FAMILY CHAOS, ATTACHMENT SECURITY, AND RESPONSIVENESS: ASSOCIATIONS WITH APPETITE SELF-REGULATION IN EARLY CHILDHOOD

BY

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DISSERTATION

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Abstract

Until recently, the majority of studies examining the etiology of excessive early childhood weight gain have focused on correlates or risk factors related to nutrition and physical activity (Woo Baidal et al., 2016). However, several promising areas for future research on obesity prevention have been identified, particularly in regards to child emotional and behavioral regulation (Lumeng, Taveras, Birch, & Yanovski, 2015), parent-child attachment relationships (Frankel et al., 2012), and the family context (Fiese & Bost, 2016; Woo Baidal et al., 2016). This is the first set of studies to examine how attachment and individual characteristics inform the development of appetite self-regulation, within the context of the family system.

Study 1. The first study aimed to identify whether there are domain-specific or domain-general associations between feeding and emotional responsiveness, and appetite and non-appetitive self-regulation. Few studies have assessed whether appetite self-regulation is subsumed as an undifferentiated aspect of overall self-regulation, or if it is a distinct characteristic with variation unexplained by general behavioral self-regulation. Similarly, although theoretical literature posits that feeding responsiveness is one component of responsive parenting generally, no empirical studies have examined whether it is truly differentiated from emotional responsiveness in the mealtime context. Confirmatory factor analyses were applied to observational and self-report data collected from a subsample of families (n = 110) of 18-24 month old children in the larger STRONG Kids 2 (SK2) Birth Cohort Project (N = 451). Findings indicate that responsiveness is a domain-specific construct, but that appetite self-regulation may be one dimension of a higher-order domain-general construct of overall self-regulation. Appetite self-regulation was distinct, but highly related to children's non-food related executive functioning. Feeding responsiveness was distinct from emotional responsiveness, and self-reported emotional responsiveness was distinct from emotional responsiveness observed during mealtimes. These findings highlight the importance of specificity in context and measurement.

Study 2. The second study aimed to examine associations between maternal attachment, family factors (household chaos, distractions, family mealtime routines), and maternal responsiveness. Structural equation modeling techniques were applied to observational and self-report data collected from the subsample of families in the SK2 project (n = 110), to assess direct, indirect, and interactive effects of family and attachment factors on responsiveness. More household chaos was associated with less feeding and self-reported emotional responsiveness. More maternal mealtime distractions were associated with less observed emotional responsiveness. Regarding interactive effects, mothers who were more distracted at mealtimes and highly insecure engaged in less observed emotional responsiveness. However, more household chaos was associated with less self-reported emotional responsiveness only among very secure mothers; very high levels of attachment insecurity attenuated these effects.

Study 3. The third study aimed to examine direct, indirect, and interactive associations between family factors, attachment, and appetite self-regulation in early childhood. Path analyses were applied to observational and self-report data collected from the subsample of families in the SK2 project (n = 110), to assess direct, indirect, and interactive effects of family factors, attachment, and responsiveness on child appetite self-regulation. Family factors (high chaos, few routines) were directly—but not indirectly via responsiveness—associated with child appetite dysregulation. Routines were associated with child appetite dysregulation among children of mothers who were highly insecure. Chaos was associated with appetite dysregulation among children of mothers who reported less emotional responsiveness.

Family and attachment factors play an important role in promoting parent responsiveness and child appetite dysregulation. These studies provide a window into the ways that these processes may influence child health. Together, findings point to a need to consider the multifaceted nature of risk and resilience, and specificity in measurement and conceptualization for future studies. This study contributes nuance to the literature on self-regulation and responsiveness, and specificity to our understanding of how individual differences in appetite self-regulation develop in early childhood. The long-term aim of this program of research is to develop recommendations for interventions designed to prevent childhood obesity.

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Chapter One: Integrated Introduction

In 2001, the U.S. Surgeon General released a call to action to prevent the incidence and decrease the prevalence of overweight and obesity in the United States (Office of the Surgeon General of the United States, 2001). In 2003, the American Academy of Pediatrics published a policy statement identifying childhood obesity as the most pressing public health issue in the United States, along with a series of recommendations for prevention (Krebs, Jacobson, & the American Academy of Pediatrics Committee on Nutrition, 2003). Of the thirteen key recommendations, five explicitly identified the family as a target for intervention. Reports from other organizations followed (American Public Health Association, 2010; White House Task Force on Childhood Obesity, 2010). Each stressed the importance of drawing on research from multiple disciplines to address childhood obesity across multiple levels of influence, from cell to society, with a particular focus on strengths and barriers to health behavior implementation among families with young children. Indeed, the family has been consistently identified as a critical context and unit-of-analysis for the study of childhood obesity etiology, prevention, and intervention (Fiese & Bost, 2016), and is the first and most consistent context in which children are socialized around food and weight (Larson, Branscomb, & Wiley, 2006). For decades, researchers have evaluated how families shape and guide child eating behavior, in efforts to identify risk and protective factors for childhood obesity (Bruch & Touraine, 1940; Costanzo & Woody, 1985). In this vein, the primary aim of this dissertation is to examine how individual differences in eating behavior emerge, in the context of individual, parent, and familial influences.

Self-Regulation and Responsiveness: Domain-Specific or Domain-General Constructs?

One factor that has come under intense scrutiny in relation to childhood obesity in recent years is child self-regulation. According to PsycINFO, from the years 2000-2009 only 18 peer-reviewed journal articles included the key terms “self-regulation” and “obesity” or “overweight” in their abstracts. The number of studies including those key terms had risen to 177 by the beginning of the year 2018, and continued to increase rapidly. Based on this trend, it is unsurprising that child self-regulation was identified as a key area for future research in a systematic review commissioned by the National Institute of Diabetes and Digestive and Kidney Diseases (Lumeng, Taveras, Birch, & Yanovski, 2015).

Self-regulation involves an individual engaging in purposeful, goal-oriented control over cognitions, behaviors, or emotions (Bernier, Carlson, & Whipple, 2010; Bridgett, Burt, Edwards, & Deater-Deckard, 2015). Interactions between parents’ behaviors and children’s innate tendencies toward inhibition, surgency, and effortful control inform the rapid development of self-regulation during the first two years of life (Bernier, Beauchamp, Carlson, & Lalonde, 2015; Eisenberg & Sulik, 2012; Kochanska, Philibert, & Barry, 2009). During the same developmental period, children are also exposed to a rapidly changing food environment, are eating an increasingly varied diet, and behaving according to a progressively more structured schedule (Anzman, Rollins, & Birch, 2010; Birch, 1999; Birch & Anzman, 2010; Birch & Davison, 2001).

Links between self-regulation and obesity have prompted researchers to critique and investigate the theoretical and empirical associations between general self-regulation and appetite self-regulation. If general self-regulation can be operationalized as the goal-oriented control of behavior, thought, and emotion, then appetite self-regulation should be operationalized in parallel as the goal-oriented control of eating behavior (Hughes, Power, O'Connor, & Fisher, 2015; Johnson, 2000; Saltzman, Fiese, Bost, & McBride, 2017; Young-Hyman, 2017). Like general self-regulation, appetite self-regulation can involve seeking out and eating food when one is hungry (in order to meet the goal of satiating hunger), and not eating or ceasing food consumption when one is full (in order to meet the goal of not becoming too full or uncomfortable, saving food for another time, etc.). As one side of the energy balance equation (the other involving energy expenditure), optimal appetite self-regulation and energy intake is clearly a key component of healthy growth and weight maintenance. However, research on the associations between self-regulation and weight in early childhood is foundationally limited because there are inconsistent patterns of association between general and appetitive self-regulation. For example, one study found that only appetite self-regulation—but not general self-regulation—was associated with body mass index (BMI) z-scores in a diverse sample of low income preschoolers (Hughes et al., 2015). Measures of executive functioning, effortful control, and delay of gratification were not associated with child weight, whereas the gold-standard assessment procedure for child appetite self-regulation (a laboratory-based task assessing eating in the absence of hunger) was strongly associated with weight outcomes. By using laboratory tasks that emerged from multiple sub-disciplines of psychology, this study carefully avoided conflating measures of effortful control with executive functioning (Hughes et al., 2015). However, other studies have found that only specific domains of general self-regulatory skills may be related to child weight outcomes in toddlers (Miller, Rosenblum, Retzloff, & Lumeng, 2016). Miller and colleagues (2016) found that non-appetitive emotion self-regulation was associated with appetitive emotion self-regulation, but the same was not true for non-appetitive and appetitive *behavioral* self-regulation. This study's findings correspond to those in cognitive psychology, which emphasize the differential correlates and consequences of "hot" (emotional) and "cool" (non-emotional) executive functions (Groppe & Elsner, 2015; Miller et al., 2016; Tan & Holub, 2011). Confirmatory factor models are needed to evaluate whether appetite and general self-regulation are related to separate domain-specific latent constructs, or to a single underlying latent construct of domain-general self-regulation.

Although child characteristics like self-regulation clearly influence weight outcomes, the importance of parents' influence over the home food environment and the development of self-regulatory skills—all of which have also been independently linked to child weight outcomes—cannot be overstated

(Anzman et al., 2010; Bernier et al., 2010; Birch & Anzman, 2010; Birch & Davison, 2001; Kochanska et al., 2009). Parents shape children's general self-regulatory skill development by serving as models and external regulators for children's emotions and behaviors (Bernier et al., 2015, 2010). Attachment theory suggests that this process is an evolutionary mechanism designed to increase offspring survival and promote healthy development (Simpson & Belskey, 2008). When infants express negative emotion, they activate a two-pronged biobehavioral attachment system designed to first increase proximity to a caregiver, and second, to prompt the caregiver to alleviate negative emotion by comforting or removing the child from the distressing stimulus (Ainsworth, 1979; Ainsworth & Bell, 1970; Bernier et al., 2015; Bowlby, 2008). Parents who respond with warmth and sensitivity to children's negative emotions can help children learn and implement a variety of healthy emotional, cognitive, and behavioral skills. These skills will allow children to regulate themselves in later life. There is a substantial amount of literature linking parent emotional responsiveness, child attachment security, and child self-regulation (Bernier et al., 2015; Bernier, Carlson, Deschênes, & Matte-Gagné, 2012; Bernier et al., 2010; Calkins & Fox, 1992).

Caregiving may be just as important for appetite self-regulation as it is for general self-regulation (Anzman et al., 2010; Birch & Davison, 2001; Birch, 1999; Costanzo & Woody, 1985; Horst & Sleddens, 2017; Lumeng et al., 2015). Food-related parenting practices such as using food to soothe children's negative emotions, restricting children's access to types or amounts of food, or pressuring children to eat past the point of satiety have all been linked to aberrant appetite-self-regulation (Hardman, Christiansen, & Wilkinson, 2016; Hittner, Johnson, Tripicchio, & Faith, 2016; Joyce & Zimmer-Gembeck, 2009; Loth, MacLehose, Fulkerson, Crow, & Neumark-Sztainer, 2014; Stifter, Anzman-Frasca, Birch, & Voegtline, 2011). Common among these practices is the motif of non-responsiveness to children's developmental, nutritional, or emotional needs. Indeed, there is active debate about whether feeding responsiveness is just one facet of an overall pattern of responsive parenting, and it does not help that there is a lack of consistent operational definitions and measurement instruments differentiating food-related and general parenting practices (Black & Aboud, 2011; Hughes et al., 2013; Kremers et al., 2013; Timperio & Fulkerson, 2014; Vollmer & Mobley, 2013). This debate is complicated even further by recent studies showing that emotional responsiveness and feeding responsiveness may uniquely contribute to child eating and weight outcomes (Bost et al., 2014; Faber & Dubé, 2015; Faber, Dubé, & Knäuper, 2018; Hardman et al., 2016; Saltzman, Pineros-Leano, Liechty, Bost, & Fiese, 2016). Empirical studies evaluating the domain-specificity and domain-generality of responsiveness are needed, as another step toward understanding the etiology of child appetite self-regulation.

Caregiving in Context: Do Attachment and Family Factors Interact in Relation to Responsiveness?

Regardless of whether feeding and emotional responsiveness are distinct or combined, responsiveness is a promising modifiable risk factor for obesity prevention (for examples, see responsiveness interventions in Aboud, Shafique, & Akhter, 2009; Savage, Birch, Marini, Anzman-Frasca, & Paul, 2016). Therefore, it is critical to understand the etiology of responsiveness as well, in order to identify whether there are certain risk or resilience factors that can promote these healthy parent-child interactions. According to attachment theory, parent responsiveness develops as a result of interactions between an individual's past and current experiences in close relationships (Ainsworth, 1979; Bowlby, 1982; Main, Kaplan, & Cassidy, 1985; van IJzendoorn, 1995). Parents exposed to warm and responsive caregivers themselves can create mental representations of the processes inherent to healthy relational interactions (Grossman, Grossman, & Kindler, 2006; Guttmann-Steinmetz, Steiner, & Waters, 2003; Waters, Rodrigues, & Ridgeway, 1998; Waters & Waters, 2006). Consistent parent responsiveness allows children to develop healthy expectations for their own and others' behaviors in close relationships, which in turn promotes the development of secure base behaviors (Bowlby, 1982, 2008; Bretherton, 1992; van IJzendoorn, 1995). In contrast, parents who are not consistently responsive have children who may not engage in secure base behaviors, in part because they do not expect others to respond to their negative emotions in warm, predictable, or sensitive ways (Ainsworth, Blehar, Waters, & Wall, 1978; Davidov & Grusec, 2006; Denham, 1993; Groh et al., 2015). These memories eventually coalesce into an evolutionarily adaptive mental representation—an internal working model of attachment—built and revised as individuals collect and organize their experiences and subsequent expectations for interactions in close relationships (Bowlby, 1982; Bretherton, 1999).

Thus, it is important to remember that parents—like children—are embedded in the context of past experiences in their family of origin, as well as the current family system. Although childhood experiences in attachment relationships are associated with adult attachment and responsiveness, these effects can be moderated by other factors external to the parent-child dyad (Cowan, 1997; Stevenson-Hinde, 1990). For example, in a study of two-parent military families where one parent had experienced adverse childhood experiences (a close correlate to attachment insecurity), having another parent who had positive childhood experiences buffered the family from negative effects on children's perceptions of responsive parenting (Oshri et al., 2015). Taking a strengths-based perspective informed by family systems theory has the added benefit of acknowledging that parent-child dyads are one subsystem of several embedded and acting within the larger family system.

This approach begs the question: Which factors in the family system can buffer or exacerbate the effects of attachment insecurity on responsiveness? Family mealtimes provide a window into daily family life, and provide an opportunity for researchers to observe whether certain food- and non-food related family processes are linked to parent and child behavior, such as mealtime distractions, mealtime routines, and overall household chaos (Fiese, Foley, & Spagnola, 2006; Fiese, Winter, & Botti, 2011; Larson et al., 2006). In regards to mealtime distractions, an experimental study that compared family interactions during a chaotic family meal—characterized by extraneous noise—and a control meal, found that parents were more likely to get distracted and less likely to engage in interpersonal communication during the chaotic meal (Fiese, Jones, & Jarick, 2015). More family mealtime routines may also be associated with increased responsiveness at mealtimes. Parents with more family mealtime routines are less likely to use food as a reward (Anderson, Must, Curtin, & Bandini, 2012), and parents with more routines in general report feeling more competent (Fiese et al., 2002; Sprunger, Boyce, & Gaines, 1985). Parenting competence, in turn, is associated with more responsiveness (Gondoli & Silverberg, 1997). Finally, household chaos has well-documented effects on parenting and child self-regulation (Coldwell, Pike, & Dunn, 2006; Dumas et al., 2005; Vernon-Feagans, Garrett-Peters, Willoughby, & Mills-Koonce, 2012; Vernon-Feagans, Willoughby, Garrett-Peters, & The Family Life Project Key Investigators, 2016). High levels of instability and disorganization in the home may make it more difficult for parents to respond sensitively to their children's developmental and emotional needs.

Together, there is consistent evidence to suggest that family factors—such as general household chaos, and more specific behaviors like routines and distractions that are more proximal to mealtimes and food-related interactions—may affect parenting behaviors in general. However, little research has evaluated whether family factors can serve as a buffer against the negative effects of parent attachment insecurity on responsiveness, despite the fact that resilience frameworks have long promoted use of strengths-based approaches to evaluating parent and child outcomes (Easterbrooks, Chaudhuri, Bartlett, & Copeman, 2011; MacPhee, Lunkenheimer, & Riggs, 2015; Masten, 2011; Oshri et al., 2015). Furthermore, the issue of domain-specificity and domain-generality in relation to feeding and emotional responsiveness persists, because it is still unclear whether both types of responsiveness are affected by past and current family experiences and dynamics. By evaluating the effects of familial processes on parent-child interactions around food and eating, researchers may be able to identify modifiable, protective factors that affect parent responsiveness and, ultimately, child outcomes. Measuring and evaluating effects on different types of responsiveness will ensure that findings and subsequent recommendations for future research are precise, and highlight implications for programs designed to promote specific parent and child outcomes.

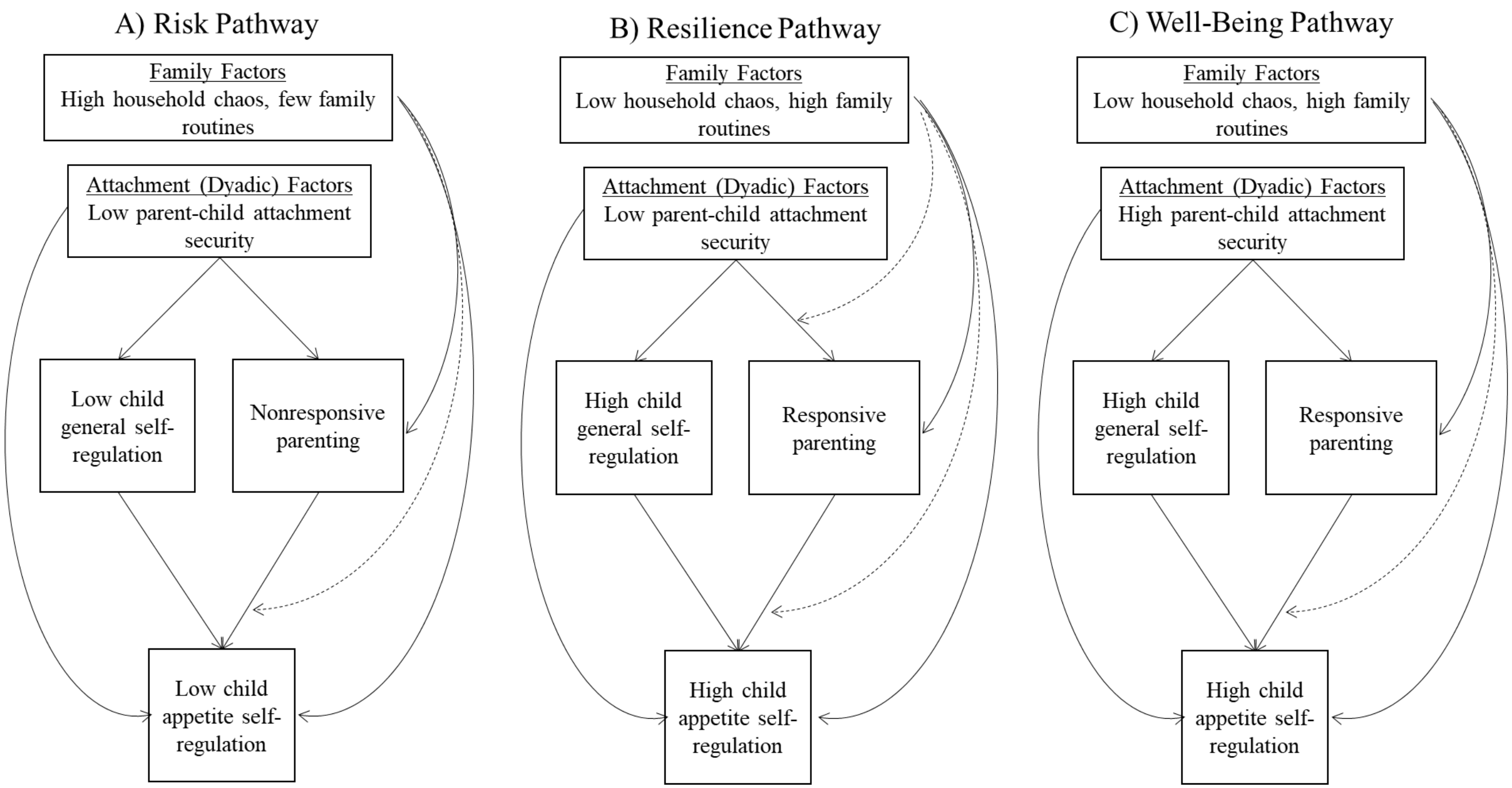
Pathways to Appetite Self-Regulation: Effects of Attachment, Family Factors, and Responsiveness

To outline the chapter so far, key issues regarding domain-specificity and domain-generality were discussed in relation to the literature on self-regulation and responsiveness in food- and non-food related contexts. Then, the literature describing independent effects of past and current family experiences on responsive parenting was highlighted; studies are clearly needed to investigate the interactive effects of attachment and family processes on responsiveness. Finally, the aim of this section is to synthesize prior research and present testable hypotheses about pathways of risk, resilience, and well-being toward child appetite self-regulation.

As discussed previously, by integrating attachment and family systems theories, a shared theoretical framework emerges that contextualizes self-regulatory skill development within the parent-child relationship, which in turn is embedded within the family as a whole (Saltzman et al., 2017). Family factors (e.g, household chaos, family mealtime routines) and parent attachment have been linked independently to child self-regulation (Anderson, Sacker, Whitaker, & Kelly, 2017; Berry et al., 2016; Coldwell et al., 2006; Cole, Musaad, Fiese, Lee, & Donovan, 2016; Ferretti & Bub, 2014; Hardman et al., 2016; Powell, Farrow, Meyer, & Haycraft, 2017; Powell, Frankel, Umemura, & Hazen, 2017). However, these factors are also associated with parent responsiveness (as reviewed in the previous section), and there is some evidence that suggests that household chaos may interact with parenting to additively influence children's general self-regulation (Coldwell et al., 2006; Vernon-Feagans et al., 2012, 2016).

The Risk pathway of this theoretical framework (Figure 1, Path A) suggests that family (e.g., high levels of household chaos, few mealtime routines) and maternal attachment factors (e.g., internal working model of attachment, adult attachment orientation) will be directly, interactively, and indirectly—via parent responsiveness—associated with poorer child appetite self-regulation. In contrast, the Wellbeing pathway (Figure 1, Path C) suggests that positive family and attachment factors may be associated with better appetite self-regulation. The resilience pathway (Figure 1, Path B) describes how risk factors can be buffered by the presence of protective factors in either the parent-child relationship or the family as a whole. Theories of biobehavioral resilience suggest that individuals exposed to adversity in early life can cope and even thrive by seeking out and attaining help from other environmental protective factors (Masten, 2011; Rutter, 2012). Resilience is a "normal" (not extraordinary) adaptive process that promotes healthy child development despite less-than-ideal circumstances by disrupting negative cascades of adaptive behavior in adverse environments, and by initiating positive developmental cascades toward more optimal outcomes (Masten, 2001; Masten & Cicchetti, 2010). For example, in a sample of low-income Black children of single mothers, protective factors (e.g., family routines, parenting support from neighbors) served as a buffer from the negative effects of risk factors (e.g., maternal neuroticism, negative life events) for child self-regulation (Murry & Body, 1999). Routines and positive parenting have been independently linked to self-regulation in low-income children (Brody, Murry, Kim, & Brown, 2002; Ferretti & Bub, 2014), suggesting that these factors may be protective for children exposed to adversity.

Figure 1. Pathways of risk, resilience, and wellbeing toward child appetite self-regulation.



Note. Figure adapted from "Development of appetite self-regulation: Integrating perspectives from attachment and family systems theory" by J. A. Saltzman, K. K. Bost, B. H., Fiese, & B. A. McBride, (2017) *Child Development Perspectives*, *12*(1), p. 53, Copyright 2017 by the Authors. Adapted with permission.

Although parent-child attachment sets the foundation for later self-regulation, longitudinal studies find that attachment does not unilaterally cause or predict self-regulatory outcomes without contributions from external factors. Relationships and variables external to the parent-child dyad may also affect parenting and subsequent child outcomes. As discussed previously in the example of military families with at least one parent who had experienced adversity in childhood, the presence of a buffering parent can mitigate negative effects of the other parent's adversity on responsive parenting (Oshri et al., 2015). A longitudinal study found that low levels of household chaos were associated with more responsive parenting, which in turn was associated with more optimal child self-regulation in a sample of 36-month old children living in poverty in the United States (Vernon-Feagans et al., 2016). Beyond the effects of sociodemographic characteristics and maternal mental health, self-regulation among children in Head Start was bolstered when families engaged in household routines around sleep, reading, and playtime (Ferretti & Bub, 2014). Indeed, when low-income mothers are asked about family mealtimes, they report that their childhood mealtime experiences—whether positive or negative—informed their current desires to have healthy family meals with their children, but that structural and organizational barriers (e.g., chaos, distractions, and lack of help) prevented them from putting plans into action (Herman, Malhotra, Wright, Fisher, & Whitaker, 2012; Malhotra et al., 2013). Despite their own experiences with early adversity, some parents may seek avenues to resilience by implementing routines, reducing household chaos, or engaging in responsiveness in efforts to give their children more opportunities to thrive. However, few—if any studies—have empirically examined resilience in regards to child appetite self-regulation, despite calls for a resilience-informed approach to addressing obesity in early childhood (Sigman-Grant, Hayes, VanBrackle, & Fiese, 2015).

Current Studies

In summary, there are three key limitations in the current literature on the development of appetite self-regulation, that the current studies aim to address. First, it is unclear whether appetite self-regulation is subsumed as an undifferentiated aspect of overall self-regulation, or if it is a distinct characteristic with variation unexplained by general behavioral self-regulation. Similarly, although theoretical literature posits that feeding responsiveness is one component of responsive parenting generally, no empirical studies have examined the underlying factor structure of these related constructs. Therefore, the first research question is: Are there domain-specific or domain-general associations between emotional and feeding responsiveness, and general and appetitive self-regulation?

Second, although responsiveness—regardless of whether it is feeding responsiveness or emotional responsiveness—is associated with self-regulation, few studies have examined the contextualized relationships between modifiable risk and protective factors for this critical parenting behavior. Specifically, little research has examined whether associations between attachment and responsiveness can be exacerbated or buffered by family-level factors, such as household chaos, mealtime routines, or family mealtime distractions. Thus, the second research aim is to discern the independent, indirect, and interactive associations between attachment and family factors with parent emotional and feeding responsiveness.

Finally, disparate literature has shown that family factors, parent-child attachment, and responsiveness are independently associated with child self-regulation, and—in some cases—with child appetite self-regulation. A framework integrating attachment and family systems theories points to three testable hypotheses about pathways of risk, resilience, and well-being toward child appetite self-regulation (Saltzman et al., 2017). In order to understand the development of child appetite self-regulation, the final research question aims to evaluate how attachment and family factors directly, indirectly—via responsiveness—and interactively are associated with child appetite self-regulation. Embracing complexity in these interactions will ensure that researchers are systematically identifying risk and protective factors in specific contexts, and creating a more holistic framework for the development of early child appetite self-regulation.

Chapter Two: Confirmatory Factor Analyses to Examine Domain-Specific and Domain-General Models of Appetite Self-Regulation and Feeding Responsiveness

Literature Review

Obesity and self-regulation. Until recently, the majority of studies examining the etiology of excessive early childhood weight gain have focused on correlates or risk factors related to nutrition and physical activity (Woo Baidal et al., 2016). However, research that examines links between interpersonal factors and health outcomes has identified promising areas for future research. A systematic review from a multidisciplinary team commissioned by the National Institute of Diabetes and Digestive and Kidney Diseases identified several promising avenues of exploration regarding causes and consequences of childhood obesity, including infant emotional and behavioral regulation (Lumeng, Taveras, Birch, & Yanovski, 2015). Emotional and behavioral dysregulation have been linked to greater risk for excessive weight gain in early childhood (Anderson & Keim, 2016; Graziano, Calkins, & Keane, 2010). Given the difficulty in differentiating between emotional and behavioral regulation among young children—as regulation is observable, where emotions are not—developmental scientists often subsume these processes as part of overall self-regulation at this early stage in development (Campos, Frankel, & Camras, 2004; Eisenberg & Sulik, 2012). Although self-regulation is broadly defined as the goal-oriented organization of behavior, emotion, or attention (Bridgett, Oddi, Laake, Murdock, & Bachmann, 2013), few studies have tackled the question of whether *appetite* self-regulation can also be subsumed as part of overall self-regulation, particularly among young children.

Appetite self-regulation can be defined as the degree to which an individual eats, or does not eat, in response to hunger and satiety (Saltzman et al., 2017). Unsurprisingly, low levels of appetite self-regulation are also related to excessive weight gain and high weight outcomes in childhood (Fisher & Birch, 2002; Hughes et al., 2015). A small body of literature has begun to explore whether and how appetite self-regulation and general self-regulation differentially affect child weight. A cross-sectional study found that only appetite self-regulation—but not general, non-food related self-regulation—was related to body mass index (BMI) z-score in a sample of low income Hispanic preschoolers (Hughes et al., 2015). Using a hierarchical regression approach, the researchers found that general self-regulation measures—executive functioning, effortful control, and delay of gratification—did not contribute to child weight, even before entering measures of appetite self-regulation into the model. Furthermore, they found few associations across the two domains of self-regulation, despite the fact that they used multiple, high-quality observational and parent-report measures to assess both constructs. Another cross-sectional study found that appetitive emotional, appetitive behavioral, and non-appetitive emotional self-regulation—but not non-appetitive behavioral self-regulation—were associated with healthier weight in toddlers (Miller et al., 2016). Additionally, non-appetitive emotion self-regulation was associated with appetitive emotion self-regulation, but neither were associated with appetitive- or non-appetitive behavioral self-regulation. Specific types of non-appetitive self-regulation skills may have differential effects on appetite self-regulation or weight. Indeed, "hot" self-regulatory skills—involving affective states, like delaying gratification or inhibiting a desirable behavior—are more consistently linked to eating behaviors and weight outcomes, than "cool" self-regulatory skills—involving abstract cognitive and behavioral challenges without an emotional context (Groppe & Elsner, 2015; Miller et al., 2016; Tan & Holub, 2011).

It is important to note that research examining the interconnections between appetite, emotional, and behavioral self-regulation has almost exclusively used either correlation- or regression-based approaches to assess independent and—in some cases—interactive effects on childhood obesity. Clearly, emotional—but perhaps not cognitive or behavioral—self-regulation is strongly associated with appetite self-regulation, regardless of whether a situation involves food or appetite. However, developmental scientists have long observed that emotional, cognitive, and behavioral self-regulation are difficult to differentiate in early childhood (Campos et al., 2004; Eisenberg & Sulik, 2012). Needed are confirmatory factor analyses and structural equation models to quantify the degree to which appetite, emotional, and cognitive/behavioral self-regulation contribute to (an) underlying latent factor(s).

Responsiveness, obesity, and self-regulation. Self-regulatory skills do not develop in a vacuum, but rather as a result of a combination of internal and external influences. The interactions between parents and children in early life influence child self-regulation by providing an external source of regulation for children's emotions and behaviors (Eisenberg & Sulik, 2012). For example, the sensitivity of caregivers' responses to infant's cues of distress is related to children's later self-regulatory capacities (Fabes, Leonard, Kupanoff, & Martin, 2001). Attachment theory describes how these processes evolved in humans to increase children's chance of survival, and suggests that the parent-child relationship plays an important role for the development of child self-regulation (Ainsworth, 1979; Bowlby, 1982). Attachment theorists posit that self-regulation develops a result of the interactions between children's temperamental characteristics and caregivers' responses to children's cues of distress (Schore & Schore, 2007). Warm, sensitive, and contingent parental responses allow infants to gradually shift from passively receiving external regulation, to learning and developing a repertoire of emotional and cognitive/behavioral tools that allow them to self-regulate later in life (Bernier et al., 2010; Calkins & Fox, 1992).

Although it is clear that attachment is important for general self-regulation, literature on the link between attachment and appetite self-regulation is limited for a number of reasons. First, most studies examining links between responsiveness—generally defined as the degree to which parents respond to children's cues of distress—and child appetite self-regulation have focused on responsiveness to *emotion* in general. However, compelling empirical evidence and theoretical arguments have emerged to suggest that responsiveness to *hunger and satiety*—particularly in the mealtime context—also affects child eating behavior (Black & Aboud, 2011; DiSantis, Hodges, Johnson, & Fisher, 2011; Saltzman et al., 2016). Again, a question regarding domain-specificity and domain-generality of a behavior prevents researchers and practitioners from targeting specific behaviors in exploratory and intervention studies.

Systematic reviews and theoretical articles have debated whether responsive parenting in general and responsive feeding are—or are not—distinct constructs (Black & Aboud, 2011; Vollmer & Mobley, 2013). Operational definitions and equivalent measurement instruments that differentiate food-related parenting from general parenting practices are sorely needed (Hughes et al., 2013; Kremers et al., 2013; Timperio & Fulkerson, 2014). The few studies that have examined contributions of both emotional and feeding responsiveness to child eating and weight outcomes have primarily used path analysis approaches. For example, one study found direct and indirect associations between parent attachment security, emotional responsiveness, and feeding practices, and child food consumption using a serial mediation model (Bost et al., 2014). Another found evidence to suggest that the intergenerational transmission of appetite self-regulation might be mediated—in part—by both emotional and feeding responsiveness (Saltzman et al., 2016). In the latter study, emotional responsiveness exerted a significant direct effect on child weight outcomes, beyond the effects of parent feeding responsiveness. Theoretical arguments suggest that emotional and feeding responsiveness are related—but distinct—constructs subsumed under the umbrella of general "responsive parenting," no studies have yet examined this hypothesis empirically.

Current study. It is currently unclear whether appetite self-regulation is subsumed as an undifferentiated aspect of overall self-regulation, or if it is a distinct characteristic with variation unexplained by general behavioral self-regulation. Similarly, although theoretical literature posits that feeding responsiveness is one component of responsive parenting generally, no empirical studies have examined whether it is truly differentiated from emotional responsiveness in the mealtime context. Given these gaps in the literature, the current study has two primary aims.

The first aim is to quantify whether self-regulation can be assessed as a domain-specific or domain-general construct, by examining the underlying factor structure of appetite, and non-appetitive emotional, cognitive, and behavioral self-regulation in early childhood. There is neurological and behavioral evidence to suggest self-regulation is relatively undifferentiated until the second year of life (Bridgett et al., 2015; Zhou, Chen, & Main, 2012), suggesting that an integrated model of self-regulation in young children may be appropriate. However, to date, no studies have assessed whether appetite self-regulation can be subsumed in this integrated model using a factor analysis framework. Therefore, three factor structures seem possible. One might be a *domain-general* model of self-regulation, with manifest indicators of appetite, cognitive/behavioral, and emotional self-regulation contributing to the variance of a latent variable indicating general self-regulation. The second would be a *domain-specific* model, with indicators of appetite self-regulation loading onto one factor, and measures of emotional and cognitive/behavioral self-regulation loading onto a distinct, but related factor. The third potential model would be a *higher-order domain-general* model, with a framework identical to the domain-specific model, but which also involves the two separate dimensions of self-regulation being predicted by a third, higher-order domain-general model.

The second aim is to quantify whether responsiveness can be assessed as a domain-specific or domain-general construct, by examining the underlying factor structures of parent feeding and emotional responsiveness. Some empirical studies have found that these constructs have differential effects on child weight in early life (Bost et al., 2014; Saltzman et al., 2016; Vollmer & Mobley, 2013), suggesting that these too may be distinct, but related constructs. Therefore, we will again test three factor structures. One will have indicators of feeding and emotional responsiveness loading onto the same latent "general responsiveness" variable. One will be the domain-specific factor structure, with indicators of feeding and emotional responsiveness loading onto two separate latent variables. The last model would involve the higher-order domain-general model, the two separate lower-order latent variables (feeding and emotional responsiveness) loading onto a third higher-order general responsiveness variable.

Secondarily, we will examine associations between the identified latent variables, in order to assess whether and how responsiveness and self-regulation are linked. The overall objective of this study is to examine whether there are domain-specific or domain-general associations between aspects of responsiveness and aspects of self-regulation. Achieving this objective will point to specific targets for intervention and prevention programs in the future, and answers several calls for evidence-based, operational definitions of responsiveness and self-regulation in food- and non-food related constructs (Hughes et al., 2013; Kremers et al., 2013; Vollmer & Mobley, 2013).

Methods

Participants and recruitment. The STRONG Kids 2 (SK2) Longitudinal Birth Cohort (N = 451) recruited families from centers, clinics, and birthing classes in East Central Illinois on a rolling basis from 2014 to 2017. Participants in the current study are families (n = 110) who are participating in a home visit sub-study designed to examine family interactions around mealtimes and early childhood self-regulation (SK2 Protective Parents). Families are eligible for this study if the target child is between the ages of 18 and 24 months, and if the family consents to a 2-hour home visit. Recruitment involved sending newsletters and fliers to eligible families, with phone-call follow-ups from a trained research assistant. Demographic characteristics are reported in Table 1.

Table 1. Home visit sample (n = 110) characteristics.

	N	%	*M*	*SD*	*Range*
Parent age at 6 weeks (years)			30.90	4.47	19.09 - 45.23
Child gestational age at birth (weeks)			39.57	1.27	37.00 - 42.29
Child age at home visit (months)*			20.97	2.73	17.80 - 34.90
Child Gender					
Female	57	51.40			
Male	53	47.70			
Breastfeeding					
Breastfeeding exclusivity at 3 months	74	67.90			
Any breastfeeding at 12 months	47	43.10			
Marital status					
Married	94	84.70			
Single	9	8.10			
Co-habiting	3	2.70			
Divorced	1	0.90			
Government benefits					
Receiving SNAP/Link	5	4.50			
Received WIC for baby	11	10.00			
Receiving WIC for Mom	15	13.60			
Monthly Income					
Less than $3,000	30	29.00			
$3,000 - $6,000	47	45.00			
More than $6,000	23	20.70			
Employment Status					
Employed/Self-Employed	79	71.80			
Unemployed	6	5.50			
Stay at home parent	20	18.20			
Student	1	0.90			
Parent education					
High school graduate	1	0.90			
Some college or technical school	21	19.10			
College graduate	40	36.40			
Post-graduate work	45	40.90			
Parent race/ethnicity (not mutually exclusive)					
White	89	80.90			
Black	8	7.30			
Asian	7	6.40			
American Indian/Alaska Native	1	0.90			
Hispanic/Latino	3	2.70			
Biracial	5	4.50			

Note.
*One child was 34.90 months old during the home visit. All other children were between 17.80 and 28.60 months old.

Home visit procedure. All home visits were conducted by two trained observers on weekday evenings according to the family's availability and schedule. During home visits, observers first explained the procedure for the visit, and then attained written and informed consent from parents to video-record the family mealtime and the child self-regulation tasks. The video camera was set up facing the target child during the mealtime, and the observers left the house to wait outside throughout the duration of the meal. Parents were instructed to tell the observers when the meal was finished. At the end of the visit, parents were given $75.00 in remuneration and children were given a toy.

Mealtime coding procedures. Mealtime videos were uploaded to a secure server and linked only to the participating family's ID number for the study. Coding occurred in several phases. First, two different graduate-level master coders were trained on the emotional responsiveness and feeding responsiveness coding schemes, using previously-collected videos (n = 7) of family mealtimes from a different study. Then, each master coder trained two undergraduate coders on their respective coding scheme. Each undergraduate coder attained adequate interrater reliability (*Intra-class correlation coefficient* $\geq$ .70) with the master coder, and with the other undergraduate coder before proceeding to the next stage post-training. Once adequate interrater reliability was attained, undergraduate research assistants began coding the videos collected for the purposes of this study. Each research assistant coded about half (n = 55) of the videos collected for this project; the master coder coded about 20% (n = 22) of videos, and overlapped equally (n = 11 videos each) with each research assistant. Coding occurred in a locked room using the INTERACT software (Mangold International, 2016). INTERACT is an observational coding software designed to code data using complex, multi-level coding schemes. Data were saved on a secure, university-owned server, and on the hard drive for each individual computer. For data management purposes, data were imported into SPSS 24.0 (IBM Analytics, 2016) after all videos were coded, but analyses were conducted with SAS 9.4 (SAS Institute, 2014).

Measures.

Feeding responsiveness. Parent feeding responsiveness has traditionally been defined as the degree to which parents attend to children's cues of satiety/hunger (Black & Aboud, 2011). Hughes and colleagues adapted the Caregiver Feeding Styles Questionnaire (CFSQ) into an observational checklist called the Feeding Behavior Coding System (FBCS; Hughes et al., 2007). The FBCS and the CFSQ are designed to assess the degree to which parents engage in responsive and demanding feeding practices (Hughes et al., 2007; Hughes, Power, Orlet Fisher, Mueller, & Nicklas, 2005). The observational checklist has been used previously with preschool-aged children (Hughes et al., 2007). Model variable statistics regarding responsiveness are presented in Table 2.

Table 2. Descriptive statistics for model variables assessing maternal emotional and feeding responsiveness

	n	*M*	*SD*	*Range*	*α (ICC)*
Maternal emotional responsiveness					
Coping with Children's Negative Emotions Scales (CCNES; 18M)					
Distress responses	106	2.55	0.59	1.25 - 3.92	0.67
Punitive responses	106	2.08	0.74	1.00 - 5.00	0.83
Minimizing responses	106	2.15	0.86	1.00 - 6.00	0.86
Emotion-focused responses	106	5.62	0.93	1.17 - 7.00	0.88
Problem-focused responses	106	5.77	0.88	1.17 - 7.00	0.89
Expressive encouragement responses	106	5.34	1.16	1.00 - 7.00	0.87
Observed maternal emotional responsiveness					
Ratio of observed sensitive responses to children's negative emotions, to total negative emotions	109	0.66	0.27	0.00 - 0.92	0.97
Ratio of observed non-sensitive responses to children's negative emotions, to total negative Emotions	109	0.08	0.16	0.00 - 0.63	0.98
Ratio of observed structuring responses to children's negative emotions, to total negative emotions	109	0.52	0.25	0.00 - 0.92	0.98
Maternal feeding responsiveness					
Caregiver Feeding Styles Questionnaire (CFSQ; 18 and 24M)					
CFSQ 18M: Feeding responsiveness	107	1.35	0.16	1.00 - 1.74	0.62
CFSQ 24M: Feeding responsiveness	98	1.29	0.14	0.95 - 1.63	0.51
Feeding Responsiveness (18-24M average)	108	1.32	0.14	0.99 - 1.68	0.72
CFSQ 18M: Parent-centered controlling feeding practices	107	1.92	0.63	1.00 - 4.00	0.60
CFSQ 24M: Parent-centered controlling feeding practices	98	1.90	0.63	1.00 - 4.00	0.60
Parent-centered controlling feeding practices (18-24M average)	108	1.91	0.57	1.00 - 4.00	0.74
CFSQ 18M: Child-centered feeding practices	107	1.38	0.49	1.00 – 3.00	0.74
CFSQ 24M: Child-centered feeding practices	107	1.67	0.57	1.00 – 4.00	0.72
Child-centered control (18-24M average)	107	1.53	0.49	1.00 – 3.13	0.82
Observed feeding responsiveness (Ratio of observed responsive to total feeding practices)	109	2.30	0.63	0.56 - 3.57	0.91

Note. ICC = Intraclass Correlation Coefficient, 18M= 18 months, 24M = 24 months

Observed feeding responsiveness. Observations of feeding responsiveness were coded using Mangold's INTERACT software (Mangold International, 2016). Coders watched mealtime videos at least once, identifying the frequency of 22 different types of responsive or demanding feeding practices as described in the FBCS. Responsive feeding practices include those that are child-centered, in which the parent's behavior is designed to teach and encourage the child to eat healthful food, while still giving the child the autonomy to choose whether or not to eat, and how much to eat. Thus, these responsive feeding practices are designed to attend to the child's cues of hunger and satiety. Examples of responsive feeding practices include allowing the child to choose which foods they eat, helping the child by cutting food, making the food interesting, and providing reasoning to the child. The original measure was created to assess the ways in which parents encourage or discourage their children to eat healthy foods. Therefore, all of the items—in some way—assess demandingness. Examples of demanding—but not responsive—feeding practices include spoon feeding the child (if not developmentally appropriate), hurrying the child, begging the child to eat, giving or offering the child second helpings, or ignoring the child. To calculate the observed feeding responsiveness score, the mean frequency of responsive feeding practices are divided by the mean frequency of all feeding practices (sum of responsive and demanding practices) that mothers use overall during the mealtime. Interpretations about parent's observed feeding responsiveness are based on this ratio. Intra-class correlation (ICC) coefficients were calculated to assess reliability across all feeding practices coded during the mealtime. Of the 109 videos, 30 (27.5%) were double coded. Inter-rater reliability was excellent (all ICCs > .90).

Parent-report of feeding responsiveness. Interpretations about parent's self-reported feeding responsiveness are based on parent's responses to 3 subscales in the Caregiver Feeding Styles Questionnaire at 18 and 24 months (CFSQ; Hughes et al., 2005). The CFSQ includes 24 items assessing the degrees to which parents engage in responsive and demanding feeding practices, and has been used with children as young as three years old (Hughes et al., 2007, 2005a). Responsive feeding practices involve those where the parent attends, or teaches the child to attend to cues of hunger and satiety, such as saying positive things about the food or arranging food in an interesting way. Seven items represented responsive feeding practices; these items were summed and divided by the sum of all items in the measure to create a ratio of responsive to demanding feeding practices. The CFSQ also includes dimensional subscales assessing parent-centered—or controlling—feeding practices and child-centered feeding practices. The parent-centered feeding practices subscale is calculated by taking the mean of three items asking about spoon-feeding the child, begging the child to eat dinner, or physically struggling with the child. The child-centered feeding practices subscale was calculated by taking the mean of six items asking about ways that parents encourage healthy eating (e.g., saying positive things about the food or the way the child is eating, describing why it is important to eat certain foods, or making changes to the food or food environment to make it more pleasant for the child). Given that reliability estimates were lower than expected for some of the subscales, scores were averaged across the 18- and 24-month survey periods. Only scores at 18 months were used for families missing data at 24 months.

Emotional responsiveness. Emotional responsiveness encompasses a pattern of warm, timely, and age-appropriate reactions to children's cues. In order to assess observed emotional responsiveness during family mealtimes, trained research assistants coded recordings of family mealtimes, using an adapted evidence-based scheme (D.O.T.S. Emotion Coding System; (Cole, Wiggins, Radzioch, & Pearl, 2007). To assess parent-reported emotional responsiveness, parents completed the Coping with Children's Negative Emotions Scale at 18 months (Fabes, Poulin, Eisenberg, & Madden-Derdich, 2002).

Observed parent emotional responsiveness. Because emotional responsiveness is contingent on the child's expression of negative emotion, we used a hierarchical coding structure in Mangold's INTERACT (Mangold International, 2016). Coders watched each video once to code maternal emotion, then again to code instances child emotion (Emotion codes) according to valence (positive or negative). Examples of positive emotion expressions include smiling or joking in mothers, and giggling or cooing in children. Examples of negative emotion expressions include furrowed brows or using a harsh tone in mothers, and crying or throwing food with an angry expression in children. Then, coders watched the video a third time to code mothers' responses to children's negative emotions. For each instance of child negative emotion expression, coders determined whether and how the mother administered a particular response behavior after the child expressed their emotions, and whether that response behavior was sensitive or not.

Six types of emotional response strategies were utilized for this coding scheme: structuring/ limit-setting, distractions, positive emotion expressions, negative emotion expressions, ignoring, and attending responses. *Structuring/ limit-setting responses* involved helping the child to manage their emotions by giving information, problem-solving, physically modifying the situation to elicit positive emotions, or giving directives. Sensitive responses were those that attended directly to the child's emotional and developmental needs. A sensitive response might involve the child being sad about a broken toy, and the parent getting the child a tissue, placing the tissue gently on the child's nose, and saying something like, "It's ok, please blow your nose." A non-sensitive response to the same situation might involve the parent abruptly fixing the toy, saying "there, it's fixed," and walking away. *Distraction responses* involve purposefully redirecting the child's attention away from something causing negative emotion. A sensitive example might involve the child being upset over not being able to play with a toy at the mealtime, and the parent responding by discussing how their food tastes and looks to divert the child's attention to their plate. A non-sensitive example might involve the parent intrusively pushing the child's plate toward them and saying, "forget the toy, you need to eat your food." *Positive emotion responses* to children's negative emotions involve expressing positive emotions, initiating physical affection toward the child, or responding to the child's bid for physical contact. A sensitive example might involve the child poking themselves with a utensil, and the parent responding by kissing the spot to make it feel better. A non-sensitive example might involve the parent responding to the child's negative emotions by laughing at the child and telling them it was not a big deal. *Negative emotion responses* might involve parent distress (the parent becomes upset upon seeing the child's negative emotion) or punishment. A sensitive example might involve the child hurting themselves, and the parent responding by looking worried and expressing their concern. A non-sensitive example might involve the parent responding by expressing clear frustration, exasperation, threatening or implementing a punishment to the child. *Attending responses* involve sustained but relatively brief moments of parental attention to the child's negative emotion with little to no action. A sensitive example might involve hearing the child whimper or shriek, and the parent responding by looking up briefly to assess the situation and saying nothing or a brief statement (e.g., "oops, it's ok"). A non-sensitive example might involve the parent looking up, sighing, and saying "Oh, please." Finally, *ignoring responses* involve either an absent response from the parent, or the parent not being present at the time of the negative emotion. Sensitive and non-sensitive ratings for ignoring were not given, because the code was defined by the absence of a behavior. Total number of emotional responses was scored as the sum of all responses, except for ignoring responses. Mothers' emotional responsiveness will be scored as a continuous, count variable, based on the frequency of sensitive strategies observed during the mealtime, divided by the total number of emotional responses. Of the 109 videos, 30 (27.5%) were double coded. Inter-rater reliability was excellent for all emotion codes, emotion response codes, and sensitivity codes (all ICCs > .90).

Parent-reported emotional responsiveness. Interpretations about parent's self-reported emotional responsiveness are based on subscales from the Coping with Children's Negative Emotions Scale (CCNES; Fabes et al., 2002). The CCNES is a 72 item measure that uses 12 vignettes with 6 items per vignette, describing scenarios where children express negative emotions and parents' responses to those scenarios. For example, one vignette states: "If my child loses some prized possession and reacts with tears, I would…" Parents report the likelihood that they would respond in six different ways for each item on a Likert scale from 1 (*very unlikely*) to 7 (*very likely*). Each item corresponds to a subscale describing types of responses to children's negative emotions. Regarding the prior example, options (and corresponding response types) include: get upset with him/her for being so careless and then crying about it (Distress response), tell my child that s/he is over-reacting (Minimizing response), help my child think of places s/he hasn't looked yet (Problem-focused response), distract my child by talking about happy things (Emotion-focused response), tell him/her its OK to cry when you feel unhappy (Expressive encouragement response), and tell him/her that's what happens when you're not careful (Punitive response). Scores for each response type are averaged across all 12 of the vignettes. Reliability was adequate across most subscales, except for the Distress subscale (Table 2).

Child cognitive, emotional, and behavioral self-regulation. Child cognitive, emotional, and behavioral self-regulation was assessed observationally using two behavioral tasks, and a parent-report questionnaire assessing self-regulatory dysfunction. All model variable statistics about child self-regulation are presented in Table 3.

Table 3. Descriptive statistics for model variables assessing child general (non-appetitive) and appetitive self-regulation

	n	*M*	*SD*	*Range*	α (ICC)	*n*	%
General (non-appetitive) self-regulation							
Behavior Rating Inventory of Executive Functioning- Preschool (24M)							
Inhibitory control	93	23.31	5.20	14 - 38	0.87		
Emotional control	93	15.32	3.53	8 - 24	0.81		
Working memory	93	22.47	5.11	14 - 33	0.87		
Planning/ organizing	93	14.76	3.75	8 - 25	0.85		
Set shifting	93	14.33	3.20	8 - 22	0.75		
Inhibitory self-control index	93	38.63	8.01	22 - 62	0.77		
Flexibility index	93	29.66	5.83	16 - 43	0.59		
Emergent metacognition index	93	37.24	8.50	22 - 55	0.88		
Global Executive Composite	93	90.40	17.40	52 - 126	0.88		
Observed self-regulation behavioral tasks (18-24 months)							
Fruit Stroop (trials correct)	106	0.92	1.04	0 - 3	0.62		
Sweets Stroop (trials correct)	106	0.98	1.04	0 – 3	0.59		
Total Stroop (trials correct)	106	1.90	1.86	0 – 6	0.74		
Gift delay: # of seconds before opening	103	45.98	21.57	0 – 60			
Gift delay: # of times child peeks at gift	103	0.44	0.76	0 – 3			
Gift delay: # of times child touches the gift	103	1.60	2.42	0 – 12			
Gift delay: children who did not wait 60s	103					33	30.0%
Gift delay: children who peeked at the gift	103					31	28.2%
Gift delay: children who touched the gift	103					57	51.8%
Appetite self-regulation							
Child Eating Behavior Questionnaire (24 months)							
Food responsiveness	98	2.42	0.60	1.20 – 4.25	0.66		
Satiety responsiveness	98	3.07	0.59	1.60 - 4.40	0.72		
Emotional overeating	98	1.59	0.46	1.00 - 3.00	0.63		
Emotional undereating	98	3.10	0.84	1.25 - 5.00	0.78		
Child weight-for-length z-score and percent at-risk for overweight/obese at 24 months	92	0.74	1.08	-4.22 – 3.34		34	35.8%

Note. ICC = Intraclass correlation coefficient.

Observed child general (non-appetitive) self-regulation. Two behavioral tasks—a modified Shape Stroop task and a Gift delay task—were implemented with young children to assess their general (non-appetitive, cognitive, emotional, and behavioral) self-regulation after the mealtime (Carlson, 2005; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996; Kochanska, Murray, & Harlan, 2000). After the meal, one researcher takes the child to an area with minimal distractions in order to do the self-regulation tasks. Parents were generally not in the room while the child was doing the self-regulation task, unless the child was distressed or the parent indicated that they did not want to leave the child alone. Tasks were videotaped and coded by two independent observers blind to the hypotheses of the study.

Attentional control was assessed as a type of child cognitive self-regulation. Attentional control was indicated according the number of times out of six that a child can correctly identify the target object in a modified Stroop task (Carlson, 2005; Kochanska et al., 2000). The six trials were divided into two blocks. The first block used fruits (apple, orange, banana), and the second block used dessert items (cookie, cupcake, ice cream). Trials were counter-balanced within and between blocks to control for order effects. Inter-rater reliability was moderate-to-poor for the Fruit Stroop ($\alpha = .62$) and the Sweets Stroop ($\alpha = .59$), but adequate for the total Stroop task calculation ($\alpha = .75$).

Inhibitory control was assessed using a Gift delay task, as an indicator of emotional and behavioral self-regulation. At the end of the visit, children were presented with a brightly-wrapped gift. Children were told that they needed to wait for one minute before opening it so that the research assistant could find a bow to put on the gift. Children were given the gift regardless of whether they opened the gift within the minute. Inhibitory control is indicated by whether the child waited a full minute before opening the gift, as well as the number of times the child attempts to peek inside the gift, or touches the gift (Kochanska et al., 1996, 2000). In the current study, 30% (n = 33) of children who attempted the task did not wait the full minute before opening their gift, 28.2% (n = 31) peeked at the gift, and 51.8% (n = 57) touched the gift. Inter-rater reliability was calculated for the number of seconds before the child opened the gift, the number of times the child touched the gift, and the number of times the child peeked at the gift, from 60% (n = 67) of videos of the gift delay task. Inter-rater reliability was excellent for each of these variables (all ICCs $\geq .87$).

Parent-report of child general (non-appetitive) self-regulation. The Behavior Rating Inventory of Executive Functioning- Preschool version (BRIEF-P; Isquith, Gioia, & Espy, 2004) was used to assess parents' perceptions of children's emotional, cognitive, and behavioral self-regulation. The BRIEF-P was designed to assess executive dysfunction in children aged two to five years old using a 63-item parent-report questionnaire. The BRIEF-P is comprised of 5 lower-order subscales, and 3 higher order subscales. Regarding the lower-order subscales, Set-shifting is comprised of 10 items, Inhibition is comprised of 16 items, Emotional control is comprised of 10 items, Working memory is comprised of 16 items, and

Planning/Organizing is comprised of 10 items. The Inhibitory Self-Control higher-order subscale is created by summing scores across the Inhibition and Emotional control subscales, and will be used to assess parent perceptions of child emotion self-regulation. The Emergent Metacognition higher-order subscale is created by summing across the Working memory and Planning/Organizing subscales, and will be used to assess parent perceptions of child cognitive self-regulation. The Flexibility higher-order subscale is created by summing across the Set-shifting and Planning/organizing subscales, and will be used to assess parent perceptions of child behavioral self-regulation. Finally, an index of global executive functioning is created by summing across the three higher-order subscales. For the sake of parsimony and data reduction, only the higher-order subscales will be used in the current study. All lower- and higher-order subscales had good reliability estimates ($\alpha > 0.70$), except for the Flexibility index which was marginal ($\alpha = 0.59$; Table 2). Given the marginal reliability for this index, it was only used in combination with other subscales in final analyses.

Child appetite self-regulation. The Children's Eating Behavior Questionnaire (CEBQ) is a parent-report questionnaire with 8 subscales comprised of 35 items, designed to assess children's eating behaviors (Carnell & Wardle, 2007; Wardle, Guthrie, Sanderson, & Rapoport, 2001). The CEBQ was initially developed for use in children between 3- to 8-years old (Carnell & Wardle, 2007), but has also been used with parents of children under two years old (Brown & Lee, 2012; Hathcock et al., 2013). The CEBQ demonstrates adequate internal reliability across subscales (α = .65 to .92; Table 2). The responsiveness to satiety, responsiveness to food, and emotional overeating subscales in the CEBQ will be used to assess parent perception of appetite self-regulation in young children. To date, there are no observational assessments of child appetite self-regulation that can be used in an uncontrolled, naturalistic, non-laboratory environment like the family home.

Child weight. Children were weighed and measured by trained research assistants at 24 months using digital scales (model 728, sexa GmbH & Co, HamBurg, Germany; model 349KLX, HealthOmeter, McCook, IL). Weight-for-length z-scores (WFL-Z) were age and sex adjusted, and calculated based on the World Health Organization's guideilines (WHO Multicentre Growth Reference Study Group, 2006).

Analytical Plan

All analyses were conducted in SAS Version 9.4 (SAS Institute, 2014). Given that several variables of interest were non-normally distributed, non-parametric Spearman correlations with pairwise deletion were used to assess associations between cognitive and appetite self-regulation. Variables that were significantly correlated with one another were submitted to confirmatory factor analyses using the PROC CALIS procedure in SAS. To assess appropriateness of model fit, absolute (Chi Square, Root Mean Square Error of Approximation [RMSEA], Standardized Root Mean Square Residual [SRMR]) and incremental fit (CFI) indices are presented and evaluated. Cutoff criteria regarding goodness of fit for

RMSEA will be $\leq$ 0.08 (including a 90% confidence interval), for SRMR will be $\leq$ 0.08, and for CFI will be $\geq$ 0.95 (Schreiber, Nora, Stage, Barlow, & King, 2006). The ratio of the chi-square coefficient to the degrees of freedom should be less than two. Path analyses to determine associations between factors were also conducted using PROC CALIS, and the same model fit indices will be used to determine goodness of fit.

Since a forced-response format was not used for the parent-report questionnaires, some subscales had more missing data than others. To assess patterns of missingness, we conducted Little's Missing Completely at Random (MCAR) test. Since Little's MCAR test failed to reject the null hypotheses that data were missing completely at random (X^2 *[df]* = 685.20 [766], p = 0.983), full information maximum likelihood (FIML) estimation was used in all subsequent analyses to leverage the available data.

Results

Participant demographics. Participants in the STRONG Kids 2 Protective Parents Project represent a subsample (n = 109) of families in the larger STRONG Kids 2: Birth Cohort (N = 451). Recruitment for the subproject began in October 2015, and continued until August 2017. Inclusion criteria required the child to be about 18-24 months old at the time of the visit, and the family to be willing to allow the investigators to complete the home visit. Over the course of the recruitment period (21 months), 198 families were eligible for participation in the home visit subsample. The final subsample included 110 families who consented to, and completed the home visit data collection procedure. One family's mealtime video-recording was lost due to technological malfunction, so for analyses involving mealtime data, the sample includes 109 families with complete data on most questionnaires.

The final subsample of children included slightly fewer girls (47%) than boys. The average age in months at the home visit was 20.97 (SD = 2.73). Due to reporting error during recruitment, one child in the sample was 34.9 months old during the home visit. All other children were between 17.8 and 28.6 months old. The final subsample of mothers was relatively homogenous. Most mothers were White, married, about 30 years old when their children were born, employed or self-employed, and well-educated. Although mothers were well-educated, there was substantial variation in reported monthly income. Families reported an average of 2.05 adults (SD = 0.42, Range = 1 - 3), and 1.65 (SD = 1.3, Range = 1 - 9) children living in the home at least some of the time when the target child was 6 weeks old. Families of four making less than $3,383 per month in Illinois qualify for partial subsidies and are below 165% of federal poverty levels, suggesting that several more families may have been eligible to receive federal financial support (Illinois Department of Human Services, 2017).

Descriptive statistics. Descriptive statistics regarding variables assessing child appetite and cognitive/ behavioral self-regulation, and maternal emotional and feeding responsiveness are reported in Tables 2 and 3, respectively.

Associations between appetite, emotional, and cognitive/behavioral self-regulation. Because several variables in this analysis were not normally distributed, non-parametric Spearman's correlation analyses were used to assess associations between appetite and cognitive/behavioral self-regulation (Table 4). It is important to note that more positive scores on the BRIEF-P indicate more dysfunction. Food responsiveness and emotional overeating were both positively correlated with the inhibitory self-control index, the emergent metacognition index, and the flexibility index of the BRIEF-P, as well as with the delay of gratification task. Emotional undereating was positively correlated with all of the BRIEF-P indices, except for the emergent meta-cognition index. Satiety responsiveness was not associated with any of the BRIEF-P indices.

Associations between delay of gratification, food responsiveness, and emotional overeating suggested that children who had poorer appetite self-regulation performed better on the gift delay task. To investigate these findings further, two-sample T-tests were employed to assess mean differences in food responsiveness by whether children were able (n = 59, 53.6%) or not able to wait the full 60 seconds in the gift delay task. Interestingly, children who waited the full 60 seconds for the gift before opening it were more food responsive (t $[df]$ = -3.19 [90], p = .002) and engaged in more emotional overeating (t $[df]$ = -2.52 [90], p = .014), as compared to children who did not wait the full 60 seconds.

Child weight-for-length Z-score at 24 months was not significantly associated with any of the parent-report or observational variables discussed in this section (data not shown). In Kruskal Wallis H-tests examining differences by children who experienced rapid growth in the first 2 years of life (n = 20, 22% of available sample; change in weight-for-length standard deviation $\geq$ .65, for data from birth to 24 months), there were no statistically significant differences between rapid-growers and non-rapid growers on any appetite self-regulation or behavioral/cognitive self-regulation variables.

Table 4. Non-parametric Spearman correlations between observed and self-reported child appetite, emotional, cognitive, and behavioral self-regulation variables.

		1	2	3	4	5	6	7	8	9	10	11
1. Emergent Meta-	r											
Cognition (BRIEF-24M)	N											
2. Inhibitory self-control	r	.747*										
index (BRIEF-24M)	N	93										
3. Flexibility Index	r	.577*	.852*									
(BRIEF-24M)	N	93	93									
4. Global EF (BRIEF-24M)	r	.917*	.931*	.819*								
	N	93	93	93								
5. Food responsiveness	r	.215*	.289*	.232*	.269*							
(CEBQ-24M)	N	93	93	93	93							
6. Emotion overeating	r	.378*	.428*	.350*	.337*	.608*						
(CEBQ-24M)	N	93	93	93	93	98						
7. Satiety responsiveness	r	.004	.116	.147	.066	-.344*	.035					
(CEBQ-24M)	N	93	93	93	93	98	98					
8. Emotion undereating	r	.180	.383*	.440*	.308*	.089	.252*	.379*				
(CEBQ-24M)	N	93	93	93	93	98	98	98				
9. Gift delay of	r	.018	.148	.235*	.117	.307*	.240*	-.006	.110			
gratification (seconds)	N	88	88	88	88	92	92	92	92			
10. Sweet Stroop	r	-.232*	-.147	-.183	-.209*	-.054	-.003	.059	.045	.071		
	N	90	90	90	90	95	95	95	95	102		
11. Fruit Stroop	r	-.071	.043	-.010	-.010	-.167	-.121	.063	.150	.168	.576*	
	N	90	90	90	90	95	95	95	95	102	106	
12. Total Stroop	r	-.164	-.060	-.104	-.119	-.129	-.060	.075	.102	.132	.884*	.877*
	N	90	90	90	90	95	95	95	95	102	106	106

Note. Each coefficient is based on pairwise deletion methods.
* p < .05

Associations between Emotional and Feeding Responsiveness. Because several subscales were not normally distributed, non-parametric Spearman's correlations were used to assess associations between observed and self-reported parent responsiveness (Table 5). There were no statistically significant associations between self-reported and observed emotional responsiveness. Self-reported emotional responsiveness was associated with self-reported feeding responsiveness, and observed emotional non-responsiveness was negatively associated with observed feeding responsiveness. Observed feeding responsiveness was moderately correlated with some, but not all aspects of self-reported feeding responsiveness.

Table 5. Non-parametric Spearman correlations between observed and self-reported parent emotional and feeding responsiveness.

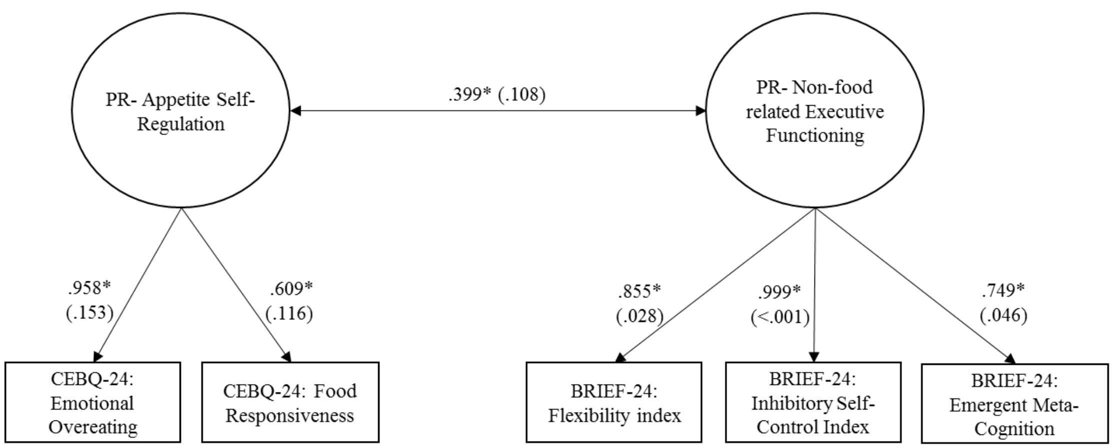
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Distress responses (CCNES 18M)	r																
	N																
2. Punitive responses (CCNES 18M)	r	.490*															
	N	106															
3. Minimizing responses (CCNES 18M)	r	.271*	.649*														
	N	106	106														
4. Emotion-focused responses (CCNES 18M)	r	-.170	.055	.122													
	N	106	106	106													
5. Problem-focused responses (CCNES 18M)	r	-.245*	.016	-.017	.602*												
	N	106	106	106	106												
6. Expressive encouragement responses (CCNES 18M)	r	-.214*	-.146	-.179	.442*	.578*											
	N	106	106	106	106	106											
7. Observed sensitive emotional responsiveness ratio	r	-.036	.010	-.003	-.007	.115	.129										
	N	105	105	105	105	105	105										
8. Observed non-sensitive emotional responsiveness ratio	r	.088	.049	.178	.181	-.065	-.037	-.356*									
	N	105	105	105	105	105	105	109									
9. Observed structuring responses	r	-.054	-.020	.075	.012	.029	.086	.487*	.047								
	N	105	105	105	105	105	105	109	109								
10. Observed attending responses	r	.070	.056	.081	.101	.035	.015	.266*	.194*	-.375*							
	N	105	105	105	105	105	105	109	109	109							
11. Observed positive affection responses	r	.058	.004	-.037	-.104	.014	-.149	.128	.008	-.122	.075						
	N	105	105	105	105	105	105	109	109	109	109						
12. Observed negative responses	r	-.026	-.093	-.047	.038	.046	-.093	-.148	.416*	.062	-.050	.211*					
	N	105	105	105	105	105	105	109	109	109	109	109					
13. Observed distracting responses	r	-.011	.059	-.022	.084	-.081	-.120	.089	.153	-.082	.011	.061	.091				
	N	105	105	105	105	105	105	109	109	109	109	109	109				
14. Parent-control feeding practices (CFSQ 18/24M avg)	r	.230*	.222*	.092	.231*	-.004	-.008	.084	.180	.003	.098	-.059	-.010	.252*			
	N	106	106	106	106	106	106	107	107	107	107	107	107	107			
15. Responsive feeding practices (CFSQ 18/24M avg)	r	-.413*	-.356*	-.193*	.060	.241*	.261*	.136	-.245*	.179	-.182	.154	.155	-.109	-.566*		
	N	106	106	106	106	106	106	107	107	107	107	107	107	107	108		
16. Child centered feeding practices (CFSQ 18/24M avg)	r	.259*	.273	.215*	.086	-.040	-.098	.014	.108	.010	.008	-.109	-.162	.044	.393*	-.632*	
	N	106	106	106	106	106	106	106	106	106	106	107	106	106	107	107	
17. Observed responsive feeding	r	-.160	-.172	-.146	-.160	.066	.041	.085	-.201*	.065	-.136	.148	-.115	-.147	-.228*	.221*	-.136
	N	105	105	105	105	105	105	109	109	109	109	109	109	109	107	107	107

Note. CCNES = Coping with Children's Negative Emotions Scale; 18M = 18 months; CFSQ = Caregiver Feeding Styles Questionnaire; 18/24M avg = Average of scores from 18 and 24 months. Spearman correlations coefficients derived using pairwise deletion methods in SAS 9.4.
* $p < .05$

Factor analyses for child self-regulation. A series of iterative confirmatory factor analyses (CFA) were implemented using FIML estimation, to assess the underlying structure of parent-reported appetite and cognitive/behavioral self-regulation. Given the unexpected pattern of associations between the gift delay task and parent-report assessments of appetite self-regulation, scores on behavioral tasks were not included in the model. Instead, post-hoc associations between behavioral task performance, child appetite self-regulation, and responsiveness will be probed using path analyses after the measurement models have been established.

A CFA modeling cognitive/behavioral self-regulation separately from appetite self-regulation was implemented using the PROC CALIS procedure. Variables underlying cognitive/behavioral self-regulation were the emergent meta-cognition index, the inhibitory self-control index, and the flexibility index of the BRIEF-P. Variables underlying appetite self-regulation were food responsiveness and emotional overeating at 24 months. The error variance for inhibitory self-control was constrained to 0.001, and variances for both latent factors—parent-reported cognitive/behavioral self-regulation, and parent-reported appetite self-regulation—were constrained to 1.0, to ensure that the predicted covariance matrix was non-positive definite. Further, the two latent factors were constrained to correlate with one another. The model was well-fit (X^2 *[df]* = 4.30 [5], *p* = 0.51; *SRMR* = 0.02; *RMSEA [90% CI]* = 0.00 [0.00, 0.13]; *CFI* = 1.00), with all indicator variables loading highly onto their respective factors (standardized factor loadings between 0.61 to 1.00; Figure 2).

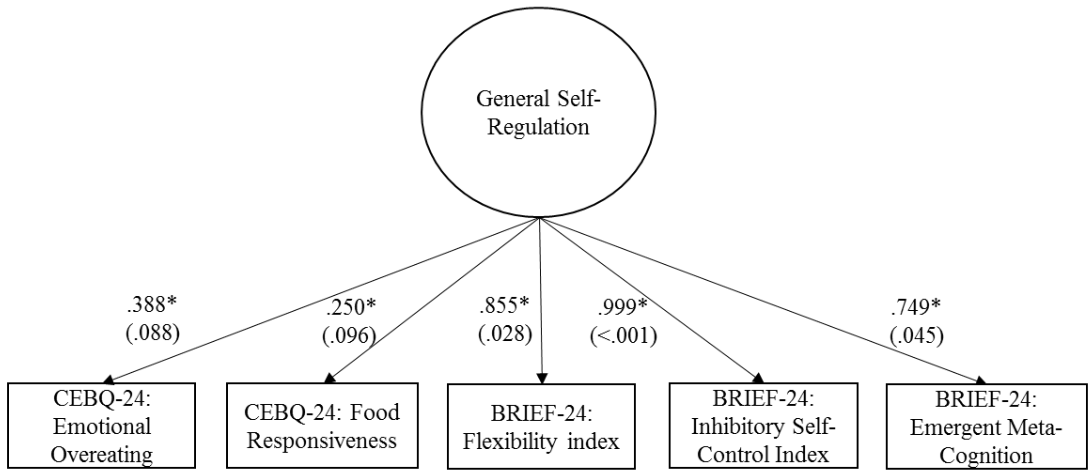
Figure 2. Standardized factor loadings (and standard errors) of latent variables for appetite and general self-regulation as domain-specific constructs.



Note. X^2 *(df)* = 4.30 (5), *p* = 0.51; *SRMR* = 0.02; *RMSEA (90% CI)* = 0.00 (0.00, 0.13); *CFI* = 1.00
PR = Parent report; CEBQ-24 = Children's Eating Behaviour Questionnaire at 24 months; BRIEF-24 = Behavior Rating Inventory of Executive Function at 24 months; SRMR = Standardized root mean-square residual; RMSEA = Root mean square error of approximation; CI = confidence interval; CFI = Comparative fit index.
* p < .05

In contrast, a model constraining all variables to load onto a single factor representing overall parent-reported child self-regulation showed absolute and relatively poor fit (X^2 *[df]* =1986.40 [6], *p* < .0001; *SRMR* = 0.13; *RMSEA [90% CI]* = 0.24 [0.17, 0.31]; *CFI* = 0.87; Figure 3). Some indicators had low factor loadings (standardized factor loadings between 0.25 to 1.00), but most were significantly related to the underlying latent construct.

Figure 3. Standardized factor loadings (and standard errors) of latent variables for overall self-regulation as a domain-general construct.

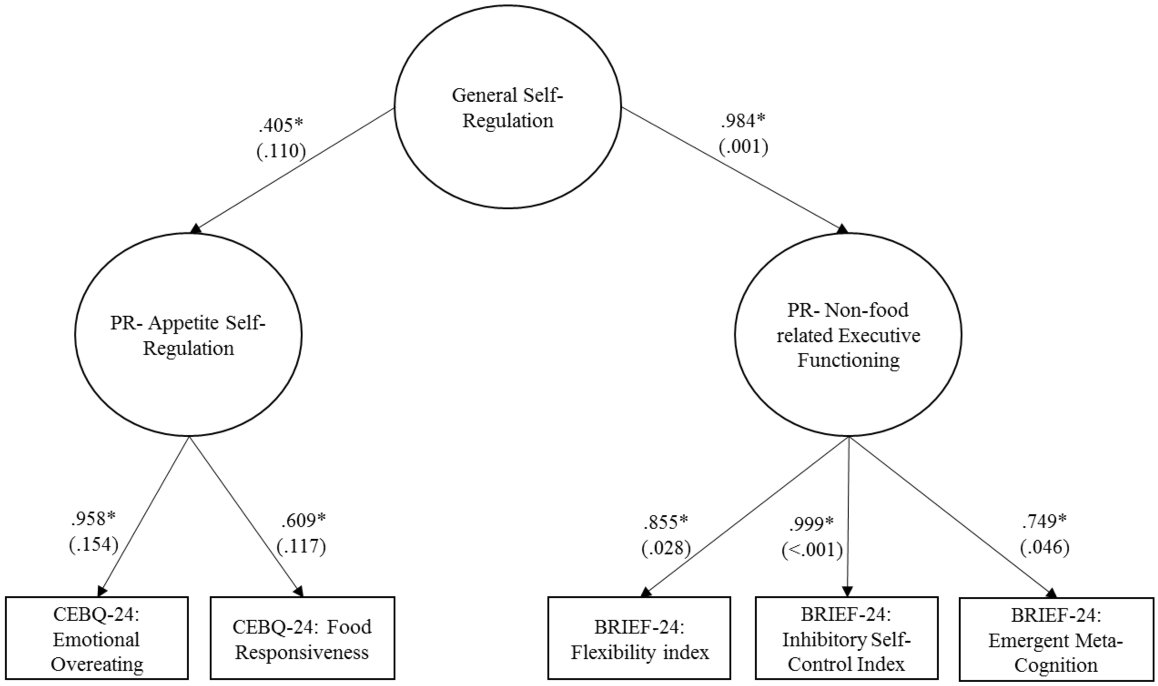


Note. X^2 *(df)* = 39.02 (6), *p* < .0001; *SRMR* = 0.13; *RMSEA (90% CI)* = 0.24 (0.17, 0.31); *CFI* = 0.87
PR = Parent report; CEBQ-24 = Children's Eating Behaviour Questionnaire at 24 months; BRIEF-24 = Behavior Rating Inventory of Executive Function at 24 months; SRMR = Standardized root mean-square residual; RMSEA = Root mean square error of approximation; CI = confidence interval; CFI = Comparative fit index.
* p < .05

Finally, a model with two lower-order latent variables (representing two dimensions: appetite self-regulation and non-appetitive executive functioning) constrained to load onto a single higher-order latent variable (general self-regulation) showed very good absolute and excellent relative model fit (X^2 *[df]* =4.30 [3], *p* = .23; *SRMR* = 0.02; *RMSEA [90% CI]* = 0.07 [0.00, 0.19]; *CFI* = 1.00; Figure 4). Lower-order indicators loaded significantly and highly onto their respective latent variables, and these lower-order factors in turn were significantly associated with the higher order construct of general self-regulation. The two latent variables were weakly—but statistically significantly—correlated with one another, beyond the effects accounted for by the higher-order latent variable (β [SE] = -.10 [.01], p < .05; data not shown in figure).

Model fit was comparable for the domain-specific model and for the higher-order domain-general model, with slightly—but not substantially—better fit in the domain-specific model. It can be concluded that the domain-general model does not provide a good fit to the data, but it is unclear whether the higher-order domain-general or the domain-specific model represent the best possible outcome.

Figure 4. Standardized factor loadings (and standard errors) of latent variables for appetite and general self-regulation, and domain-general higher-order general self-regulation constructs.



Note. X^2 *(df)* = 4.30 (3), *p* = 0.23; *SRMR* = 0.02; *RMSEA (90% CI)* = 0.07 (0.00, 0.19); *CFI* = 1.00
PR = Parent report; CEBQ-24 = Children's Eating Behaviour Questionnaire at 24 months; BRIEF-24 = Behavior Rating Inventory of Executive Function at 24 months; SRMR = Standardized root mean-square residual; RMSEA = Root mean square error of approximation; CI = confidence interval; CFI = Comparative fit index.
* p < .05

Factor analyses of parent emotional and feeding responsiveness. A series of CFAs were implemented using FIML estimation, to assess the underlying structure of responsiveness. The aim of this series of analyses is to assess the underlying factor structures and associations between self-reported and observed emotional and feeding responsiveness. Given the pattern of correlations observed in Table 5, we first tested a four-factor model of emotional responsiveness examining: self-reported positive emotional responses, self-reported negative emotional responses, observed positive emotional responses, and observed negative emotional responses. We iteratively refined the model based on indicator loading values and model fit indices.

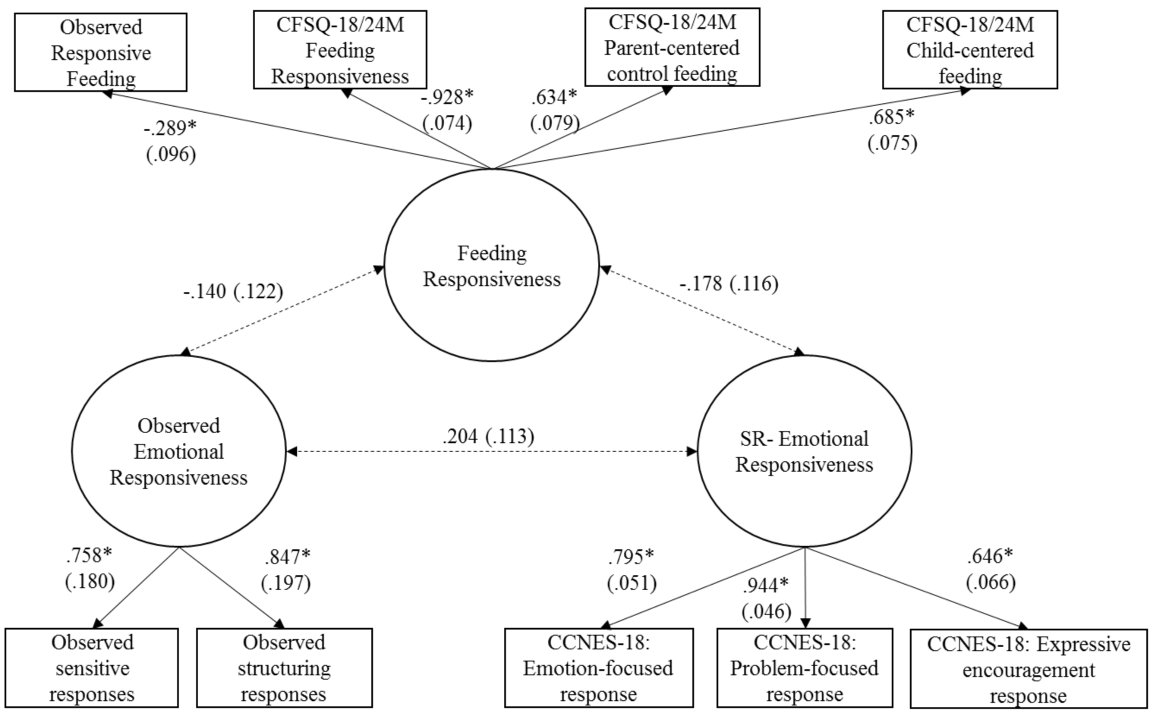
After assessing initial model specifications, error variances for observed structuring, negative, and non-sensitive responses, as well as self-reported punitive responses were constrained to 0.001, and variances for latent factors were constrained to 1.0, to ensure that the predicted covariance matrix was non-positive definite. This initial model examining only emotional responsiveness was poorly fit (X^2 *[df]* = 257.17 [42], $p \leq .0001$; *SRMR* = 0.106; *RMSEA [90% CI]* = 0.22 [0.19, 0.24]; *CFI* = .629).

After analyzing standardized factor loadings, error variances, attending responses were dropped from the observed emotional responsiveness variable. The observed and self-reported negative emotional responsiveness latent variables were also dropped because of negative eigenvalues on indicator variables. The remaining latent variables—self-reported emotional responsiveness and observed emotional responsiveness—were constrained to correlate. The model was substantially improved and well-fit (X^2 *[df]* = 2.36 [4], *p* = .669; *SRMR* = 0.035; *RMSEA [90% CI]* = 0.00 [0.00, 0.11]; *CFI* = 1.00).

Next, we implemented a CFA modeling observed feeding responsiveness and self-reported feeding responsiveness together. Unlike the emotional responsiveness variables, the pattern of association between observed and self-reported feeding responsiveness was sufficiently strong and consistent to suggest that feeding responsiveness could be represented by one underlying latent factor. Variables underlying feeding responsiveness included observations of responsive feeding, self-reported parent-centered feeding (CFSQ, 18-24M average), self-reported feeding responsiveness (CFSQ, 18-24M average), and self-reported child-centered feeding (CFSQ, 18-24M average). The initial model was well fit (X^2 *[df]* = 0.442 [2], *p* = .80; *SRMR* = 0.014; *RMSEA [90% CI]* = 0.00 [0.00, 0.12]; *CFI* = 1.00).

A second set of CFAs was conducted estimating the factor structure of responsive feeding, self-reported emotional responsiveness, and observed emotional responsiveness, all together. Responsive feeding was indicated by observed feeding responsiveness, self-reported feeding responsiveness (CFSQ, 18-24M average), self-reported parent-centered feeding (CFSQ, 18-24M average), and self-reported child-centered feeding. Self-reported and observed emotional responsiveness were constructed according to previous model specifications. After assessing model specifications, latent factors were constrained to correlate, and their error variances were constrained to 1.0 to ensure that the covariance matrix was non-positive definite. For this model (Figure 5), fit was very good (X^2 *[df]* = 30.50 [24], *p* = 0.16; *SRMR* = 0.07; *RMSEA [90% CI]* = 0.04 [0.00, 0.10]; *CFI* = 0.978).

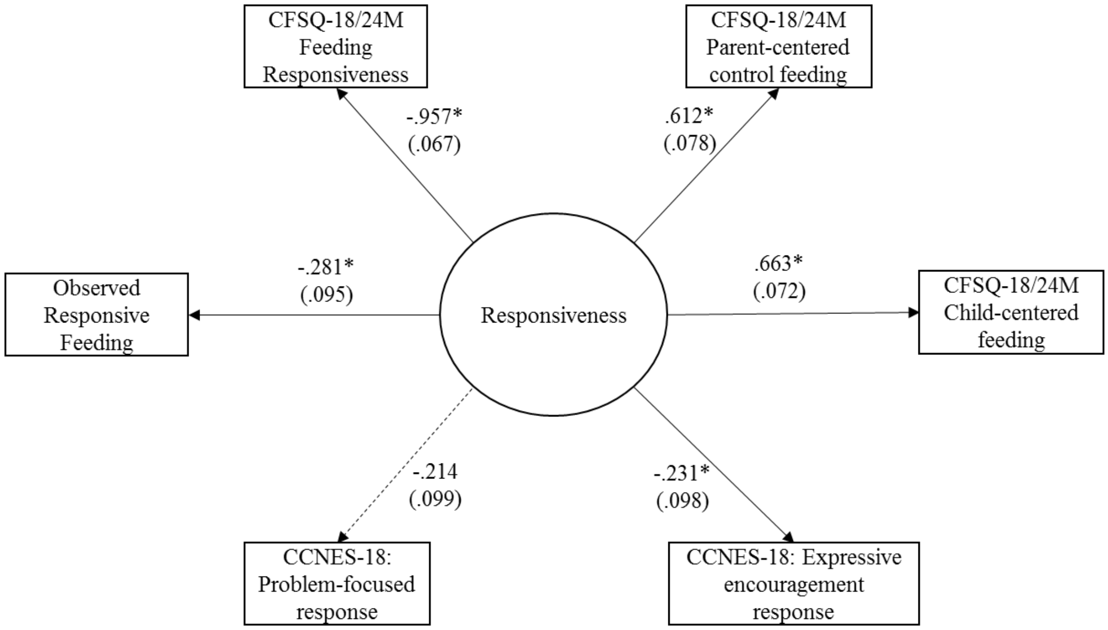
Figure 5. Standardized factor loadings (and standard errors) of latent variables for emotional and feeding responsiveness as a domain-specific construct.



Note. Solid lines indicate significant association or factor loading. Dashed lines indicate no statistically significant association.
X^2 *(df)* = 30.5 (24), *p* = 0.17; *SRMR* = 0.07; *RMSEA (90% CI)* = 0.04 (0.00, 0.09); *CFI* = 0.978
SR = Parent report; CFSQ-18/24M = Caregiver Feeding Styles Questionnaire, 18 and 24 month average; CCNES-18 = Coping with Children's Negative Emotions Scale at 18 months; SRMR = Standardized root mean-square residual; RMSEA = Root mean square error of approximation; CI = confidence interval; CFI = Comparative fit index.
* p < .05

An undifferentiated model was also tested by examining whether the variables from the CFSQ, CCNES, observed feeding responsiveness, and observed emotional responsiveness measures loaded onto a single underlying factor of responsiveness. This model had very poor fit (X^2 *[df]* = 220.75 [24], $p \leq$ .0001; *SRMR* = 0.20; *RMSEA [90% CI]* = 0.26 [0.22, 0.29]; *CFI* = 0.370) and several indicators did not significantly onto the hypothesized latent factor. After removing variables with low and non-significant loading values (emotion-focused responses, problem-focused responses, observed sensitive responses, and observed structuring responses), the model still demonstrated poor fit (Figure 6; X^2 *[df]* =56.77 [9], $p \leq$ .0001; *SRMR* = 0.14; *RMSEA [90% CI]* = 0.22 [0.17, 0.28]; *CFI* = 0.70). Systematically removing indicators with low and non-significant loading led to a final model identical to the feeding responsiveness latent variable described in Figure 5. Results from path and confirmatory factor analyses suggest that emotional and feeding responsiveness are distinct, but related constructs**.**

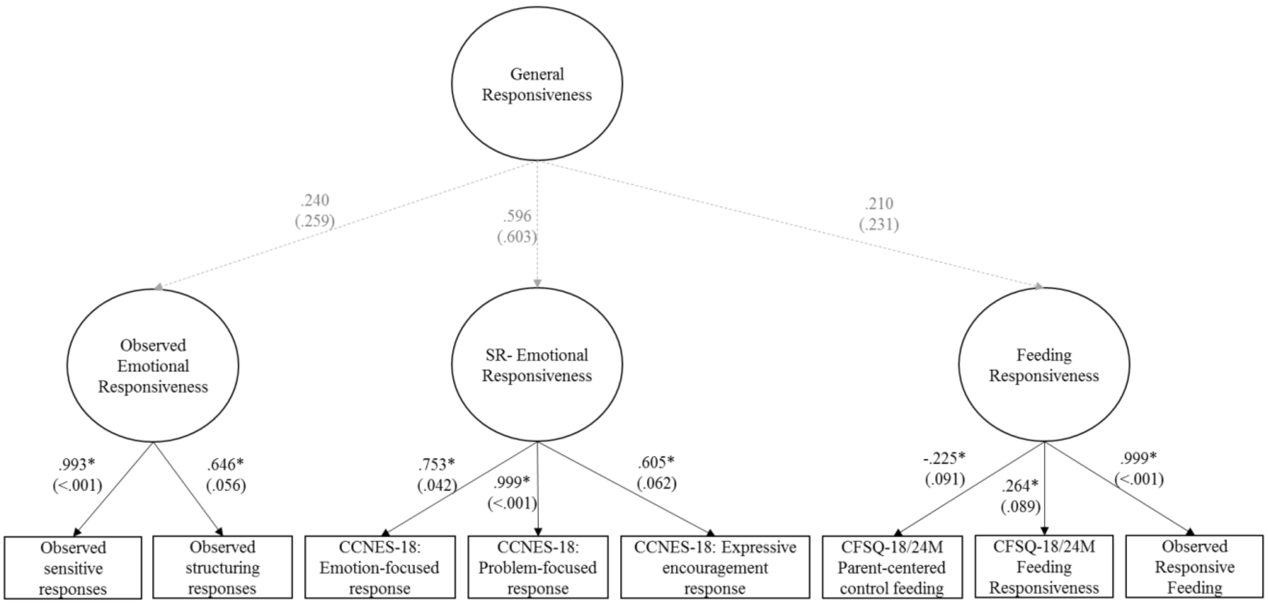
Figure 6. Standardized factor loadings (and standard errors) of latent variables for responsiveness as a domain-general construct.



Note. Solid lines indicate significant association or factor loading. Dashed lines indicate no statistically significant association.
X^2 *(df)* = 56.77 (9), $p \leq .0001$; *SRMR* = 0.14; *RMSEA (90% CI)* = 0.22 (0.17, 0.28); *CFI* = 0.70
SR = Parent report; CFSQ-18/24M = Caregiver Feeding Styles Questionnaire, 18 and 24 month average; CCNES-18 = Coping with Children's Negative Emotions Scale at 18 months; SRMR = Standardized root mean-square residual; RMSEA = Root mean square error of approximation; CI = confidence interval; CFI = Comparative fit index.
* p < .05

Finally, a model with two lower-order latent variables (representing two dimensions: feeding responsiveness and emotional responsvieness) constrained to load onto a single higher-order latent variable (general responsiveness) showed poor model fit (X^2 *[df]* =68.61 [20], $p < .0001$; *SRMR* = 0.12; *RMSEA [90% CI]* = 0.15 [0.11, 0.19]; *CFI* = 0.81; Figure 7). Not all lower-order indicators loaded significantly onto their respective latent variables. For example, child-centered feeding was not significantly associated with feeding responsiveness in this model, and removal improved model fit. Furthermore, these lower-order factors were not significantly associated with the higher order construct of general responsiveness, nor were they significantly associated with one another (as was the case in the domain-specific model depicted in Figure 5).

Figure 7. Standardized loadings (and standard errors) of latent variables for emotional and feeding responsiveness as a domain-general higher-order construct.



Note. Solid lines indicate significant association or factor loading. Dashed lines indicate no statistically significant association.
X^2 *(df)* = 68.61 (20), $p \leq .0001$; *SRMR* = 0.12; *RMSEA (90% CI)* = 0.15 (0.11, 0.19); *CFI* = 0.81
SR = Parent report; CFSQ-18/24M = Caregiver Feeding Styles Questionnaire, 18 and 24 month average; CCNES-18 = Coping with Children's Negative Emotions Scale at 18 months; SRMR = Standardized root mean-square residual; RMSEA = Root mean square error of approximation; CI = confidence interval; CFI = Comparative fit index. * $p < .05$

Associations between responsiveness, self-regulation, and child weight. Finally, a structural equation model examining associations between model variables was estimated using the measurement models identified previously and child weight-for-length z-score (Table 6). Weight was not associated with any other variables, and so was dropped from the final model (data not shown). Both child appetite self-regulation and cognitive/behavioral self-regulation were associated with feeding responsiveness, but only appetite self-regulation was associated with parent-report of emotional responsiveness. There was a marginal—but not statistically significant—association between parent-report and observed emotional responsiveness. For this model, fit was very good (X^2 [df] = 83.30 [68], p = 0.10; SRMR = 0.07; RMSEA [90% CI] = 0.04 [0.00, 0.08], CFI = .974).

Post-hoc analyses examining links with the behavioral tasks (gift delay, Stroop tasks) were also conducted using path models in PROC CALIS. Again, only appetite self-regulation was positively associated with the gift delay, suggesting that children with poorer appetite self-regulation were more likely to wait to open the gift (r = .266, p < .05). There were no significant associations between cognitive/behavioral self-regulation or responsiveness and scores on behavioral tasks.

Table 6. Standardized path coefficients for associations between latent variables assessing child self-regulation and parent responsiveness.

	1	2	3	4
1. Parent-report of child appetite self-regulation				
2. Parent-report of child cognitive/behavioral self-regulation	.388*			
3. Observed emotional responsiveness	-.116	-.011		
4. Parent-report of emotional responsiveness	-.201*	.013	.198	
5. Feeding responsiveness (observed and self-report)	.431*	.305*	-.121	-.162

Note. X^2 *(df)* = 83.30 (68), *p* = .100; *SRMR* = .070; *RMSEA (90% CI)* = .045 (.000, .075); *CFI* = .974

Discussion

Overall, this study not only found evidence to suggest that self-regulation and responsiveness are domain-specific, but also found that nuances in measurement (observational vs. self-report) may further differentiate these constructs. Specifically, we found that appetite self-regulation and non-appetitive self-regulation were related, but distinct constructs. Although the same was true for feeding and emotional responsiveness, this study added nuance to literature by showing that parent report of emotional responsiveness and observed emotional responsiveness at mealtimes were also distinct. Using structural equation modeling techniques, we found evidence to suggest that feeding responsiveness—but not emotional responsiveness—was associated with children's appetite self-regulation and non-appetitive (cognitive, emotional, and behavioral) self-regulation.

We found that self-regulation may be a domain-specific construct, with appetite self-regulation and non-appetitive self-regulation emerging as related, but distinct constructs. However, it is also possible that self-regulation is a multidimensional higher-order construct, with appetite-related self-regulatory abilities distinct—but related—to non-appetitive executive functions. This is consistent with prior studies in adults pointing to multidimensionality in related aspects of self-regulation, as well as developmental studies that indicate that self-regulation is relatively undifferentiated in early life (Bridgett et al., 2013; Miyake & Friedman, 2012; Zhou et al., 2012). Interestingly, both were significantly associated with feeding responsiveness and only appetite self-regulation was associated with parent-report of emotional responsiveness. This corresponds to previously published research showing a strong association between emotional responsiveness and child food consumption, beyond the effects of feeding responsiveness alone (Bost et al., 2014; Saltzman et al., 2016). However, the lack of association between observed emotional responsiveness and child appetite self-regulation was surprising. Theoretically, we would expect that emotional responsiveness observed during the mealtime would have a bigger effect on child appetite self-regulation, as compared to emotional responsiveness in general. Nevertheless, these findings suggest that emotional responsiveness in general—not in the dinnertime setting specifically—has a substantial effect on children's appetite self-regulation. This may be because we only observed emotional responsiveness in the home at one point, weakening the power of the association. Alternatively, it may be that parents' general patterns of responding to children's negative emotions are less varied than parents' responses at mealtimes (where there are many distractions and activities to be coordinated), thus facilitating children's self-regulatory skill development more consistently. Finally, it is also possible that the observational assessments were biased by the single observation point, and thus were not sensitive enough to nuance in parent emotional responsiveness.

Despite the fact that we were unable to use the behavioral tasks in the structural model, they provided several surprising insights into links between children's appetitive and non-appetitive self-regulatory skills. First, we found that observed child cognitive/behavioral self-regulation (gift delay, sweet Stroop, and fruit Stroop) was associated only with certain subscales in the BRIEF-P. The Stroop tasks assess set-shifting and cognitive flexibility. Nevertheless, children who performed better on the sweet Stroop showed lower dysfunction on the emergent meta-cognition and global executive function indices—but not on the flexibility index—of the BRIEF-P. On one hand, the lack of association with the flexibility index may be due to the small sample size and the few trials implemented for the Stroop task. Indeed, the flexibility index trended toward being associated with the sweet Stroop, although the link was not statistically significant ($r = -.183$, $p = .08$). On the other hand, previous research suggests that cognitive/behavioral self-regulation may not be perceptibly differentiated (into cognitive flexibility, inhibitory control, etc.) until middle childhood or early adolescence (Lee, Bull, & Ho, 2013). In support of this undifferentiated model, the Global Executive Functioning index was significantly associated with the sweet Stroop task. There were no associations between the BRIEF-P and the fruit Stroop. This may mean that the type or desirability of food may affect children's ability to complete the task. However, these findings must be interpreted with caution given the marginal reliability of the fruit and sweet Stroop scores, as well as the flexibility index of the BRIEF-P.

We also identified a significant positive association between scores on the gift delay task (assessing emotional/behavioral self-regulation) and child appetite self-regulation. Although intuitively we would expect children who waited for the gift to also be have better appetite self-regulation (that is, less overeating and food responsiveness), it is possible that the gift delay task did not serve as an effective test of self-regulation in this age group. For example, it may be that the timing (60 seconds) was not challenging enough to test children's ability to delay gratification if they were very focused on receiving the reward. Indeed, 180-360 second timing challenges have been used previously with children in this age group and slightly older, with more variability (Carlson, 2005; Kochanska et al., 2000). The explanation is bolstered by the highly skewed distribution for the observed inhibitory control variable, and the fact that only 30% of children did not wait the full 60 seconds before opening the gift. A second potential explanation for the counter-intuitive association between the gift delay and appetite self-regulation may be that food and non-food rewards elicit different response patterns from children who are, and are not, food responsive (Johnson, Parry, & Drabman, 1978). A meta-analysis performance on self-regulation tasks among children with and without obesity found differences in performance on food-related tasks, but not non-food related tasks (Thamotharan, Lange, Zale, Huffhines, & Fields, 2013). Although no firm conclusions can be drawn from the current study's findings, we can posit that children who have poorer appetite self-regulation may respond differently to non-food rewards as compared to children who are less food responsive.

Our results regarding observed self-regulation are limited both because of our reliance on behavioral tasks implemented in the family home and because of significant gaps in the literature. The familiar environment or the short wait-time for the gift delay (other studies have had children wait for 180 seconds) may have modified children's responses on the tasks. However, our findings suggest that future research should compare results between data based on parent-perceptions and observations. Furthermore, an observational assessment of child appetite self-regulation that can be implemented in the family home—without experimenter involvement or modification of the food environment—is sorely needed to assess whether parent perceptions of child appetite self-regulation are reliable.

In regards to parent responsiveness, three factors emerged from our analyses: feeding responsiveness, self-reported emotional responsiveness, and observed emotional responsiveness during mealtimes. Self-reported and observed emotional responsiveness comprised two separate, but related, latent variables, whereas feeding responsiveness was subsumed under one latent variable. These findings may suggest that—like self-regulation—parents' perceptions of emotional responsiveness and observed emotional responsiveness during mealtimes are distinct, but related constructs. Indeed, other studies have found that direct observation of parent emotional responsiveness do not correlate to perceptions or self-reports of emotional responsiveness (Nelson, Leerkes, O'Brien, Calkins, & Marcovitch, 2012). Findings may also reflect a measurement issue. Whereas the observational assessment of feeding responsiveness was created based on the self-report assessment of feeding responsiveness used in the study, the observational assessment of emotional responsiveness was not developed as a direct companion to the self-report measure of emotional responsiveness. Finally, the mealtime environment may also play a role; parents may behave differently during mealtimes, or their emotional response strategies may differ based on the needs of the context. For instance, a parent who typically engages in high levels of emotional responsiveness may struggle to manage picky eaters, time constraints, and work-life stressors during mealtimes, making it more difficult for them to use responsive emotional strategies at meals. When food or eating is not involved, the same parent may have an easier time utilizing responsive emotional strategies.

Feeding responsiveness was not significantly associated with self-reported or observed emotional responsiveness in path models, although both trended towards association. Given the identical coding contexts for observed feeding and emotional responsiveness, we would expect a significant correlation between the two latent variables. One possibility is that multicollinearity or a strong association between observed and self-reported emotional responsiveness may obscure variability due to feeding responsiveness. However, when testing the full model without self-reported emotional responsiveness or its associated indicator variables, there was still not a significant association between observed feeding and emotional responsiveness (data not shown). A second possibility is that the findings may reflect an issue with the coding scheme, or use of too few indicator variables describing observed emotional responsiveness. However, interrater reliability was excellent for all of the coding schemes regarding maternal emotional responsiveness (Table 2), and the model was specified based on correlations between observed variables, indicating that this was the most appropriate model for the data. Therefore, it is most likely that observed feeding and emotional responsiveness are operationally different behaviors, at least at mealtimes. Thus, we should expect that these distinct behaviors will have differential effects on child outcomes. In other words, not only does there seem to be domain specificity in regards to emotional responsiveness (mealtimes vs. non-mealtime contexts), but further specificity regarding parents' patterns of responsiveness to food- and non-food related situations.

Findings suggest that responsiveness varies across contexts (mealtimes vs. non-mealtime contexts), type of behavior (feeding vs. emotion), and measurement (self-reported vs. observed responsiveness). Researchers should attend carefully to these nuances by using multiple measures, conducting observations in mealtime and non-mealtime contexts, and avoiding conflation of these distinct parenting processes. Systematic reviews of the literature identifying differential effects between types and contexts for responsiveness on other child behaviors may be warranted in order to identify specific targets for future study or prevention strategies. Finally, these findings highlight the importance of promoting responsiveness using specific language and operational definitions. Researchers, healthcare, and childcare providers must be consistent and clear about what it means to be responsive, and how parents may be able to practice different types of responsiveness in different contexts.

Strengths and limitations. There are several limitations of the current study that bear noting. First, the sample was quite small for a factor analysis approach. Studies replicating these preliminary findings with larger datasets ($n > 200$) are sorely needed. Second, we found no association between observational assessments of cognitive and emotional/behavioral self-regulation and the parent-report assessments of non-appetitive self-regulation. This points to measurement issues for the observational assessments, suggesting that these tasks may not be appropriate for use in home-based contexts or may not have been challenging enough (i.e. the gift delay task). Although concerns for participant burden prevented us from asking families to bring their children in for lab-based assessments, we accounted for this problem by excluding these measures from the CFA models and examining them in separate post-hoc analyses. Future research should consider using more challenging tasks in the least distracting area of the home environment, whenever possible, in order to assess whether observations and parent perceptions of child general self-regulation are congruent. Third, marginally acceptable reliability for several of the subscales used in this study suggest that measurement issues may extend to the parent-report questionnaires as well. Although we used multiple measures for most of the constructs in this study, a critical limitation is that there was not an observational assessment of child appetite self-regulation. On this topic, counter-intuitive associations between child appetite self-regulation and our observational assessments of non-appetitive self-regulation mean that our findings on the domain-specificity of self-regulation are preliminary, and should be replicated in future studies. To the best of our knowledge, there are currently no valid and reliable observational coding schemes for child appetite self-regulation that can be implemented in the home, rather than a lab. Despite these limitations, the use of multiple measures, rigorous observational data collection, and confirmatory factor analysis methods strengthens the value and conclusions drawn from these data.

Conclusions

This study carries implications for research and practice. From a research perspective, it is imperative that empirical analyses test the assumptions that have been made about the domain-generality and the domain-specificity of self-regulation and responsiveness. By showing that self-regulation and responsiveness may be domain-specific constructs, we find empirical support for explanations of null effects on obesity observed for interventions promoting general self-regulation or general responsiveness (Aboud et al., 2009; Miller et al., 2016). Next steps include assessing the differential effects of these domain-specific constructs on child weight outcomes and trajectories in larger, longitudinal samples, and replicating findings using alternative observational measures of emotional responsiveness and general child self-regulation. By identifying whether food- and non-food related behaviors can be conceptualized as unified components of one construct, or are elements with unique risk factors and etiologies of their own, this research provides foundational knowledge about two constructs of critical concern for childhood obesity.

Chapter Three: Associations between Family Factors, Maternal Attachment, and Maternal Responsiveness at Family Meals

Literature Review

One of the key ways that parents promote self-regulation in early childhood is via responsiveness to children's bids and cues for attention or proximity in this early exploratory phase (Kochanska et al., 2009). A parent who provides warm, contingent, and developmentally sensitive responses to a child's negative emotions is not only modeling a healthy emotion regulation response to a negative situation, but is also showing the child that they will respond appropriately, quickly, and consistently in the event of danger or distress (Spinrad, Stifter, Donelan-McCall, & Turner, 2004). Parent responsiveness is significantly associated with a number of positive emotional and behavioral outcomes, including improved coping with and resilience to adversity (Boughton & Lumley, 2011; Watson et al., 2014), increased social competence (Denham, 1993), and empathy (Davidov & Grusec, 2006). Parent responsiveness has also been linked to a number of child behaviors that have implications for physical health, such as lower intake of nutrient dense foods (Ray, Kalland, Lehto, & Roos, 2013), or lower likelihood of emotional eating (Topham et al., 2011). Thus, scientists examining the development of *appetite* self-regulation have adopted and applied the concept of responsiveness to the feeding context (Black & Aboud, 2011; Hughes et al., 2013; Rollins, Savage, Fisher, & Birch, 2016). Both emotional and *feeding responsiveness*—defined loosely as parents' capacities to attend and respond to children's cues of hunger and satiety—have been consistently linked to children's eating behaviors (Saltzman et al., 2016; Topham et al., 2011). Although emotional and feeding responsiveness have been subsumed under a theoretical umbrella of general responsive parenting, empirical evidence has emerged to suggest that these may be distinct, but related behaviors (Bost et al., 2014; Saltzman, Bost, McBride, & Fiese, *in preparation)*.

Attachment, emotional responsiveness, and feeding responsiveness. Parent emotional responsiveness develops in part as a result of past experiences in close relationships (van IJzendoorn, 1995). Parents who are more emotionally responsive are more likely to have secure internal working models of attachment (Bost et al., 2006; Pederson, Gleason, Moran, & Bento, 1998). An internal working model of attachment is built over the course of early parent-child interactions, in which a pattern of cue-and-response allows the child to accrue information about interpersonal interactions with the parent and develop a secure base script (Ainsworth, 1979; Vaughn et al., 2007; Waters & Waters, 2006). Attachment theory posits that a consistent pattern of parent responsiveness to children's distress allows children to develop positive expectations for adult behavior, a positive internal working model, and give them access to a secure base script (Bowlby, 1982). Responsiveness does not occur in a vacuum, but rather within the context of parents' experiences and their current family environments (Saltzman, Fiese, Bost, & McBride, 2017). The aim of the current study is to investigate whether and how family and attachment-related factors co-act in relation to emotional and feeding responsiveness, differentially.

Several studies have also explored the association between adult attachment and feeding responsiveness (Bost et al., 2014; Powell et al., 2017). One study using a serial mediation model found that mothers who are more insecurely attached are more likely to be emotionally non-responsive, which in turn was related to use of more non-responsive feeding practices (e.g., using food to soothe negative emotions; Bost et al., 2014). Other components of attachment—like mind-mindedness and sensitivity—have also been examined in relation to feeding practices. For example, in a small sample of mothers and infants, maternal mind-mindedness when children were 6 months old was indirectly related to observed feeding responsiveness at 1 year old via the effects of observed general parenting sensitivity (Farrow & Blissett, 2014). These findings suggest that the association between parent attachment and feeding responsiveness may be indirect via emotional responsiveness. Importantly, attachment consistently predicts dysregulated eating behavior in adults (Barone & Guiducci, 2009; Tasca & Balfour, 2014) and young children (Goossens, Braet, Bosmans, & Decaluwé, 2011; Saltzman & Liechty, 2016), and there is burgeoning evidence to suggest that there may be intergenerational effects. Parents with an anxious-insecure attachment orientation are more likely to report using persuasive-controlling feeding practices with their preschool-aged children, which in turn is significantly associated with child appetite dysregulation (Powell et al., 2017).

Although it is likely that parents with less secure attachment orientations are at greater risk for using nonresponsive feeding practices, there are several gaps in the literature that have yet to be addressed. First, most studies examining links between attachment and parent responsiveness have focused on either emotional responsiveness or feeding responsiveness, but few have examined effects on both constructs simultaneously. Persisting questions regarding the domain-specificity and domain-generality of responsiveness prevent researchers from targeting specific behaviors that may improve parenting practices relevant to child appetite self-regulation. Second, empirical papers examining the effects of interpersonal relationships on self-regulation tend to emphasize the importance of a *sole caregiver*. However, not only are these primary caregivers bringing their own experiences to the table, in countless families many people are present during mealtimes, and may exert effects on one another's behaviors in real time (Berge et al., 2014; Czaja, Hartmann, Rief, & Hilbert, 2011; Fiese, Jones, & Jarick, 2015). Finally, although dyads are a critical part of the family and affect individual outcomes, focusing on the parent-child pair may limit understanding of how *family* factors affect parenting and child outcomes (Fiese, Gundersen, Koester, & Jones, 2016; Fiese, Hammons, & Grigsby-Toussaint, 2012). Addressing these issues will ensure that educational interventions can (1) target specific types of responsive parenting behaviors that are most likely to influence child health outcomes, and (2) effectively account for external factors that may be influencing a parent's capacity for responsiveness, whether to children's appetitive cues or to their emotional cues.

To address these limitations, we argue that principles from family systems theory can be utilized to test hypotheses about how interpersonal relationships between dyads and the family as a whole can contribute to parents' responsiveness and—eventually—to child appetite self-regulation. Family systems theory posits that a family is not defined by the characteristics of individual members added together, but rather by their interactions and relationships (Bowen, 1966; Cox & Paley, 1997). By identifying potential family-level risk or protective factors, it will be possible to examine how these characteristics interact with or mitigate the effects of attachment on parent responsiveness in situations that do, or do not involve food.

Family factors and responsiveness. Mealtimes are multidimensional events affected by organizational and interpersonal factors. These family-level factors—such as household chaos, family routines, or distractions at mealtimes—may also affect parents' capacities for responsiveness during these complex, daily events. Organizational factors affecting mealtimes have received a substantial amount of attention in the literature. Studies have consistently found that household chaos—defined as high levels of confusion, agitation, and pressure, and a lack of organization and routine—is directly associated with general child self-regulation (Coldwell et al., 2006; Dumas et al., 2005; Martin, Razza, & Brooks-Gunn, 2012). Previous research has explored two potential pathways from chaos to child self-regulation (Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005; Hughes, Roman, & Ensor, 2014; Vernon-Feagans, Willoughby, Garrett-Peters, & The Family Life Project Key Investigators, 2016). One pathway suggests that there is a direct link between chaos/ disorganization and child self-regulation, in which the child becomes overstimulated and subsequently withdraws from the unpredictable household environment. The other path is mediated by parenting, in which chaos/ disorganization in the home becomes stressful and unpredictable for parents, making it difficult for them to respond appropriately to their children's emotions. In the large prospective study that Vernon-Feagans et al. (2016) conducted to examine these pathways, they found that responsive parenting mediated the association between household chaos in the first three years of life and children's behavioral regulation in kindergarten, suggesting that chaos decreased a parent's capacity to be responsive to their child. A different study found that household chaos moderated the association between responsive parenting and children's behavioral regulation, suggesting instead that parenting served as a buffer against the negative effects of chaos (Coldwell et al., 2006). Although these findings lend support to the indirect pathway from chaos to child self-regulation via parenting, measurement and study design differences make it difficult to compare results across studies. In Vernon-Feagans et al. (2016), an exploratory factor analysis was conducted on 10 cumulative indicators of household chaos collected over the course of the first two years of life, and two latent variables were used in a structural equation modeling framework to account for measurement error. In contrast, in Coldwell et al. (2006), the more commonly-used Confusion, Hubbub, and Order Scale (Matheny, Wachs, Ludwig, & Phillips, 1995) was used in hierarchical multiple regression analyses applied to data from a sample of parents of 4- to 6-year olds (Coldwell et al., 2006). Furthermore, chaos is not the only organizational family factor linked to responsiveness.

Family mealtime routines—in which meals are eaten at about the same time, in the same place each day, with clear and direct communication about responsibilities and roles for each person at the meal—may make it easier for parents to respond appropriately to children's emotions and cues of hunger/satiety (Fiese et al., 2002). The association between routines and parent responsiveness—whether to emotion or to hunger/satiety—is understudied, but there are strong theoretical foundations for the link. In early life, children are socialized most proximally by the family (Grusec & Davidov, 2010), and they develop a sense of group belonging as a result of observing and participating in family practices, routines, and rituals (Fiese et al., 2002). Parents with family routines feel more competent (Fiese et al., 2002; Sprunger, Boyce, & Gaines, 1985), and this competence may make it easier for them to respond appropriately to children's needs. Parents who report more routines around mealtimes are less likely to use food as a reward (Anderson et al., 2012) and are less likely to have children that are overweight (Anderson & Whitaker, 2010). Mechanisms for this association are understudied, but it is possible that families with mealtime routines have predictable patterns of behavior around food that allow parents to focus on connecting with and responding to their children at the meal, rather than focusing on structural or organizational stressors (Fiese et al., 2012; Jones & Fiese, 2014).

Consistent with research showing associations between attachment security, feeding, and eating, several studies have shown that warm interpersonal interactions are associated with healthier eating behavior and weight outcomes (Berge et al., 2014; Saltzman, Bost, Musaad, Fiese, & Wiley, 2017). But these warm interpersonal interactions—for example, a parent responding appropriately to a child's emotional or appetitive cue—can be hampered if family members are not actively engaged at mealtime. In a small sample of mother-child dyads observed during a typical family mealtime at home, families with no distractions at the meal (e.g., no TV, toys, or reading material) had children who engaged in less fussy eating behavior (Powell et al., 2017). They also found that mothers who ate with and ate the same meal as their children—rather than eating away from the table, not at the same time as the child, or a different meal than the child—had children who refused fewer foods, were easier to feed, and made fewer negative statements about food (Powell et al., 2017). Mothers who are more distracted during bottle-feeding sessions with their infants were less sensitive to their children's cues of fullness (Golen & Ventura, 2015), and mothers who are more distracted during breastfeeding have infants who are perceived to have a larger appetite (Ventura & Teitelbaum, 2017). In an experimental study, families ate more unhealthy foods and had less interpersonal communication when they were exposed to distractions during a controlled, laboratory-based mealtime, as compared to when there was no distraction (Fiese, Jones, & Jarick, 2015). Based on these theoretical foundations and empirical studies, it is possible that distractions will influence a parent's ability to respond appropriately to a child's hunger/satiety or emotions at mealtimes.

There are a few conclusions that can be drawn from these findings to guide the hypotheses, methods, and analysis strategies used in future research. First, family-level factors—like chaos/disorganization, routines, and mealtime distractions—do seem to affect parenting behaviors in general. However, few—if any—studies have examined how these relationships play out when accounting for the effects of parents' attachment orientations on their responses to children's emotions, and no studies have examined whether these factors are independently or interactively associated with parenting around food. Second, differences in measurement and analytical strategies make it difficult to compare results across studies. In Vernon-Feagans et al. (2016), an exploratory factor analysis was conducted on 10 cumulative indicators of household chaos collected over the course of the first two years of life (Vernon-Feagans et al., 2016). The authors found that chaos was indirectly associated with child self-regulation, via parent responsiveness. In contrast, in Coldwell et al. (2006), the more commonly-used Confusion, Hubbub, and Order Scale (Matheny et al., 1995) was used in a sample of parents of 4- to 6-year olds (Coldwell et al., 2006). This study showed that household chaos and parenting had additive effects on child behavior, rather than indirect effects, although measurement differences highlight the need for studies using multiple assessment methods. Additionally, although household routines and mealtime distractions have previously been examined independently in relation to responsive parenting (Golen & Ventura, 2015; Powell et al., 2017; Ventura & Teitelbaum, 2017), to the best of our knowledge no studies have compared their relative contributions in responsive parenting outcomes. The current study aims to address these limitations in research linking responsiveness to family factors (e.g., routines, household chaos, and distractions) and attachment, by taking an integrated approach and examining relative contributions of these factors to maternal responsiveness during mealtimes.

Current study. By integrating concepts from family systems and attachment theories, we aim to examine how the family system as a whole may directly—and indirectly via responsiveness—affect child appetite self-regulation (Saltzman et al., 2017). This theoretical integration pointed to three potential pathways toward parent responsiveness and subsequent appetite self-regulation. The Risk pathway posits that low attachment security and more family risk factors (e.g. few family mealtime routines, more mealtime distractions and chaos in the home) additively confer risk for poor appetite self-regulation directly, and indirectly via low parent responsiveness. The Resilience pathway suggests that family protective factors may provide a buffer against the negative effects of low attachment security on responsiveness and better appetite self-regulation. Finally, the Well-being pathway illustrates how family protective factors and high attachment security would both increase a parent's capacity for responsiveness, and a child's capacity to engage in appetite self-regulation.

In this study, we will take a first step toward testing these pathways by examining how family factors and attachment are independently or interactively associated with parent responsiveness. First, we hypothesized that we would find evidence for the Risk pathway, in which high levels of household chaos and mealtime distractions, few family mealtime routines, and low parent attachment security would be associated independently with poorer parent responsiveness. As discussed previously, literature has found evidence to suggest that each of these factors is independently associated with poorer parent responsiveness. However, few studies have examined these factors together, thus preventing researchers from comparing effects across these various predictors.

Second, based on prior literature showing that household chaos exacerbates the association between low parent positivity and child self-regulation (Coldwell et al., 2006), we also hypothesized that family factors would moderate the association between attachment security and responsiveness. In accordance with the Resilience pathway described previously, we expected that family protective factors (low levels of household chaos, more dinnertime routines, fewer mealtime distractions) would buffer the negative effects of attachment insecurity on maternal responsiveness. In accordance with the Risk pathway described previously, we also expected that family risk factors (high levels of household chaos, fewer dinnertime routines, more mealtime distractions) would exacerbate the negative effects of attachment insecurity on responsiveness.

Finally, we were interested in examining whether effects of chaos, routines, and parent attachment security on feeding responsiveness were different, as compared to effects of these factors on emotional responsiveness. In a prior study, we found that feeding responsiveness and emotional responsiveness were domain-specific constructs (Saltzman et al., in preparation). Therefore, we expected that family and attachment factors that were more proximal to the mealtime or food (e.g., mealtime routines, distractions during family mealtimes) would be more closely related to feeding responsiveness, and that factors that applied to the family more generally (e.g., household chaos, attachment) would be more strongly related to emotional responsiveness.

Method

Participants and recruitment. Participants in this study were drawn from a subsample (n = 110) of families in the larger STRONG Kids 2: Birth Cohort (SK2) project (N = 451). The SK2 project is a transdisciplinary birth cohort study that aims to examine the multilevel predictors of weight trajectories and dietary habits over the first five years of life. Mothers in the SK2 project were recruited from clinics and birthing classes in East Central Illinois on a rolling basis from May 2013 to January 2017, during their third trimester of pregnancy. Recruitment notices were also placed on a university website. Mothers and children were excluded if the child was born prematurely (< 37 weeks), birth conditions precluded normal feeding (e.g., phenylketonuria, etc.), or low birthweight (<2.5 kg). The subsample of families (n = 110) in the current study participated in a 2-3 hour home visit, which involved an Attachment Script Assessment interview and videotaping the family mealtime. Families were eligible if the target child was between 18-24 months old. Of the 198 families who were eligible, 110 families agreed to participate in the study between October 2015 and July 2017. Demographic characteristics of the subsample are reported in Table 7.

Table 7. Home visit sample characteristics

	N	%	*M*	*SD*	*Range*
Parent age at 6 weeks (years)			30.90	4.47	19.09 - 45.23
Child gestational age at birth (weeks)			39.57	1.27	37.00 - 42.29
Child age at home visit (months)*			20.97	2.73	17.80 - 34.90
Child Gender					
Female	57	51.40			
Male	53	47.70			
Marital status					
Married	94	84.70			
Single	9	8.10			
Co-habiting	3	2.70			
Divorced	1	0.90			
Receiving government benefits (SNAP, WIC, or TANF)	17	15.50			
Monthly Income					
Less than $3,000	30	29.00			
$3,000 - $6,000	47	45.00			
More than $6,000	23	20.70			
Employment Status					
Employed/Self-Employed	79	71.80			
Unemployed	6	5.50			
Stay at home parent	20	18.20			
Student	1	0.90			
Parent education					
High school graduate	1	0.90			
Some college or technical school	21	19.10			
College graduate	40	36.40			
Post-graduate work	45	40.90			
Parent race/ethnicity (not mutually exclusive)					
White	89	80.90			
Black	8	7.30			
Asian	7	6.40			
American Indian/Alaska Native	1	0.90			
Hispanic/Latino	3	2.70			
Biracial	5	4.50			
Perceived financial strain (n, % with score > 1)	8	7.30	1.09	0.38	1.00 – 3.50

Note.
* One child was 34.90 months old during the home visit. All other children were between 17.80 and 28.60 months old.

Home visit procedure. Home visits were scheduled on weekday evenings according to the family's availability. Researchers attained written and informed consent from parents prior to video-recording family mealtimes and audio-recording the attachment script assessment. During the mealtime, the video camera was set up facing the target child's seat. The researchers left the home during the mealtime, and came back inside once the parents indicated that the meal was finished. After the mealtime, one researcher went with the mother to a private space and conducted the Attachment Script Assessment, and another researcher worked with the child conducting a number of behavioral tasks (not examined in current study). At the end of the home visit, parents were debriefed and provided $75.00 in remuneration and children were given a toy.

Mealtime coding procedures. Videos of family mealtimes were uploaded and stored on a secure server immediately after the home visit. Coding occurred in several phases. First, three different graduate-level master coders were trained to apply the Actions/ Distractions, emotional responsiveness, and feeding responsiveness coding schemes (described in detail below), using videotapes that were previously collected and coded from a different study. Then, each master coder trained two, upper-level undergraduate coders on their respective coding schemes, creating three teams of three independent coders per team. After each undergraduate coder attained adequate inter rater reliability (intra-class correlation coefficient [ICC] $\geq$ .70) with the master coder and the other undergraduate coder on the training videos, they began coding videos collected for the current study. Each undergraduate coded about half (n = 55) of the videos for this project, while the master coder coded 20% or more (n = 22) of the videos, overlapping equally with each undergraduate. All coding was conducted using Mangold's INTERACT software (Mangold International, 2016), which is an observational coding software designed to apply complex, multilevel coding schemes. After all videos were coded, data were imported into SPSS 24.0 (IBM Analytics, 2016) for data management purposes, although all analyses for the current study occurred in SAS 9.4 (SAS Institute, 2014).

Measures.

***Family and household factors*.**

*Family mealtime distractions***.** Family mealtime distractions were assessed using the Actions/Distractions subscale of the ABC's of Family Mealtimes coding system when children were 18-24 months old (Fiese, Botti, & Greenberg, 2007; Fiese et al., 2011). For this coding scheme, the mealtime was watched in full at least one time for every person present at the meal (e.g., if three people were present at the mealtime, coders would watch the video at least three times). Coders watched the video at least once to focus on the distractions of the target child, at least once to focus on the distractions of the mother, and so on. Coders were instructed to focus on one person each time they watched the mealtime video. Each time the person performed a behavior that could be considered a distraction, coders noted who the actor was, the type of behavior they engaged in, the time the behavior began, and the time the behavior ended.

Distractions were defined as behaviors that take an individual physically or mentally away from the meal, in that their gaze or attention will be at least partly focused on something away from the meal or the meal's location. Distraction start times were indicated by a person turning their back on the meal, averting their gaze unquestioningly from the meal, or leaving the vicinity of the meal (typically going off-camera). Distraction end times were indicated by a person turning back to the meal, sitting down, averting their gaze back to the meal or the people at the meal, or returning to the vicinity of the meal (typically coming back on-camera).

Distractions were divided into four categories. *Technology distractions* involved turning appliances on or off, using any electronic devices (e.g., computer, laptop, tablet, cell phone, stereo, videogame, television, etc.), or adjusting settings on these devices (e.g., volume control). N*on-technology object distractions* involved playing with or paying attention to non-electronic objects (e.g., toys, books, pets, etc.) while not facing the meal or attending to the people at the meal. *Leave taking distractions* involved getting up and leaving the meal for any reason (e.g., leaving to run errands while others are still at the meal, answering the phone or the door, etc.), standing up and talking to people away from the mealtime, going to the bathroom, or any other distraction that by necessity or preference physically removes an individual from the mealtime location. *Food-related distractions* involved leaving the main mealtime location to get something needed for the meal (e.g., utensils, dishes, cups, food, condiments, etc.), relocating the meal or things needed for the meal, or checking on food that was away from the mealtime location. Interrater agreement was adequate for all types of distractions for mothers, fathers, and target children ($ICC \geq .70$), except for paternal non-technology object distractions ($ICC = .52$, $p = .08$).

Household chaos. Household chaos was assessed at 12 and 24 months using the 15-item, self-report Confusion, Hubbub, and Order Scale (CHAOS; Matheny et al., 1995). Mothers indicated how much each statement (e.g., "It's a real zoo in our home," "We almost always seem to be rushed," etc.) in the CHAOS describes their home from 1 (*Very much like your own home*) to 4 (*Not at all like your own home*). Total CHAOS scores are calculated by summing the responses for the 15 items. Higher scores indicate more chaotic, disorganized, and rushed home characteristics. Reliability was excellent at both 12 and 24 months ($\alpha = .85$ and .84, respectively).

Family dinnertime routines. Family mealtime routines were assessed using the dinnertime subscale of the Family Ritual Questionnaire, which parents completed at 12 and 24 months (Fiese & Kline, 1993). The dinnertime subscale assesses family rituals and routines in the mealtime setting, using 7 items (e.g., "some families regularly eat dinner together"). Parents indicate the degree to which this is true for their family on a scale from 1 to 4, with higher scores reflecting more routines and rituals. The dinnertime routines subscale demonstrates good reliability at both 12 and 24 months (α = .79 and .80, respectively).

Maternal attachment security.

Maternal attachment scriptedness. The Attachment Script Assessment (ASA; Waters & Rodrigues Doolabh, 2004) has been used across cultures to assess an adult's knowledge of attachment as a secure base relationship, by eliciting their internal working model of that relationship with a secure base script (Coppola, Vaughn, Cassibba, & Costantini, 2006; Vaughn et al., 2006; Waters, Rodrigues, & Ridgeway, 1998). In the ASA, the secure base script is elicited through a structured interview protocol in which mothers respond to six word-prompt outlines that are designed to create stories. Three stories involve an adult and a child, and three stories involve two adults. The mother is instructed to tell a story using every word in the order that they appear, starting from the left-most column. The word-prompts are organized such settings, actors (either a parent-child, or two-adult dyad), key content, activities, and a potential conclusion are identified, but they provide only a general framework for a story. Individuals with access to a secure base script will understand the implication that a secure base interaction occurs in the story, and will describe an interaction between actors, an interruption to the interaction, distress, and a resolution as suggested by the word-prompt. Narratives from the ASA are scored on a 7-point scale, describing the degree to which the passage is organized around the secure base script, from 1 (*word prompts are used idiosyncratically, with no secure base script organization*), to 7 (*extensive secure base script organization with elaboration*). One adult-child story and one adult-adult story are used as controls and do not allude to a secure base interaction, and so were not included in these analyses. In the current study, the ASA was implemented among a subset (n = 89) of mothers in the study, who did not differ significantly on demographic characteristics, as compared to mothers who did not complete the ASAs. Each story was coded three times each by two independent coders to assess interrater reliability. Interrater reliability among coders for adult-adult (ICC = .85*)* and adult-child stories (ICC = .84*)* was excellent, as was reliability for all. Higher scores indicated higher attachment security.

Maternal self-report of relationship orientation. The Relationship Scales Questionnaire (RSQ) was used to assess mothers' orientations to relationships in adulthood (Griffin & Bartholomew, 1994). The RSQ includes 30 items on 5-point Likert scales, which comprise four subscales corresponding to a four-category model of adult attachment relationships. These categories were originally derived from the latent orthogonal dimensions of orientations to self (attachment anxiety) and to others (attachment avoidance). Security is assessed by averaging five items (e.g., "*I find it easy to get emotionally close to others,*" "*I am comfortable having other people depend on me,*"), and is high when individuals feel positively towards the self and to others (α = .55). Fearfulness is assessed by averaging four items (e.g., "*I worry that I will be hurt if I allow myself to become too close to others," "I find it difficult to trust others completely*"), and is high when individuals feel negatively towards the self and to others (α = .83). Preoccupation is assessed by averaging four items (e.g., "*I want to be completely emotionally intimate with others*," *"I worry that others don't value me as much as I value them"*), and is high when individuals feel negatively towards the self and positively towards others (α = .33). Finally, dismissing is assessed by averaging five items (e.g., "*I prefer not to depend on others," "I am comfortable without close emotional relationships*"), and is high when individuals feel positively towards the self and negatively towards others (α = .68). Cronbach's alpha coefficients for some of these subscales are lower than is typically acceptable, but are still comparable to previously published data (.21 < α < .65) on adults (Griffin & Bartholomew, 1994; Guédeney, Fermanian, & Bifulco, 2010). Given the very low internal consistency for Preoccupation, this subscale will not be included.

Responsiveness.

Feeding responsiveness. Feeding responsiveness is the degree to which parents attend to children's cues of hunger and satiety (Black & Aboud, 2011). The Caregiver Feeding Styles Questionnaire (CFSQ; (Hughes et al., 2005) was adapted to create an observational checklist called the Feeding Behavior Coding System (FBCS; Hughes et al., 2007). Both are designed to assess the degree to which parents use responsive feeding practices, as compared to non-responsive, or demanding feeding practices.

Observed feeding responsiveness was assessed using the FBCS in Mangold's INTERACT software (Mangold International, 2016). Coders watched mealtime videos at least once per family, and identified the frequency of 22 different types of feeding practices. These feeding practices were categorized as either demanding, or responsive. Responsive feeding practices are those in which the parent's behavior teaches or encourages the child to eat healthful food while respecting the child's autonomy to choose whether or not to eat, and how much to eat. For example, parents might allow their child to choose which foods from those served to try, cut the child's food for them to feed themselves, plate the food in an interesting way, or provide reasons for the child to eat certain foods. Demanding feeding practices are those in which parents place expectations or rules on the child's eating behavior, which do not attend to the child's internal cues of hunger or satiety, and do not give the child developmentally appropriate autonomy over certain choices at the mealtime. For example, parents might spoon feed the child (if not developmentally appropriate), hurry the child through the meal, beg the child to eat, or give or offer a second helping. To calculate observed feeding responsiveness, the mean frequency of responsive feeding practices are divided by the mean frequency of all feeding practices (sum of responsive and demanding feeding practices). Interpretations are based on this ratio, with higher values indicating a greater proportion of feeding practices were responsive, and lower values indicating that a lower proportion of feeding practices were responsive. Interrater reliability was calculated based on 30 (27.5%) double-coded videos, and was excellent for all feeding practices coded during the mealtime (all intra-class correlation coefficients $\geq$ .90).

Parent's self-reported feeding responsiveness was assessed using the responsiveness ratio and the parent-centered control subscale of the Caregiver Feeding Styles Questionnaire at 18 and 24 months (CFSQ; Hughes et al., 2005). Of the 24 items in the CFSQ, 7 are summed and divided by the sum of all items in the measure to create a ratio of responsive-to-demanding feeding practices, as in the FBCS. The parent-centered feeding practices subscale is calculated by taking the mean of three items regarding controlling feeding behavior (e.g., spoon feeding, begging, or struggling with the child to eat). Reliability estimates were < .70, and so scores across 18 and 24 months were averaged.

Emotional responsiveness. Emotional responsiveness is contingent on the child's expression of negative emotion, so a hierarchical coding structure was applied in INTERACT to assess observed emotional responsiveness (Mangold International, 2016). Coders watched each video once to code maternal emotion, then again to code child emotion. Emotions were coded as either positive or negative. Examples of positive emotion includes smiling or joking in mothers, and giggling or babbling in children. Examples of negative emotion for mothers in include frowning or using harsh tones, and for children include crying or throwing things angrily. Then, coders watched the video a third time to assess mothers' responses to children's negative emotions. Coders determined what kind of response mothers gave to children after they expressed negative emotions, and whether that response was sensitive or not. This coding scheme was adapted from the D.O.T.S Coding System (Cole et al., 2007).

Emotional response strategies were categorized as either structuring/ limit-setting, distractions, positive emotions, negative emotions, ignoring, or attending responses. Structuring/ limit setting responses involve giving the child information, problem solving with them, giving directives, or physically modifying a situation to ameliorate the child's negative emotions. Distraction responses involve purposefully redirecting the child's attention from the situation causing the negative emotions. Positive emotion responses involve expressing positivity about the child's negative emotion or the situation causing the negative emotion, engaging in physical affection, or expressing emotional affection. Negative emotion responses involve the parent becoming upset when seeing the child's negative emotion, giving or threatening punishment, or withholding affection despite the child's bids. Attending responses involved sustained but brief moments of attention to the child's negative emotion with little or no action. Finally, ignoring responses involve either an absent response from the parent, or the parent not being present to observe the negative emotion.

With the exception of ignoring responses, after selecting a type of emotional response strategy, coders were indicate whether the emotional response was sensitive or not to the situation, as well as to the child's emotional and developmental needs. For example, a sensitive structuring/limit setting response to a child being sad about a broken toy might involve the parent placing a tissue near the child's face and saying that it was ok, and asking the child to blow their nose. A non-sensitive structuring/limit setting response to the same situation might involve the parent grabbing the toy, fixing it, and walking away without a word. Because ignoring responses involve absence of a behavior, sensitive and non-sensitive ratings were not given for this category. Sensitivity is scored as a continuous count variable based on the ratio of the frequency of sensitive strategies observed during the mealtime to total number of emotional responses (sum of frequency of all responses, except ignoring responses). Reliability was assess on 30 (27.5%) videos that were double-coded, and intra-class correlation coefficients were quite high (ICC's > .90, see Table 8).

Self-reported emotional responsiveness was assessed with the Coping with Children's Negative Emotions Scale (CCNES; Fabes et al., 2002). The CCNES includes 72 items applied to 12 vignettes, with 6 items per vignette, describing scenarios where children express negative emotions and potential responses to those scenarios. Parents report the likelihood of each responses on a Likert scale from 1 (*very unlikely*) to 7 (*very likely*). Each item for each vignette corresponds to one of six response categories: distress responses, minimizing responses, punitive responses, encouraging emotional expression responses, problem-focused responses, and emotion-focused responses. Reliability for most of these scales was excellent (α's > .80), except for distress responses, which was marginal (α = .67).

Covariates.

*Child Temperament***.** Given the strong bidirectional associations between child temperament and parent responsiveness (Davidov & Grusec, 2006; Kochanska et al., 2009), we examined whether the dimension of child effortful control was a covariate in all relevant analyses. Child effortful control was measured using the Orienting/Regulatory Capacity subscale in the very short version of the Infant Behavior Questionnaire-Revised (IBQR) when children were 3 months old (Gartstein & Rothbart, 2003; Putnam, Helbig, Gartstein, Rothbart, & Leerkes, 2014). The IBQR includes 36 items that comprise three subscales (surgency, negative affectivity, orienting/regulatory capacity) of 12 items each. Given the links between effortful control and parenting identified previously (Karreman, van Tuijl, van Aken, & Deković, 2008; Kochanska et al., 2000), we focused on this dimension of temperament as a covariate in all analyses. The orienting/regulatory capacity subscale describes infants' capacities for sustained attention, pleasure from interpersonal warmth and closeness, attentional shifting, and soothability—all key components of effortful control in early childhood (α = .73).

Table 8. Descriptive statistics regarding maternal attachment security, family mealtime chaos, and maternal responsiveness

	n	*M*	*SD*	*Range*
Maternal Attachment Security				
Relationship Scales Questionnaire (RSQ; 18m)				
RSQ- Fearful	104	2.30	0.92	1.00 – 4.75
RSQ- Secure	104	3.50	0.71	2.00 – 5.00
RSQ- Dismissing	104	2.97	0.76	1.20 – 5.00
Attachment Script Assessment (ASA) Scores (18-24m home visit interview)				
Adult-adult stories	89	3.27	1.03	1.42 – 5.42
Adult-child stories	89	3.39	1.12	1.00 – 6.25
Family chaos, dinnertime routines, mealtime characteristics, and mealtime distractions				
Chaos, Hubbub and Order Scale (CHAOS; 12 and 24m self-report)				
CHAOS Score 12m	105	1.75	0.44	1.00 – 3.27
CHAOS Score 24m	91	1.83	0.47	1.07 – 2.93
CHAOS Score average 12/24m	107	1.78	0.44	1.03 – 3.27
Family Ritual Questionnaire (FRQ; 12 and 24m self-report)				
Dinnertime routines 12m	106	3.87	0.66	1.57 - 5.00
Dinnertime routines 24m	91	3.90	0.69	1.71 - 5.00
Dinnertime routines 12/24 m average	108	3.88	0.62	1.86 - 4.92
Observations of family characteristics at mealtimes (18- 24m home visit)				
Number of family members at the meal	109	3.39	1.14	2.00 - 9.00
Mealtime length (minutes)	109	17.07	3.94	6.00 - 20.00
Family distractions at mealtimes*	109	0.00	1.00	-1.13 - 4.86
Paternal % of time in distraction	74	0.18	0.18	0.00 - 0.93
Maternal % of time in distraction	109	0.16	0.17	0.00 - 0.83
Child % of time in distraction	109	0.09	0.19	0.00 - 0.83
Maternal responsiveness				
Observed emotional responsiveness* (18-24m home visit)				
Sensitive emotional responses	109	0.66	0.27	0.00 – 0.92
Structuring/ limit setting emotional responses	109	0.52	0.25	0.00 – 0.92
Self-reported emotional responsiveness (18m, CCNES)*				
Problem-focused responses	106	5.77	0.88	1.17 – 7.00
Emotion-focused responses	106	5.62	0.93	1.17 – 7.00
Expressive encouragement responses	106	5.34	1.16	1.00 – 7.00
Feeding responsiveness*				
SR parent-centered feeding (CFSQ, 18/24m avg)	108	1.92	0.59	1.00 – 4.00
SR child-centered feeding (CFSQ, 18/24m avg)	108	1.53	0.50	1.00 – 3.13
SR responsive feeding (CFSQ, 18/24m avg)	108	1.32	0.15	0.98 – 1.68
Observed responsive feeding (18-24m home visit)	109	2.30	0.63	0.56 – 3.57

Note. CCNES = Coping with Children's Negative Emotions Scale, Caregiver Feeding Styles Questionnaire (CFSQ).

Demographics. Maternal marital status, education, employment, race, age, child gender, child age in months, meal length (minutes), family income, receipt of government assistance (WIC, SNAP, or TANF) and perceived financial hardship were examined as potential covariates in all analyses (Table 1). Mothers self-reported marital status, education, employment, race, family income, age, child gender on single items. Mothers also self-reported that they received government assistance from the Women, Infant, and Children (WIC) program, the Supplemental Nutrition Assistance Program (SNAP), or the Temporary Assistance for Needy Families (TANF) for either themselves or their children. Perceived financial hardship was assessed using the two-item financial strain subscale of the Perceived Economic Hardship Questionnaire ($\alpha = .87$; Barrera, Caples, & Tein, 2001). Data about race/ethnicity are presented in Table 1. Given the homogenous sample and small cell sizes, parent race and perceived financial strain were analyzed as dichotomous variables (White, non-White) using non-parametric tests.

Analysis. The current research question focuses on the independent and interactive effects of family factors and maternal attachment on maternal responsiveness to children's hunger/satiety. There are a number of possible ways to answer this question, each with strengths and weaknesses. The two frameworks that would be most appropriate for these data are multilevel models (MLM), or structural equation models (SEM). A MLM can identify person- and family-level effects, making it a particularly useful analytical technique for family scientists (Card & Barnett, 2015). However, in the current study, the person-level outcome is only measured and meaningful for one person in the family (mothers). Given this and the resulting pattern of missingness on the outcome variable for fathers and children (responsiveness was only measured for mothers, although a predictor variable [distractions] was assessed for fathers and children), a MLM would not be appropriate for these data.

There are a number of other factors to consider that make a case for using SEM, particularly given the multi-method approach to the current study. A SEM allows researchers to isolate error due to measurement, evaluate covariances between exogenous and endogenous variables, and to assess relative contributions of a number of predictors on a number of outcomes all while accounting for the aforementioned covariances (Marsh, Morin, Parker, & Kaur, 2014; Schreiber et al., 2006). The measurement model stage of an SEM is a confirmatory factor analysis designed to examine relationships between observed and unobserved variables in a theory-driven factor structure (Schreiber et al., 2006). In this step, unobserved variables (or latent variables) are regressed on at least two observed variables (also known as manifest or indicator variables), in order to evaluate the "fit" between the hypothesized covariance matrix and the observed covariance matrix. Variances of the latent variables are fixed to 1, and variance of one indicator variable per latent variable is fixed to .001 in order to reduce the number of parameters that need to estimated, and to ensure that the model is identified. Histograms, skew, and kurtosis were analyzed to ensure that all indicator variables met assumptions regarding multivariate normality. Data regarding distractions for mothers, fathers, and children were highly skewed, and transformations did not attenuate the issue. We used these data in their raw format, so effects from these variables should be interpreted with caution. All other variables were approximately normally distributed.

At the next step—the SEM—paths linking the latent variables identified in a well-fitting measurement model are constrained according to *a priori* hypotheses. Several of the hypothesized predictors were measured at the same time as the hypothesized outcomes, so we acknowledge that much of this data is cross-sectional. However, for the sake of brevity, we will refer to the family (household chaos, dinnertime routines, mealtime distractions) and attachment variables (attachment security) as predictors, and emotional and feeding responsiveness were as outcomes.

The fit of the hypothesized (observed) covariance matrix is again evaluated in comparison to the (unobserved) population covariance matrix. Model fit can be described by absolute and comparative fit indices (Hooper, Coughlan, & Mullen, 2008; Schreiber et al., 2006). The majority of variables in this study are continuous and the aim of the current study is to evaluate a structural path model that was hypothesized *a priori* (rather than exploring and comparing a measurement model in a number of different samples). Therefore, we will use the following indicators of fit: Chi Square (X^2), Root Mean Square Error of Approximation (RMSEA and 90% confidence interval [CI]), Standardized Root Mean Square Residual (SRMR), Bentler's Comparative Fit Index (CFI). The X^2 is useful for model trimming; a ratio of X^2 to X^2-degrees-of-freedom that is less than or equal to 3, and a non-significant p-value for the X^2 will be used to indicate good fit. The RMSEA is the most commonly used absolute measure fit, and it assesses fit between the population (unobserved) covariance matrix and the observed covariance matrix, and it favors parsimony (Hooper, Coughlan, & Mullen, 2008). The RMSEA also has the added benefit of having a confidence interval due to the known distribution around the statistic, making it easier to make precise evaluations of whether the model is well fit. Good fit is generally indicated by and RMSEA < .07, a lower limit confidence interval close to zero, and an upper limit confidence interval $\leq$ .08 (Hooper et al., 2008; Steiger, 2007). The SRMR is a standardized version of the root mean square residual statistic, which evaluates the average squared differences between the residuals of the observed covariances and the residuals of the unobserved covariances (Hu & Bentler, 1999). The SRMR should be less than .08 to indicate good model fit. Finally, the CFI—a comparative, or incremental fit index—takes into account sample size when comparing the X^2 value of the observed model and the X^2 of the null model, and is ideal to use to evaluate fit when a sample is small. The benefit of reporting the CFI is that it allows for comparison of the hypothesized model with correlated latent variables, to a null model where all variables are uncorrelated. A CFI $\geq$ .95 is needed to indicate good fit (Hooper et al., 2008; Schreiber et al., 2006). Modification indices were used sparingly, and suggested constraints were added to the model only if there was both strong empirical and theoretical rationale for the modification.

Missing data. Little's missing completely at random test was not significant and we could not reject the null hypothesis (X^2 *[df]* = 1530.12 [1751], *p* = 1.00), suggesting that there is not evidence for a pattern in the missing data. Since a forced-response format was not used for the parent-report questionnaires, some subscales had more missing data than others. Between 0 and 19.1% of data were missing for model variables. Highest levels of missingness were reported for attachment scriptedness (19.1%) and chaos and dinnertime routines at 24 months (both at 17.3%). Given that these variables were all approximately normally distributed, missing in a random pattern, and had fewer than 20% of cases missing, missing data were accounted for using full information maximum likelihood (FIML) estimation in SEM analyses in PROC CALIS (SAS Institute, 2014).

Covariates. Associations between outcome variables (feeding and emotional responsiveness variables) and dichotomous covariates (child gender, receipt of government assistance, race/ethnicity, and financial strain) were examined using two-tailed non-parametric Mann-Whitney U tests with significance set at $\alpha = .05$ when cell sizes were large enough to warrant analysis. Associations between outcome variables and categorical (2+ categories) covariates (education, employment, marital status) were examined using non-parametric Kruskal Wallis H-tests. Finally, associations between model variables and continuous covariates (child age, parent age, family income, perceived financial strain, and child effortful control) were examined using non-parametric Spearman's correlation analyses with significance levels set at $\alpha = .05$.

Results

Descriptive statistics. Participant characteristics are reported in Table 7. Parents were mostly White, well-educated, married, and middle class, suggesting that this sample is at low risk for having obesogenic risk factors. There were about equal numbers of male and female children, and children were—on average—about 20.97 months old. Although families were eligible for the study only if the target child was between 18-24 months, one child in the sample is 34.09 months old due to reporting error. Of the 110 families who agreed to participate in the home visit, there are 109 family mealtime videos. One mealtime video was lost to technology error.

Bivariate associations between covariates and outcome indicators. Regarding categorical covariates, only receipt of government assistance was associated significantly with model outcome variables (indicators of responsiveness). We were unable to analyze differences by race/ethnicity or financial strain as covariates because of small cell sizes (Table 7). Mothers who reported receiving government assistance were observed engaging in less responsive feeding at mealtimes ($z = -2.71$, $p < .01$), than mothers who did not report receiving government assistance. Child gender, marital status, maternal education, and maternal employment were not significantly associated with any outcome variables.

Regarding continuous covariates, child effortful control, income, mealtime length, child age, and parent age were associated significantly with outcome measures of responsiveness. Mealtime length (r = .24, p = .01), income (r = .32, p < .01), and child age (r = -.21, p = .03) were associated with observed responsive feeding. Child age was associated with self-reported child-centered feeding (r = .20, p = .04) and observed responsive feeding (r = -.21, p = .03). Parent age was associated with self-reported child-centered feeding (r = -.31, p < .01), self-reported responsive feeding (r = .34, p < .01), and self-reported problem-focused responses to children's negative emotions (r = .28, p = .01). Child effortful control was associated with parent-report of emotion-focused (r = .24, p = .01), problem-focused (r = .33, p < .01), and expressive encouragement responses to children's negative emotions (r = .22, p = .02). Although financial strain was associated with emotion-focused responses to children's negative emotions (r = -.27, p < .01), this variable was highly skewed because of too little variability. Since only 8 families indicated any financial strain (a score > 1), this variable was dropped from analyses.

Based on these findings, we initially controlled for child effortful control, income, mealtime length, child age, parent age, and receipt of government assistance in all relevant analyses, before systematically removing covariates that were not associated with outcomes.

Measurement model. Descriptive statistics regarding model variables are reported in Table 8, and correlations are reported in Table 9. We specified the measurement models for family, attachment, and responsiveness constructs individually using PROC CALIS in SAS 9.4, and based our initial model specifications off theory and data from the correlation matrix reported in Table 9.

Table 9. Spearman correlations between family, maternal attachment, and maternal responsiveness variables.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Mom Distractions	r																				
	N																				
2. Dad Distractions	r	.41*																			
	N	74																			
3. Child Distractions	r	.26*	.23*																		
	N	109	74																		
4. CHAOS (12m)	r	-.07	-.01	.13																	
	N	104	71	104																	
5. CHAOS (24m)	r	.06	-.08	.05	.67*																
	N	90	65	90	89																
6. Dinner routines (12m)	r	-.17	-.07	-.17	-.09	-.12															
	N	105	71	105	105	89															
7. Dinner routines (24m)	r	-.21	-.23	-.13	-.22*	-.24*	.62*														
	N	90	65	90	89	91	89														
8. ASA-Child	r	-.03	-.04	-.18	-.07	-.03	.05	.05													
	N	89	57	89	84	71	85	71													
9. ASA-Adult	r	-.15	.08	-.24*	-.11	-.10	.10	.01	.77*												
	N	89	57	89	84	71	85	71	89												
10. RSQ-Fearful	r	.17	.01	.12	.35*	.26*	-.07	-.12	-.23*	-.27*											
	N	103	69	103	100	88	101	88	85	85											
11. RSQ-Secure	r	.03	.10	-.07	-.28*	-.11	.04	.03	.16	.27*	-.73*										
	N	102	69	102	98	87	99	87	83	83	101										
12. RSQ-Dismissing	r	.15	.06	.05	.13	.07	.00	-.06	-.17	-.19	.60*	-.40*									
	N	103	70	103	100	89	101	89	84	84	103	102									
13. Obs feeding responsiveness	r	-.16	-.37*	-.38*	-.22*	-.09	-.01	.22*	.05	.12	-.20*	.10	-.17								
	N	109	74	109	104	90	105	90	89	89	103	102	103								
14. CFSQ- Feed responsiveness	r	-.05	.01	-.07	-.21*	-.30*	.05	.17	-.07	.00	-.17	.13	-.07	.22*							
	N	107	72	107	104	91	105	91	87	87	104	102	104	107							
15. CFSQ- Parent control feeding	r	.19	.17	.21*	.06	.21*	-.09	-.14	.00	.00	.10	-.03	.04	-.22*	-.57*						
	N	107	72	107	104	91	105	91	87	87	104	102	104	107	108						
16. CFSQ-Child centered feeding	r	.10	.00	.07	.12	.30*	-.11	-.04	-.01	-.03	.16	-.02	.20*	-.14	-.64*	.41*					
	N	106	72	106	103	91	104	91	86	86	104	102	104	106	107	107					
17. CCNES-EFR	r	.13	.20	.16	-.12	-.07	.00	.00	.00	.17	-.20*	.23*	-.10	-.16	.06	.22*	.09				
	N	105	71	105	102	90	103	90	85	85	104	102	104	105	106	106	106				
18. CCNES-PFR	r	-.09	.07	-.13	-.19	-.19	.18	.10	-.03	.12	-.34*	.38*	-.22*	.07	.24*	-.01	-.04	.60*			
	N	105	71	105	102	90	103	90	85	85	104	102	104	105	106	106	106	106			
19. CCNES-EER	r	-.10	-.09	-.06	-.07	-.11	.07	.06	.06	.09	-.21*	.18	-.07	.04	.26*	-.01	-.09	.44*	.58*		
	N	105	71	105	102	90	103	90	85	85	104	102	104	105	106	106	106	106	106		
20. Observed sensitivity	r	-.14	-.11	-.12	-.11	-.02	-.02	.00	-.07	-.07	-.14	.06	.10	.08	.14	.08	.01	-.01	.11	.13	
	N	109	74	109	104	90	105	90	89	89	103	102	103	109	107	107	106	105	105	105	
21. Observed structuring	r	.12	.01	.04	-.12	-.05	-.07	.13	.00	-.02	.03	-.01	.03	.07	.18	-.01	.00	.01	.03	.09	.49*
	N	109	74	109	104	90	105	90	89	89	103	102	103	109	107	107	106	105	105	105	109

Note.; CFSQ = Caregiver Feeding Styles Questionnaire, CCNES = Coping with Children's Negative Emotions Scale; EFR = Emotion-focused responses; PFR = Problem-focused responses; EER = Expressive encouragement responses. * $p < .05$

Three key family-level constructs emerged from the correlation table. First, family mealtime distractions were indexed by small to moderate correlations between maternal and father distractions. Given that the correlation was not very strong, and because distractions were assessed among different people, these variables were kept separate and modeled as individual predictors in all relevant analyses. Additionally, Cronbach's alpha scores did not indicate that a composite of these scores would be a highly reliable approach to analysis ($\alpha = .69$). Second, CHAOS scores at 12 and 24 months were highly correlated. Third, dinnertime routines subscales at 12 and 24 months were highly correlated. Composite scores were created based on the average scores for CHAOS and for dinnertime routines across the two time points (Table 8). These composites demonstrated very good internal consistency ($\alpha = .82$ and .80, respectively). Analyses of histograms, skewness, and kurtosis indicated that these composite variables were approximately normally distributed.

Regarding attachment factors, two constructs emerged from the correlation table. The ASA adult and child stories, and the fearful and dismissing RSQ subscales were highly positively correlated. The secure subscale was negatively correlated with the fearful and dismissing subscales, but did not have a consistent pattern of association with the ASA scores. This inconsistency, along with the low reliability of the secure subscale suggested that the measure would be inappropriate for use in further analyses, and so was dropped from the model. Based on the pattern of correlations, secure attachment was indexed by the adult-adult and adult-child scores for the ASAs, and insecure attachment was indexed by the dismissing and fearful subscales of the RSQ. Rather than creating composite scores for these constructs, a latent variable approach was used because the indicators were assessing highly related—but distinct—constructs. Two latent variables were constructed in PROC CALIS according to this pattern, with the variance of the latent variables constrained to 1.0, and the variance of the fearful subscale constrained to a non-negative constant. Model fit was very good (X^2 [df] = 0.58 [2], p = 0.75; SRMR = 0.02; RMSEA [90% CI] = 0.00 [0.00, 0.13]; CFI = 1.00), although the RMSEA upper-bound was higher than ideal. Nevertheless, the indicators loaded well onto their respective latent variables (standardized loading coefficients between .59 and 1.00) and other fit statistics (X^2, CFI, SRMR) indicated good fit.

We conducted factor analyses to understand whether responsiveness was a domain-specific (e.g., indicators of feeding responsiveness and indicators of emotional responsiveness load onto their own latent variables) or a domain-general (e.g., feeding and emotional responsiveness load on the same underlying latent variable) in a prior study using the same data (Saltzman et al., *in preparation*). We repeat those analyses here, and use the latent variable approach for these variables—rather than the composite variable approach—given that the indicators are different measures/subscales assessing the same underlying construct. Three key constructs emerged from the correlation table. First, feeding responsiveness was indexed by observed responsive feeding, and self-reported responsive feeding, parent-centered controlling feeding, and child-centered controlling feeding. Second, self-reported emotional responsiveness was indexed by the three CCNES subscales, problem-focused responses, emotion-focused responses, and expressive encouragement responses to children's negative emotions. Finally, observed emotional responsiveness was indexed by observed sensitive responses and observed structuring responses to children's negative emotions during the mealtime. Therefore, three latent variables were constructed in PROC CALIS according to this pattern, with the variance of the latent variables constrained to 1.0. Model fit was very good (X^2 [df] = 26.6 [24], p = 0.20; SRMR = 0.07; RMSEA [90% CI] = 0.05 [0.00, 0.09]; CFI = 0.98), and the indicators loaded well onto their respective factors (standardized loading coefficients between .28 and .94).

Latent variables (attachment security [ASAs], attachment insecurity [RSQ], feeding responsiveness, observed emotional responsiveness, and self-reported emotional responsiveness) were constructed and submitted together with the composite scores to evaluate associations between model variables, and to assess fit of the measurement model. Parameterization involved constraining the variances of the latent variables and one indicator per latent variable to 1.0 and .001, respectively. Model fit was not adequate and showed substantial room for improvement (X^2 [df] = 144.54 [100], p = 0.002; SRMR = 0.09; RMSEA [90% CI] = 0.06 [0.04, 0.09]; CFI = 0.92). Modification indices suggested that error for children's distractions and for child-centered feeding were both significantly associated with error for a number of other indicator variables in the model. However, there was no theoretical basis to correlate these errors, so these variables were dropped from analyses. Measurement model fit improved and all fit indices but the X^2 were within acceptable range (X^2 [df] =100.26 [77], p = 0.04; SRMR = 0.08; RMSEA [90% CI] = 0.05 [0.00, 0.08]; CFI = 0.95). Standardized and unstandardized loadings for these latent variables, and fit statistics for the measurement model without the composite scores are presented in Table 10.

Table 10. Standardized and unstandardized loadings for latent variables assessing attachment security, attachment insecurity, feeding responsiveness, observed emotional responsiveness, and self-reported emotional responsiveness in a measurement model.

	Standardized factor loadings β (SE)	Unstandardized factor loadings B (SE)
Attachment security		
ASA- Adult-adult stories	.77 (.04)	.80 (.09)
ASA- Adult-child stories	.99 (.00)	1.11 (.08)
Attachment insecurity		
RSQ- Fearfulness	.99 (.00)	.91 (.06)
RSQ- Dismissing	.59 (.06)	.45 (.06)
Feeding responsiveness		
Observed responsive feeding	-.27 (.09)	-.16 (.06)
CFSQ-Responsive feeding	-.98 (.00)	-.14 (.01)
CFSQ- Parent-centered controlling feeding	.60 (.06)	.35 (.05)
Observed emotional responsiveness		
Observed structuring	.65 (.06)	.16 (.02)
Observed sensitivity	.99 (.00)	.27 (.02)
Self-reported emotional responsiveness		
CCNES- Problem-focused responses	.99 (.00)	.88 (.06)
CCNES- Emotion-focused responses	.75 (.04)	.70 (.08)
CCNES- Expressive encouragement responses	.61 (.06)	.70 (.10)

Note. All indicators loaded onto their respective factors significantly ($p < .05$). Measurement model fit was excellent (X^2 [df] = 57.46 [49], p = .19; SRMR = .08; RMSEA [90% CI] = .04 [.00, .08], CFI = .978).

Structural equation model.

Associations between covariates and responsiveness. After assessing the unconditional measurement model, we examined associations between relevant covariates and outcome variables. The latent variable representing feeding responsiveness was significantly associated with parent age, and self-reported emotional responsiveness was significantly associated with effortful control (data not shown). Observed emotional responsiveness was not significantly associated with any covariates. Parent age and effortful control are included as covariates in all relevant analyses.

Associations between family and attachment predictors and latent outcomes. Effects of the hypothesized predictors and covariates on the outcomes were assessed in a SEM framework (Table 11) using an iterative procedure to trim the models for parsimony.

Table 11. Standardized path coefficients (and standard errors) estimating effects of family factors and maternal attachment on maternal responsiveness using full information maximum likelihood estimation.

	Feeding responsiveness		Observed emotional responsiveness			Self-reported emotional responsiveness		
	Model 1[a]	Model 2[b]	Model 1[a]	Model 2[b]	Model 3[c]	Model 1[a]	Model 2[b]	Model 3[c]
Predictors	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
Security (ASA)	-.12 (.11)	-.11 (.10)	-.11 (.10)	-.12 (.10)	-	-.05 (.09)		
Insecurity (RSQ)	-.06 (.11)		-.12 (.10)	-.16 (.10)	-.05 (.09)	-.22 (.10)*	-.20 (.09)*	-.15 (.08)
Chaos	-.17 (.10)	-.22 (.09)*	-.11 (.11)			-.18 (.09)	-.21 (.09)*	-.30 (.09)*
Dinner routines	.07 (.10)		-.05 (.11)			.09 (.11)		
Distractions								
Mom	-.03 (.11)		-.24 (.11)*	-.23 (.09)*	-.26 (.09)*	.19 (.12)	.12 (.08)	-
Dad	.05 (.14)		.01 (.14)			-.09 (.20)		
Maternal age	.38 (.10)*	.38 (.10)*						
Child temperament						.32 (.10)*	.33 (.08)*	.29 (.09)
Interaction terms[d]								
Mom distractions x Insecurity					-.20 (.09)*			
Chaos x Insecurity								.19 (.09)*
Model fit indices								
X^2 [df]	38.67 [34]	10.24 [12]	17.18 [21]	11.52 [12]	1.83 [3]	35.5 [34]	16.48 [15]	5.31 [9]
RMSEA	.04	.00	.00	.00	.00	.02	.03	.00
(90% CI)	(.00, .08)	(.00, .09)	(.00, .06)	(.00, .09)	(.00, .13)	(.00, .07)	(.00, .10)	(.00, .07)
SRMR	.08	.05	.05	.06	.03	.05	.05	.03
CFI	.980	1.00	1.00	1.00	1.00	.996	.993	1.00

Note. β = Standardized path coefficient, ASA = Attachment Script Assessment, RSQ = Relationship Scales Questionnaire, RMSEA = Root Mean Square Error of Approximation, CI = Confidence Interval, SRMR = Standardized Root Mean Square Residual, CFI = Bentler's Comparative Fit Index.

[a]Model 1 includes all potential predictors in the model.

[b]Model 2 includes only predictors that have independent effects (β > .10) on the outcome of interest.

[c]Model 3 includes predictors that have independent (β > .10) and significant interactive effects (p < .05) on the outcome of interest.

[d]No Model 3 is presented for feeding responsiveness, because there were no significant interactive effects.

* p < .05

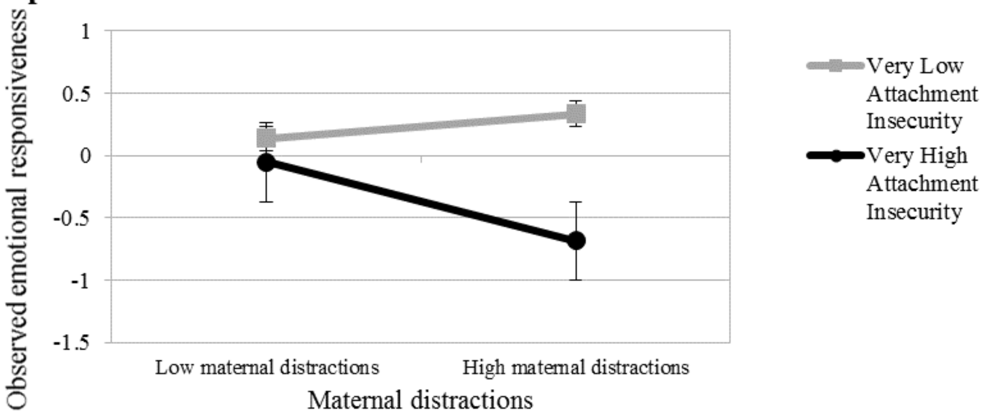
All the potential predictors and relevant were included in Model 1 (Table 11). In Model 2, predictors were only retained if they had independent effects that were large enough to warrant further meaningful analyses ($\beta > .10$). Additionally, in line with the hypotheses described previously, interaction effects were also investigated. There is a lack of consensus on the most robust way to estimate interactions between latent variables in SAS when predictors have missing data (Enders, Baraldi, & Cham, 2014). Therefore, these findings are exploratory and should be interpreted with caution. Factor scores for the two latent variable predictors (attachment security and attachment insecurity) were calculated and saved using PROC CALIS and PROC SCORE procedures in SAS; these scores are automatically standardized. Distractions variables and composite scores for CHAOS and dinnertime routines were mean-centered. Interaction terms based on these factors and mean-centered variables were systematically added to and removed from models after independent effects were identified in Model 2. Thus, in Model 3, predictors that had independent ($\beta > .10$) and significant interactive effects ($p < .05$) on the outcome were retained.

Effects of attachment and family factors on feeding responsiveness. In Model 1, only attachment security, chaos, and parent age had substantial (but non-significant) standardized effects on feeding responsiveness to be included in the trimmed model, although model fit was very good (Table 11). In Model 2, parent age and household chaos had significant independent effects on feeding responsiveness, but attachment security did not. Although interactions between household chaos and attachment security were examined, the interaction term did not have a significant effect on the outcome (B [SE] = -.01 [.09]). Model fit was very good, save for the RMSEA upper-limit that was higher than ideal (X^2 [df] =12.24 [9], p = 0.20; SRMR = 0.05; RMSEA [90% CI] = 0.05 [0.00, 0.13]; CFI = 0.95).

Effects of attachment and family factors on observed emotional responsiveness. In Model 1, attachment security, attachment insecurity, and maternal distractions had substantial independent effect on observed emotional responsiveness (Table 11). In Model 2, only maternal distractions had a significant independent effect on observed emotional responsiveness, but attachment insecurity and attachment security did not. In Model 3, we investigated interactions between maternal distractions and attachment security, and between maternal distractions and attachment insecurity. There was a significant interactive effect of maternal distractions and attachment insecurity on observed emotional responsiveness, but not of maternal distractions with attachment security. In order to preserve model parsimony, attachment security was removed from the final model. Model fit was very good, although the RMSEA upper bound was slightly out of the acceptable range in Models 2 and 3. It is important to note that model fit worsened in Model 3, suggesting that these findings should be interpreted with caution.

Simple slopes analyses were conducted using the coefficients and covariances from Model 3 to evaluate the interactive effects of maternal distractions and attachment insecurity on observed emotional responsiveness. Mothers who were highly insecure (+2 SD from the mean on attachment insecurity) and engaged in more distractions at mealtimes (+2 SD from the mean on maternal distractions), engaged in significantly less observed emotional responsiveness, as compared to mothers who were less insecure and/or had fewer distractions (Figure 8).

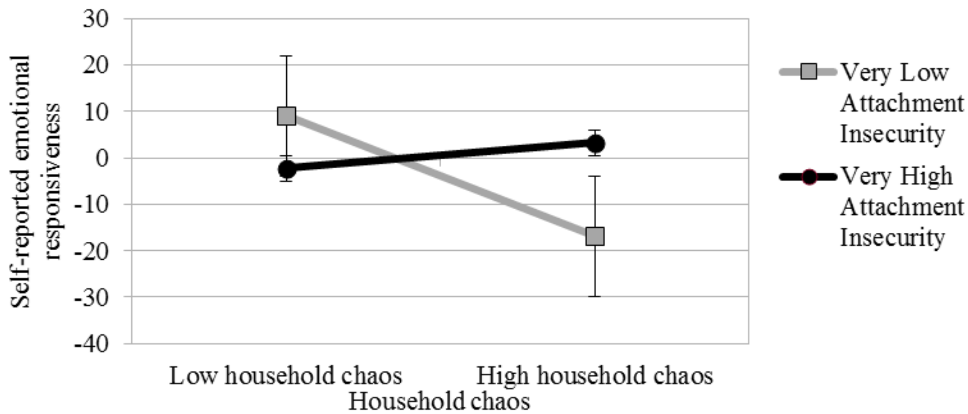
Figure 8. Mothers who are highly insecure and have more distractions at mealtimes engage in less observed emotional responsiveness



Effects of attachment and family factors on self-reported emotional responsiveness. In Model 1, attachment insecurity, household chaos, maternal distractions, and child temperament had substantial independent effects on self-reported emotional responsiveness. In Model 2, attachment insecurity, chaos, and child temperament—but not maternal distractions—had significant independent effects on self-reported emotional responsiveness. In Model 3, we systematically investigated interactions between attachment insecurity and chaos, attachment insecurity and maternal distractions, and maternal distractions and household chaos. There was a significant interactive effect of household chaos and attachment insecurity on self-reported emotional responsiveness. There were not significant interactive effects of attachment insecurity and maternal distractions, or maternal distractions and household chaos on self-reported emotional responsiveness, so maternal distractions was removed from the model to preserve model parsimony. Model fit was excellent in Model 3, and the more parsimonious approach with the interaction term showed improved fit in comparison to Model 2.

Simple slopes analyses were conducted using the coefficients and covariances from Model 3 to evaluate the interactive effects of household chaos and attachment insecurity on self-reported emotional responsiveness (Figure 9). We found that mothers who had high levels of household chaos (+2 SD from the mean), and had very low levels of attachment insecurity (-2 SD from the mean) engaged in significantly less self-reported emotional responsiveness than mothers with high levels of attachment insecurity. There was no difference in self-reported emotional responsiveness among mothers who were highly insecure, by high or low levels of household chaos. High household chaos was only associated with self-reported emotional responsiveness among mothers who were more secure.

Figure 9. Mothers who are highly insecure may be resilient to effects of household chaos on self-reported emotional responsiveness.



Discussion

The aim of the current study was to investigate independent and interactive effects of family and attachment factors onto maternal feeding and emotional responsiveness. First, findings are briefly summarized in relation to our hypotheses. Second, results are discussed in relation to extant literature on feeding and emotional responsiveness separately. Finally, we assess the strengths and limitations, make recommendations for future literature, and discuss implications of the current study's findings for researchers and practitioners.

Our first hypothesis was that we would find evidence to suggest that more family risk factors (high levels of household chaos and mealtime distractions, few family mealtime routines) and low attachment security would independently be associated with lower responsiveness. This hypothesis was partially supported, depending on the specific family factor, measures of attachment security vs. insecurity, and type of responsiveness. Lower levels of attachment insecurity were strongly associated with lower self-reported emotional responsiveness, although attachment was not associated with observed emotional responsiveness or feeding responsiveness. Higher levels of household chaos were significantly associated with less feeding responsiveness and less self-reported emotional responsiveness, but not with observed emotional responsiveness. More maternal distractions during mealtimes were associated with less observed emotional responsiveness.

Second, we hypothesized that family protective factors would buffer, and family risk factors would exacerbate the negative effects of attachment insecurity on responsiveness. These hypotheses were also partially supported. In support of the latter, mothers who were more distracted at mealtimes and were highly insecure, were observed engaging in less emotional responsiveness during mealtimes. In support of the former hypothesis, there was no association between household chaos and self-reported emotional responsiveness for mothers who were highly insecure, although more household chaos was associated with less self-reported emotional responsiveness among mothers who had low levels of attachment *insecurity* (higher levels of *security*). In contradiction to these hypotheses, there were no significant interaction effects between attachment security and family factors on feeding responsiveness.

Finally, we hypothesized that effects of family and attachment variables—whether independent or interactive—would be different for feeding and emotional responsiveness outcomes. Specifically, we expected that factors more proximal to the mealtime (dinnertime routines and distractions) would be more closely tied to feeding responsiveness, whereas general family factors (chaos) would be more closely tied to emotional responsiveness. This hypothesis was not supported by the evidence. For example, general household chaos was the only variable associated with feeding responsiveness. In direct contradiction to the hypothesis, dinnertime routines and distractions were not associated with maternal feeding responsiveness. However, maternal distractions during mealtimes were strongly associated with emotional responsiveness observed during mealtimes. These effects may be due to the same measurement context for these variables, given that both were observational assessments from the mealtime videos. However, they may also reflect true associations, particularly given that standardized effects were significant, despite large standard errors.

Household chaos was significantly negatively associated with feeding and self-reported emotional responsiveness, controlling for the effects of attachment and parent age. In the literature on emotion-related parenting, it is generally understood that household chaos can influence parent's emotional responsiveness (Vernon-Feagans et al., 2016) and children's subsequent self-regulatory behavior (Coldwell et al., 2006). Socioeconomic stressors—such as having a low household income, financial strain, or low maternal education—may exacerbate the association between household chaos and mothers' responsiveness (Deater-Deckard, 2014; Vernon-Feagans et al., 2016). Indeed, low-income mothers report that household chaos and disorganization are barriers to having consistent mealtimes (Herman et al., 2012; Malhotra et al., 2013), and having more well-defined goals for feeding (Goulding et al., 2015; Pesch, Harrell, Kaciroti, Rosenblum, & Lumeng, 2011). It is telling that chaos still exerted a unique effect on maternal feeding and self-reported emotional responsiveness in a sample of families with few socioeconomic risk factors. Not only does this finding support previous arguments that chaos is a more proximal risk factor than poverty for responsiveness (Vernon-Feagans et al., 2016), but it also suggests that chaos has a pervasive effect on parenting in multiple contexts. Indeed, although feeding and emotional responsiveness are distinct parenting behaviors with different etiologies, household chaos seems to make it more difficult for mothers' to respond effectively to both appetitive and emotional cues from their children.

Chaos was also associated with self-reported emotional responsiveness as a function of attachment insecurity. There was no association between household chaos and self-reported emotional responsiveness among mothers who were highly insecure. Surprisingly, high levels of household chaos were associated with less self-reported emotional responsiveness, only among mothers who reported low attachment insecurity. There are several possible explanations for these findings. On one hand, mothers who are more insecure may have past experiences that prepare and inoculate them from the negative effects of household chaos on their perceived ability to respond to their children's negative emotions. Indeed, the common denominator for the fearful and dismissing subscales of the RSQ is a generally negative feeling about how other people will behave in close relationships (Griffin & Bartholomew, 1994). These attachment styles indicate a history of exposure to others who are not necessarily predictable, consistent, or warm in close relationships. Mothers with these more insecure attachment styles may not expect predictability or consistency; they have dealt with difficulty before, so household chaos does not faze them. They may be resilient to the effects of household chaos on their ability to respond to their children's negative emotions. In contrast, mothers who are less insecure may have expectations of predictability or consistency for their relationships. Thus, these mothers are sensitive to the effects of household chaos on their perceived emotional responsiveness. Stress inoculation theory suggests that individuals exposed to chronic stress in childhood have developed coping strategies that are adaptive in difficult contexts (Wadsworth, 2015). Ignoring household chaos—or simply not having a strong physiological or psychological response to this kind of stress—may be adaptive for individuals exposed to chronic stressors, like an unpredictable attachment figure (Holmes, 2017). When these individuals have their own families, they may be resilient to adversity posed by household chaos, given their past experiences coping with difficulty.

On the other hand, we did not find that this resiliency extended to observed emotional responsiveness during mealtimes. Rather, we found that mothers who were more insecure and who engaged in more distractions at mealtimes were less likely to be observed being emotionally responsiveness. There are three possible explanations for this inconsistency. First, mothers self-reports of emotional responsiveness may not translate directly to how they behave. Similarly, observed emotional responsiveness in the current study may not be a reflection of self-reported emotional responsiveness, because we observed these behaviors in the mealtime context specifically. Mealtimes may be uniquely stressful or difficult contexts for mothers with insecure attachment, given that they require direct engagement with children's appetitive cues and their emotional cues. Although these mothers self-report that their emotional responsiveness does not change when exposed to indicators of disorganization (e.g., distractions during mealtimes), in practice they may have a difficult time sorting through the added stress to engage effectively with their children's negative emotions. Second, it is equally possible that emotional responsiveness observed during mealtimes is qualitatively different from emotional responsiveness observed during situations that do not involve food. Attachment insecurity is a strong predictor of dysregulated eating and feeding behaviors in mothers and children (Bost et al., 2014; Saltzman & Liechty, 2016; Scharfe, 2012). The fact that we found effects on emotional responsiveness observed during mealtimes may indicate that the mealtime context itself has a large influence on a parent's ability to respond appropriately to their children's emotional cues. For example, an insecurely attached parent may be able to respond consistently and appropriately to a child's cue of hunger/satiety, because this simply involves meeting a need that will directly ensure survival. In contrast, it may be more difficult for an insecurely attached parent to respond to children's negative emotions during the mealtime, because they must complete this already-difficult task in addition to responding to their cues of hunger and satiety and coping with external family-level stressors (e.g., chaos, distractions, etc.).

We found no effects of attachment insecurity on feeding responsiveness in the current study, in contrast to our expectations and previous findings. There are several explanations for this finding. First, it is possible that our operational definition of responsive feeding may not be the type of responsive feeding that has been linked previously to attachment insecurity. Several studies have found that adult attachment insecurity is associated with persuasive-controlling feeding (Powell et al., 2017) and emotion-related feeding (Bost et al., 2014; Hardman et al., 2016). Theoretical papers have suggested that these feeding practices can be considered non-responsive, because they do not attend to a child's cues of hunger and satiety, but rather to external stimuli such as negative emotion or a parent's perception of children's weight or appetite (Black & Aboud, 2011; Saltzman et al., 2017). Although our prior research has shown that feeding responsiveness is quantifiably distinct from emotional responsiveness (Saltzman et al., *in preparation*), there is scant empirical evidence exploring whether specific feeding practices can be categorized consistently as responsive or non-responsive feeding. Our study did not measure specific food-related parenting practices—restrictive, pressuring, or providing food as a reward—but rather a general approach to feeding children in response to their cues of hunger and satiety.

This forces us to ask the question: is it appropriate to measure feeding by dividing specific behaviors into responsive and non-responsive approaches? Our self-report and observational measures of feeding responsiveness—the Caregiver Feeding Styles Questionnaire (CFSQ) and the Feeding Behavior Coding System—were developed based on Maccoby and Martin's (1983) construct of responsiveness in general parenting (Hughes et al., 2005; Maccoby & Martin, 1983), not Ainsworth and Bowlby's construct of responsiveness in attachment (Ainsworth, 1979; Ainsworth et al., 1978; Bowlby, 1982). Items for the CFSQ were developed in order to distinguish between demanding and responsive feeding behaviors (Hughes et al., 2005). Demandingness was operationalized by assessing how frequently the parent encouraged eating, whereas responsiveness was operationalized by assessing how the parent went about encouraging the child's eating behaviors (Hughes et al., 2005). These operational definitions are quite different from the operational definitions of emotional responsiveness used in attachment theory, suggesting that the underlying approaches to measurement development may explain the null effects of attachment on "feeding responsiveness" in the current study. Thus, the measures used in the current study may not allow us to categorize different feeding practices as being sensitive, contingent, and appropriate to a child's developmental needs in all situations. In order to assess whether observed feeding responsiveness is associated with adult attachment, observational coding schemes should assess whether each instance of feeding behavior is sensitive to the current situation, contingent to the moment's cue, and appropriate to a child's developmental needs. Additionally, future research needs to probe the factor structure of feeding responsiveness using multiple measures of specific feeding practices, in order to assess whether current self-report measures allow for this kind of nuance, or if new measures are needed.

The use of multiple measurements and naturalistic observational data collection strengthen the design, and can increase our confidence in the conclusions drawn. The associated latent variable analysis techniques that can be used to leverage these data also allow us to elevate our analysis to a more abstract level, while accounting for measurement error in a SEM framework (Bollen, 2002). However, due to the time-consuming data collection procedures that multiple measures demand, the sample size may be more limited than a similar study focused on using only self-report measures in a panel survey format. Although it may be more ideal to run path analyses with a larger sample size, the cost and time associated with conducting 200+ home visits and was beyond the scope of the current project. Given that we were able to identify relatively robust effects despite larger standard errors, we are more at risk for Type II error, rather than Type I error. Small sample size is a common issue in studies using observational coding schemes, and is one of the limitations of collecting observational data (Margolin et al., 1998). Another common issue with observational research is social desirability; neither parents nor children were asked to rate the degree to which they felt compelled to behave in a certain way because of the observation. By using multiple measurement methods and coders for each construct, and by estimating measurement error, this bias can be partially attenuated (Baucom, Leo, Adamo, Georgiou, & Baucom, 2017). Additionally, this study is limited in that most data were collected at a single time point (when children were between 18 and 24 months old), and therefore we are unable to suggest that these are causal pathways. We also only observed and collected self-report data on mothers' responsiveness; fathers play an important role in responsiveness and there is scan research exploring fathers' behaviors during mealtimes specifically. Finally, we acknowledge the strong effect that culture has on feeding and mealtimes. Given the relatively homogenous characteristics of our sample, we make no assertions about the generalizability of these results.

Conclusions

Results of this study show that family factors are more closely linked to feeding responsiveness, whereas family and attachment factors are both independently and interactively associated with emotional responsiveness. Associations between household chaos and feeding responsiveness suggest that interventions aimed at improving feeding responsiveness should consider providing mothers with techniques to reduce general household chaos, rather than focusing only on disorganization around meals. There is also preliminary evidence to suggest that attachment insecurity may attenuate the association between household chaos and maternal emotional responsiveness during mealtimes. Research focused on parenting—particularly among parents who may have been exposed to early adversity—should consider taking a strengths-based approach to examining how structural and interpersonal factors may be related to behaviors during mealtimes specifically. Finally, future research is needed to ascertain whether feeding responsiveness and emotional responsiveness observed during mealtimes have differential effects on child outcomes.

Chapter Four: Direct, Indirect, and Interactive Effects of Family Factors, Maternal Attachment, and Responsiveness on Child Appetite Self-Regulation

Literature Review

Child appetite self-regulation—or adherence to internal cues of hunger and satiety—is associated with better weight outcomes and lower likelihood of excessive weight gain in early childhood (Fisher & Birch, 2002; Hughes et al., 2015). Child appetite self-regulation is also associated with general (non-appetitive) self-regulation, which is typically defined as the purposeful organization of emotional, attentional, or behavioral control (Bridgett et al., 2013; Hughes et al., 2015; Tan & Holub, 2011). Appetitive and general self-regulation are distinct—albeit highly related—constructs with slightly different effects on child weight outcomes (Hughes et al., 2015; Miller et al., 2016; Saltzman et al., *in preparation*). For example, appetitive emotional, appetitive behavioral, and non-appetitive emotional self-regulation are associated with child weight outcomes; whereas general self-regulation and non-appetitive behavioral self-regulation are not associated with weight outcomes (Hughes et al., 2015; Miller et al., 2016). The etiology of children's general self-regulation depends on a positive parent-child relationship, which provides a healthy model for learning self-regulation skills, and security for the child to explore the environment with the knowledge that they have a responsive caregiver who can alleviate their distress or exposure to danger should the need arise (Bernier et al., 2015; Calkins & Fox, 1992; Gunnar & Donzella, 2002; Kochanska et al., 2009; Mikulincer, Shaver, & Pereg, 2003). The parent-child relationship, in turn, is ensconced within the context of the family as a whole (Cowan, 1997; Fosco & Grych, 2013). Children are exposed to other family members, routines, and organizational processes that may influence child self-regulation directly, interactively with, or indirectly via processes in the parent-child relationship (Coldwell et al., 2006; Fiese & Bost, 2016; Morris, Silk, Steinberg, Myers, & Robinson, 2007; Sigman-Grant et al., 2015). However, it remains to be seen whether the development of children's appetite self-regulation has similar or differential antecedents.

We previously proposed a conceptual framework integrating attachment and family systems theories, which informed a series of testable hypotheses regarding pathways of risk, resilience, and well-being toward the development of child appetite self-regulation (Saltzman, Fiese, Bost, & McBride, 2017). The risk pathway posits that family risk factors (high levels of household chaos, few family routines) and low parent-child attachment will directly—and indirectly via low levels of parent responsiveness—exacerbate low levels of child appetite self-regulation. The resilience pathway hypothesizes that family protective factors will buffer children from the negative effects of low parent-child attachment security, which in turn will have direct effects—and indirect effects via responsiveness—on child appetite self-regulation. Finally, the well-being pathway suggests that family- and attachment-related protective factors will directly—and indirectly via high levels of parent responsiveness--contribute to more optimal child appetite self-regulation. Neither self-regulation nor parenting behaviors occur within a vacuum. By considering how family factors may buffer or exacerbate the effects of attachment-related processes, researchers will be able to identify specific targets for future obesity prevention programs, whether they be modifiable risk factors in the general population, or protective factors among high-risk families. To address these issues, we discuss the etiology of child appetite self-regulation from the perspectives of attachment and family systems theories, identify limitations, and describe how the aims of the current study are designed to address gaps in the literature.

Attachment, responsiveness, and child appetite self-regulation. Parents can influence child self-regulation by serving as external regulatory controls (Eisenberg & Sulik, 2012). Attachment theorists posit that self-regulation generally develops a result of the interactions between children's temperamental characteristics, and caregivers' responses to children's early cues of distress (Schore & Schore, 2007). Warm, sensitive, and contingent parental responses to children's negative emotions provide a scaffold for infants to learn and build a repertoire of cognitive, emotional, and behavioral tools that build the foundations for self-regulation in later life (Bernier et al., 2010; Calkins & Fox, 1992). By responding appropriately to children's negative emotions, parents help children develop expectations for interactions in close relationships—or their mental representations of attachment relationships (Bost et al., 2006; van IJzendoorn, 1995; Wong et al., 2011).

Grounded in schematic memory theories, mental representations of attachment are hypothesized to inform parent-child interactions by providing access to an internal working model of expectations that organize actors' behaviors in close relationships (Bost et al., 2006; Waters & Waters, 2006). To measure these internal working models, researchers evaluate individuals' access to attachment scripts—or schematic cognitions that form structure for common elements of specific events (e.g., characters, settings, challenges, arcs, and resolutions in stories; Waters & Waters, 2006). A child with a parent who is emotionally responsive will develop a secure base script, in which they expect that parents can detect negative emotions, work to alleviate them, and effectively comfort and regulate the child's negative emotions before returning to positive parent-child interactions. According to Bowlby and Ainsworth's theories, a child with a parent who is less emotionally responsive will not be able to develop positive expectations of interactions in close relationships (Ainsworth, 1979; Ainsworth & Bell, 1970; Bakermans-Kranenburg, IJzendoorn, & Kroonenberg, 2004; Bowlby, 1982; Main, Kaplan, & Cassidy, 1985; Waters & Waters, 2006). These children do not anticipate that close others will behave in predictably supportive ways, and so are not provided a model of healthy regulation, nor a secure base from which they can learn to regulate their emotions, behaviors, and cognitions (Bernier et al., 2015, 2010). Securely attached children have healthier behavioral inhibition patterns (Calkins & Fox, 1992; Heikamp, Trommsdorff, Druey, Hübner, & von Suchodoletz, 2013), physiological responses to distress

(Hill-Soderlund et al., 2008), and emotion regulation capacities (Kochanska et al., 2009), as compared to children who are not securely attached. It is clear that maternal attachment security directly—and indirectly via effects on sensitive and responsive caregiving—influences children's general self-regulatory skill development. Mothers with more ready access to secure base scripts engage in more positive and sensitive parenting, and have children with higher levels of academic achievement and secure base behavior, and fewer internalizing, externalizing, and self-regulatory problems (Coppola et al., 2006; Cowan, Cohn, Cowan, & Pearson, 1996; McLear, Trentacosta, & Smith-Darden, 2016; Vaughn et al., 2007).

A burgeoning body of literature has emerged exploring how mothers' attachment-related perceptions and behaviors are related to children's *appetitive* self-regulation. For example, maternal attachment anxiety is associated directly—and indirectly via effects on emotion-focused feeding practices—with emotional over-eating in preadolescents (Hardman et al., 2016). Maternal attachment anxiety has also been indirectly linked with children's appetite self-regulation, via effects on persuasive-controlling feeding practices (Powell et al., 2017a). As an important aside, these studies focus on feeding practices as mediators for the association between maternal attachment and child appetite self-regulation. This focus was borne from theoretical frameworks suggesting that emotional responsiveness and feeding responsiveness should be subsumed as part of general parenting responsiveness (Black & Aboud, 2011; Pérez-Escamilla, Segura-Pérez, & Lott, 2017). Although feeding and emotional responsiveness are theoretically similar constructs, like appetitive and general self-regulation, these are empirically distinct—but related—behaviors (Saltzman et al., *in preparation*). Indeed, one study found that insecure mothers were more likely to use negative responses to children's negative emotions (e.g., punishing or dismissing child expressions of negative emotions), which increased the likelihood that they would use emotion-focused feeding practices (e.g., feeding children in response to negative affect; Bost et al., 2014). In turn, emotion-focused feeding practices and fewer family mealtime routines predicted more unhealthy food consumption in the mothers' preschool aged children.

Together, these findings suggest that maternal attachment orientations may have indirect effects on child appetite self-regulation. However, several limitations to the current literature remain. First, it is unclear whether emotional or feeding responsiveness (or both) serves as mechanisms or moderators for the association between maternal attachment orientations and child appetite self-regulation. One could argue that emotional responsiveness has a more pervasive effect on children's general self-regulation, which in turn would influence child appetite self-regulation. However, it is also possible that feeding responsiveness has a more proximal effect on appetite self-regulation specifically. Studies evaluating the contributions of these different types of responsiveness to child appetite self-regulation are needed to assess whether interventions should target one, both, or neither of these behaviors in efforts to prevent excessive early weight gain. Second, few studies have evaluated whether and how these attachment processes are associated with child appetite self-regulation within the context of family-level factors, such as household chaos or family routines. The maternal-child relationship—and the associated behavioral milieu—is embedded within the family unit as a whole. Integrating attachment and family systems theories will allow us to investigate and ultimately identify a more accurate framework for the contextualized development of appetite self-regulation.

Household chaos, family mealtime routines, and child appetite self-regulation. Family factors—such as household chaos and routines—are strongly associated with different dimensions of children's general self-regulation (Anderson, Sacker, Whitaker, & Kelly, 2017; Bater & Jordan, 2017; Coldwell et al., 2006; Ferretti & Bub, 2014; Martin, Razza, & Brooks-Gunn, 2012; Vernon-Feagans, Willoughby, Garrett-Peters, & The Family Life Project Key Investigators, 2016). Studies have consistently found that children with fewer household routines have poorer emotion self-regulation (Anderson et al., 2017; Bater & Jordan, 2017; Miller et al., 2017). Meanwhile, children exposed to higher levels of household chaos have poorer behavioral self-regulation and executive functioning (Berry et al., 2016; Coldwell et al., 2006; Dumas et al., 2005; Hart, Petrill, Deater Deckard, & Thompson, 2007; Vernon-Feagans et al., 2016).

It is important to distinguish between these distinct family processes. Household chaos is typically defined as high levels of noise, overcrowding, unpredictability, or disorganization in the home, and is comprised of two key dimensions; instability and disorder (Evans & Wachs, 2010). Instability involves having unpredictable routines and changes to settings or relationships within the home, whereas disorder involves too little structure and organization, and too much noise and crowding (Evans & Wachs, 2010; Vernon-Feagans et al., 2012). Thus, routines are one component of household chaos, and are specifically important for children's general and appetitive self-regulation because of their implications for a predictable home environment. In a sample of 380 low-income preschoolers, child cortisol partially moderated the association between family routines, general household chaos, and child emotion self-regulation (Miller et al., 2017). Based on biological stress response theories focused on the early-life programming of the hypothalamic-pituitary-adrenal axis among children exposed to chronic stress, the authors hypothesized and found that there was a stronger association between routines and emotion self-regulation among children with lower cortisol levels. However, exposure to household chaos was strongly associated with child emotion self-regulation regardless of children's biological indicators of chronic stress. Because chaos is a more general and extensive type of household disorganization, it may be more consistently damaging to children's self-regulatory capacities as compared to family routines specifically.

Routines may be particularly important for children exposed to chronic stress, because they can provide stability and predictability for children who may not have be exposed to the comfort of consistency in other arenas of life. This predictability then could support them as in safe environmental exploration, interactions with others, and learning self-regulatory skills. Given that the physiological signature of chronic stress in early childhood is present among insecurely attached children (Ahnert, Gunnar, Lamb, & Barthel, 2004), it follows that routines may provide a measure of stability for children who are exposed to less predictable parent-child interactions and responsiveness in early life. In the study by Miller and colleagues (2017), having predictability in household routines may have buffered children from the negative effects of chronic stress on self-regulation. Predictability around specific routines may provide more insight for effects on child appetite self-regulation. Family mealtime routines are associated with fewer child internalizing behaviors (Fiese et al., 2006), better emotion regulation (Anderson et al., 2017), fewer picky eating behaviors (Cole, Musaad, Fiese, Lee, & Donovan, 2016), and healthier child weight outcomes (Anderson & Whitaker, 2010). Routines around processes more proximal to the food environment may provide additional protection for children exposed to the unpredictability of a less secure or less responsive parent. Together, these findings show that family organization and predictability can influence a child's ability to regulate their behavior.

Several studies have also found that the effects of family factors on children's self-regulation may be moderated or mediated by parenting factors. For example, Coldwell and colleagues found that household chaos exacerbated the negative effects of less warm and more hostile parenting on child self-regulation (Coldwell et al., 2006). However, another study found that the effects of household chaos on children's general self-regulation were partially mediated by parent emotional responsiveness (Vernon-Feagans et al., 2016). Thus, there is substantial evidence to suggest that family factors may influence children's general self-regulation—directly, indirectly, or as a function of parenting.

However, there have been few studies investigating these links with child appetite self-regulation, and no studies have evaluated whether family factors can buffer children from the negative effects of attachment-related risk factors, such as low parent attachment security or low levels of parent responsiveness. Without understanding the direct, indirect, and interactive relationships between these embedded processes, researchers may inadvertently discard interventions targeting behaviors that are protective for higher-risk of families (e.g., families with parents with high attachment insecurity), but that exert no effects for low-risk families (e.g., families with parents with low attachment insecurity).

Current study. The aim of the current study is to investigate the independent and interactive associations between family factors (household chaos and family mealtime routines), maternal attachment, and maternal responsiveness with child appetite dysregulation. Three key hypotheses were tested, based on evidence from our previous research and the extant literature. First, we expected family factors (e.g., household chaos and dinnertime routines) and maternal and child attachment security to be independently associated with child appetite self-regulation. Specifically, we hypothesized that more household chaos, fewer dinnertime routines, and lower maternal attachment security would be associated with less child appetite self-regulation. Second, we expected that family and attachment factors would also have indirect effects on child appetite self-regulation, via maternal emotional and feeding responsiveness. Third, we predicted that maternal attachment security and responsiveness would moderate associations between family factors and child appetite self-regulation. Specifically, we expected that low levels of household chaos and more mealtime routines would buffer children from the negative effects of low parent attachment and responsiveness, whereas high levels of household chaos and fewer mealtime routines would exacerbate these negative effects.

Method

Participants and recruitment. Participants in the current study were from a subsample of families (n = 110) in the larger STRONG Kids 2 Study (SK2; N = 451). The SK2 study aims to investigate multilevel predictors of child weight trajectories and dietary habits in the first five years of life. Mothers in SK2 were recruited during their third trimester of pregnancy from birthing classes and clinics in East Central Illinois from May 2013 to January 2017. Families were excluded if children were premature (< 37 weeks), unable to feed normally (e.g., phenylketonuria), or were low birthweight (< 2.5 kg). The subsample of families in the current study were recruited to participate in a 2-3 hour home visit, which involved a videotaped family mealtime and a structured interview with mothers. Families were eligible if the target child was in SK2 and between 18 and 24 months old. Of the 198 families who were eligible, 110 families agreed to participate in the study between October 2015 and July 2017. Demographic characteristics of the subsample are reported in Table 12, and are not significantly different from demographic characteristics in the larger SK2 sample.

Home visit procedures. Home visits were scheduled according to the family's availability on weekday evenings. Mothers provided written and informed consent prior to video-recording the family mealtimes and audio-recording the maternal interview. First, two trained observers arrived at the home, greeted the child, and discussed consent/ assent with mothers while the child attenuated to their presence. Second, once the family was ready to eat dinner, video cameras were set up to face the target child's seat during mealtimes, and observers left the home to let the family eat. Third, a member of the family let the observers know when the meal was done, and the observers went back inside to complete the maternal interview. One observer went with the mother to a private space to complete the interview, and the other observer worked with the child conducting a series of behavioral tasks (not examined in current study). At the end of the visit, parents were debriefed and provided remuneration ($75.00) and children were given a toy.

Table 12. Home visit sample characteristics

	N	%	*M*	*SD*	*Range*
Parent age at 6 weeks (years)			30.90	4.47	19.09 - 45.23
Child gestational age at birth (weeks)			39.57	1.27	37.00 - 42.29
Child age at home visit (months)*			20.97	2.73	17.80 - 34.90
Absence of father at the mealtime	36	32.70			
Child Gender					
Female	57	51.40			
Male	53	47.70			
Marital status					
Married	94	84.70			
Single	9	8.10			
Co-habiting	3	2.70			
Divorced	1	0.90			
Monthly Income					
Less than $3,000	30	29.00			
$3,000 - $6,000	47	45.00			
More than $6,000	23	20.70			
Employment Status					
Employed/Self-Employed	79	71.80			
Unemployed	6	5.50			
Stay at home parent	20	18.20			
Student	1	0.90			
Work hours (> 40 hours/week)	13	11.80			
Maternal education					
High school graduate	1	0.90			
Some college or technical school	21	19.10			
College graduate	40	36.40			
Post-graduate work	45	40.90			
Maternal race/ethnicity (not mutually exclusive)					
White	89	80.90			
Black	8	7.30			
Asian	7	6.40			
American Indian/Alaska Native	1	0.90			
Hispanic/Latino	3	2.70			
Biracial	5	4.50			

Note.
*One child was 34.90 months old during the home visit. All other children were between 17.80 and 28.60 months old.

Coding procedures. Videos of family mealtimes were stored on a secure university server, and were coded in several phases. Two separate coding teams of six individuals total focused on coding observed feeding responsiveness and observed emotional responsiveness. Each team was led by a master coder who coded videos collected for a previous study during training. Each master coder trained two, upper-level undergraduate coders on their respective coding schemes. Each undergraduate coder attained adequate inter rater reliability (intra-class correlation coefficient [ICC] $\geq$ .70) with the master coder and the other undergraduate coder on the training videos before proceeding to the next step. Each undergraduate coded about half (n = 55) of all mealtime videos for their respective coding schemes. The master coders double-coded about 20% (n = 22) or more of the videos for each coding scheme, overlapping equally with each undergraduate. Undergraduates were blinded to which videos would be double-coded. Significant differences in coding (ICC < .70) were resolved by discussion and attaining consensus across coders. All coding was conducted with Mangold's INTERACT software (Mangold International, 2016), which is designed to apply complex multilevel coding schemes to in vivo or pre-recorded data. After all videos were coded, data were imported to SPSS 24.0 (IBM Analytics, 2016).

Measures.

Family factors.

Household chaos. Household chaos was measured using the 15-item Confusion, Hubbub, and Order Scale (CHAOS) when children were 12 and 24 months old (Matheny, Wachs, Ludwig, & Phillips, 1995; Table 13). For each item (e.g., "It's a real zoo in our home,"), mothers indicated how much the statement described their family or home from 1 (*Very much like your own home*) to 4 (*Not at all like your own home*). Scores were calculated by summing responses across the 15 items, with higher scores indicating more chaotic or disorganized home characteristics. Reliability for the current study was excellent at 12 and 24 months (α = .85 and .84, respectively), and is comparable to other studies that have used the CHAOS among families with toddlers (Matheny et al., 1995).

Table 13. Descriptive statistics about family factors, maternal-child attachment, responsiveness, and appetite self-regulation.

	N	M	SD	Range
Family factors				
Household chaos components score	109	0.00	1.00	-1.92 - 2.97
Household chaos (12m)	109	1.75	0.44	1.00 – 3.27
Household chaos (24m)	109	1.84	0.48	1.07 - 3.13
Dinnertime routines components score	109	0.00	1.00	-3.51 - 1.80
FRQ- Dinnertime routines (12m)	109	3.88	0.67	1.57 - 5.00
FRQ- Dinnertime routines (24m)	109	3.89	0.63	1.71 - 5.00
Maternal attachment				
Attachment scriptedness (collected between 18 and 24m)	89	3.33	1.02	1.21 - 5.67
Attachment insecurity (RSQ) components score	109	0.00	0.97	-2.09 - 2.53
RSQ- Fearful(18m)	109	2.28	0.90	1.00 - 4.75
RSQ- Dismissing (18m)	109	2.97	0.75	1.20 - 5.00
Maternal responsiveness				
Feeding responsiveness component score	110	0.00	1.00	-2.93 - 2.47
Observed responsive feeding (collected between 18 and 24m)	109	2.30	0.63	0.56 - 3.57
CFSQ- Feeding responsiveness (18/24m average)	109	1.32	0.15	0.99 - 1.68
CFSQ- Parent-centered control (18/24m average)	109	1.92	0.59	1.00 - 4.00
Self-reported emotional responsiveness component score	109	0.00	0.99	-5.25 - 1.37
CCNES- Problem-focused responses (18m)	109	5.77	0.87	1.17 - 7.00
CCNES- Emotion-focused responses (18m)	109	5.61	0.92	1.17 - 7.00
CCNES- Expressive encouragement responses (18m)	109	5.35	1.14	1.00 - 7.00
Observed emotional responsiveness component score	109	0.00	1.00	-2.48 - 1.41
Observed sensitivity (collected between 18 and 24m)	109	0.66	0.27	0.00 - 0.92
Observed structuring (collected between 18 and 24m)	109	0.52	0.25	0.00 - 0.92
Child appetite self-regulation				
Child appetite self-regulation components score	109	0.00	0.99	-1.70 - 3.47
CEBQ- Food responsiveness (18/24m average)	109	2.40	0.59	1.30 - 4.20
CEBQ- Emotional overeating (18/24m average)	109	1.55	0.45	1.00 - 3.00
Child temperament (effortful control; IBQR 3m)	109	5.34	0.64	3.42 - 6.70

Note. 12m = 12 months; 24m = 24 months; 3m = 3 months; FRQ = Family Ritual Questionnaire; RSQ = Relationship Scales Questionnaire; AQS = Attachment Q-Sort; CEBQ = Child Eating Behavior Questionnaire; IBQR = Infant Behavior Questionnaire-Revised.
Descriptive statistics are derived from n = 10 imputed datasets. There are no significant differences in descriptive statistics between imputed and raw data. Data were not imputed for the ASA.

Family mealtime routines. The dinnertime routines subscale of the Family Ritual Questionnaire was used to assess family mealtime routines at 12 and 24 months (Fiese & Kline, 1993; Table 13). The dinnertime routines subscale includes 7 items with statements about family rituals and routines during mealtimes (e.g., “some families regularly eat dinner together”). Parents indicate the degree to which each statement describes their family on a scale from 1 to 4, with lower scores reflecting fewer routines and rituals around mealtimes. This subscale demonstrates good reliability at both 12 and 24 months (α = .79

and .80, respectively), and has been used successfully in studies of families with very young children (Fiese, Hooker, Kotary, & Schwagler, 1993).

***Attachment factors*.**

*Maternal attachment scriptedness***.** The Attachment Script Assessment (ASA; Waters & Rodrigues Doolabh, 2004; Table 13) is a culturally-sensitive, semi-structured interview designed to assess an individual's access to a secure base script, by activating their internal working model of relationships (Coppola et al., 2006; Vaughn et al., 2006; Waters et al., 1998). In order to elicit mothers' secure base scripts, interviewers showed mothers six word-prompt outlines and asked them to tell stories from the outlines in a structured interview. Three of the stories involved an adult and a child, and three involved two adults; one adult-child story and one adult-adult story served as controls without a secure base script outline. The outlines provide only a general framework for a story (e.g., actors, setting, key content, activities, and conclusion). However, the outlines are organized such that individuals with access to a secure base script will describe the following: (1) a constructive activity for two attachment partners; (2) an interruption to the activity where one partner becomes distressed; (3) the distressed partner expresses a cue or bid for help; (4) the other partner recognizes the bid and offers to help; (5) the distressed partner accepts the help; (6) the help effectively solves the problem; (7) the help alleviates or regulates negative affect for the distressed partner; and (8) the attachment partners go back to their prior activity or they initiate a new activity (Waters & Waters, 2006).

The story narratives are audio-recorded with mothers' consent, transcribed verbatim, and coded independently by two experts in attachment theory. Coders score each narrative three times, and those three scores are averaged to generate a final score for each narrative. All of the stories were coded three times by two independent coders, one of whom received training from the creators of the coding scheme. Scores are given on a 7-point scale, and describe the degree to which each passage exemplifies the secure base script, from 1 (*word prompts are used idiosyncratically, with no secure base script organization*), to 7 (*elaborate and extensive secure base script organization*). Higher scores indicate higher attachment scriptedness and security. The ASA was implemented among a subset of mothers (n = 89) in the current study, who did not differ significantly from mothers who did not complete the ASA on demographic characteristics. Scores across all stories were averaged to create a final measure of mothers' attachment scriptedness. Inter-rater reliability among coders for the adult-adult stories (ICC = .85) and the adult-child stories (ICC = .84) was excellent, as was reliability for the combined score (ICC = .87).

*Maternal attachment insecurity***.** Maternal attachment insecurity was assessed using two subscales from the Relationship Scales Questionnaire (RSQ; Griffin & Bartholomew, 1994). The RSQ asks participants to report their feelings toward themselves and others in any kind of close relationship. Participants respond to 30 items on 5-point Likert scales; these items correspond to two latent orthogonal dimensions of orientations to self (attachment anxiety) and to others (attachment avoidance). With these dimensions, participants can also be given scores on four different types of attachment orientations: secure, preoccupied, fearful, and dismissing. The fearful and dismissing subscales are used in the current study to assess attachment insecurity, because they are both types of attachment insecurity (Table 13). Although preoccupied attachment (high attachment anxiety, low attachment avoidance) is also considered a type of insecure attachment, it was not included in the current study given low internal reliability (α = .33). Fearfulness (α = .83) is assessed by taking the average of four items (e.g., "*I find it difficult to depend on other people*," "*I worry about being alone*,"). Individuals are high on fearfulness when they feel negatively toward the self (high attachment anxiety) and negatively toward others (high attachment avoidance). Dismissing (α = .68) is assessed by taking the average five items (e.g., "*I prefer not to have other people depend on me*," "*I am comfortable without close emotional relationships*," "*It is very important to me to feel independent*"). Individuals are high on dismissing when they feel positively toward the self (low attachment anxiety) and negatively toward others (high attachment avoidance).

Responsiveness.

Feeding responsiveness. Feeding responsiveness is operationalized as the degree to which parents do or do not attend and respond to children's hunger and satiety cues (Black & Aboud, 2011; Saltzman et al., 2017). In the current study, observational and self-report measures of feeding responsiveness were combined to create a composite score based off prior findings in a latent variable analysis framework (Saltzman et al., in preparation). The observational Feeding Behavior Coding System (FBCS) was adapted from the Caregiver Feeding Styles Questionnaire (Hughes et al., 2007, 2005).

Observed feeding responsiveness was assessed by applying the FBCS to mealtime videos (Table 13). Coders watching each video at least once and identified the prevalence of 22 different feeding practices that could be categorized as either demanding or responsive. Responsive feeding involved behavior that teaches or encourages healthy eating, while also respecting the child's autonomy to choose whether or not to eat and how much to consume (e.g., cutting food for the child to feed themselves, allowing the child to choose which foods to try from several healthy options). Demanding feeding involved parents placing expectations on children for certain kinds of eating behaviors, not attending to child cues of hunger/satiety, and not allowing the child developmentally appropriate autonomy over certain choices at mealtimes (e.g., spoon feeding, offering second helpings). To calculate observed feeding responsiveness, the mean frequency of responsive feeding was divided by the mean frequency of all feeding practices used in the mealtime (sum of responsive and demanding feeding practices). Higher values for this ratio indicate greater use of responsive feeding practices. Of 109 videos, 30 (27.5%) were double-coded; inter-rater reliability was excellent for all feeding practices assessed during the mealtime (all ICC's $\geq$ .90). Coders were blind to which videos were being double-coded.

Self-reported feeding responsiveness was assessed using two subscales from the 24-item Caregiver Feeding Styles Questionnaire (CFSQ; Hughes et al., 2005): feeding responsiveness and parent-centered controlling feeding (Table 13). For the feeding responsiveness scale, scores for 7 items were summed and divided by the sum of all feeding practices in the measure, similar to the procedure in the FBCS. Parent-centered feeding was calculated by taking the mean score for three items describing controlling feeding (e.g., begging or struggling with the child over food, or spoon feeding). Reliability estimates across 18 and 24 month scores were very good (α's > .70), so scores were averaged across these time points for data reduction.

Principal components analysis (PCA) was used to create a composite score for feeding responsiveness. A single component comprised of the score for observed feeding responsiveness, self-reported feeding responsiveness, and a reverse score of the parent-centered controlling feeding emerged from these analyses, and explained 58% of the variance across the scales. Each subscale's component score coefficient was > .30 and we rejected the null hypothesis of Bartlett's test of sphereicity, indicating that the components analysis was appropriate.

Emotional responsiveness. Emotional responsiveness is operationalized as the degree to which parents attend and respond to children's cues of distress (Davidov & Grusec, 2006; Denham, 1993). Observational and self-report measures of emotional responsiveness were used separately in the current study, based on previous findings suggesting that parent perceptions of emotional responsiveness differed substantially from emotional responsiveness observed during a mealtime (Saltzman et al., *in preparation*).

Observed maternal emotional responsiveness during mealtimes was assessed using a hierarchical coding structure in order to account for the fact that the behavior is contingent on children's expressions of negative emotions. Coders watched each video once to code maternal emotion, once to code child emotion, and a third time code maternal emotional responses. Maternal and child emotions were coded as either positive or negative using event-based sampling. Relevant to the current study, operationalization of child negative emotions included behaviors (e.g., crying or throwing things angrily), facial expressions (e.g., pouting or furrowing the brow), and vocal expressions (e.g, yelling or whining). To assess mothers' responses to children's negative emotions, coders applied an adapted version of the D.O.T.S Coding System (Cole, Wiggins, Radzioch, & Pearl, 2007). The D.O.T.S system requires coders to (1) select one of six different types of responses (discussed below), and (2) to determine whether the response was sensitive or insensitive to the child's developmental or emotional needs. Sensitivity was scored as a continuous ratio variable by dividing the total number of sensitive responses observed during the mealtime, by the total number of emotional responses (minus ignoring responses, which did not receive a code of sensitive/non-sensitive).

Of the six types of emotional responses (structuring/limit setting, distractions, positive emotions, negative emotions, ignoring, attending), only structuring (r = .642, p <.001) and attending (r = .239, p = .01) were associated with use of a greater proportion of sensitive responses to children's negative emotions. Structuring/limit setting is defined as providing information to the child, problem solving with the child, modifying a physical environmental characteristic for the child, or giving the child directives in an effort to ameliorate their negative emotion. For example, a sensitive structuring/limit setting response might involve the mother gently pulling the child's high chair closer to the table after s/he whines, reaches for something on the table, and makes an angry face. A non-sensitive structuring/limit setting response might involve the mother abruptly grabbing the object the child reached for and slamming it on the child's tray in the high chair. A sensitive attending response might involve the mother briefly glancing at the child with a neutral expression when they whine, but not interfering and letting the child self-soothe. A non-sensitive attending response might involve the mother rolling her eyes at the child's whining, and making a bored expression at the child as they whine.

In a prior study using confirmatory factor analyses, we found that sensitive responses and structuring responses (but not attending responses) comprised a well-fitted latent variable representing the underlying structure of emotional responsiveness in these data (Saltzman et al., in preparation). In the current study, we created a composite score representing observed emotional responsiveness using PCA on the Sensitive and Structuring variables (Table 13). A single component comprised of these two variables emerged from analyses, and explained 82.1% of the variance across the scales. Each subscales component score was equal to .55 and we rejected the null hypothesis of Bartlett's test of sphereicity, indicating that the components analysis was appropriate for the data.

Three subscales from the Coping with Children's Negative Emotions Scale (Fabes et al., 2001, 2002) were used to assess mothers' reports of their own emotional responsiveness (Table 13). The CCNES includes 12 vignettes with 6 items each, for a total of 72 items corresponding to six subscales. The vignettes present a hypothetical scenario where parents have to respond to their children's negative emotions, and the six items for each vignette correspond to six different types of emotional responses. These emotion response types are either positive (indicating that the parent is more emotionally responsive) or negative (indicating that the parent is less emotionally responsive). In the current study, we focus on positive emotional responses to assess maternal self-report of emotional responsiveness. Positive emotional responses include use of problem-focused responses (α = .89), emotion-focused responses (α = .88), and expressive encouragement responses (α = .87). Problem-focused responses to children's negative emotions may involve helping the child think about new ways to approach an issue or helping the child to self-soothe. Emotion-focused responses may involve comforting the child to forget about an accident or soothing the child directly. Expressive encouragement responses may involve encouraging the child to talk about their negative emotions or telling the child it is ok to be upset or to cry.

These subscales were highly inter-correlated (*r's* = .52 and .75, *p's* < .001). In a prior study using confirmatory factor analyses, we found that these positive emotional responses comprised a well-fitted latent variable representing the underlying structure of self-reported emotional responsiveness in these data (Saltzman et al., in preparation). In the current study, we created a composite score representing self-reported emotional responsiveness using PCA on the problem-focused, emotion-focused, and expressive encouragement responses variables. A single component comprised of these three variables emerged from analyses, and explained 75% of the variance across the scales. Each subscale's component score was greater than .36 and we rejected the null hypothesis of Bartlett's test of sphereicity, indicating that the components analysis was appropriate for the data.

***Appetite dysregulation*.** Two subscales from the Children's Eating Behavior Questionnaire (CEBQ; Table 13) were used to generate a component score representing child appetite dysregulation at 18 and 24 months (Carnell & Wardle, 2007; Wardle et al., 2001). The CEBQ is a parent-report survey of 35 items that comprise 8 subscales regarding children's eating behaviors, and was initially developed for use among 3- to 8-year olds, but has also been used with parents of children under two years old (Brown & Lee, 2012; Carnell & Wardle, 2007; Hathcock et al., 2013; Wardle et al., 2001). Responsiveness to food is assessed using 5 items (e.g., "*If given the chance, my child would always have food in his/her mouth*"), and demonstrates excellent internal reliability. Higher scores on food responsiveness indicate greater food approach or responsiveness to food-related cues. Emotional overeating is assessed using 4 items (e.g., "*My child eats more when worried*"), and also demonstrates excellent internal reliability. Higher scores on the emotional overeating scale indicate that the child tends to eat more when experiencing negative emotions.

Scores for responsiveness to food (r = .60, p < .001) and emotional overeating (r = .70, p < .001) were highly correlated across the 18 and 24-month time points, so we averaged these scores. These averaged scores of food responsiveness and emotional overeating were also highly correlated (r = .605, p < .001), and in a prior confirmatory factor analysis, we found that the averaged scores comprised a well-fitted latent variable representing child appetite dysregulation (Saltzman et al., in preparation). In the current study, we constructed a composite score representing child appetite dysregulation using PCA, on the responsiveness to food and emotional overeating subscales. A single component score explained 80.2% of the variance in the data, each subscale's component coefficient was = .56, and we rejected the null hypothesis of Bartlett's test of sphereicity, indicating that the components analysis was appropriate for the data.

***Covariates*.** Maternal report of household income, marital status, maternal age, race/ethnicity, work hours, and maternal education were evaluated as potential covariates (Table 12). Given associations between child effortful control and child appetite self-regulation, mothers also reported on children's temperament using the very short form of the Infant Behavior Questionnaire-Revised (IBQR) when children were three months old (Table 13; Putnam, Helbig, Gartstein, Rothbart, & Leerkes, 2014). The IBQR includes 36 items that comprise three subscales (effortful control, surgency, negative affectivity) of 12 items each. Neither surgency (r = .18) nor negative affectivity (r = -.13) were significantly associated with child appetite dysregulation in the current study ($p > .05$). Given associations between effortful control and child appetite self-regulation identified previously (Pieper & Laugero, 2013), and links between effortful control and child appetite self-regulation in the current study (Table 13), only the dimension of effortful control was included as a covariate in analyses. Effortful control is assessed by items regarding children's capacity for sustained attention and attentional shifting, as well as their pleasure from interpersonal closeness and soothability (α = .73).

Analysis plan.

Missing data. All analyses were conducted in Statistical Package for Social Sciences (SPSS) version 24.0 (IBM Analytics, 2016). Since a forced-response format was not used for the parent-report questionnaires, some subscales had more missing data than others. Between 0 and 19.1% of data were missing for model variables. Highest levels of missingness were reported for attachment scriptedness (19.1%) and chaos and dinnertime routines at 24 months (both at 17.3%). We could not reject the null hypothesis of Little's Missing Completely at Random test (MCAR; X^2[df] = 4960.66 [56188], $p = 1.00$). Given that these variables were all approximately normally distributed, missing in a random pattern, and had fewer than 20% of cases missing, multiple imputation using a fully conditional specification (Markov Chain Monte Carlo method) was applied to address and handle missing data (Dong & Peng, 2013). This method can only be used when data are not missing in a pattern, and is an iterative two-step numerical simulation method. In the first step, the MCMC method draws random samples of the missing data and random samples of parameters from the observed data. In the second step, a random sample of parameter estimates is drawn from the combination of random samples from step one. After iterating between these steps, the Markov Chain converged forming 10 imputed datasets, which were aggregated by generating mean scores across the datasets.

Throughout this imputation process, we made several decision rules in order to preserve the integrity of the data. First, we did not impute ASA data for mothers who did not complete the ASA, as the interviews were conducted only with a subset of the full sample. This was a conservative decision, as there were no significant differences in demographic characteristics between mothers who did and did not complete the ASA. Second, we did a case-level analysis in order to assess the effects of outliers on the imputation process. One case demonstrated illogical imputed values (e.g., highly negative values for a variable with a minimum of zero) for several variables, because >20% of the self-reported data for this case was missing. This prevented the procedure from imputing logical values based on the individual's other self-reported data, so data from self-reports for this case were coded as missing, and data from observations were retained in the analyses. Finally, one child AQS and one family mealtime video (for two different families) were lost due to technological and reporting errors, and we chose not to impute these data because measurement error may influence the imputation process (e.g., using self-report variables to inform imputation for variables from direct observation). There were no significant differences in means, standard deviations, or the ranges for the raw and imputed datasets, so for the sake of parsimony, we present only the imputed descriptive statistics for model variables in Table 13. Descriptive demographic characteristics are reported from the raw dataset in Table 12.

Univariate and bivariate analyses. Since all of the model variables were approximately normally distributed according to analysis of histograms, skew, and kurtosis, Pearson's correlation coefficients were used to examine bivariate associations between model variables.

In order to assess which control variables to include in the final models, correlation analyses were conducted to assess associations between appetite dysregulation and continuous covariates (child effortful control, parent age, child age, and household income). Independent sample t-tests were conducted between appetite dysregulation and dichotomous covariates (child gender, presence or absence of father at mealtime, parent race [White vs. non-White], and hours worked per week [less vs. more than 40 hours per week]). Analyses of variance (ANOVA) were conducted to examine differences in between groups in categorical covariates (maternal education and marital status) and appetite dysregulation.

***Direct, indirect, and interactive effects*.** Direct, indirect, and interactive effects were assessed using the PROCESS macro version 3.0 for SPSS version 24.0 (Hayes, 2013a). The PROCESS macro allows for bootstrapping (n = 10,000) when estimating indirect and interactive effects. All variables were mean-centered prior to moderation analyses.

Results

Sample characteristics. Families in the SK2 subsample (n = 110) were mostly White, well-educated, and married (Table 12). Few families had mothers who worked more than 40 hours per week, and most mothers were either employed or a stay-at-home parent. About a third of families had fathers who were absent from the videotaped mealtime, and there was substantial variability in reported monthly household income. All children were between approximately 18 and 24 months of age, although one child was substantially older (34.9 months) due to reporting error at the time of recruitment.

Bivariate associations.

Associations between family factors and maternal responsiveness. Household chaos was associated significantly with less self-reported emotional responsiveness, and marginally with less feeding responsiveness (p = .06; Table 14). Dinnertime routines were not significantly associated with any type of responsiveness, but were marginally linked with more feeding responsiveness (p = .09).

Associations between family factors and child outcomes. Household chaos was associated with significantly more child appetite dysregulation (Table 14). Dinnertime routines were associated with significantly less appetite dysregulation.

Associations between maternal-child attachment and responsiveness. Maternal self-reported attachment insecurity was not significantly associated with any measure of maternal or child attachment and maternal responsiveness (Table 14). However, maternal attachment insecurity was marginally linked to feeding responsiveness (p = .06).

Associations between maternal attachment and child appetite dysregulation. There were no significant associations between maternal attachment and child appetite dysregulation (Table 14).

Table 14. Pearson's correlations between family factors, attachment, responsiveness, and child appetite self-regulation and weight.

		1	2	3	4	5	6	7	8	9	10	11	12
1. Child appetite dysregulation	r												
	N												
2. Household chaos	r	.35*											
	N	109											
3. Dinnertime routines	r	-.22*	-.23*										
	N	109	109										
4. Maternal attachment insecurity (RSQ)	r	.04	.27*	-.03									
	N	109	109	109									
5. Maternal attachment security (ASA)	r	.02	-.08	.06	-.25*								
	N	88	88	88	89								
6. Feeding responsiveness	r	-.26**	-.18	.16	-.18	.01							
	N	109	109	109	110	89							
7. Self-reported emotional responsiveness	r	-.24*	-.22*	.11	-.17	.06	.11						
	N	109	109	109	110	89	110						
8. Observed emotional responsiveness	r	-.02	-.16	.05	-.02	-.04	.08	.18					
	N	109	109	109	110	89	110	110					
9. Child effortful control (3m)	r	-.24*	-.11	.20*	.03	-.06	.04	.29*	.12				
	N	108	108	108	109	88	109	109	109				
10. Parent age	r	-.28*	-.05	.03	-.05	-.12	.18	.26*	-.01	-.04			
	N	108	108	108	108	87	108	108	108	108			
11. Child age	r	-.07	.08	-.10	.11	.02	-.11	-.05	.02	-.05	-.05		
	N	109	109	109	110	89	110	110	110	109	108		
12. Household income	r	-.24*	-.25*	.02	-.16	.15	.22*	.11	.17	.08	.14	-.06	
	N	108	108	108	109	88	109	109	109	109	108	109	
13. Mealtime length (min)	r	-.16	.05	.18	.06	.18	.12	.13	.10	.04	-.14	-.14	.23*
	N	108	108	108	108	109	109	108	109	108	109	109	108

Note. WFLZ = weight-for-length z-score; RSQ = Relationships Scales Questionnaire; ASA= Attachment Script Assessment; min = minutes.
* $p < .05$

Associations between responsiveness and child outcomes. Maternal feeding responsiveness and maternal self-reported emotional responsiveness were significantly associated with less child appetite dysregulation (Table 14). There were no significant associations between observed emotional responsiveness and child appetite dysregulation.

Associations between child outcomes and covariates. Appetite dysregulation was significantly associated with lower parent age, lower household income, and effortful control (Table 14). Appetite dysregulation was not associated with child gender, child age, presence or absence of father at mealtime, parent race, or hours worked per week, and so these variables were dropped from further analyses.

Path analyses.

Total, direct, and indirect effects. **A**nalyses of indirect effects has two key requirements: the hypothesized “predictor” is associated with the hypothesized “mediator,” and the hypothesized “mediator” is associated with the “outcome” (Hayes, 2013a, 2013b). It is important to note that we use the terms “predictor,” “outcome,” and “mediator” for the sake of parsimony, but acknowledge the cross-sectional nature of these data and make no inferences to causal pathways. Based on these requirements, there were two potential indirect pathways to examine. First, we evaluated the direct effects of chaos on child appetite dysregulation, and indirect and total effects via feeding and self-reported emotional responsiveness. Second, we assessed direct effects of dinnertime routines on child appetite dysregulation, and indirect and total effects via feeding responsiveness. Both of these analyses controlled for the effects of parent age and household income. Chaos had significant direct and total effects on appetite dysregulation, but there were no significant indirect effects via feeding or self-reported emotional responsiveness (Table 15). The total effects model examining dinnertime routines as a direct and indirect (via feeding responsiveness) predictor of child appetite dysregulation was significant. However, direct and indirect effects were not significant.

Table 15. Total, direct, and indirect effects of family factors, maternal attachment insecurity, and responsiveness on child appetite dysregulation, controlling for parent age, household income, and child effortful control.

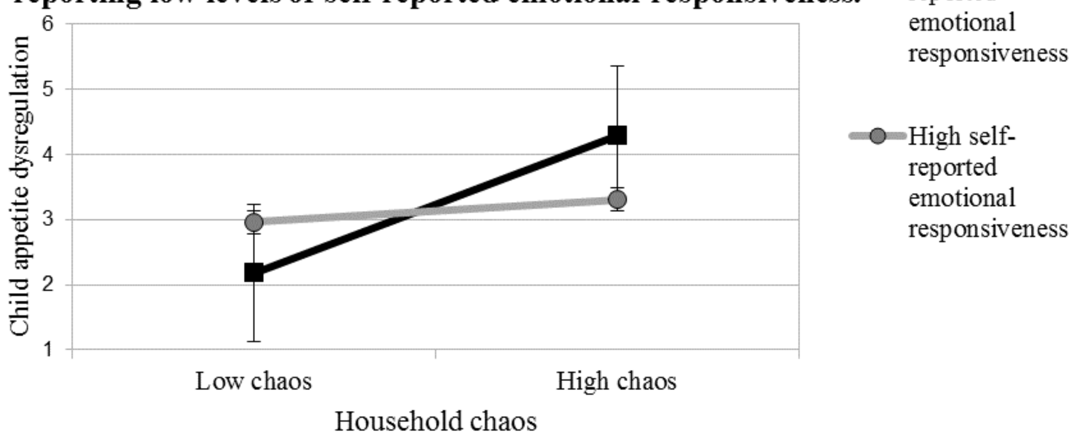
	Total effects			Direct effects			Indirect effects		
	B	SE	95% CI	B	SE	95% CI	B	SE	95% CI
IV: Chaos									
M: Feeding responsiveness	.28*	0.09	(.11, .46)	.26*	0.09	(.09, .44)	0.02	0.02	(-.01, .07)
M: Self-reported emotional responsiveness	.28*	0.09	(.11, .46)	.27*	0.09	(.09, .45)	0.01	0.02	(-.02, .06)
IV: Dinnertime routines									
M: Feeding responsiveness	-.20*	0.09	(-.38, -.01)	.17	0.09	(-.35, .01)	-.02	0.02	(-.08, .01)

Note. IV = independent variable; M = mediator variable; CI = confidence interval.
* $p < .05$

***Interaction effects*.** Unlike analysis of direct and indirect effects, moderation does not require that predictors, moderators, and outcomes are associated in bivariate analyses. Moderation suggests that the effect of a predictor on an outcome is conditional on a third variable (Hayes, 2013b). Given the strong effect of family factors (chaos and dinnertime routines) on child appetite dysregulation, we systematically examined interactions to answer three key questions.

Does the effect of family factors (chaos or dinnertime routines) on child appetite dysregulation change as a function of maternal feeding or emotional responsiveness (Table 16)? For these analyses, we controlled for parent age and household income—but not maternal or child attachment security—based on patterns of association with child appetite dysregulation in bivariate analyses. Chaos had a strong independent effect on child appetite dysregulation in each model (Table 16). However, interactive effects were only significant when self-reported emotional responsiveness was the moderator (Figure 10). Analysis of simple slopes suggests that there was only a significant association between household chaos and child appetite dysregulation among children of mothers who self-report low levels of emotional responsiveness (-2 SD from mean).

Figure 10. Significant association between household chaos and child appetite dysregulation only among children of mothers reporting low levels of self-reported emotional responsiveness.



Note. Slope at low levels of self-reported emotional responsiveness was significant (R^2 *[SE]* = .43 [.11], $p < .001$). Slope at high levels of emotional responsiveness was not significant (R^2 *[SE]* = .07 [.12], $p = .53$).

Table 16. Independent and interactive effects of household chaos and responsiveness on child appetite dysregulation.

Moderator	Feeding responsiveness			Self-reported emotional responsiveness			Observed emotional responsiveness		
Independent variables, IV: Chaos	B	SE	95%CI	B	SE	95%CI	B	SE	95%CI
Parent age	-.04*	.02	(-.08, -.01)	-.04*	.02	(-.07, -.01)	-.05*	.02	(-.08, -.02)
Household income	-.03	.02	(-.07, .02)	-.02	.02	(-.07, .02)	-.03	.02	(-.08, .01)
Child effortful control	-.34*	.13	(-.59, -.06)	-.30*	.14	(-.57, -.02)	-.34*	.14	(-.61, -.08)
Chaos	.26*	.09	(.08, .43)	.26*	.09	(.09, .44)	.26*	.09	(.08, .44)
Responsiveness	-.15	.09	(-.33, .02)	.05	.10	(-.15, .25)	.09	.09	(-.09, .27)
Chaos x Responsiveness interaction term	-.13*	.10	(-.31, .07)	-.21*	.08	(-.38, -.04)	-.12	.08	(-.28, .04)
Model fit									
R^2	.23			.29*			.26*		
ΔR^2	.01			.04*			.02		
F	6.23*			7.00*			6.16*		
ΔF	1.49			6.30*			2.29		
Independent variables, IV: Dinnertime routines									
Parent age	-.04*	.02	(-.08, -.01)	-.04*	.02	(-.07, -.01)	-.05*	.02	(-.08, -.02)
Household income	-.04	.02	(-.08, .01)	-.04	.02	(-.08, .01)	-.05*	.02	(-.10, -.00)
Child effortful control	-.28*	.14	(-.56, -.01)	-.25	.15	(-.54, .04)	-.30*	.14	(-.58, -.01)
Dinnertime routines	-.19*	.09	(-.38, -.01)	-.18	.09	(-.38, .01)	-.19*	.09	(-.37, -.00)
Responsiveness	-.13	.09	(-.31, .05)	-.02	.10	(-.22, .19)	0.04	.09	(-.15, .22)
Dinnertime routines x Responsiveness interaction term	-.12	.11	(-.33, .09)	0.16	.09	(-.02, .34)	0.07	.10	(-.13, .26)
Model fit									
R^2	.24*			.24*			.21*		
ΔR^2	.01			.03			.00		
F	5.21*			5.31*			4.56*		
ΔF	1.31			3.28			.48		

Note. Six separate moderation analyses were run, using either household chaos or dinnertime routines as the independent variable, and feeding, self-reported emotional, or observed emotional responsiveness as a moderator. Interacting variables were mean-centered.
*p < .05

Dinnertime routines were also independently related to child appetite dysregulation, beyond the effects of parent age, household income, and responsiveness (Table 16). There were no significant interactive effects between dinnertime routines and responsiveness on child appetite dysregulation.

Table 17. Independent and interactive effects of family factors and maternal attachment on child appetite dysregulation.

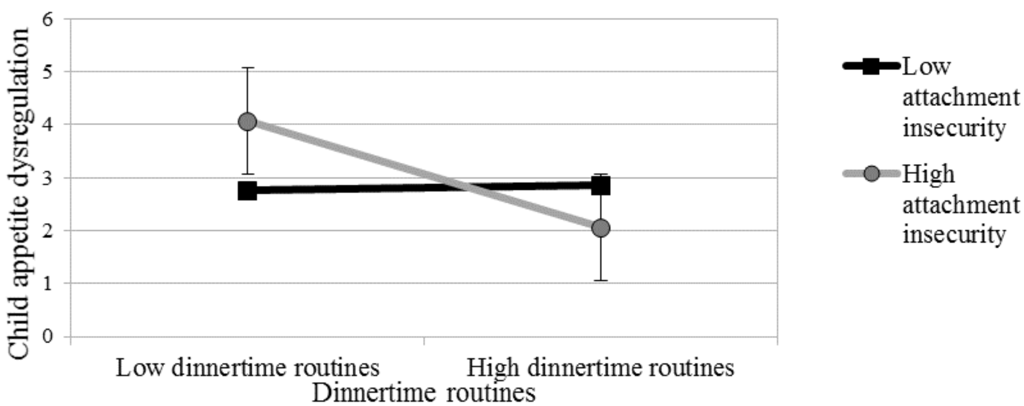
Moderator	Maternal attachment insecurity (RSQ)			Maternal attachment security (ASA)		
Independent variables, IV: Chaos	B	SE	95%CI	B	SE	95%CI
Parent age	-.04*	.02	(-.07, -.01)	-.05*	.02	(-.08, -.01)
Household income	-.03	.02	(-.07, .02)	-.04	.02	(-.09, .00)
Chaos	.24*	.10	(.05, .44)	.18	.10	(-.02, .38)
Attachment	-.10	.09	(-.28, .08)	.04	.09	(-.14, .23)
Child effortful control	-.30*	.14	(-.58, -.02)	-.27	.16	(-.58, .05)
Feeding responsiveness	-.15	.09	(-.33, .03)	-.29*	.10	(-.48, -.10)
Self-reported emotional responsiveness	-.09	.1	(-.33, .03)	-.04	.10	(-.24, .16)
Chaos x Attachment interaction term	.09	.09	(-.09, .27)	.15	.11	(-.06, .37)
Model fit						
R^2	.28*			.35*		
ΔR^2	.01			.02		
F	4.84*			5.36*		
ΔF	1.02			1.95		
Independent variables, IV: Dinnertime routines						
Parent age	-.04*	.02	(-.07, -.01)	-.05*	.02	(-.08, -.01)
Household income	-.04	.02	(-.08, .00)	-.05*	.02	(-.10, -.01)
Dinnertime routines	-.18	.09	(-.37, .00)	-.12	.11	(-.34, .10)
Attachment	-.04	.09	(-.22, .14)	.03	.10	(-.16, .22)
Child effortful control	-.21	.15	(-.50, .09)	-.25	.16	(-.58, .07)
Feeding responsiveness	-.16	.09	(-.34, .02)	-.29*	.10	(-.48, -.10)
Self-reported emotional responsiveness	-.13	.09	(-.32, .07)	-.05	.11	(-.26, .16)
Dinnertime routines x Attachment interaction term	-.19*	.09	(-.37, -.01)	-.06	.11	(-.28, .15)
Model fit						
R^2	.26*			.33*		
ΔR^2	.03*			.00		
F	4.45*			4.73*		
ΔF	4.13*			.35		

Note. Four separate moderation analyses were run, using either household chaos or dinnertime routines as the independent variable, and attachment security or insecurity as moderators. Interacting variables were mean-centered.
* p < .05

Does the effect of family factors (chaos or dinnertime routines) on child appetite dysregulation change as a function of maternal attachment security (Table 17)? For these analyses, we controlled for parent age, household income, and maternal feeding and self-reported emotional responsiveness because these variables were associated with child appetite self-regulation in bivariate analyses. Chaos had a significant independent effect on child appetite dysregulation when maternal attachment insecurity (composite score from variables in the RSQ) was the moderator, but not when maternal attachment security (composite score from the ASA) was the moderator. This may be because a subset of (n = 89) families in the current study completed the ASA, and analyses including the ASA were limited to this subsample. There were no significant interactions between chaos and maternal attachment on child appetite dysregulation. In contrast, dinnertime routines had a significant independent effect, and interacted with maternal attachment insecurity to influence child appetite dysregulation. Analysis of simple slopes suggests that there was only a significant association between dinnertime routines and child appetite dysregulation among children of mothers who self-reported high levels of attachment insecurity (+ 2 SD from mean; Figure 11).

Post-hoc analyses. We also investigated whether interactions between responsiveness and attachment (maternal and child) were significantly associated with child appetite dysregulation. Controlling for parent age and household income, there were no significant interactive effects between responsiveness and attachment on child appetite dysregulation (data not shown).

Figure 11. Significant association between dinnertime routines and child appetite dysregulation only among children of mothers reporting high attachment insecurity.



Note. Slope at low levels of attachment insecurity was not significant (R^2 *[SE]* = .02 [.13], p = .89). Slope at high levels of attachment security was significant (R^2 *[SE]* = -.38 [.13], p = .005).

Discussion

The results of this study suggest that family factors play an important role in promoting child appetite self-regulation, but that these effects may be attenuated or exacerbated by certain relational characteristics, such as maternal attachment insecurity and emotional responsiveness. The first hypothesis was partially supported; we expected that family factors and attachment would be associated independently with child appetite dysregulation. Family factors—but not maternal- or child attachment security—were associated with child appetite dysregulation in correlation analyses. However, our second hypothesis focused on investigating indirect effects and pathways from family and attachment factors to child appetite dysregulation was not supported. Analysis of indirect effects suggested that household chaos, dinnertime routines, and responsiveness were directly—but not indirectly via responsiveness—associated with appetite dysregulation. Finally, our third hypothesis was partially supported. In support of a resilience framework, more dinnertime routines were associated with less appetite dysregulation among mothers who were highly insecure. Additionally, dinnertime routines were not associated with different levels of appetite dysregulation among mothers who were less insecure (more secure). These findings suggest that dinnertime routines were protective for children of mothers who were more insecure, but were not necessarily protective for mothers who were more secure. In support of a risk framework, more household chaos was associated with higher levels of appetite dysregulation, only among children of mothers who reported low levels of emotional responsiveness. Having more or less household chaos was not associated with different levels of appetite dysregulation among mothers who reported high levels of emotional responsiveness, lending support for the resilience pathway. These findings are discussed in detail below.

Household chaos and child appetite dysregulation: Emotional responsiveness as a buffer. Household chaos interacted with relational characteristics (emotional responsiveness) to influence child appetite dysregulation. Consistent with prior studies, household chaos was associated with child appetite self-regulation beyond the effects of income and socioeconomic status (Hart et al., 2007; Martin et al., 2012; Vernon-Feagans et al., 2016). Our findings provide additional nuance by showing that these effects are moderated by parenting. Consistent with a risk framework, household chaos was only associated with child appetite dysregulation among children of mothers who reported lower levels of emotional responsiveness. These results compliment a previous study that found that high levels of household chaos and low levels of parent warmth/enjoyment were additively associated with more child behavioral problems among 4- to 6-year olds (Coldwell et al., 2006). However, we also found that there was no association between household chaos and child appetite dysregulation among children of mothers who reported high levels of emotional responsiveness. On one hand, we see that mothers who report lower levels of emotional responsiveness are likely exacerbating the effects of high levels of household chaos on child appetite dysregulation. Not only is the child exposed to the disorganization of the home, but they also lack exposure to a consistent, contingent, warmly responsive parent, placing them at greater risk for experiencing disruptions to the development of appetite self-regulation. On the other hand, mothers who report higher levels of emotional responsiveness may be creating a predictable, safe emotional climate for their children. These mothers may be protecting their children from the negative effects of household chaos (unpredictable, disorganized, or unstable environment) by providing a predictable, organized response to their child's emotional needs. Consistent with a differential susceptibility standpoint (Ellis, Boyce, Belsky, Bakermans-Kranenburg, & Ijzendoorn, 2011; Pluess & Belsky, 2010), children exposed to lower levels of maternal emotional responsiveness do seem to be more susceptible to the negative effects of household chaos, whereas children exposed to higher levels of parental emotional responsiveness are less susceptible to these environmental effects.

Although self-reported emotional responsiveness served as a moderator for the association between household chaos and appetite dysregulation, neither feeding responsiveness nor observed emotional responsiveness had the same effect. There are several possible explanations for and interpretations of these differential effects. Observations of emotional responsiveness were collected only during the family mealtime, whereas the CCNES asks mothers to report how likely they are to respond in particular ways to children's negative emotions in a variety of scenarios (e.g., receiving an undesirable birthday gift, losing a prized possession, falling off a bike; Fabes et al., 2002). Notably, the CCNES does not ask parents about their emotional responsiveness in scenarios that involve food or eating, but this general measure of parent emotional responsiveness was more associated with child appetite dysregulation than observed emotional responsiveness during mealtimes. On one hand, it is possible that a greater number of observations of parent emotional responsiveness during mealtimes will be needed to detect a significant effect. On the other hand, mealtimes are only one scenario out of many where they are responding to negative emotions and thus modeling healthy regulatory strategies. The CCNES captures mothers' general responses to children's negative emotions, meaning that children would be exposed to these general emotional responses more often than emotional responses during a mealtime. Feeding responsiveness may not have served as a moderator for the same reason; children are exposed to non-food responsiveness more often than food-related responsiveness. Given that both emotional and feeding responsiveness during mealtimes may be particularly challenging for mothers who are preoccupied with or affected by food or weight (Cutting, Fisher, Grimm-Thomas, & Birch, 1999; Francis, Hofer, & Birch, 2001; Saltzman et al., 2016), these differential effects warrant further investigation.

For now, findings suggest that parents' general orientations toward emotional responsiveness may be a more appropriate intervention target for promoting appetite dysregulation among children exposed to high levels of household chaos, than feeding responsiveness alone. Future studies should continue to investigate whether emotional responsiveness during mealtimes differs substantially from emotional responsiveness in non-food related situations, and should consider whether the "dosage" of exposure to certain types of responsiveness (emotional vs. feeding) may have differential effects on child outcomes. Furthermore, only observations of and self-reports from mothers were used in the current study. Efforts are currently underway to code fathers' emotional and feeding responsiveness during these mealtimes, in order to assess how fathers' responsiveness may compliment or contradict the effects of mothers' responsiveness on child eating behaviors.

Dinnertime routines and child appetite dysregulation: Attachment security as a buffer. Dinnertime routines were also independently associated with child appetite dysregulation only among children of mothers who were high on attachment insecurity. There was no association between dinnertime routines and child appetite dysregulation among children of mothers who were less insecure in their attachment orientations. These findings can also be interpreted from the intersections between family systems, attachment, and differential susceptibility theories (Cowan, 1997; Ellis et al., 2011). Mothers who are more insecure, but who are more organized about mealtimes may have children who experience the benefits of a predictable food environment. Mothers who are insecure but who do not have high levels of dinnertime routines may have children who are more susceptible to the dual risk factors of an insecurely attached parent and a less organized household. Moms who are less insecure may create a predictable emotional environment, and so a more predictable food environment on top of these benefits may not have differential effects on children's appetite dysregulation.

Then why did attachment insecurity also not moderate the association between household chaos and child appetite dysregulation? One explanation relies on considering the positioning of our outcome of interest (child appetite self-regulation) relative to our predictors (family and relational factors) in a socio-ecological framework (Harrison et al., 2011). Chaos and attachment orientations are rather distal factors to the mealtime and food-related situations, whereas emotional responsiveness and dinnertime routines are both relevant for the mealtime (albeit in slightly different ways). Because dinnertime routines are more proximal to the food environment and attachment more distal, results may be indicating that "background" environmental effects (beliefs about relationships with other people or household chaos) can be attenuated by concentrated positive changes or characteristics in behaviors or processes more proximal to eating or mealtimes (emotional responsiveness and dinnertime routines). Another explanation focuses more on measurement; the measures of household chaos and attachment insecurity are both assessments of negative behavior, whereas the measures of dinnertime routines and responsiveness were assessments of positive behavior. Regarding the latter, both factors would have exerted positive effects, with dinnertime routines simply exerting a stronger effect on the outcome. In the case of the former, the same may be true with chaos exerting negative independent effects that maternal attachment insecurity would not have exacerbated any further. It is possible that our sample size may not be large enough or the measures not sensitive enough to detect moderation effects unless there is at least one departure from a profile of risk or wellbeing.

Thus, although the conclusions from the current study are bolstered by the use of multiple measures and time points as well as naturalistic observations of family mealtimes, there are several limitations to that warrant discussion. By bootstrapping standard errors, we were able to identify relatively robust independent and interactive effects of family and relational factors on child appetite dysregulation. However, a smaller sample size limits our capacity to reduce the likelihood of Type II error. For example, although attachment security (measured with the ASA) and insecurity (measured with the RSQ) were not directly associated with child appetite dysregulation in the current study, there is substantial meta-analytic evidence linking attachment to aberrant eating behavior in the general population (Faber, Dubé, & Knäuper, 2018). Thus, even though attachment was not directly associated with appetite dysregulation in the current study, this may be due more to small effect or sample sizes. Additionally, the current study is limited in that we used composite scores instead of latent variables in order to assess our variables of interest. Given the complexity of the hypothesized relationships, our ability to use structural equation modeling in the current study was again precluded by the small sample size. Finally, we do not include evaluations of child behaviors (beyond effortful control) that likely have additional effects on child appetite dysregulation. For example, children's general self-regulation is strongly associated with child appetite dysregulation. However, the focus of the current study was to investigate how familial and parental factors may influence children's eating behavior, meaning that inclusion of additional child-level variables (such as general self-regulation or child attachment security) was beyond the scope of the study.

Conclusions

Overall, the current study finds evidence to suggest that household chaos and dinnertime routines have independent and interactive effects on child appetite dysregulation. Maternal emotional responsiveness may be a protective factor for children in families exposed to higher levels of household chaos, whereas dinnertime routines may be protective for children of mothers higher in attachment insecurity. Future research should consider how to address the current study's limitations by evaluating whether effects of family- and relational factors on child appetite dysregulation are direct, or indirect via children's general self-regulation. For example, although it was beyond the scope of the current paper to test this pathway, it is possible that the effects of maternal (or child) attachment on appetite dysregulation are indirect via children's general self-regulation. Additionally, it is important to note that measures of responsiveness and attachment were assessed only for mothers, so investigating the role of fathers' responsiveness and paternal attachment on child appetite dysregulation should be a key priority.

Nevertheless, it is clear that family and relational factors do interact significantly to influence children's eating behaviors. The current study addresses and systematically investigates how family processes, routines, and relationships may influence child appetite self-regulation, and has identified key modifiable risk and protective factors within these complex contexts.

Chapter Five: Integrated Discussion

More than a third of 2- to 5-year old children in the United States are considered overweight or obese, and recent data suggest that prevalence may actually be increasing despite earlier indications suggesting that obesity rates had stagnated among certain preschoolers (Ogden et al., 2016; Skinner, Ravanbakht, Skelton, Perrin, & Armstrong, 2018). Strong associations between self-regulation and weight outcomes (Anderson & Keim, 2016; Frankel et al., 2012; Herman & Polivy, 2011), and responsiveness and self-regulation (Bornstein & Tamis-LeMonda, 1989; Davidov & Grusec, 2006; Diamond & Aspinwall, 2003) fuel consistent interest in addressing these links in interventions sensitive to the challenges families face in health behavior change. Prevention and policy efforts have targeted self-regulation and parent responsiveness in efforts to reduce and prevent excessive weight gain in children before they enter preschool, but success has been mixed suggesting that critical lacunae remain (Aboud et al., 2009; Lumeng et al., 2017; Pérez-Escamilla et al., 2017; Savage et al., 2016). Researchers have long called for more specific operational definitions of these constructs, citing lack of consistency across theoretical frameworks, a dearth of direct observational studies, and little work exploring how interrelationships between relevant processes and practices may influence parenting and subsequent child outcomes (Hughes et al., 2013; Timperio & Fulkerson, 2014). These limitations prevent scientists, practitioners, and policymakers from identifying how specific behaviors and contexts may promote risk or resilience for child weight outcomes.

To address these lines of inquiry, this project aimed to understand how contextually embedded individual, relational, and familial processes are related to appetite self-regulation in early childhood. Three studies were conducted in a step-wise fashion, in order to systematically investigate this developmental process. The first study examined whether self-regulation (appetitive vs. non-appetitive self-regulation) and responsive parenting (feeding vs. emotional responsiveness) were domain-specific or domain-general constructs, in order to ascertain whether future research should target specific practices or more general styles of behavior. The second study aimed to understand parent responsiveness in the context of past and current relational (e.g., maternal secure base scripts, adult attachment orientations) and current family experiences (e.g., household chaos, mealtime routines, mealtime distractions), to identify internal and external risk and protective factors that may interfere with putting responsive parenting practices into play. The third study investigated how these familial, relational, and parenting (e.g., emotional and feeding responsiveness) factors influence child appetite self-regulation, to understand the contextualized etiology of this critical health behavior. Although each article uniquely contributes to current gaps in the literature, two themes embody key takeaways across all three studies: (1) *risk and resilience are multifaceted* and (2) *specificity in measurement is needed*.

In regards to the first theme, families, parents (specifically mothers), and children demonstrated that they were capable of fostering wellbeing, while they were exposed to a number of different risk factors. However, findings must be interpreted with attention to the specific behaviors and contexts. To begin, the clearest example of the resilience theme was found in the second (Study 2) and third studies (Study 3), examining the effects of familial and attachment-related factors on responsiveness and child appetite self-regulation, respectively. In the second study, we found that mothers' attachment insecurity had a complex effect on mothers' observed and self-reported emotional responsiveness. Although maternal attachment insecurity exacerbated the effects of mealtime distractions on mothers' observed emotional responsiveness during mealtimes, maternal attachment insecurity also protected mothers' from the negative effects of household chaos on self-reported emotional responsiveness. In the third study, we found that household chaos was associated with child appetite dysregulation among children of mothers with low levels of emotional responsiveness, and that dinnertime routines were associated with child appetite dysregulation only among children of mothers who were high on attachment insecurity. These findings provide evidence in support of pathways to risk and resilience, described in the Integrated Introduction (Chapter 1) and in a previously published manuscript describing the guiding theoretical framework for this study (Saltzman et al., 2017).

Merging these results into a cohesive narrative requires that we consider the specificity of our measures and definitions, but perhaps more importantly, it requires that we consider the lived experiences of insecurely attached mothers and their children. Insecure attachment in adulthood is often—though not always—an indicator that an individual has experienced relational instability at the least, or profound trauma at the extreme (Mickelson, Kessler, & Shaver, 1997; Waters, Merrick, Treboux, Crowell, & Albersheim, 2000). To survive these circumstances, mothers may have made critical adaptations to the ways that they respond to stress, disorder, and unpredictability. Resilience theories suggest that exposure to relational stressors in early life (e.g., emotional/ physical abuse, neglect, endangerment, domestic violence, etc.) may prompt children to learn and engage in *adaptive* strategies to ensure survival (Blair, 2010; Dix, 1991; Landa & Duschinsky, 2013; Masten, 2001). Although the "adaptiveness" of certain strategies is certainly context-specific (e.g., dissociating may be adaptive for surviving an abusive partner, but is not adaptive for navigating workplace conflict), these solutions may reinforce a positive feedback loop that may result in short-term, but not long-term benefits (Blair, 2010).

It is possible that insecurely attached mothers in the current sample have been inoculated against the pervasive stress and instability inherent to household chaos. Stress inoculation theories suggest that overcoming a challenging—but not overwhelming—amount of stress in early life can enhance regulatory capacities such as cognitive processing and emotional regulation (Lyons & Parker, 2007; Lyons, Parker, Katz, & Schatzberg, 2009; Rutter, 2012). We can speculate that after consistent exposure to a moderate level of stress and instability, it may not be adaptive for mothers to activate the resource-depleting physiological stress response process when they are exposed to household chaos. Learning to persevere in parenting around general household instability and disorder would have become an adaptive strategy designed to ensure their own and their children's survival in the face of adversity. In efforts to ignore household chaos, these mothers may be protecting themselves from experiencing an overload on their capacity to respond warmly, sensitively, and productively to their children's negative emotions (Study 2). This may explain why household chaos was associated with lower levels of self-reported emotional responsiveness only among mothers who had more secure attachment orientations. Without the prior inoculation, the stress and instability of household chaos made it more difficult for these mothers to feel like they were responding sensitively to their children's negative emotions. These findings and interpretations may seem inconsistent with prior research showing that household chaos is associated with lower levels of parent responsiveness in large samples of predominantly low-income families (Deater-Deckard, Chen, Wang, & Bell, 2012; Evans et al., 2010; Evans & Wachs, 2010). On one hand, these findings could be explained by the lack of socioeconomic diversity in our sample; families in the STRONG Kids 2 Project were predominantly White, well-educated, and middle income. On the other hand, integrating attachment and family systems theories allows us to provide further nuance regarding associations between chaos and parenting in stressful contexts. By including adult attachment orientation as a moderator in our analyses, we extend previous work and find evidence to suggest that the associations between chaos and parenting may be moderated by different stressors with differential effects. Stress inoculation theories suggest that there is a "challenge threshold," or a point at which stressors become too overwhelming (Lyons & Parker, 2007; Lyons et al., 2009; Rutter, 2012). Poverty (the primary moderator used in previous studies)—but not maternal attachment orientations—could exacerbate the association between household chaos and parenting, because the level of stress involved in navigating financial and structural challenges is much greater than the level of stress involved in navigating parenting with an insecure attachment orientation. This interpretation is speculative, but it points to testable hypotheses for future research examining the moderating effect of maternal attachment on associations between household chaos, parenting, and child self-regulation.

In regards to child appetite self-regulation (Study 3), however, chaos was negatively associated with child appetite self-regulation only among mothers reporting low levels of emotional responsiveness. In this study, maternal emotional responsiveness is a protective factor for child resilience to the negative effects of household chaos on appetite self-regulation. Mothers who—despite household chaos—feel that they are responsive to their children's emotional needs, have children who are seemingly unaffected by the instability and uncertainty of household chaos. Findings are unchanged when controlling for maternal attachment insecurity (data not shown), indicating that perceptions of emotional responsiveness may be protective regardless of a mothers' own attachment orientations. These findings point to risk and resilience in a differential susceptibility framework (Ellis et al., 2011; Pluess & Belsky, 2010), although it is unclear if children or mothers (or both) are resilient to the negative effects of chaos in the current studies. Cross-sectional studies have found that responsiveness may moderate or attenuate the association between chaos and child outcomes (Coldwell et al., 2006; Rosemond, Blake, Bernal, Burke, & Frongillo, 2016). However, longitudinal studies have found that responsiveness is a mediator for the association between household chaos and child self-regulation, which corresponds to a pathway of risk (Evans et al., 2010; Vernon-Feagans et al., 2016). Although there were no significant indirect effects of chaos on child appetite dysregulation via responsiveness in the current study, this may simply be due to the cross-sectional nature of the analyses or the low-risk nature of the sample.

Maternal mealtime distractions were associated with less observed maternal emotional responsiveness at mealtimes only among mothers who were highly insecure (Study 2). Dinnertime routines were only associated with child appetite self-regulation among children of mothers who were highly insecure (Study 3). These findings seem contrary to the previous statements about resilience, and highlight instead the role of risk. Why are insecurely attached mothers resilient to the effects of chaos—but not to mealtime distractions—in their emotional responsiveness patterns (Study 2)? Why are children of insecure mothers resilient to the effects of chaos—but not the effects of dinnertime routines—on appetite self-regulation (Study 3)? The answer is two-fold, and points clearly to the second theme: *specificity*. First, in regards to the findings for Study 2, observed emotional responsiveness and distractions were measured during mealtimes, whereas self-report measures of adult attachment orientations and emotional responsiveness ask about emotionality in a variety of scenarios, none of which involve food, meals, weight, or eating. It may be that household chaos—as a more general indicator of household instability and disorder—has a broader and more pervasive effect on overall emotional responsiveness in non-food-related contexts. If this is true, it is not surprising that mealtime distractions would be associated with emotional responsiveness observed during the same mealtime. In regards to the findings for Study 3, it is possible that dinnertime routines are a more proximal risk factor for appetite dysregulation in children, as compared to chaos. As compared to general household chaos, dinnertime routines may have a more pronounced effect on the stability and organization of the setting, timeframe, and interpersonal interactions at family mealtimes specifically, which could in turn have an impactful influence on appetitive processes, particularly among children of insecure mothers. These children may be reacting to the compounded influence of unpredictability in the caregiving environment and in the home food environment.

Although the themes of *multifaceted risk and resilience* and *specificity* are most apparent in Study 2 and Study 3, they permeate Study 1 as well. In regards to specificity, the key finding from Study 1 was that both context and measurement matter for both responsiveness and self-regulation. Confirmatory factor analyses found that appetitive and general self-regulation were highly related, but distinct constructs. However, contrary to our hypotheses, we found that children who waited a full minute before opening a desirable gift had higher levels of appetite dysregulation, as compared to children who did not wait to open the gift. This particular finding indicates that, although children with more appetite dysregulation are higher in food responsiveness and overeating behaviors, food responsiveness may not always translate to increased reward responsiveness in general. In an example from prior literature, people with obesity and binge eating disorder (a type of severe appetite dysregulation) are no different from people with obesity and no binge eating disorder, and people in a normal-weight control group on measures of trait-level reward responsiveness and on neural responses to non-food stimuli (Schag et al., 2013). Although findings in Study 1 do not suggest that children with high levels of appetite dysregulation are resilient to the rewarding effects of non-food stimuli, they do indicate that these children may not necessarily be at risk for impulsivity or aberrant reward responses in non-food contexts.

The theme of specificity was even more apparent in confirmatory factor analyses examining feeding and emotional responsiveness. It is critical for us to consider the differences between parents responses to emotions and their responses to appetitive cues. However, even more compelling is the stark need for improved measures of emotional and feeding responsiveness in food-related contexts. Observed emotional responsiveness during mealtimes and self-reported emotional responsiveness were not subsumed into a latent construct of emotional responsiveness overall. Furthermore, the magnitude of the associations between feeding responsiveness and observed emotional responsiveness, and feeding responsiveness and self-reported emotional responsiveness were comparable, with slightly strong associations for the latter pair. If context mattered most, we should have seen stronger associations between feeding responsiveness and emotional responsiveness observed during mealtimes. If measurement mattered most, we should have seen stronger associations between self-reported and observed emotional responsiveness. The fact that the largest path coefficient was the link between self-reported and observed emotional responsiveness provides some evidence to suggest that the constructs being measured are related, but perhaps should be analyzed as distinct factors. It may be that there were too many inconsistencies (both measurement and context) in the evaluation of emotional responsiveness to come to any firm conclusions. Perhaps unsurprisingly, these results point more to questions than answers.

Across the three studies, results are promising and paint a hopeful picture about resilience, responsiveness, and self-regulation. Nevertheless, methodological and conceptual limitations preclude claims about directionality of association, and the generalizability of results across samples and methods. For example, it is critical to note that variables (latent and observed) measuring household chaos and family routines were derived from measures collected when children were 12 and 24 months of age, and so represent an average amount of household chaos or routines over the course of the second year of a child's life. Measures of attachment, responsiveness, and child appetite self-regulation were taken between 18 and 24 months. Although these data were collected at different time points, our ability to identify the direction of effects is limited by cross-over across collection points. Second, because we collected only one mealtime video per family, we cannot generalize findings about associations between distractions and observed emotional responsiveness during mealtimes over time, and we cannot assess causal pathways. Third, this was a relatively low-risk sample in comparison to some prior publications assessing similar processes (Hughes et al., 2007; Vernon-Feagans et al., 2016). That said, the fact that some of these risk and resilience processes emerged in a "low-risk" sample (e.g., the sample included primarily White, well-educated, and moderately wealthy families) indicates that further investigation and replication may be warranted, particularly in samples of higher-risk families. Third, we found no effects on or of feeding responsiveness across analyses, suggesting that this construct may not have been measured or operationalized appropriately. Although all of the measures used in the current study have been validated in previous studies, more research may be needed to investigate whether other approaches to operationalizing and measuring feeding responsiveness provide more information. Finally, there is a striking lack of research on the role of fathers in the current studies and the extant literature. Although fathers are often present at mealtimes, it is currently unclear to what extent they engage in and influence feeding responsiveness and emotional responsiveness, and how this influences child eating behaviors. These issues and others are discussed in the next section on recommendations for basic and applied research. Recommendations for parents and providers should be weighed in light of these limitations.

Recommendations for Future Basic and Applied Research

There are three key recommendations for basic and applied scientists in this field moving forward. First, longitudinal studies using direct observations at multiple time points are needed. In particular, studies should weigh the costs and benefits of multiple observations of family mealtimes over the first two years of a child's life. On one hand, observational research at this scale would be time and resource intensive. On the other hand, this approach would provide a depth of knowledge about directionality that wouldn't be attainable otherwise.

Second, validation studies are needed to (1) ascertain whether other approaches are more appropriate for operationalizing feeding responsiveness, and (2) develop observational assessments of child appetite self-regulation/eating behavior that can be applied in naturalistic home settings. The former issue was discussed previously. In regards to the latter, to date there are no observational assessments of child appetite self-regulation that can be applied to videotapes of family mealtimes in the home. Although observational assessments of "loss of control eating" and "eating in the absence of hunger" come close to tapping the appetite self-regulation construct, these assessments can only be implemented in the context of laboratory-based tasks relying on scales and weighted plates (Fisher & Birch, 2002; Tanofsky-Kraff, Marcus, Yanovski, & Yanovski, 2008). This type of assessment would provide crucial information about whether parent-report measures of child appetite self-regulation are valid or comparable to observer-based assessments, and efforts to validate such an assessment may provide more insight into elements of mealtimes that can improve child appetite self-regulation.

Finally, it is critical that researchers consider taking a strengths-based, family systems-informed approach to designing and analyzing data from basic and applied studies. Several modifiable factors may influence appetite self-regulation in early childhood, including maternal emotional responsiveness, household chaos, and dinnertime routines. In regards to responsiveness, household chaos and mealtime distractions may be fruitful targets for intervention. In these studies, we found that maternal attachment insecurity plays a role in risk and resilience. A strengths-based approach to health promotion in families with insecure attachment relationships may involve having mothers make meaning of their past experiences, and describe how they inform current decisions around emotional responsiveness, feeding, and their child's eating behaviors. It will also be important for future research to examine whether and how paternal responsiveness influences the association between household chaos, family routines, and child appetite self-regulation.

Recommendations for Parents

If parents are concerned about mealtimes or their child's eating behavior, they may want to consider the following recommendations. First, in early childhood, it is important to balance flexibility and predictability. Meals and snacks should happen at about the same time, in about the same place each day. That said, if a child is genuinely hungry between meals and snacks, consider providing small snacks before mealtimes to curb fussiness or negativity in relation to food. Second, parents should consider trying to cultivate a positive mealtime environment. Although mealtimes may be stressful, they are also a time for parents and children to come together around a common goal, to interact, and to discuss the matters of daily life. To reduce mealtime stress, it may be helpful to create consistent mealtime routines and to communicate clearly with other adults about roles and responsibilities for mealtimes. Finally, coping with a child's ever-changing emotions and eating behaviors requires that parents focus on building and maintaining their own mental wellbeing. Intervention efforts have successfully improved parent emotion regulation, emotional responsiveness, and child emotion regulation by teaching parents to identify and regulate their own emotions, to view children's emotional expressions as learning opportunities to label and discuss emotions, to empathize and validate children's emotions, and to help children solve emotional problems in the moment (Havighurst, Wilson, Harley, Prior, & Kehoe, 2010; Wilson, Havighurst, & Harley, 2012).

Conclusions

Considering specificity and the multifaceted nature of risk and resilience help us to make sense of the development of appetite self-regulation in context. The roles of maternal attachment and emotional responsiveness exemplifies the multifaceted nature of risk and resilience. Maternal attachment insecurity exacerbated the negative association between maternal distractions and observed emotional responsiveness (Study 2), and the negative association between dinnertime routines and child appetite dysregulation (Study 3). However, maternal attachment insecurity also served as a protective factor, buffering mothers from the negative effects of household chaos on self-reported emotional responsiveness (Study 2). High levels of emotional responsiveness, in turn, buffered children from the deleterious effects of household chaos on appetite dysregulation (Study 3). High levels of household chaos and few dinnertime routines emerged as clear risk factors for lower emotional responsiveness and appetite dysregulation. However, the theme of specificity is needed to make sense of the disparate findings across analyses. Self-regulation and responsiveness are domain-specific constructs (Study 1). Furthermore, emotional responsiveness during mealtimes and perceptions of general emotional responsiveness did not exert the same effects on child outcomes (Study 3), nor were they affected by the same family and attachment factors (Study 2). Similarly, feeding responsiveness and emotional responsiveness clearly did not exert the same effects on child outcomes. While neither mediated associations between family factors and child outcomes, low levels of emotional responsiveness—but not feeding responsiveness—exacerbated the negative effects of household chaos on child appetite self-regulation (Study 3). Future research should consider prioritizing longitudinal studies with direct observational assessments across multiple time points; validation studies for observational assessments of appetite self-regulation and feeding responsiveness; and strengths-based approaches to interventions. Mothers and children are susceptible to risk, but they may also engage in adaptive strategies that promote resilience in appetite self-regulation (and perhaps subsequent weight outcomes). Moving forward, efforts to improve appetite self-regulation should take care to balance focus on reducing risk and promoting resilience in families with young children.

References

Aboud, F. E., Shafique, S., & Akhter, S. (2009). A responsive feeding intervention increases children's self-feeding and maternal responsiveness but not weight gain. *The Journal of Nutrition*, *139*(9), 1738–1743. doi: 10.3945/jn.109.104885

Ahnert, L., Gunnar, M. R., Lamb, M. E., & Barthel, M. (2004). Transition to child care: Associations with infant–mother attachment, infant negative emotion, and cortisol elevations. *Child Development*, *75*(3), 639–650. doi: 10.1111/j.1467-8624.2004.00698.x

Ainsworth, M. S. (1979). Infant–mother attachment. *American Psychologist*, *34*(10), 932–937. doi: 10.1037/0003-066X.34.10.932

Ainsworth, M. S., Blehar, M., Waters, E., & Wall, S. (1978). *Patterns of attachment: Observations in the Strange Situation and at home.* Hillsdale, NJ: Erlbaum.

Ainsworth, M. S., & Bell, S. M. (1970). Attachment, exploration, and separation: illustrated by the behavior of one-year-olds in a strange situation. *Child Development*, *41*(1), 49–67. doi: 10.2307/1127388

American Academy of Pediatrics. (2003). Prevention of pediatric overweight and obesity. *Pediatrics, 112*(2), 424–430. doi: 10.1542/peds.112.2.424

American Public Health Association. (2010). *Child Health Policy for the United States* (Policy Statement No. 201013). Retrieved from https://www.apha.org

Anderson, S. E., Sacker, A., Whitaker, R. C., & Kelly, Y. (2017). Self-regulation and household routines at age three and obesity at age eleven: Longitudinal analysis of the UK Millennium Cohort Study. *International Journal of Obesity*, *41*(10), 1459–1466. doi: 10.1038/ijo.2017.94

Anderson, S. E., & Keim, S. A. (2016). Parent–child interaction, self-regulation, and obesity prevention in early childhood. *Current Obesity Reports, 5*(2), 192-200. doi: 10.1007/s13679-016-0208-9

Anderson, S. E., Must, A., Curtin, C., & Bandini, L. G. (2012). Meals in our household: Reliability and initial validation of a questionnaire to assess child mealtime behaviors and family mealtime environments. *Journal of the Academy of Nutrition and Dietetics*, *112*(2), 276–284. doi: 10.1016/j.jada.2011.08.035

Anderson, S. E., & Whitaker, R. C. (2010). Household routines and obesity in US preschool-aged children. *Pediatrics*, *125*(3), 420–428. doi: 10.1542/peds.2009-0417

Anzman, S. L., Rollins, B. Y., & Birch, L. L. (2010). Parental influence on children's early eating environments and obesity risk: Implications for prevention. *International Journal of Obesity*, *34*(7), 1116–1124. doi: 10.1038/ijo.2010.43

Bakermans-Kranenburg, M. J., van IJzendoorn, M. J., & Kroonenberg, P. M. (2004). Differences in attachment security between African-American and white children: Ethnicity or socio-economic status? *Infant Behavior and Development*, *27*(3), 417–433. doi: 10.1016/j.infbeh.2004.02.002

Barone, L., & Guiducci, V. (2009). Mental representations of attachment in Eating Disorders: A pilot study using the Adult Attachment Interview. *Attachment & Human Development*, *11*(4), 405–417. doi: 10.1080/14616730902814770

Barrera, M., Caples, H., & Tein, J.-Y. (2001). The psychological sense of economic hardship: Measurement models, validity, and cross-ethnic equivalence for urban families. *American Journal of Community Psychology*, *29*(3), 493–517. doi: 10.1023/A:1010328115110

Bater, L. R., & Jordan, S. S. (2017). Child routines and self-regulation serially mediate parenting practices and externalizing problems in preschool children. *Child & Youth Care Forum*, *46*(2), 243–259. doi: 10.1007/s10566-016-9377-7

Baucom, B. R. W., Leo, K., Adamo, C., Georgiou, P., & Baucom, K. J. W. (2017). Conceptual and statistical issues in couples observational research: Rationale and methods for design decisions. *Journal of Family Psychology*, *31*(8), 972–982. doi: 10.1037/fam0000370

Berge, J. M., Rowley, S., Trofholz, A., Hanson, C., Rueter, M., MacLehose, R. F., & Neumark-Sztainer, D. (2014). Childhood obesity and interpersonal dynamics during family meals. *Pediatrics, (134)*5, 923-932. doi: 10.1542/peds.2014-1936

Bernier, A., Beauchamp, M. H., Carlson, S. M., & Lalonde, G. (2015). A secure base from which to regulate: Attachment security in toddlerhood as a predictor of executive functioning at school entry. *Developmental Psychology*, *51*(9), 1177–1189. doi: 10.1037/dev0000032

Bernier, A., Carlson, S. M., Deschênes, M., & Matte-Gagné, C. (2012). Social factors in the development of early executive functioning: A closer look at the caregiving environment. *Developmental Science*, *15*(1), 12–24. doi: 10.1111/j.1467-7687.2011.01093.x

Bernier, A., Carlson, S. M., & Whipple, N. (2010). From external regulation to self-regulation: Early parenting precursors of young children's executive functioning. *Child Development*, *81*(1), 326–339. doi: 10.1111/j.1467-8624.2009.01397.x

Berry, D., Blair, C., Willoughby, M., Garrett-Peters, P., Vernon-Feagans, L., & Mills-Koonce, W. R. (2016). Household chaos and children's cognitive and socio-emotional development in early childhood: Does childcare play a buffering role? *Early Childhood Research Quarterly*, *34*, 115–127. doi: 10.1016/j.ecresq.2015.09.003

Birch, L. L. (1999). Development of Food Preferences. *Annual Review of Nutrition*, *19*(1), 41–62. doi; 10.1146/annurev.nutr.19.1.41

Birch, Leann L., & Anzman, S. L. (2010). Learning to eat in an obesogenic environment: A developmental systems perspective on childhood obesity. *Child Development Perspectives*, *4*(2), 138–143. doi: 10.1111/j.1750-8606.2010.00132.x

Birch, L. L., & Davison, K. K. (2001). Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatric Clinics of North America*, *48*(4), 893–907. doi: 10.1016/S0031-3955(05)70347-3

Black, M. M., & Aboud, F. E. (2011). Responsive feeding is embedded in a theoretical framework of responsive parenting. *The Journal of Nutrition*, *141*(3), 490–494. doi: 10.3945/jn.110.129973

Blair, C. (2010). Stress and the development of self-regulation in context. *Child Development Perspectives*, *4*(3), 181–188. doi: 10.1111/j.1750-8606.2010.00145.x

Bollen, K. A. (2002). Latent variables in psychology and the social sciences. *Annual Review of Psychology*, *53*(1), 605–634. doi: 10.1146/annurev.psych.53.100901.135239

Bornstein, M. H., & Tamis-LeMonda, C. S. (1989). Maternal responsiveness and cognitive development in children. *New Directions for Child and Adolescent Development*, *1989*(43), 49–61. doi: 10.1002/cd.23219894306

Bost, K. K., Shin, N., Mcbride, B. A., Brown, G. L., Vaughn, B. E., Coppola, G., … Korth, B. (2006). Maternal secure base scripts, children's attachment security, and mother – child narrative styles. *Attachment & Human Development*, *8*(3), 241–260. doi: 10.1080/14616730600856131

Bost, K. K., Wiley, A. R., Fiese, B., Hammons, A., McBride, B., & the STRONG Kids Team (2014). Associations between adult attachment style, emotion regulation, and preschool children's food consumption. *Journal of Developmental & Behavioral Pediatrics*, *35*(1), 50–61. doi: 10.1097/01.DBP.0000439103.29889.18

Boughton, K. L., & Lumley, M. N. (2011). Parent prediction of child mood and emotional resilience: The role of parental responsiveness and psychological control. *Depression Research and Treatment, 2011*(2011), 1-9. doi: 10.1155/2011/375398

Bowen, M. (1966). The use of family theory in clinical practice. *Comprehensive Psychiatry*, *7*(5), 345–374. doi: 10.1016/S0010-440X(66)80065-2

Bowlby, J. (1982). Attachment and loss: Retrospect and prospect. *American Journal of Orthopsychiatry*, *52*(4), 664–678. doi: 10.1111/j.1939-0025.1982.tb01456.x

Bowlby, J. (2008). *A Secure Base: Parent-Child Attachment and Healthy Human Development*. New York, NY. Basic Books.

Bretherton, I. (1992). The origins of attachment theory. *Developmental Psychology*, *28*(5), 759–775. doi: 10.1037/0012-1649.28.5.759

Bretherton, I. (1999). Updating the ‘internal working model’ construct: Some reflections. *Attachment & Human Development*, *1*(3), 343–357. doi: 10.1080/14616739900134191

Bridgett, D. J., Burt, N. M., Edwards, E. S., & Deater-Deckard, K. (2015). Intergenerational transmission of self-regulation: A multidisciplinary review and integrative conceptual framework. *Psychological Bulletin*, *141*(3), 602–654. doi: 10.1037/a0038662

Bridgett, D. J., Oddi, K. B., Laake, L. M., Murdock, K. W., & Bachmann, M. N. (2013). Integrating and differentiating aspects of self-regulation: Effortful control, executive functioning, and links to negative affectivity. *Emotion*, *13*(1), 47–63. doi: 10.1037/a0029536

Brody, G. H., Murry, V. M., Kim, S., & Brown, A. C. (2002). Longitudinal pathways to competence and psychological adjustment among African American children living in rural single–parent households. *Child Development*, *73*(5), 1505–1516. doi: 10.1111/1467-8624.00486

Brown, A., & Lee, M. (2012). Breastfeeding during the first year promotes satiety responsiveness in children aged 18–24 months. *Pediatric Obesity*, *7*(5), 382–390. doi: 10.1111/j.2047-6310.2012.00071.x

Bruch, H. M. D., & Touraine, G. A. B. (1940). Obesity in childhood: V. The family frame of obese children*. *Psychosomatic Medicine*, *2*(2), 141–206. doi: 10.1097/00006842-194004000-00005

Calkins, S. D., & Fox, N. A. (1992). The relations among infant temperament, security of attachment, and behavioral inhibition at twenty-four months. *Child Development*, *63*(6), 1456–1472. doi: 10.1111/j.1467-8624.1992.tb01707.x

Campos, J. J., Frankel, C. B., & Camras, L. (2004). On the nature of emotion regulation. *Child Development*, *75*(2), 377–394. doi: 10.1111/j.1467-8624.2004.00681.x

Card, N. A., & Barnett, M. A. (2015). Methodological considerations in studying individual and family resilience. *Family Relations*, *64*(1), 120–133. doi: 10.1111/fare.12102

Carlson, S. M. (2005). Developmentally sensitive measures of executive function in preschool children. *Developmental Neuropsychology*, *28*(2), 595–616. doi: 10.1207/s15326942dn2802_3

Carnell, S., & Wardle, J. (2007). Measuring behavioural susceptibility to obesity: Validation of the child eating behaviour questionnaire. *Appetite*, *48*(1), 104–113. doi: 10.1016/j.appet.2006.07.075

Coldwell, J., Pike, A., & Dunn, J. (2006). Household chaos – links with parenting and child behaviour. *Journal of Child Psychology and Psychiatry*, *47*(11), 1116–1122. doi: 10.1111/j.1469-7610.2006.01655.x

Cole, N. C., Musaad, S. M., Fiese, B. H., Lee, S.-Y., & Donovan, S. M. (2016). Influence of family mealtime routines on preschoolers’ picky eating behaviors and food consumption. *The FASEB Journal*, *30*(1_supplement), 1150.11. doi: 10.1096/fasebj.30.1_supplement.1150.11

Cole, P., Wiggins, C., Radzioch, A., & Pearl, A. (2007). *D.O.T.S. Emotion coding system.* Unpublished manual.

Coppola, G., Vaughn, B. E., Cassibba, R., & Costantini, A. (2006). The attachment script representation procedure in an Italian sample: Associations with adult attachment interview scales and with maternal sensitivity. *Attachment & Human Development*, *8*(3), 209–219. doi: 10.1080/14616730600856065

Costanzo, P. R., & Woody, E. Z. (1985). Domain-specific parenting styles and their impact on the child's development of particular deviance: The example of obesity proneness. *Journal of Social and Clinical Psychology*, *3*(4), 425–445. doi: 10.1521/jscp.1985.3.4.425

Cowan, P. A. (1997). Beyond meta-analysis: A plea for a family systems view of attachment. *Child Development*, *68*(4), 601–603. doi: 10.2307/1132111

Cowan, P. A., Cohn, D. A., Cowan, C. P., & Pearson, J. L. (1996). Parents' attachment histories and children's externalizing and internalizing behaviors: Exploring family systems models of linkage. *Journal of Consulting and Clinical Psychology*, *64*(1), 53–63. doi: 10.1037/0022-006X.64.1.53

Cox, M. J., & Paley, B. (1997). Families as systems. *Annual Review of Psychology*, *48*(1), 243–267. doi: 10.1146/annurev.psych.48.1.243

Cutting, T. M., Fisher, J. O., Grimm-Thomas, K., & Birch, L. L. (1999). Like mother, like daughter: Familial patterns of overweight are mediated by mothers' dietary disinhibition. *The American Journal of Clinical Nutrition*, *69*(4), 608–613. doi: 10.1097/00004583-199910000-00028

Czaja, J., Hartmann, A. S., Rief, W., & Hilbert, A. (2011). Mealtime family interactions in home environments of children with loss of control eating. *Appetite*, *56*(3), 587–593. doi: 10.1016/j.appet.2011.01.030

Davidov, M., & Grusec, J. E. (2006). Untangling the links of parental responsiveness to distress and warmth to child outcomes. *Child Development*, *77*(1), 44–58. doi: 10.1111/j.1467-8624.2006.00855.x

Deater-Deckard, K. (2014). Family matters: Intergenerational and interpersonal processes of executive function and attentive behavior. *Current Directions in Psychological Science*, *23*(3), 230–236. doi: 10.1177/0963721414531597

Deater-Deckard, K., Chen, N., Wang, Z., & Bell, M. A. (2012). Socioeconomic risk moderates the link between household chaos and maternal executive function. *Journal of Family Psychology*, *26*(3), 391–399. doi: 10.1037/a0028331

Denham, S. A. (1993). Maternal emotional responsiveness and toddlers' social-emotional competence. *Journal of Child Psychology and Psychiatry*, *34*(5), 715–728. doi: 10.1111/j.1469-7610.1993.tb01066.x

Diamond, L. M., & Aspinwall, L. G. (2003). Emotion regulation across the life span: An integrative perspective emphasizing self-regulation, positive affect, and dyadic processes. *Motivation and Emotion*, *27*(2), 125–156. doi: 10.1023/A:1024521920068

DiSantis, K. I., Hodges, E. A., Johnson, S. L., & Fisher, J. O. (2011). The role of responsive feeding in overweight during infancy and toddlerhood: A systematic review. *International Journal of Obesity*, *35*(4), 480–492. doi: 10.1038/ijo.2011.3

Dix, T. (1991). The affective organization of parenting: Adaptive and maladaptive processes. *Psychological Bulletin*, *110*(1), 3–25. doi: 10.1037/0033-1909.110.1.3

Dong, Y., & Peng, C.-Y. J. (2013). Principled missing data methods for researchers. *SpringerPlus*, *2*(1), 222. doi: 10.1186/2193-1801-2-222

Dumas, J. E., Nissley, J., Nordstrom, A., Smith, E. P., Prinz, R. J., & Levine, D. W. (2005). Home chaos: sociodemographic, parenting, interactional, and child correlates. *Journal of Clinical Child & Adolescent Psychology*, *34*(1), 93–104. doi: 10.1207/s15374424jccp3401_9

Easterbrooks, M. A., Chaudhuri, J. H., Bartlett, J. D., & Copeman, A. (2011). Resilience in parenting among young mothers: Family and ecological risks and opportunities. *Children and Youth Services Review*, *33*(1), 42–50. doi: 10.1016/j.childyouth.2010.08.010

Eisenberg, N., & Sulik, M. J. (2012). Emotion-related self-regulation in children. *Teaching of Psychology*, *39*(1), 77–83. doi: 10.1177/0098628311430172

Ellis, B. J., Boyce, W. T., Belsky, J., Bakermans-Kranenburg, M. J., & van Ijzendoorn, M. H. (2011). Differential susceptibility to the environment: An evolutionary–neurodevelopmental theory. *Development and Psychopathology*, *23*(1), 7–28. doi: 10.1017/S0954579410000611

Enders, C. K., Baraldi, A. N., & Cham, H. (2014). Estimating interaction effects with incomplete predictor variables. *Psychological Methods*, *19*(1), 39–55. doi: 10.1037/a0035314

Evans, G. W., Gonnella, C., Marcynyszyn, L. A., Gentile, L., & Salpekar, N. (2005). The role of chaos in poverty and children's socioemotional adjustment. *Psychological Science*, *16*(7), 560–565. doi: 10.1111/j.0956-7976.2005.01575.x

Evans, G. W., Ricciuti, H. N., Hope, S., Schoon, I., Bradley, R. H., Corwyn, R. F., & Hazan, C. (2010). Crowding and cognitive development: The mediating role of maternal responsiveness among 36-month-old children. *Environment and Behavior*, *42*(1), 135–148. doi: 10.1177/0013916509333509

Evans, G. W., & Wachs, T. D. (2010). *Chaos and its influence on children's development*. Washington, D.C.: American Psychological Association.

Faber, A., & Dubé, L. (2015). Parental attachment insecurity predicts child and adult high-caloric food consumption. *Journal of Health Psychology*, *20*(5), 511–524. doi: 10.1177/1359105315573437

Faber, A., Dubé, L., & Knäuper, B. (2018). Attachment and eating: A meta-analytic review of the relevance of attachment for unhealthy and healthy eating behaviors in the general population. *Appetite*, *123*, 410–438. doi: 10.1016/j.appet.2017.10.043

Fabes, R. A., Leonard, S. A., Kupanoff, K., & Martin, C. L. (2001). Parental coping with children's negative emotions: Relations with children's emotional and social responding. *Child Development*, *72*(3), 907–920. doi: 10.1111/1467-8624.00323

Fabes, R. A., Poulin, R. E., Eisenberg, N., & Madden-Derdich, D. A. (2002). The Coping with Children's Negative Emotions Scale (CCNES): Psychometric properties and relations with children's emotional competence. *Marriage & Family Review*, *34*(3–4), 285–310. doi: 10.1300/J002v34n03_05

Farrow, C., & Blissett, J. (2014). Maternal mind-mindedness during infancy, general parenting sensitivity and observed child feeding behavior: A longitudinal study. *Attachment & Human Development*, *16*(3), 230–241. doi: 10.1080/14616734.2014.898158

Ferretti, L. K., & Bub, K. L. (2014). The influence of family routines on the resilience of low-income preschoolers. *Journal of Applied Developmental Psychology*, *35*(3), 168–180. doi: 10.1016/j.appdev.2014.03.003

Fiese, B. H., Jones, B. L., & Jarick, J. M. (2015). Family mealtime dynamics and food consumption: An experimental approach to understanding distractions. *Couple and Family Psychology: Research and Practice*, *4*(4), 199–211. doi: 10.1037/cfp0000047

Fiese, B. H., & Bost, K. K. (2016). Family ecologies and child risk for obesity: Focus on regulatory processes. *Family Relations*, *65*(1), 94–107. doi: 10.1111/fare.12170

Fiese, B. H., Botti, J. C., & Greenberg, S. (2007). *ABC Family Mealtime Coding Manual*. University of Illinois, Urbana Champaign.

Fiese, B. H., Foley, K. P., & Spagnola, M. (2006). Routine and ritual elements in family mealtimes: Contexts for child well-being and family identity. *New Directions for Child and Adolescent Development*, *2006*(111), 67–89. doi: 10.1002/cd.156

Fiese, B. H., Gundersen, C., Koester, B., & Jones, B. (2016). Family chaos and lack of mealtime planning is associated with food insecurity in low income households. *Economics & Human Biology*, *21*, 147–155. doi: 10.1016/j.ehb.2016.01.004

Fiese, B. H., Hammons, A., & Grigsby-Toussaint, D. (2012). Family mealtimes: A contextual approach to understanding childhood obesity. *Economics & Human Biology*, *10*(4), 365–374. doi: 10.1016/j.ehb.2012.04.004

Fiese, Barbara H., Hooker, K. A., Kotary, L., & Schwagler, J. (1993). Family rituals in the early stages of parenthood. *Journal of Marriage and the Family*, *55*(3), 633. doi: 10.2307/353344

Fiese, B. H., & Kline, C. A. (1993). Development of the Family Ritual Questionnaire: Initial reliability and validation studies. *Journal of Family Psychology*, *6*(3), 290–299. doi: 10.1037/0893-3200.6.3.290

Fiese, B. H., Tomcho, T. J., Douglas, M., Josephs, K., Poltrock, S., & Baker, T. (2002). A review of 50 years of research on naturally occurring family routines and rituals: Cause for celebration? *Journal of Family Psychology*, *16*(4), 381–390. doi: 10.1037/0893-3200.16.4.381

Fiese, B. H., Winter, M. A., & Botti, J. C. (2011). The ABCs of Family Mealtimes: Observational lessons for promoting healthy outcomes for children with persistent asthma. *Child Development*, *82*(1), 133–145.doi: 10.1111/j.1467-8624.2010.01545.x

Fisher, J. O., & Birch, L. L. (2002). Eating in the absence of hunger and overweight in girls from 5 to 7 y of age. *The American Journal of Clinical Nutrition*, *76*(1), 226–231. doi: 10.1093/ajcn/76.1.226

Fosco, G. M., & Grych, J. H. (2013). Capturing the family context of emotion regulation: A family systems model comparison approach. *Journal of Family Issues*, *34*(4), 557–578. doi: 10.1177/0192513X12445889

Francis, L. A., Hofer, S. M., & Birch, L. L. (2001). Predictors of maternal child-feeding style: maternal and child characteristics. *Appetite, 37*(3), 231–243. doi: 10.1006/appe.2001.0427

Frankel, L. A., Hughes, S. O., O'Connor, T. M., Power, T. G., Fisher, J. O., & Hazen, N. L. (2012). Parental influences on children's self-regulation of energy intake: Insights from developmental literature on emotion regulation. *Journal of Obesity*, *2012*, 1–12. doi: 10.1155/2012/327259

Gartstein, M. A., & Rothbart, M. K. (2003). Studying infant temperament via the Revised Infant Behavior Questionnaire. *Infant Behavior and Development*, *26*(1), 64–86. doi: 10.1016/S0163-6383(02)00169-8

Golen, R. B., & Ventura, A. K. (2015). Mindless feeding: Is maternal distraction during bottle-feeding associated with overfeeding? *Appetite*, *91*, 385–392. doi: 10.1016/j.appet.2015.04.078

Gondoli, D. M., & Silverberg, S. B. (1997). Maternal emotional distress and diminished responsiveness: The mediating role of parenting efficacy and parental perspective taking. *Developmental Psychology*, *33*(5), 861-868. doi: 10.1037/0012-1649.33.5.861

Goossens, L., Braet, C., Bosmans, G., & Decaluwé, V. (2011). Loss of control over eating in pre-adolescent youth: The role of attachment and self-esteem. *Eating Behaviors*, *12*(4), 289–295. doi: 10.1016/j.eatbeh.2011.07.005

Goulding, A. N., Lumeng, J. C., Rosenblum, K. L., Chen, Y.-P., Kaciroti, N., & Miller, A. L. (2015). Maternal feeding goals described by low-income mothers. *Journal of Nutrition Education and Behavior*, *47*(4), 331-337. doi: 10.1016/j.jneb.2015.03.012

Graziano, P. A., Calkins, S. D., & Keane, S. P. (2010). Toddler self-regulation skills predict risk for pediatric obesity. *International Journal of Obesity*, *34*(4), 633–641. doi: 10.1038/ijo.2009.288

Griffin, D. W., & Bartholomew, K. (1994). Models of the self and other: Fundamental dimensions underlying measures of adult attachment. *Journal of Personality and Social Psychology*, *67*(3), 430–445. doi: 10.1037/0022-3514.67.3.430

Groh, A. M., Roisman, G. I., Haydon, K. C., Bost, K., McElwain, N., Garcia, L., & Hester, C. (2015). Mothers' electrophysiological, subjective, and observed emotional responding to infant crying: The role of secure base script knowledge. *Development and Psychopathology*, *27*(1), 1237–1250. doi: 10.1017/S0954579414000881

Groppe, K., & Elsner, B. (2015). The influence of hot and cool executive function on the development of eating styles related to overweight in children. *Appetite*, *87*(Supplement C), 127–136. doi: 10.1016/j.appet.2014.12.203

Grossman, K., Grossman, K., & Kindler, H. (2006). Early care and the roots of attachment and partnership representations: The Bielefeld and Regensburg Longitudinal Studies. In K. E. Grossmann, K. Grossmann, & E. Waters (Eds.), *Attachment from infancy to adulthood: The major longitudinal studies* (pp. 98–136). New York, NY: Guilford Press.

Grusec, J. E., & Davidov, M. (2010). Integrating different perspectives on socialization theory and research: A domain-specific approach. *Child Development*, *81*(3), 687–709. doi: 10.1111/j.1467-8624.2010.01426.x.

Guédeney, N., Fermanian, J., & Bifulco, A. (2010). La version française du Relationship Scales Questionnaire de Bartholomew (RSQ, Questionnaire des échelles de relation) : étude de validation du construit [Construct validation study of the Relationship Scales Questionnaire (RSQ) on an adult sample]. *L'Encephale*, *36*(1), 69–76. doi: 10.1016/j.encep.2008.12.006

Gunnar, M. R., & Donzella, B. (2002). Social regulation of the cortisol levels in early human development. *Psychoneuroendocrinology*, *27*(1–2), 199–220. doi: 10.1016/S0306-4530(01)00045-2

Guttmann-Steinmetz, S., Steiner, M., & Waters, H. (2003, April). *Co-constructing script-like representations of early secure base experience*. Paper presentation presented at the Society for Research on Child Development, Tampa, FL.

Hardman, C. A., Christiansen, P., & Wilkinson, L. L. (2016). Using food to soothe: Maternal attachment anxiety is associated with child emotional eating. *Appetite*, *99*, 91–96. doi: 10.1016/j.appet.2016.01.017

Harrison, K., Bost, K. K., McBride, B. A., Donovan, S. M., Grigsby-Toussaint, D. S., Kim, J., … Jacobsohn, G. C. (2011). Toward a developmental conceptualization of contributors to overweight and obesity in childhood: The Six-Cs Model. *Child Development Perspectives*, *5*(1), 50–58. doi: 10.1111/j.1750-8606.2010.00150.x

Hart, S. A., Petrill, S. A., Deater-Deckard, K., & Thompson, L. A. (2007). SES and CHAOS as environmental mediators of cognitive ability: A longitudinal genetic analysis. *Intelligence*, *35*(3), 233–242. doi: 10.1016/j.intell.2006.08.004

Hathcock, A., Krause, K., Viera, A. J., Fuemmeler, B. F., Lovelady, C., & Østbye, T. (2013). Satiety responsiveness and the relationship between breastfeeding and weight status of toddlers of overweight and obese women. *Maternal and Child Health Journal*, *18*(4), 1023–1030. doi: 10.1007/s10995-013-1331-9

Havighurst, S. S., Wilson, K. R., Harley, A. E., Prior, M. R., & Kehoe, C. (2010). Tuning In To Kids: Improving emotion socialization practices in parents of preschool children – findings from a community trial. *Journal of Child Psychology and Psychiatry*, *51*(12), 1342–1350. doi: 10.1111/j.1469-7610.2010.02303.x

Hayes, A. F. (2013a). PROCESS macro for SPSS and SAS. Retrieved April 25, 2015, from http://processmacro.org/

Hayes, A. F. (2013b). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY. Guilford Press.

Heikamp, T., Trommsdorff, G., Druey, M. D., Hübner, R., & von Suchodoletz, A. (2013). Kindergarten children's attachment security, inhibitory control, and the internalization of rules of conduct. *Developmental Psychology*, *4*, 133. doi: 10.3389/fpsyg.2013.00133

Herman, A. N., Malhotra, K., Wright, G., Fisher, J. O., & Whitaker, R. C. (2012). A qualitative study of the aspirations and challenges of low-income mothers in feeding their preschool-aged children. *The International Journal of Behavioral Nutrition and Physical Activity*, *9*(132), 1-13. doi: 10.1186/1479-5868-9-132

Herman, C. P., & Polivy, J. (2011). Self-regulation and the obesity epidemic. *Social Issues and Policy Review*, *5*(1), 37–69. doi: 10.1111/j.1751-2409.2011.01025.x

Hill-Soderlund, A. L., Mills-Koonce, W. R., Propper, C., Calkins, S. D., Granger, D. A., Moore, G. A., … Cox, M. J. (2008). Parasympathetic and sympathetic responses to the strange situation in infants and mothers from avoidant and securely attached dyads. *Developmental Psychobiology*, *50*(4), 361–376. doi: 10.1002/dev.20302

Hittner, J. B., Johnson, C., Tripicchio, G., & Faith, M. S. (2016). Infant emotional distress, maternal restriction at a home meal, and child BMI gain through age 6 years in the Colorado Adoption Project. *Eating Behaviors, 21*, 135–141. doi: 10.1016/j.eatbeh.2016.01.008

Holmes, J. (2017). Roots and routes to resilience and its role in psychotherapy: A selective, attachment-informed review. *Attachment & Human Development*, *19*(4), 364–381. doi: 10.1080/14616734.2017.1306087

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods, 6*(1), 53–60. Retrieved from https://arrow.dit.ie

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. doi: 10.1080/10705519909540118

Hughes, C., Roman, G., & Ensor, R. (2014). Parenting and executive function. *Wellbeing*, *1*(2:8), 1-25. doi: 10.1002/9781118539415.wbwell007

Hughes, S. O., Frankel, L. A., Beltran, A., Hodges, E., Hoerr, S., Lumeng, J., … Kremers, S. (2013). Food parenting measurement issues: Working group consensus report. *Childhood Obesity*, *9*(s1), S–95. doi: 10.1089/chi.2013.0032

Hughes, S. O., Patrick, H., Power, T. G., Fisher, J. O., Anderson, C. B., & Nicklas, T. A. (2007). The impact of child care providers' feeding on children's food consumption. *Journal of Developmental and Behavioral Pediatrics*, *28*(2), 100–107. doi:10.1097/01.DBP.0000267561.34199.a9

Hughes, S. O., Power, T. G., O'Connor, T. M., & Fisher, J. O. (2015). Executive functioning, emotion regulation, eating self-regulation, and weight status in low-income preschool children: How do they relate? *Appetite, 89*(Supplement C), 1–9.doi: 10.1016/j.appet.2015.01.009

Hughes, S. O., Power, T. G., Orlet Fisher, J., Mueller, S., & Nicklas, T. A. (2005). Revisiting a neglected construct: Parenting styles in a child-feeding context. *Appetite*, *44*(1), 83–92. doi: 10.1016/j.appet.2004.08.007

IBM Analytics. (2016). *Statistical package for the social sciences, Version 24.0*. Retrieved from http://www.ibm.com/analytics/us/en/technology/spss/

Illinois Department of Human Services. (2017). *Department of Human Services: The Emergency Food Progam - Income Eligiblity Guidelines (English and Spanish)* - IDHS 4509(E/S). Retrieved December 18, 2017, from http://www.dhs.state.il.us

Isquith, P. K., Gioia, G. A., & Espy, K. A. (2004). Executive function in preschool children: examination through everyday behavior. *Developmental Neuropsychology*, *26*(1), 403–422. doi: 10.1207/s15326942dn2601_3

Johnson, S. L. (2000). Improving preschoolers' self-regulation of energy intake. *Pediatrics*, *106*(6), 1429–1435. doi: 10.1542/peds.106.6.1429

Johnson, W. G., Parry, W., & Drabman, R. S. (1978). The performance of obese and normal size children on a delay of gratification task. *Addictive Behaviors*, *3*(3), 205–208. doi: 10.1016/0306-4603(78)90020-5

Jones, B. L., & Fiese, B. H. (2014). Parent routines, child routines, and family demographics associated with obesity in parents and preschool-aged children. *Frontiers in Psychology*, *5*(374), 1-10. doi: 10.3389/fpsyg.2014.00374

Joyce, J. L., & Zimmer-Gembeck, M. J. (2009). Parent feeding restriction and child weight: The mediating role of child disinhibited eating and the moderating role of the parenting context. *Appetite*, *52*(3), 726–734. doi: 10.1016/j.appet.2009.03.015

Karreman, A., van Tuijl, C., van Aken, M. A. G., & Deković, M. (2008). Parenting, coparenting, and effortful control in preschoolers. *Journal of Family Psychology*, *22*(1), 30–40. doi: 10.1037/0893-3200.22.1.30

Kochanska, G., Murray, K., Jacques, T. Y., Koenig, A. L., & Vandegeest, K. A. (1996). Inhibitory control in young children and its role in emerging internalization. *Child Development*, *67*(2), 490–507. doi: 10.1111/j.1467-8624.1996.tb01747.x

Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology*, *36*(2), 220–232. doi: 10.1037/0012-1649.36.2.220

Kochanska, G., Philibert, R. A., & Barry, R. A. (2009). Interplay of genes and early mother–child relationship in the development of self-regulation from toddler to preschool age. *Journal of Child Psychology and Psychiatry*, *50*(11), 1331–1338. doi: 10.1111/j.1469-7610.2008.02050.x

Kremers, S., Sleddens, E., Gerards, S., Gubbels, J., Rodenburg, G., Gevers, D., & van Assema, P. (2013). General and food-specific parenting: Measures and interplay. *Childhood Obesity*, *9*(Suppl 1), S-22-S-31. doi: 10.1089/chi.2013.0026

Landa, S., & Duschinsky, R. (2013). Crittenden's dynamic–maturational model of attachment and adaptation. *Review of General Psychology*, *17*(3), 326–338. doi: 10.1037/a0032102

Larson, R. W., Branscomb, K. R., & Wiley, A. R. (2006). Forms and functions of family mealtimes: Multidisciplinary perspectives. *New Directions for Child and Adolescent Development*, *2006*(111), 1–15. doi: 10.1002/cd.152

Lee, K., Bull, R., & Ho, R. M. H. (2013). Developmental changes in executive functioning. *Child Development*, *84*(6), 1933–1953. doi: 10.1111/cdev.12096

Loth, K. A., MacLehose, R. F., Fulkerson, J. A., Crow, S., & Neumark-Sztainer, D. (2014). Are food restriction and pressure-to-eat parenting practices associated with adolescent disordered eating behaviors?: Parent feeding practices and disordered eating behaviors. *International Journal of Eating Disorders*, *47*(3), 310–314. doi: 10.1002/eat.22189

Lumeng, J. C., Miller, A. L., Horodynski, M. A., Brophy-Herb, H. E., Contreras, D., Lee, H., … Peterson, K. E. (2017). Improving self-regulation for obesity prevention in head start: A randomized controlled trial. *Pediatrics*, *139*(5), e20162047. doi: 10.1542/peds.2016-2047

Lumeng, J. C., Taveras, E. M., Birch, L. L., & Yanovski, S. Z. (2015). Prevention of obesity in infancy and early childhood: A National Institutes of Health workshop. *JAMA Pediatrics*, *169*(5), 484–490. doi: 10.1001/jamapediatrics.2014.3554

Lyons, D. M., & Parker, K. J. (2007). Stress inoculation-induced indications of resilience in monkeys. *Journal of Traumatic Stress*, *20*(4), 423–433. doi: 10.1002/jts.20265

Lyons, D. M., Parker, K. J., Katz, M., & Schatzberg, A. F. (2009). Developmental cascades linking stress inoculation, arousal regulation, and resilience. *Frontiers in Behavioral Neuroscience*, *3*. doi: 10.3389/neuro.08.032.2009

Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent-child interaction. In P. H. Mussen & E. M. Hetherington (Eds.), *Handbook of Child Psycology, Volume 4* (pp. 1-101). New York, NY: Wiley.

MacPhee, D., Lunkenheimer, E., & Riggs, N. (2015). Resilience as regulation of developmental and family processes. *Family Relations*, *64*(1), 153–175. doi: 10.1111/fare.12100

Main, M., Kaplan, N., & Cassidy, J. (1985). Security in infancy, childhood, and adulthood: A move to the level of representation. *Monographs of the Society for Research in Child Development*, *50*(1/2), 66–104. doi: 10.2307/3333827

Malhotra, K., Herman, A. N., Wright, G., Bruton, Y., Fisher, J. O., & Whitaker, R. C. (2013). Perceived benefits and challenges for low-income mothers of having family meals with preschool-aged children: Childhood memories matter. *Journal of the Academy of Nutrition and Dietetics*, *113*(11), 1484–1493. doi: 10.1016/j.jand.2013.07.028

Mangold International. (2016). INTERACT (Version 16).

Margolin, G., Oliver, P. H., Gordis, E. B., O’Hearn, H. G., Medina, A. M., Ghosh, C. M., & Morland, L. (1998). The nuts and bolts of behavioral observation of marital and family interaction. *Clinical Child and Family Psychology Review*, *1*(4), 195–213. doi: 10.1023/A:1022608117322

Marsh, H. W., Morin, A. J. S., Parker, P. D., & Kaur, G. (2014). Exploratory structural equation modeling: An integration of the best features of exploratory and confirmatory factor analysis. *Annual Review of Clinical Psychology*, *10*(1), 85–110. doi: 10.1146/annurev-clinpsy-032813-153700

Martin, A., Razza, R. A., & Brooks-Gunn, J. (2012). Specifying the links between household chaos and preschool children's development. *Early Child Development and Care*, *182*(10), 1247–1263. doi: 10.1080/03004430.2011.605522

Masten, A. S. (2001). Ordinary magic. Resilience processes in development. *The American Psychologist*, *56*(3), 227–238. doi: 10.1037/0003-066X.56.3.227

Masten, Ann S. (2011). Resilience in children threatened by extreme adversity: Frameworks for research, practice, and translational synergy. *Development and Psychopathology*, *23*(2), 493–506. doi: 10.1017/S0954579411000198

Masten, Ann S., & Cicchetti, D. (2010). Developmental cascades. *Development and Psychopathology*, *22*(3), 491–495. doi: 10.1017/S0954579410000222

Matheny, A. P., Wachs, T. D., Ludwig, J. L., & Phillips, K. (1995). Bringing order out of chaos: Psychometric characteristics of the confusion, hubbub, and order scale. *Journal of Applied Developmental Psychology*, *16*(3), 429–444. doi: 10.1016/0193-3973(95)90028-4

McLear, C., Trentacosta, C. J., & Smith-Darden, J. (2016). Child self-regulation, parental secure base scripts, and at-risk kindergartners' academic achievement. *Early Education and Development*, *27*(4), 440–456. doi: 10.1080/10409289.2016.1091972

Mickelson, K. D., Kessler, R. C., & Shaver, P. R. (1997). Adult attachment in a nationally representative sample. *Journal of Personality and Social Psychology*, *73*(5), 1092–1106. doi: 10.1037/0022-3514.73.5.1092

Mikulincer, M., Shaver, P. R., & Pereg, D. (2003). Attachment theory and affect regulation: The dynamics, development, and cognitive consequences of attachment-related strategies. *Motivation and Emotion*, *27*(2), 77–102. doi: 10.1023/A:1024515519160

Miller, A. L., Rosenblum, K. L., Retzloff, L. B., & Lumeng, J. C. (2016). Observed self-regulation is associated with weight in low-income toddlers. *Appetite*, *105*(Supplement C), 705–712. doi: 10.1016/j.appet.2016.07.007

Miller, A. L., Song, J.-H., Sturza, J., Lumeng, J. C., Rosenblum, K., Kaciroti, N., & Vazquez, D. M. (2017). Child cortisol moderates the association between family routines and emotion regulation in low-income children. *Developmental Psychobiology*, *59*(1), 99–110. doi: 10.1002/dev.21471

Miyake, A., & Friedman, N. P. (2012). The nature and organization of individual differences in executive functions four general conclusions. *Current Directions in Psychological Science*, *21*(1), 8–14. doi: 10.1177/0963721411429458

Morris, A. S., Silk, J. S., Steinberg, L., Myers, S. S., & Robinson, L. R. (2007). The role of the family context in the development of emotion regulation. *Social Development*, *16*(2), 361–388. doi: 10.1111/j.1467-9507.2007.00389.x

Murry, V. M., & Body, G. H. (1999). Self-regulation and self-worth of black children reared in economically stressed, rural, single mother-headed families: The contribution of risk and protective factors. *Journal of Family Issues*, *20*(4), 458–484. doi: 10.1177/019251399020004003

Nelson, J. A., Leerkes, E. M., O'Brien, M., Calkins, S. D., & Marcovitch, S. (2012). African American and European American mothers' beliefs about negative emotions and emotion socialization practices. *Parenting: Science & Practice*, *12*(1), 22–41. doi: 10.1080/15295192.2012.638871

Office of the Surgeon General of the United States. (2001). *The Surgeon General's call to action to prevent and decrease overweight and obesity*. Rockville (MD): Office of the Surgeon General (US). Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK44206/

Ogden, C. L., Carroll, M. D., Lawman, H. G., Fryar, C. D., Kruszon-Moran, D., Kit, B. K., & Flegal, K. M. (2016). Trends in obesity prevalence among children and adolescents in the United States, 1988-1994 through 2013-2014. *Journal of the American Medical Association*, *315*(21), 2292–2299. doi: 10.1001/jama.2016.6361

Oshri, A., Lucier-Greer, M., O'Neal, C. W., Arnold, A. L., Mancini, J. A., & Ford, J. L. (2015). Adverse childhood experiences, family functioning, and resilience in military families: A pattern-based approach. *Family Relations*, *64*(1), 44–63. doi: 10.1111/fare.12108

Pederson, D. R., Gleason, K. E., Moran, G., & Bento, S. (1998). Maternal attachment representations, maternal sensitivity, and the infant–mother attachment relationship. *Developmental Psychology*, *34*(5), 925–933. doi: 10.1037/0012-1649.34.5.925

Pérez-Escamilla, R., Segura-Pérez, S., & Lott, M. (2017). *Feeding guidelines for infants and young toddlers: A responsive parenting approach*. Robert Wood Johnson Foundation Healthy Eating Researc Expert Panel on Best Practices for Promoting Healthy Nutrition, Feeding Patterns, and Weight Status for Infants and Toddlers from Birth to 24 Months. Retrieved from http://healthyeatingresearch.org

Pesch, M. H., Harrell, K. J., Kaciroti, N., Rosenblum, K. L., & Lumeng, J. C. (2011). Maternal styles of talking about child feeding across sociodemographic groups. *Journal of the American Dietetic Association*, *111*(12), 1861–1867. doi: 10.1016/j.jada.2011.09.003

Pieper, J. R., & Laugero, K. D. (2013). Preschool children with lower executive function may be more vulnerable to emotional-based eating in the absence of hunger. *Appetite*, *62*, 103–109. doi: 10.1016/j.appet.2012.11.020

Pluess, M., & Belsky, J. (2010). Differential susceptibility to parenting and quality child care. *Developmental Psychology*, *46*(2), 379. doi: 10.1037/a0015203

Powell, E. M., Frankel, L. A., Umemura, T., & Hazen, N. (2017). The relationship between adult attachment orientation and child self-regulation in eating: The mediating role of persuasive-controlling feeding practices. *Eating Behaviors*, *26*(Supplement C), 121–128. doi: 10.1016/j.eatbeh.2017.02.006

Powell, F., Farrow, C., Meyer, C., & Haycraft, E. (2017). The importance of mealtime structure for reducing child food fussiness. *Maternal & Child Nutrition*, *13*(2), 1-7. doi: 10.1111/mcn.12296

Putnam, S. P., Helbig, A. L., Gartstein, M. A., Rothbart, M. K., & Leerkes, E. (2014). Development and assessment of Short and Very Short Forms of the Infant Behavior Questionnaire–Revised. *Journal of Personality Assessment*, *96*(4), 445–458. doi: 10.1080/00223891.2013.841171

Ray, C., Kalland, M., Lehto, R., & Roos, E. (2013). Does parental warmth and responsiveness moderate the associations between parenting practices and children's health-related behaviors? *Journal of Nutrition Education and Behavior*, *45*(6), 602–610. doi: 10.1016/j.jneb.2013.04.001

Rollins, B. Y., Savage, J. S., Fisher, J. O., & Birch, L. L. (2016). Alternatives to restrictive feeding practices to promote self-regulation in childhood: A developmental perspective. *Pediatric Obesity*, *11*(5), 326–332. doi: 10.1111/ijpo.12071

Rosemond, T. N., Blake, C., Bernal, J., Burke, M. P., & Frongillo, E. A. (2016). Strong interpersonal relationships buffer the impact of chaos on quality of family meal interactions in food-insecure households. *The FASEB Journal*, *30*(1 Supplement), 149.6-149.6. doi: abs/10.1096/fasebj.30.1_supplement.149.6

Rutter, M. (2012). Resilience as a dynamic concept. *Development & Psychopathology*, *24*(2), 335–344. doi: 10.1017/S0954579412000028

Saltzman, J. A., Bost, K. K., McBride, B. A., & Fiese, B. H. (*in preparation*). Appetite self-regulation and feeding responsiveness: Confirmatory factor analyses to examine domain-specific and domain-general models.

Saltzman, J. A., Fiese, B. H., Bost, K. K., & McBride, B. A. (2017). Development of appetite self-regulation: Integrating perspectives from attachment and family systems theory. *Child Development Perspectives*, 1–7. doi: 10.1111/cdep.12254

Saltzman, J. A., Bost, K. K., Musaad, S. M. A., Fiese, B. H., & Wiley, A. (2017). Predictors and outcomes of mealtime emotional climate in families with preschoolers. *Journal of Pediatric Psychology, 43*(2), 195-206. doi: 10.1093/jpepsy/jsx109

Saltzman, J. A., & Liechty, J. M. (2016). Family correlates of childhood binge eating: A systematic review. *Eating Behaviors*, *22*(1), 62–71. doi: 10.1016/j.eatbeh.2016.03.027

Saltzman, J. A., Pineros-Leano, M., Liechty, J. M., Bost, K. K., & Fiese, B. H. (2016). Eating, feeding, and feeling: Emotional responsiveness mediates longitudinal associations between maternal binge eating, feeding practices, and child weight. *The International Journal of Behavioral Nutrition and Physical Activity*, *13*(89), 1-14. doi: 10.1186/s12966-016-0415-5

SAS Institute (2014). *SAS 9.4 output delivery system: User's guide*. Cary, NC. SAS Institute.

Savage, J. S., Birch, L. L., Marini, M., Anzman-Frasca, S., & Paul, I. M. (2016). Effect of the INSIGHT responsive parenting intervention on rapid infant weight gain and overweight status at age 1 year: A randomized clinical trial. *Journal of the American Medical Association Pediatrics*, *170*(8), 742–749. doi: 10.1001/jamapediatrics.2016.0445

Schag, K., Teufel, M., Junne, F., Preissl, H., Hautzinger, M., Zipfel, S., & Giel, K. E. (2013). Impulsivity in Binge Eating Disorder: Food cues elicit increased reward responses and disinhibition. *PLOS ONE*, *8*(10), e76542. doi: 10.1371/journal.pone.0076542

Scharfe, E. (2012). Maternal attachment representations and initiation and duration of breastfeeding. *Journal of Human Lactation*, *28*(2), 218–225. doi: 10.1177/0890334411429111

Schore, J. R., & Schore, A. N. (2007). Modern attachment theory: The central role of affect regulation in development and treatment. *Clinical Social Work Journal*, *36*(1), 9–20. doi: 10.1007/s10615-007-0111-7

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research*, *99*(6), 323–338. doi: 10.3200/JOER.99.6.323-338

Sigman-Grant, M., Hayes, J., VanBrackle, A., & Fiese, B. (2015). Family Resiliency: A neglected perspective in addressing obesity in young children. *Childhood Obesity*, *11*(6), 664–673. doi: 10.1089/chi.2014.0107

Simpson, J. A., & Belskey, J. (2008). Attachment theory within a modern evolutionary framework. In J. Cassidy & P. R. Shaver (Eds.) *Handbook of attachment: Theory, research, and clinical applications* (Vol. 2, pp. 131–157). New York: NY. The Guilford Press.

Skinner, A. C., Ravanbakht, S. N., Skelton, J. A., Perrin, E. M., & Armstrong, S. C. (2018). Prevalence of obesity and severe obesity in us children, 1999–2016. *Pediatrics*, e20173459. doi: 10.1542/peds.2017-3459

Spinrad, T. L., Stifter, C. A., Donelan-McCall, N., & Turner, L. (2004). Mothers' regulation strategies in response to toddlers' affect: links to later emotion self-regulation. *Social Development*, *13*(1), 40–55. doi: 10.1111/j.1467-9507.2004.00256.x

Sprunger, L. W., Boyce, W. T., & Gaines, J. A. (1985). Family-infant congruence: Routines and rhythmicity in family adaptations to a young infant. *Child Development*, *56*(3), 564–572. doi: 10.2307/1129746

Steiger, J. H. (2007). Understanding the limitations of global fit assessment in structural equation modeling. *Personality and Individual Differences*, *42*(5), 893–898. doi: 10.1016/j.paid.2006.09.017

Stevenson-Hinde, J. (1990). Attachment within family systems: An overview. *Infant Mental Health Journal*, *11*(3), 218–227. doi: 10.1002/1097-0355(199023)11:3<218::AID-IMHJ2280110304>3.0.CO;2-1

Stifter, C. A., Anzman-Frasca, S., Birch, L. L., & Voegtline, K. (2011). Parent use of food to soothe infant/toddler distress and child weight status. An exploratory study. *Appetite*, *57*(3), 693–699. doi: 10.1016/j.appet.2011.08.013

Tan, C. C., & Holub, S. C. (2011). Children's self-regulation in eating: Associations with inhibitory control and parents' feeding behavior. *Journal of Pediatric Psychology*, *36*(3), 340–345. doi: 10.1093/jpepsy/jsq089

Tanofsky-Kraff, M., Marcus, M. D., Yanovski, S. Z., & Yanovski, J. A. (2008). Loss of control eating disorder in children age 12y and younger: Proposed research criteria. *Eating Behaviors*, *9*(3), 360–365. doi: 10.1016/j.eatbeh.2008.03.002

Tasca, G. A., & Balfour, L. (2014). Attachment and eating disorders: A review of current research. *International Journal of Eating Disorders*, *47*(7), 710–717. doi: 10.1002/eat.22302

Thamotharan, S., Lange, K., Zale, E. L., Huffhines, L., & Fields, S. (2013). The role of impulsivity in pediatric obesity and weight status: A meta-analytic review. *Clinical Psychology Review*, *33*(2), 253–262. doi: 10.1016/j.cpr.2012.12.001

Timperio, A., & Fulkerson, J. A. (2014). Food-related parenting: Issues and challenges. *Public Health Nutrition*, *17*(05), 957–959. doi: 10.1017/S1368980014000354

Topham, G. L., Hubbs-Tait, L., Rutledge, J. M., Page, M. C., Kennedy, T. S., Shriver, L. H., & Harrist, A. W. (2011). Parenting styles, parental response to child emotion, and family emotional responsiveness are related to child emotional eating. *Appetite*, *56*(2), 261–264. doi: 10.1016/j.appet.2011.01.007

van der Horst, K., & Sleddens, E. F. C. (2017). Parenting styles, feeding styles and food-related parenting practices in relation to toddlers' eating styles: A cluster-analytic approach. *PLoS ONE*, *12*(5), e0178149. doi: 10.1371/journal.pone.0178149

van IJzendoorn, M. H. (1995). Adult attachment representations, parental responsiveness, and infant attachment: A meta-analysis on the predictive validity of the Adult Attachment Interview. *Psychological Bulletin*, *117*(3), 387–403. doi: 10.1037/0033-2909.117.3.387

Vaughn, B. E., Coppola, G., Verissimo, M., Monteiro, L., Santos, A. J., Posada, G., … Korth, B. (2007). The quality of maternal secure-base scripts predicts children's secure-base behavior at home in three sociocultural groups. *International Journal of Behavioral Development*, *31*(1), 65–76. doi: 10.1177/0165025407073574

Vaughn, B. E., Waters, H. S., Coppola, G., Cassidy, J., Bost, K. K., & Veríssimo, M. (2006). Script-like attachment representations and behavior in families and across cultures: Studies of parental secure base narratives. *Attachment & Human Development*, *8*(3), 179–184. doi: 10.1080/14616730600856008

Ventura, A. K., & Teitelbaum, S. (2017). Maternal distraction during breast- and bottle feeding among WIC and non-WIC mothers. *Journal of Nutrition Education and Behavior*, *49*(7), S169-S176.e1. doi: 10.1016/j.jneb.2017.04.004

Vernon-Feagans, L., Garrett-Peters, P., Willoughby, M., & Mills-Koonce, R. (2012). Chaos, poverty, and parenting: Predictors of early language development. *Early Childhood Research Quarterly*, *27*(3), 339–351. doi: 10.1016/j.ecresq.2011.11.001

Vernon-Feagans, L., Willoughby, M., Garrett-Peters, P., & The Family Life Project Key Investigators. (2016). Predictors of behavioral regulation in kindergarten: Household chaos, parenting, and early executive functions. *Developmental Psychology*, *52*(3), 430–441. doi: 10.1037/dev0000087

Vollmer, R. L., & Mobley, A. R. (2013). Parenting styles, feeding styles, and their influence on child obesogenic behaviors and body weight. A review. *Appetite*, *71*, 232–241. doi; 10.1016/j.appet.2013.08.015

Wadsworth, M. E. (2015). Development of maladaptive coping: A functional adaptation to chronic, uncontrollable stress. *Child Development Perspectives*, *9*(2), 96–100. doi: 10.1111/cdep.12112

Wardle, J., Guthrie, C. A., Sanderson, S., & Rapoport, L. (2001). Development of the Children's Eating Behaviour Questionnaire. *Journal of Child Psychology and Psychiatry*, *42*(7), 963–970. doi: 10.1111/1469-7610.00792

Waters, E., Merrick, S., Treboux, D., Crowell, J., & Albersheim, L. (2000). Attachment security in infancy and early adulthood: A twenty-year longitudinal study. *Child Development*, *71*(3), 684–689. doi: 10.1111/1467-8624.00176

Waters, H. S., & Waters, E. (2006). The attachment working models concept: Among other things, we build script-like representations of secure base experiences. *Attachment & Human Development, 8*(3), 185–197. doi: 10.1080/14616730600856016

Waters, H. S., Rodrigues, L. M., & Ridgeway, D. (1998). Cognitive underpinnings of narrative attachment assessment. *Journal of Experimental Child Psychology, 71*(3), 211–234. doi: 10.1006/jecp.1998.2473

Waters, H.S., & Rodrigues Doolabh, L. (2004). *Manual for decoding secure base narratives.* Unpublished manuscript.

Watson, K. H., Dunbar, J. P., Thigpen, J., Reising, M. M., Hudson, K., McKee, L., … Compas, B. E. (2014). Observed parental responsiveness/warmth and children's coping: Cross-sectional and prospective relations in a family depression preventive intervention. *Journal of Family Psychology, 28*(3), 278–286. doi: 10.1037/a0036672

White House Task Force on Childhood Obesity. (2010). *Solving the problem of childhood obesity within a generation: White House task force on childhood obesity report to the president*. Washington, D.C. Retrieved from http://permanent.access.gpo.gov/lps122972/tfco_fullreport_may2010.pdf

WHO Multicentre Growth Reference Study Group. (2006). *WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development.* Geneva: World Health Organization. Retrieved from http://www.who.int/childgrowth/standards/technical_report/en/

Wilson, K. R., Havighurst, S. S., & Harley, A. E. (2012). Tuning In To Kids: An effectiveness trial of a parenting program targeting emotion socialization of preschoolers. *Journal of Family Psychology*, *26*(1), 56–65. doi: 10.1037/a0026480

Wong, M., Bost, K. K., Shin, N., Verissomo, M., Maia, J., Monteiro, L., … Vaughn, B. E. (2011). Preschool children's mental representations of attachment: Antecedents in their secure base behaviors and maternal attachment scripts. *Attachment & Human Development*, *13*(5), 489–502. doi: 10.1080/14616734.2011.602256

Woo Baidal, J. A., Locks, L. M., Cheng, E. R., Blake-Lamb, T. L., Perkins, M. E., & Taveras, E. M. (2016). Risk factors for childhood obesity in the first 1,000 days: A systematic review. *American Journal of Preventive Medicine*, *50*(6), 761–779. doi: 10.1016/j.amepre.2015.11.012

Young-Hyman, D. (2017). Introduction to special issue: Self-regulation of appetite—it's complicated. *Obesity*, *25*, S5–S7. doi: 10.1002/oby.21781

Zhou, Q., Chen, S. H., & Main, A. (2012). Commonalities and differences in the research on children's effortful control and executive function: A call for an integrated model of self-regulation. *Child Development Perspectives*, *6*(2), 112–121. doi: 10.1111/j.1750-8606.2011.00176.x

Appendix A: List of Measures

Construct	Level	Measure	Time point	Survey/ Visit
Household chaos	Maternal report	Confusion, Hubbub, and Order Scale	12 and 24m	Survey
Dinnertime routines	Maternal report	Family Ritual Questionnaire	12 and 24m	Survey
Emotional Responsiveness	Maternal report	Coping with Children's Negative Emotions Scale	18m	Survey
	Observation	Adapted D.O.T.S Coding Scheme (mealtime)	Between 18-24m	Home Visit
Feeding Responsiveness	Maternal report	Caregiver Feeding Styles Questionnaire	18 and 24m	Survey
	Observation	Feeding Behavior Coding Scheme (mealtime)	Between 18-24m	Home Visit
Distractions	Observation	ABCs of Family Mealtimes Coding Scheme (mealtime)	Between 18-24m	Home Visit
Maternal attachment	Interview	Attachment Script Assessment	Between 18-24m	Home Visit
	Maternal report	Relationship Scales Questionnaire	18m	Survey
Child executive functioning/ general self-regulation	Maternal report	Behavior Rating Inventory of Executive Functioning-Preschool/Parent Report	24m	Survey
	Observational task	Gift delay task	Between 18-24m	Home Visit
	Observational task	Sweets/Fruit Stroop task	Between 18-24m	Home Visit
Child appetite self-regulation	Maternal report	Child Eating Behavior Questionnaire	18 and 24m	Survey