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Associations of Maternal Stress and Maternal Feeding Practices at Child Aged 6 Years

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## ABSTRACT

Parent feeding practices, or specific goal-oriented strategies used by parents when feeding their children, play an important role in healthy development during childhood. Promoting structure-based parent feeding practices and reducing control-based feeding practices may help children develop healthy food preferences and eating behaviors. The aims of this study were: 1) To examine the association between maternal stress and maternal feeding practices at child aged 6 years; and 2) To examine the potential moderating effect of household chaos on the association between maternal stress and maternal feeding practices at child aged 6 years. This study was a secondary analysis of data from the Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) randomized control trial. Participants for the current study included 169 mother-child dyads who were recruited for INSIGHT from a Central Pennsylvania maternity ward just after birth and participated through child aged 6 years. Mothers reported sociodemographic characteristics and completed the Structure Control and Parental Feeding questionnaire, the Perceived Stress Scale, and the Confusion, Hubbub, and Order Scale at child aged 6 years. Linear regression models examined the associations between maternal feeding practices and maternal stress, and the potential moderating effect of household chaos on this association. Mothers were on average age 29.4 years, 88.2% were married, and 83.0% had annual household incomes >\$50,000. Maternal perceived stress was significantly associated with maternal use of restriction, a control-based feeding practice ( $B = 0.023$ ,  $SE = 0.011$ ,  $p = 0.04$ ) in adjusted models. There were no other significant relationships between maternal perceived stress and their feeding practices. Household chaos did not moderate the effect between maternal perceived stress and maternal use of restriction. Maternal feeding practices play a significant role in child health and development and more research is needed to examine which parent and household factors are associated with structure- versus control-based feeding practices. Future studies should investigate these relationships in more diverse samples that often experience more stressors placing them at risk for higher stress.

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## Chapter 1

### Introduction

#### *Childhood Obesity*

Childhood obesity is a growing public health concern in the United States (US). Obesity among children and adolescents has more than tripled since the 1970s, with nearly one in five school-aged children living with obesity (Fryar et al., 2020). Data from the National Health and Nutrition Examination Survey (NHANES) from 2017-2020, before the COVID-19 pandemic, shows that among children ages 2-19 years, obesity prevalence was 19.7% (Stierman et al., 2021). Data from NHANES also shows that obesity prevalence increased with age where 12.7% of children between 2-5 years, 20.7% between 6-11 years, and 22.2% between 12-19 years were living with obesity (Stierman et al., 2021), which makes starting obesity prevention efforts early in life important. Childhood obesity prevalence continues to increase in the U.S. underscoring the need to understand factors that influence weight status during early childhood.

Body mass index (BMI) is a ratio of weight to height used to categorize an individual's weight status (i.e., underweight, normal weight, overweight, obese) and risk for chronic disease. For children aged 2-19 years, obesity is defined as having a BMI  $\geq$  95<sup>th</sup> percentile when plotted on CDC growth charts based on age- and -biological sex (Hampl et al., 2023). Children with obesity are at increased risk for adverse health outcomes such as cardiovascular disease, type 2 diabetes, asthma, sleep apnea, certain cancers, and joint problems (Sanyaolu et al., 2019). Children with obesity also experience adverse psychosocial outcomes such as lower self-esteem, higher stress, and higher depressive symptoms compared to children with normal weight status

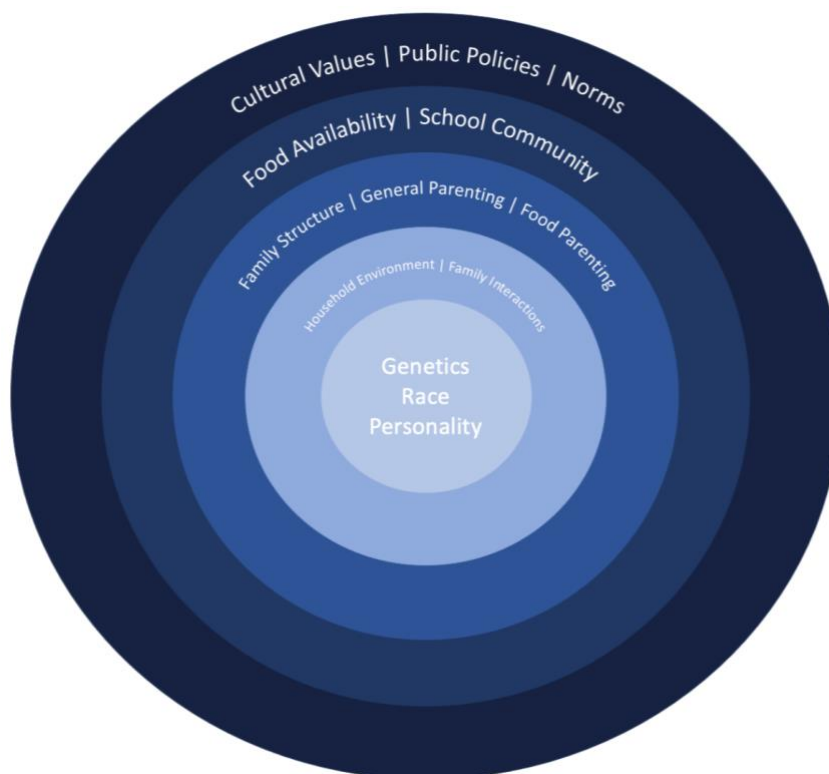
(Sanyaolu et al., 2019). In addition, obesity that begins during early childhood often continues into adulthood, which increases the risk for chronic disease across the lifespan (Simmonds et al., 2016). For example, a systematic review and meta-analysis of several large cohort studies showed that 55% of children aged 7-11 years with obesity experienced obesity when they were aged 12-19 years, and 80% of these children experienced obesity during adulthood (Simmonds et al., 2016). Much like obesity during childhood, obesity during adulthood increases the risk for chronic diseases such as cardiovascular disease, type 2 diabetes, and certain cancers (Sanyaolu et al., 2019). Because of obesity's adverse comorbidities and their long-lasting impacts into adulthood, it is important to understand the factors that influence the onset of obesity during childhood.

Obesity is a complex and chronic disease with origins in both genetic and environmental factors. Many environmental factors are thought to be modifiable and are often targets of obesity prevention and treatment efforts. Bronfenbrenner's ecological systems theory is used as a framework for understanding child development based on the dynamic interactions between an individual child and their environment (Bronfenbrenner, 1979). Ecological systems theory has also been used as a framework for understanding individual and environmental factors that influence the development of obesity during childhood (Boonpleng et al., 2013). Within this framework, there are concentric circles, representing the microsystem, mesosystem, exosystem, and macrosystem, that surround the individual (in this case a child) which may influence child health outcomes. The innermost circle is the individual child defined as the one receiving the influences from the environment and includes their genetics, race, and predisposed personality traits. The next circle is the microsystem, defined as the immediate environment in which the individual interacts, and in the context of obesity, includes the child's household environment



and interactions with other members of their family. Next, is the mesosystem defined as the social relationships in the child's life that may influence their weight status and include family structure, general parenting, and food parenting. The exosystem is defined as the larger social systems that do not directly influence the child but may impact the child's weight status such as food availability within the child's school and community. Lastly, the outermost circle is the macrosystem defined as the overarching structures that affect a child's environment and include cultural values, national and state-level policies, and customs. According to ecological systems theory (Bronfenbrenner, 1979; Boonpleng et al., 2013), these dynamic interconnected systems may work together to increase or reduce the risk of obesity during early childhood. See **Figure 1** for a conceptual diagram of ecological systems theory in the context of child weight status.

**Figure 1.** Conceptual Diagram of Factors Influencing Child Weight Status Based on the Ecological Systems Theory



Previous research has targeted other potentially modifiable factors thought to influence weight status during childhood such as school and community factors (exosystem), for the prevention of obesity during childhood (Boonpleng et al., 2013). However, since young children rely primarily on their parents for healthy growth and development, targeting factors within the home (mesosystem) such as parent feeding practices, have been examined as environmental factors that may be protective against or promote obesity during childhood (Boonpleng et al., 2013). As such, parent feeding practices are the focus of this honors thesis.

### ***Parent Feeding Practices***

Feeding practices are specific goal-oriented strategies and techniques used by parents during mealtimes to maintain, modify, or improve their child's diet and behaviors (Shloim et al., 2015). Parent feeding practices have been described in various ways in the literature (Vaughn et al., 2016; Savage et al., 2017). However, parent feeding practices have been widely described as being responsive or non-responsive to a child's needs. Responsive feeding practices are prompt, contingent, developmentally appropriate strategies to recognize and assist children with appetite self-regulation including understanding their own hunger and fullness cues (Savage et al., 2018). These feeding practices use structure and guidance to help children develop autonomy and appetite self-regulation and have been associated with higher social and emotional regulation among children (Savage et al., 2018). In contrast, non-responsive feeding practices are coercive, cold, and intrusive strategies to assert dominance over a child and their behaviors (Savage et al., 2018). These feeding practices use control to limit children's autonomy and self-regulation and have been associated with overfeeding, rapid weight gain, and risk of obesity among young children (Savage et al., 2018). Responsive feeding practices are associated with healthy child eating behaviors such as appetite self-regulation and healthy weight outcomes compared to non-

responsive feeding practices (Savage et al., 2018), which is why responsive feeding practices are recommended as “best practice” by the Dietary Guidelines for Americans 2020-2025 (USDA, 2020) and the American Academy of Pediatrics (AAP, 2023).

To better understand the feeding practices used by parents, Savage et al. developed the *Structure and Control in Parent Feeding* questionnaire, which measures both responsive feeding practices that provide structure and are responsive to a child’s needs and non-responsive feeding practices that are controlling and are non-responsive to a child’s needs (2017). Structure-based feeding practices include establishing clear routines, expectations, and limits for children so they can make guided decisions within the boundaries of the parents’ rules (Savage et al., 2017). Structure-based feeding practices are associated with healthier child eating behaviors and weight outcomes (Shloim et al., 2015). One study found that preschool-aged children had higher self-regulation during meals when their mothers created structured mealtime settings versus children whose mothers created less structured mealtime settings (Frankel et al., 2018). In addition to self-regulation, multiple studies found structured mealtime settings to be inversely associated with food fussiness (Costa & Oliveira, 2023) among young children, which may lead to adverse outcomes.

In contrast, control-based feeding practices include restricting certain types of foods or portion sizes, using pressure to get a child to eat, using food as a reward, and using food to soothe non-hunger-related distress (Savage et al., 2017). While control-based feeding practices may yield the parent’s desired effect for their child’s eating (e.g., the child stops eating due to restriction, the child tries a new vegetable because of pressure to eat), it can lead to adverse child outcomes in the long-term (Vaughn et al., 2016). Recent studies show that control-based feeding practices decrease a child’s appetite self-regulation, which can decrease their ability to stop

eating when they are full and make healthier food choices (Mahmood et al., 2021). In a systematic review of feeding practices and weight status among children ages 4-12 years, children who experienced control-based feeding practices on average had significantly higher BMI compared to children who did not experience control-based feeding practices (Shloim et al., 2015). Additionally, there is evidence that control-based feeding practices increase a child's desire for highly palatable, energy-dense foods (Shloim et al., 2015). Another literature review shows a positive correlation between control-based feeding practices and obesogenic eating behaviors (Costa & Oliveira, 2023) such as overeating, high food responsiveness (i.e., feeling a strong desire to eat food upon seeing, tasting, or smelling it), and high enjoyment of food (i.e., having positive and pleasurable experiences when interacting with food; Scaglioni et al., 2018).

When looking at specific control-based feeding practices, restriction has been associated with increased eating in the absence of hunger, pressure to eat has been associated with high food fussiness (hyper-selectivity of foods) and low food responsiveness (less sensitive to eating because of visual, olfactory, or gustatory food cues) among children aged 5–9 years (Costa & Oliveira, 2023). One study that examined restriction in children aged 5-6 and 10-12 years old suggested that restriction could have a protective effect from unhealthy weight gain in younger children, but this effect is weakened in older children (Campbell et al., 2006). However, findings are mixed on the impact of restriction on child weight status. Given that any protective effect does not persist into later childhood, parents should be encouraged to use structure-based feeding practices that promote covert restriction (i.e., the subtle restriction that limits the availability and access of certain unhealthy foods without the child knowing) rather than overt restriction (i.e., the restriction that openly controls the availability and access of certain unhealthy foods with the child knowing).

Parent feeding practices are important modifiable factors in the prevention of obesity during childhood. Structure-based feeding practices such as having mealtime routines and setting reasonable limits on unhealthy foods have been associated with healthy eating habits and weight status during childhood (Scaglioni et al., 2018). In addition, current child feeding guidelines recommend that parents use responsive feeding practices that provide structure (USDA, 2020; Pérez-Escamilla et al., 2017). However, other factors within the home environment like daily stressors may influence a parent's ability to use structure-based practices over control-based feeding practices. As such, this thesis examined the influence of parents' self-reported stress and household chaos in the context of their feeding practices.

### *Parent Stress*

Stress is pervasive in the lives of parents. In a 2023 U.S. parenting survey published by Pew Research, 29% of all parents reported that being a parent is stressful all or most of the time and mothers reported experiencing more stress compared with fathers (Minken & Horowitz, 2023). Stress that a parent may experience can be divided into two categories: parenting stress and general stress. Parenting stress entails specific unpleasant emotions or physiological symptoms felt by parents as they handle the unique demands of parenthood (Almaatani et al., 2023). Meanwhile, general stress encompasses the mental, behavioral, and physiological reactions that anyone can experience as a result of responding to difficult life events or situations more generally (Almaatani et al., 2023). For this thesis, general stress will be the focus.

Current literature provides evidence for parent stress being associated with parent use of control-based feeding practices. In a literature review exploring the relationship between parent stress and parent feeding practices, most studies found general stress to be associated with greater use of restriction (a control-based feeding practice) among parents of children aged  $\leq 5$

years (Almaatani et al., 2023). One of the studies within this systematic literature review found that general stress was positively associated with parent use of food to soothe non-hunger-related distress, which is a control-based feeding practice used to regulate child emotions (Rodgers et al., 2014). Another study found that in times of crisis, parents are more likely to engage in control-based feeding practices (González et al., 2022). In a study examining the self-reported difference in parent stress and parent feeding practices before vs. during the COVID-19 pandemic, parents who reported higher than normal stress were associated with significantly greater use of food for emotional regulation, food as a reward, and pressure to eat, which are control-based (González et al., 2022). Additionally, these higher reports of parent stress had a stronger, inverse association with the structure-based feeding practices to encourage a balanced diet (González et al., 2022). Parent stress is a significant factor associated with control-based parent feeding practices. It is important to examine how this relationship between parent stress and parent feeding practices is affected by household chaos, the moderator variable that will be assessed in the following analyses.

### ***Household Chaos***

The level of disorganization or environmental confusion in a family home is often conceptualized in terms of household chaos and is measured by high levels of background stimulation such as noise and distractions, the absence of routines and structure in daily activities, and an overly fast-paced family life. (Marsh et al., 2020) Household chaos has been associated with higher parent-child conflict, lower responsiveness, less supportive parenting, and less positive parenting (Marsh et al., 2020). In a systematic scoping review of household chaos and parent-child health outcomes, lower levels of household chaos were associated with more structured-based feeding, such as offering fruits and vegetables and promoting child autonomy

while eating (Marsh et al., 2020). One study used a nationally representative sample to investigate the relationship between preschool children's dietary intake and household chaos. Findings show that homes with low household chaos had significantly greater consumption and availability of fruits and vegetables than homes with higher household chaos (Martin-Biggers et al., 2018). Additionally, homes with preschool children and low household chaos consumed fewer sugar-sweetened beverages and had fewer salty/fatty snacks available than high household chaos homes (Martin-Biggers et al., 2018). This data suggests that lower household chaos levels are linked to more structure-based feeding practices (i.e., limiting unhealthy foods) and healthier home food environments, which are both valuable factors in reducing the risk for early childhood obesity.

A study examining household chaos and stress in the context of a home food environment, or a household's availability and accessibility to nutritious foods, found that households with higher levels of chaos and unmanaged parent stress had less frequent family meals and greater mealtime barriers (e.g., lack of time, energy, organization) (Fulkerson et al., 2019). Another study observing home environment characteristics of household chaos, parent stress, and parent-child interactions with children of average age 6.4 years found that families with high levels of household chaos and stress had children with higher BMI and food responsiveness when compared to families with low levels of household chaos and food responsiveness (Buchanan et al., 2021). In another study examining household chaos on maternal stress and caregiving outcomes, women randomly assigned to take care of a baby simulator in a chaotic room had greater physiological stress as measured by increased salivary cortisol (Bodrij et al., 2021). While there is evidence that household chaos is linked with control-based feeding practices, poor dietary outcomes, and physiological stress, there is a need for more studies

investigating the potential moderating effect of household chaos on the relationship between parent stress and parent feeding practices.

### *INSIGHT Study*

To understand the relationship between parent stress and parent feeding practices, data from the Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) study was used for this study. INSIGHT is a randomized controlled trial that included 279 mother-infant dyads and was designed to prevent rapid weight gain during infancy (Paul et al., 2014). Mother-infant dyads were recruited within two weeks postpartum between 2012-2014 from the Milton S. Hershey Children's Hospital maternity ward. Inclusion criteria for mother-infant dyads included 20 years of age or older, English-speaking, primiparous with a full-term pregnancy ( $\geq 37$  weeks of gestation), infant birth weight  $> 2500$  g, and no significant health issues that would affect study participation. Mothers provided informed consent to participate at enrollment (Paul et al., 2014).

After enrollment, mothers were randomized to either a responsive parenting intervention or child safety control intervention (Paul et al., 2014). Mothers participating in the interventions engaged in educational sessions facilitated by trained nurses during home visits at infant ages 3-4 weeks, 16 weeks, 28 weeks, 28 weeks, and 40 weeks, and at a research visit at aged 1 year. The responsive parenting intervention, informed by a range of developmental literature, was designed to promote responsive parenting practices characterized by promptness, contingency, and emotional support across four areas: feeding, soothing, sleep, and interactive play (Paul et al., 2014). During home visits, nurses guided mothers in establishing structured feeding environments by setting routines, expectations, and limits. Mothers learned to recognize hunger and fullness cues in infants, model healthy eating behaviors, and engage in a shared feeding



responsibility with their child (i.e., parents must provide healthy food and model healthy eating habits, while their children must communicate their states of hunger and fullness; Paul et al., 2014). The nurses also provided age-appropriate instructions for helping a fussy but not hungry infant, initiating and maintaining longer infant sleep, putting an infant to sleep while they are drowsy but awake, and engaging infants in age-appropriate physical activity (Paul et al., 2014). The child safety control intervention, informed by home safety literature, was designed to promote safe home environments for growing children. Although the curriculum varied between the responsive parenting intervention and the child safety control intervention, both were matched on intensity and participant time commitment (or intervention dose). Additionally, both interventions were developmentally appropriate and built upon previous lessons to help with participant learning (Paul et al., 2014).

The results showed that infants whose mothers were assigned to the responsive parenting intervention had lower mean BMI z-scores and lower weight-for-length percentiles compared to children in the safety control intervention at infant aged 1 years (Savage et al., 2016). Mothers in the responsive parenting intervention were also more likely to use structure-based feeding practices and less likely to use non-responsive (i.e., control-based) feeding practices compared to mothers in the child safety control intervention at infant aged 1 year (Savage et al., 2018). The results from infant aged 3 years showed that children whose mothers were assigned to the responsive parenting intervention had modestly lower mean BMI z-scores but there were no significant differences in BMI percentiles compared to children in the child safety control intervention (Paul et al, 2018). Mothers in the responsive parenting intervention were more likely to use certain structure-based feeding practices (e.g., consistent mealtimes) and less likely to use non-responsive feeding practices (e.g., pressure to eat, food to soothe, food as reward) compared

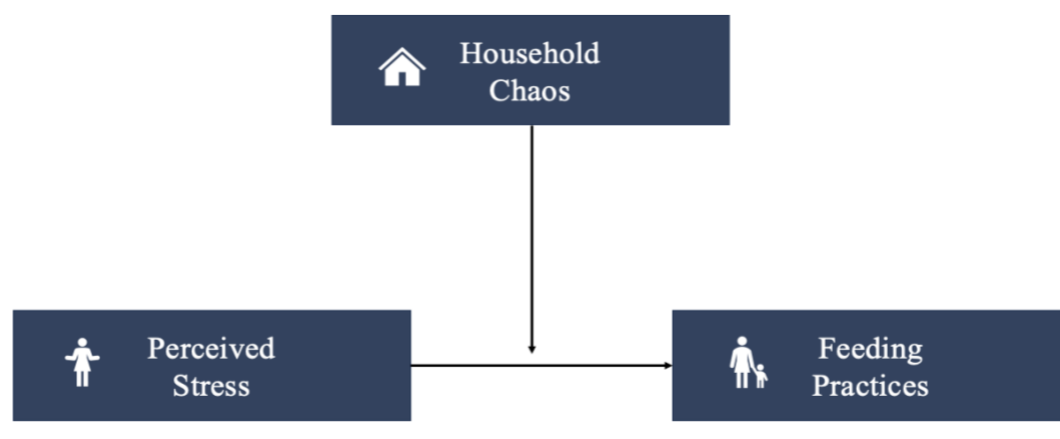
to mothers in the child safety control intervention at child aged 3 years (Ruggiero et al., 2021).

Although data for maternal perceived stress and feeding practices was collected during INSIGHT, the relationship between these two variables has yet to be explored within this sample.

### *Study Purpose*

As childhood obesity rates continue to rise, factors affecting maternal feeding practices should be investigated to help promote healthy child growth and development. Analyzing the relationship between maternal feeding practices, maternal perceived stress, and household chaos could give further insight into the development of parenting interventions that also target stress and household chaos to promote structure-based feeding practices and reduce control-based feeding practices. The purpose of this study is to examine the associations between maternal stress and maternal feeding practices among mothers with children aged 6 years participating in INSIGHT and to examine household chaos as a potential moderator of this relationship. See **Figure 2** for a conceptual diagram of the explored relationships within this thesis.

**Figure 2** Conceptual Diagram of the Relationship between Maternal Perceived Stress, Feeding Practices, and Household Chaos as Explored in the Current Thesis



## Chapter 2

### Study Aims

**Aim 1:** To examine the association between maternal perceived stress and maternal feeding practices at child aged 6 years.

*Hypothesis 1a:* Maternal stress will be negatively associated with structure-based feeding practices (i.e., limiting exposure to unhealthy foods, and consistent mealtime routines).

*Hypothesis 1b:* Maternal stress will be positively associated with control-based feeding practices (i.e., pressure to eat, restriction, food as reward, and food to soothe).

**Aim 2:** To examine the potential moderating effect of household chaos on the association between maternal perceived stress and maternal feeding practices at child aged 6 years.

*Hypothesis 2a:* Household chaos will strengthen the association between maternal self-reported stress and feeding practices.

## Chapter 3

### Methods

#### *Study Design and Participants*

This is a secondary analysis of data collected from the INSIGHT study when children were aged 6 years. The INSIGHT study was approved by the Pennsylvania State University Institutional Review Board (PRAMS034493) and registered at [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (NCT01167270). Although the responsive parenting and child control safety interventions were not delivered after infants aged 1 year, mothers completed surveys to update sociodemographic characteristics and completed surveys related to child feeding and household environment at child ages of 3, 6, and 9 years. The current study includes mother-child dyads who participated in INSIGHT from birth through child aged 6 years. A total of 223 mothers were contacted by the study team to complete their 6-year study visit and surveys and 203 mother-child dyads provided data on the primary outcome (i.e., child height and weight data).

#### **Measures**

Mothers were asked to complete study surveys online via REDCap (Research Data Capture; Harris, 2009) or mailed paper surveys when their child was aged 6 years.

#### *Sociodemographic Characteristics*

Some sociodemographic characteristics were self-reported by mothers at enrollment including maternal race and ethnicity, and electronic medical records were used to obtain their age and their child's sex at enrollment. Given the changing nature of some sociodemographic characteristics including highest education level, marital status, and annual household income mothers self-reported these again when their child was aged 6 years.

### ***Maternal Feeding Practices***

Mothers completed the Structure and Control in Parent Feeding questionnaire at child aged 6 years. This 51-item questionnaire was designed to measure structure-based and control-based feeding practices. The questionnaire includes two structure-based subscales: limiting exposure (11 items,  $\alpha = 0.77$ ; e.g., “*I keep a lot of snack foods [potato chips, cheese puffs, tortilla chips] in my house.*”) and consistent mealtime routines (11 items,  $\alpha = 0.70$ ; e.g., “*I let my child eat snack foods anytime during the day.*”). It also includes four control-based subscales: pressure to eat (6 items,  $\alpha = 0.76$ ; e.g., “*I have to trick, distract, play with, or praise my child to get him/her to finish his/her food.*”), restriction (6 items,  $\alpha = 0.71$ ; e.g., “*I hide foods that I don’t want my child to eat*”), food as reward (3 items,  $\alpha = 0.78$ ; e.g., “*I offer my child his/her favorite food(s) as a reward for good behavior.*”), and food to soothe (4 items,  $\alpha = 0.87$ ; e.g., “*I offer food to get my child to do certain things I want him/her to do.*”). Items were scored on a 5-point scale of 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always. Higher scores indicate greater use of that feeding practice.

### ***Maternal Perceived Stress***

Mothers completed the Perceived Stress Scale at child aged 6 years. This validated 10-item questionnaire is widely used and was developed to measure how individuals perceive the amount of stress in their own lives (Cohen et al., 1983). Items were scored on a 5-point scale of 1 = never, 2 = almost never, 3 = sometimes, 4 = fairly often, and 5 = very often. Total scores were calculated by summing all responses (possible scores range from 10 to 50), with higher scores indicating greater perceived stress.

### ***Household Chaos***

Mothers completed the Confusion, Hubbub, and Order Scale questionnaire at child aged 6 years. This validated 15-item questionnaire is widely used to evaluate household chaos (e.g., high levels of noise, lack of household routines, and crowded home traffic patterns; Matheny, Thoben, & Wilson, 1982). Items were scored on a 4-point scale of 1 = very much like my own home, 2 = somewhat like my own home, 3 = a little bit like my own home, and 4 = not at all like my own home. Total scores were calculated by summing all responses (possible scores ranged from 15 to 60) with higher scores indicating greater household chaos.

### ***Statistical Analysis***

The analytic sample for this study included 169 mother-child dyads who finished the 6-year mark of the study and had complete data on the main variables of interest (i.e., feeding practices, perceived stress, and household chaos). Descriptive statistics for the main variables of interest are presented as means (standard deviations) for continuous variables and frequencies (percentages) for categorical variables. Statistical assumptions (e.g., linear relationship between variables, normality, outliers) were examined and met for all main study variables of interest. Bivariate correlations were used to examine the strength and the direction of the relationship between the main study variables. Linear regression models examined the associations between maternal perceived stress and maternal feeding practices. For significant linear regression models, the moderating effect of household chaos on this association was examined. All models controlled for the study group and maternal age at the time of 6-year survey completion. Results for linear regression models include beta coefficients, which can be negative or positive, and have a *P* value to indicate statistical significance. The beta coefficient is the degree of change in the dependent variable for every 1 unit of change in the independent variable. A t-test assesses

whether the beta coefficient is statistically and significantly different from zero. If the beta coefficient is positive, the interpretation is that for every 1-unit increase in the independent variable, the dependent variable will increase by the beta coefficient value. If the beta coefficient is negative, the interpretation is that for every 1-unit increase in the independent variable, the dependent variable will decrease by the beta coefficient value.

Statistical analyses for this study were completed using SAS Version 9.4 (SAS Institute Inc., Cary, NC, USA), and were conducted by Amy Moore, Ph.D., M.S., R.D. in coordination with the author of this honors thesis, and a p-value of 0.05 was used to determine statistical significance. The primary responsibilities of the author of this honors thesis were to complete a thorough review of the existing literature, develop an honors thesis proposal that includes study aims and hypotheses, develop basic knowledge of data management and data analysis procedures, and develop a full draft of the honor thesis in conjunction with mentors Jennifer Savage Williams, Ph.D. and Amy Moore, Ph.D., M.S., R.D.

## Chapter 4

### Results

#### *Sociodemographic Characteristics*

Table 1 presents the sociodemographic characteristics of INSIGHT participants included in this study. Mothers were on average 29.4 (SD = 4.3) years of age, and the majority were White (95.3%), non-Hispanic (94.6%), married (88.2%), and college-educated (43.8%), with annual household incomes of >\$50,000 (83.8%). Children were predominantly White (94.1%), non-Hispanic (94.7%), and evenly distributed by sex (50.9% female).



**Table 1.** Sociodemographic characteristics of INSIGHT participants in this study (n = 169).

<b><u>Mother Characteristics</u></b>	
<b>Age in years, mean (SD)</b>	29.4 (4.3)
<b>Body Mass Index, mean (SD)</b>	28.0 (6.6)
<b>Race, n(%)</b>	
Black	2 (1.2)
White	161 (95.3)
Native Hawaiian or Pacific Islander	1 (0.6)
Asian	4 (2.4)
Other	1 (0.6)
<b>Ethnicity, n (%)</b>	
Non-Hispanic	159 (94.6)
Hispanic	9 (5.4)
<b>Marital Status, n (%)</b>	
Not Married	20 (11.8)
Married	149 (88.2)
<b>Education, n (%)</b>	
HS graduate or less	9 (5.3)
Some College	35 (20.7)
College Graduate	74 (43.8)
≥ Graduate Degree	51 (30.2)
<b>Household Income, n (%)</b>	
<\$10,000	3 (1.8)
\$10,000-\$24,999	6 (3.6)
\$25,000-\$49,999	15 (8.9)
\$50,000-\$74,999	51 (30.2)
\$75,000-\$99,999	40 (23.7)
≥\$100,000	50 (30.0)
Do not know/Refuse to Answer	4 (2.4)
<b><u>Child Characteristics</u></b>	
<b>Sex, n (%)</b>	
Male	83 (49.1)
Female	86 (50.9)
<b>Overweight/Obese, n (%)<sup>a</sup></b>	53 (31.4)
<b>Race, n (%)</b>	
Black	5 (3.00)
White	159 (94.1)
Asian	3 (1.8)
Biracial	2 (1.2)

<sup>a</sup> Overweight defined as child body mass index of 85<sup>th</sup> percentile to less than 95<sup>th</sup> percentile and obese 95<sup>th</sup> percentile or greater using CDC growth charts and reference standards.

### *Descriptive Statistics for Main Study Variables*

Table 2 presents simple descriptive statistics for the main study variables. Means scores (possible scores ranged from 1-5) for maternal use of structure-based feeding practices were as follows: limiting exposure:  $M = 3.45$ ,  $SD = 0.51$  and consistent mealtime routines:  $M = 3.79$ ,  $SD = 0.45$ . Mean scores (possible scores ranged from 1-5) for maternal use of control-based feeding practices were as follows: pressure to eat:  $M = 1.97$ ,  $SD = 0.62$ ; restriction:  $M = 2.31$ ,  $SD = 0.79$ , food as reward:  $M = 2.33$ ,  $SD = 0.82$ ; and food to soothe:  $M = 1.52$ ,  $SD = 0.58$ . The mean score (possible scores ranged from 10 to 50) for perceived stress was  $M = 23.39$ ,  $SD = 5.61$  and the mean score for household chaos (possible scores ranged from 15 to 60) was  $M = 26.78$ ,  $SD = 6.67$ .

**Table 2.** Simple descriptive statistics for maternal structure and control-based feeding practices, perceived stress, and household chaos (n=169).

Variable	M	SD	Range	Coefficient Alpha
<b>Feeding Practices<sup>a</sup></b>				
Limiting Exposure	3.45	0.51	2.00 – 4.45	0.76
Consistent Mealtime Routines	3.79	0.45	2.55 – 4.90	0.69
Pressure to Eat	1.97	0.62	1.00 – 3.50	0.76
Restriction	2.31	0.79	1.00 – 4.50	0.74
Food as Reward	2.33	0.82	1.00 – 4.75	0.77
Food to Soothe	1.52	0.58	1.00 – 3.40	0.87
<b>Perceived Stress<sup>b</sup></b>	23.39	5.61	11.00 - 38.00	-
<b>Household Chaos<sup>c</sup></b>	26.78	6.67	15.00 - 45.00	-

<sup>a</sup> Structure Control and Parental Feeding Questionnaire scores range from Never (1) to Always (5) (Savage et al., 2017).

<sup>b</sup> Perceived Stress Scale scores ranged from 10-50 (Cohen et al., 1983).

<sup>c</sup> Confusion, Hubbub, and Order Scale scores range from 15-60 (Matheny, Thoben, & Wilson, 1982).

Note: M = Mean; SD = Standard Deviation; Coefficient Alpha = Cronbach's alpha a measure of internal consistency

Table 3 presents bivariate correlations for the main study variables. Maternal use of limiting exposure was positively, significantly correlated with consistent mealtime routines ( $r = 0.36, p < 0.0001$ ) and restriction ( $r = 0.40, p < 0.0001$ ). Pressure to eat was positively and significantly correlated with restriction ( $r = 0.36, p < 0.0001$ ), food as reward ( $r = 0.49, p < 0.0001$ ), and food to soothe ( $r = 0.39, p < 0.0001$ ). Restriction was positively and significantly correlated with food as reward ( $r = 0.39, p < 0.0001$ ) and food to soothe ( $r = 0.44, p < 0.001$ ).

Food as reward was positively and significantly correlated with food to soothe ( $r = 0.46$ ,  $p < 0.0001$ ). Household chaos was positively and significantly correlated with food as reward ( $r = 0.19$ ,  $p = 0.02$ ), food to soothe ( $r = 0.22$ ,  $p = 0.005$ ), and perceived stress ( $r = 0.41$ ,  $p < 0.0001$ ). Perceived stress was positively and significantly associated with restriction ( $r = 0.17$ ,  $p = 0.03$ ), but not the other feeding practices. There were no other significant correlations between the main variables of interest.

**Table 3.** Bivariate correlations between maternal structure and control-based feeding practices, perceived stress, and household chaos ( $n=169$ ).

	1.	2.	3.	4.	5.	6.	7.	8.
1. Limiting Exposure <sup>a</sup>	-							
2. Consistent Mealtime Routines <sup>a</sup>	0.39**	-						
3. Pressure to Eat <sup>a</sup>	0.05	0.0001	-					
4. Restriction <sup>a</sup>	0.40**	0.09	0.36**	-				
5. Food as Reward <sup>a</sup>	-0.05	-0.05	0.49**	0.40**	-			
6. Food to Soothe <sup>a</sup>	0.02	-0.10	0.39**	0.44**	0.46**	-		
7. Perceived Stress <sup>b</sup>	0.09	-0.13	0.12	0.17*	0.09	0.10	-	
8. Household Chaos <sup>c</sup>	0.15	-0.10	0.01	0.10	0.19*	0.22**	0.41**	-

<sup>a</sup> Structure Control and Parental Feeding Questionnaire scores range from Never (1) to Always (5) (Savage et al., 2017).

<sup>b</sup> Perceived Stress Scale scores ranged from 10-50 (Cohen et al., 1983).

<sup>c</sup> Confusion, Hubbub, and Order Scale scores range from 15-60 (Matheny, Thoben, & Wilson, 1982).

\*\*  $p < 0.01$ ; \*  $p < 0.05$

## ***Results by Study Aim***

### *Aim 1: Associations Between Maternal Stress and Maternal Feeding Practices*

Table 4 presents results for the adjusted linear regression models for the associations between maternal stress and maternal feeding practices. The adjusted linear regression model for the association between maternal perceived stress and their use of restriction revealed a statistically significant effect ( $F(3,154) = 2.81, p = 0.04; R^2$  of 0.05). The regression coefficient (B) for perceived stress was 0.02, with a standard error of 0.01. This indicates that for each unit change in perceived stress, there is an increase of 0.02 units in restriction. This positive relationship between maternal perceived stress and their use of restriction was found to be statistically significant ( $t = 2.10, p = 0.04$ ). There were no other statistically significant associations between maternal perceived stress and maternal feeding practices.

**Table 4.** Adjusted linear regression models for the association between maternal perceived stress and maternal feeding practices (n=169).

Feeding Practice <sup>a</sup>	B	SE	<i>t</i>	<i>P</i> value
Limiting Exposure	0.007	0.007	0.89	0.37
Consistent Mealtime Routines	-0.009	0.006	-1.52	0.13
Pressure to Eat	0.012	0.009	1.35	0.18
Restriction	0.023	0.011	2.10	<b>0.04</b>
Food as Reward	0.012	0.011	1.03	0.30
Food to Soothe	0.008	0.008	1.08	0.28

<sup>a</sup> Structure Control and Parental Feeding Questionnaire scores range from Never (1) to Always (5) (Savage et al., 2017).

Note: B = Regression Coefficient; SE = Standard Error; All models adjusted for study group and maternal age at 6 year study visit.

*Aim 2: Moderating Effect of Household Chaos on Associations Between Maternal Stress and Maternal Feeding Practices*

The adjusted linear regression model examining the moderating effect of household chaos on the significant association between maternal perceived stress and their use of restriction was not statistically significant; household chaos did not moderate the relationship between perceived stress and their use of restriction (B = -0.001, SE = 0.002, p = 0.55).

## **Chapter 5**

### **Discussion**

This current study examined the associations between maternal perceived stress and their feeding practices at child aged 6 years, as well as household chaos as a potential moderator. In this sample of predominantly White mothers with high socioeconomic status, findings revealed a positive association between mothers' perceived stress and their use of restriction, a control-based feeding practice defined as controlling a child's access to less unhealthy foods using a rigid, authoritative approach (Costa & Oliveira, 2023). However, household chaos was not a significant moderator of this association. This finding suggests that mothers' perceived stress plays a role in their use of restriction, which provides evidence for including strategies for reducing stress in future child feeding interventions.

Findings showing an association between maternal perceived stress and their use of restriction are important and consistent with some previous literature on parent feeding practices. A systematic review investigating this relationship found that general stress was positively and significantly associated with restriction at child aged 2-5 years for two studies and not statistically significant for three studies (Almaatani, 2023). One explanation for these mixed findings is that current research investigating this relationship is mostly low- to moderate-quality since it is an underexplored field (Almaatani, 2023). Another potential reason why these findings are mixed is that the relationship between general stress and restriction is moderated by child weight perception (i.e., a mother who believes her child is overweight will use more restriction). Few studies have investigated this relationship, thus more research is needed to better understand

the relationship between perceived stress and restriction and how the relationship might change in different contexts.

The relatively low average perceived stress in this sample, high average use of structure-based feeding practices (i.e., limiting exposure, consistent mealtime routines), and low average use of control-based feeding practices (e.g., pressure to eat, food to soothe) are expected and could be explained by the demographic makeup of the INSIGHT study, that is White, married, well-educated, and middle or upper-middle class. One longitudinal study examining maternal stress across diverse racial and ethnic households with kindergarten-aged children found that U.S. native-born Black mothers, Hispanic immigrant, and Asian immigrant mothers had significantly higher parenting stress than both immigrant and native-born White mothers (Nomaguchi & House, 2013). This study proposed that higher stress might be due to mothers of color having greater structural disadvantages (e.g., being single, low-income, full-time employed while balancing motherhood, and of low educational attainment), and authoritarian (i.e., control-based) parenting values (Nomaguchi & House, 2013). Although this thesis covered general stress and not parenting stress, this study gives potential insight as to why self-reported perceived stress was on average low and why the relationship between perceived stress and most feeding practices was non-significant.

The results from this current study did not support the hypothesis that perceived stress would be negatively associated with structure-based feeding practices. To my knowledge, there are few studies investigating the relationship between maternal perceived stress and structure-based feeding practices. However, perceived stress was hypothesized to be negatively correlated with structure-based feeding practices because stress may impact a mother's ability to limit exposure and create consistent mealtime routines. There was some evidence from this current



study to support the previous literature that perceived stress is positively associated with control-based feeding practices, as seen between maternal perceived stress and their use of restriction. One cross-sectional study investigating the associations between child weight and controlling parent feeding practices found restriction to be a result of mothers expressing concern over their child's weight status (Webber et al., 2010). Nevertheless, this relationship between maternal perceived stress and their use of restriction was still very weak and had marginal significance as a factor of child feeding outcomes.

The two structure-based feeding practices (limiting exposure and consistent mealtime routines) had weak positive, significant correlation with one another, while the four control-based feeding practices (pressure to eat, restriction, food as reward, food to soothe) had weak and moderate positive, significant correlations with one another. This is to be expected since feeding practices are often not practiced in isolation. One article discussing the various constructs of feeding practices explains how feeding practices are often difficult to trace since they are used in conjunction and often influence one another (Vaughn et al., 2016). Limiting exposure to unhealthy foods and restriction had a moderate positive, significant correlation with one another. These two feeding practices have similar motivations, both reducing the child's unhealthy foods. Effectively, these two practices vary in their feeding responsiveness and their goals. Limiting exposure to unhealthy foods is a form of covert control that promotes a child's autonomy to make balanced choices with reasonable guidelines and structure from parents for the child to follow (Vaughn et al., 2016). In contrast, restriction is a form of overt control that uses explicit, non-negotiable bans on food which can lead to defiance and a stronger desire for less healthy foods (Vaughn et al., 2016).

The low average household chaos was somewhat expected, and this could also be explained by the demographic makeup of the INSIGHT study. Previous literature has found household chaos to be positively linked with lower caregiver education and annual household income (Marsh et al., 2020). Additionally, household chaos was shown to have a significant moderate positive relationship with perceived stress. This is an important finding since previous studies have examined household chaos and child perceived stress, but not household chaos and maternal perceived stress (Marsh et al., 2020). Household chaos had a weak positive and significant relationship with control-based practices including food as reward and food to soothe. While, to our knowledge, there is currently no literature investigating this relationship, one possible explanation for this correlation is that these control-based practices are often used to regulate children when there are environmental disruptions (as a result of household chaos) since using structure- and autonomy-promoting strategies may take more time and energy for the parents to use consistently. Finally, household chaos was not a significant moderator for the significant association between maternal perceived stress and their use of restriction.

The current study had several notable strengths. This study included data from INSIGHT, an ongoing longitudinal study of mother-child dyads with good retention at child aged 6 years. The questionnaires used were validated and had adequate internal consistency, as indicated by their Cronbach coefficient alphas (i.e., between 0.70 – 0.79). Additionally, this thesis was a novel contribution to nutrition research, as it examined maternal perceived stress and their feeding practices in well-educated sample of high socioeconomic status, which is a surprisingly understudied area, as well as investigated a critical period of development (i.e., children aged 6 years) where cognitive, social, and emotional development increases rapidly. However, this study is not without limitations. Participant recruitment occurred at only one hospital in Central

Pennsylvania, and the enrolled sample reflected the demographics of that region (e.g., predominantly White, high socioeconomic status). Future studies should include more racially, ethnically, and socioeconomically diverse participants. Another limitation was self-reported data collection methods. Data was self-reported by mothers which can lead to response biases (e.g., social desirability bias, memory bias). Additionally, the analyzed data is cross-sectional and does not indicate any causality between the studied variables versus if it were a randomized control trial or experiment. Although the analyses controlled for study group, the effect of study group was borderline significant ( $p = 0.05$ ) in the model including maternal perceived stress and restriction. Future research should utilize different methods beyond self-report such as observed mealtimes between the mother and child to assess feeding practices and direct measures of stress. Finally, a longitudinal study design could be used to understand how these factors change over time.

In sum, findings from this study found that mothers reporting greater use of restrictive feeding practices, a control-based feeding practice, also reported higher perceived stress. Beyond this significant finding, the hypotheses generated in this thesis were not supported. Maternal stress was not found to be negatively associated with structure-based feeding practices. Household chaos did not moderate the relationship of maternal stress and feeding practices. Nonetheless, these findings advance the current field of child nutrition outcomes by providing a comprehensive analysis of the interplay between maternal feeding practices, maternal stress, and household chaos and offering new insights that were previously unexplored in existing literature. Additional research with a more diverse sample is necessary to determine the relationship between maternal stress, maternal feeding practices, and household chaos overtime.

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# Lindsay Aluquin

## Education

**The Pennsylvania State University** — *University Park, PA*

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*Major:* Nutritional Science | *Minors:* Spanish, Global Health

*Dean's List:* Fall 2020 - Fall 2024

*Expected Graduation Date:* May 2024

## Professional Experiences

**Center for Childhood Obesity Research, *Research Assistant*** *Oct. 2021 - Present*

- Collects and cleans data on youth eating patterns and caretaker-child relations in low-income, rural spaces.
- Creates a secure and engaging environment for preschool-aged children during data collection for a nutrition education research project, facilitating enthusiasm and cooperation

**Cook Like a Chef Camp, *Camp Counselor*** *July. 2022 - Present*

- Leads engaging and educational cooking activities for children ages 9-14, honing their culinary skills and promoting teamwork and creativity in a fun camp setting.
- Established clear expectations and boundaries for behavior, by enforcing rules with kindness and understanding, while also addressing any misbehavior firmly and decisively

**Willow Tree Home Health Care, *Home Health Aide*** *Jan. 2024 - Present*

- Offers elderly folks dependable and compassionate care to foster their independence while maintaining a safe, positive living environment
- Listens to clients with empathy and attention to detail to respond to their needs swiftly and attentively

## Leadership Experience

**Penn State Filipino Association, *Co-Cultural Director, VP, President*** *Sept. 2020 - Present*

- Orchestrated cultural showcases, secured venues and funding, and oversaw choreographers and committees.
- Directed a 30+ member concession stand team at PSU football games, achieving a record-breaking \$21,000 in revenue in one year.
- Organizes weekly meetings, delegated tasks for extensive projects, and provided guidance on event planning for a 12-person board.

**The Singing Lions, *Primary THON™ Chair, Alumni Chair*** *Sept. 2020 - Present*

- Achieved a record-breaking \$26,000+ in THON fundraising over two years by leveraging alumni connections and forging partnerships with local businesses.
- Facilitates communication with 200+ alumni through newsletters for organization updates and donor outreach.

**Presidential Leadership Academy, *Member*** *Aug. 2021 - Present*

- Cultivates leadership skills by attending professional development workshops, publishing weekly discussion posts, and collaborating closely with campus administrators