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I, Sarah Sander, hereby submit this original work as part of the requirements for the degree of Master of Science in Nutrition.

It is entitled:
Parental Control Over Dietary Intake and the Association with Weight Over Time in Girls

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Parental Control Over Dietary Intake and the Association with Weight Over Time in Girls

A thesis submitted to the
Graduate School
of the University of Cincinnati
in partial fulfillment of the
requirements for the degree of
Master of Science
in the Department of Nutritional Sciences
of the College of Allied Health Science
by
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Abstract

Objective: To evaluate the relationship between parental controlling behaviors on dietary intake with the use of feeding strategies including: control, restriction, and pressure or encouragement to eat, and weight outcomes over time in sample of black and white female participants.

Design: Secondary data analysis using randomly selected sample from the longitudinal dataset of the National Growth and Health Study (NGHS).

Participants/Setting: The original data included 10 years of follow-up with 2,379 girls (1,213 black and 1,116 white) from age 9 or 10 years old to 18 to 19 years old. The participants were recruited at three clinical centers for the NHLBI Growth and Health Study: Washington D.C., Cincinnati, Ohio, and San Francisco, California. 60 cases among the original sample with complete data on BMI and parental control between time points one and five were selected for this analysis.

Methods: Weight status was determined by BMI percentiles based on the CDC standardized growth chart. Weight status was categorized as underweight, normal weight, overweight, or obese. For data analysis, a dichotomous variable was generated (overweight or obese vs. underweight or normal weight). Parental controlling behaviors on dietary intake with the use of feeding strategies including: control, restriction, and pressure or encouragement to eat, were measured using 8 items from questionnaires completed by female participants. From these responses, the total parental control score was calculated at each time point to determine the level of parental controlling behaviors on eating. Multiple logistic regression models were used to examine whether
being overweight or obese was predicted by parental controlling behaviors with other covariates, such as race and parental educational level.

**Results:** Parental controlling behaviors on dietary intake were seen as a significant predictor of weight status for the female participants at four out of five time points. The highest odds ratios (ORs) were seen at year one and year four (OR: 1.519 and 1.549 respectively).

**Conclusion:** Participants that experienced higher parental controlling behaviors on dietary intake with the use of the following feeding strategies monitoring and control, restriction, and pressure or encouragement to eat, were more likely to be overweight or obese compared to participants who experienced less parental controlling behaviors on dietary intake. Higher total parental control scores were found when participants were younger; these scores trended downward as participants grew older, implying parents or caretakers used less controlling behavior in the feeding environment over time.
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Introduction

The prevalence for childhood overweight and obesity have seen a dramatic increase since 1980. It is now estimated that nearly 17% of children between the ages of 2 and 19 years old are obese \(^1\). In this time frame, obesity rates in children ages 6 to 11 years old increased from 6.5% to 19.6%, while rates for adolescents 12-19 years old increased from 5% to 18.1% \(^1\). Obesity and overweight status in childhood is a strong predictor for being overweight or obese later in life and is associated with an increased risk for cardio-metabolic diseases \(^2-7\). The increasing rates of childhood overweight and obesity and the implications for future health problems stress the need for effective prevention and intervention programs. However, the development of overweight status and obesity status in childhood needs to be more clearly understood to better develop these programs.

The development of overweight and obesity in childhood involves many factors and their complex interaction with one another \(^8-10\). The following factors were implicated by the Centers for Disease Control and Prevention in 2010 in the development of overweight and obesity in childhood: genetic, behavioral, and environmental such as community, school, and the home \(^8-10\). Thus far, school-based intervention programs have shown little to no consistent results in their efforts to increase physical activity, improve dietary intake overall, or to promote weight loss that is both long-term and clinically significant \(^11-14\).

It is commonly believed that parents and caretakers play a significant role in shaping children’s eating habits and food preferences, both of which have implications for
growth and weight status \textsuperscript{15-18}. Of particular interest then, is the feeding environment in the home related to children’s eating patterns. A better understanding of the feeding environment in the home and its relationship to overweight status and obesity would assist in developing effective prevention and intervention programs that could instruct parents and caretakers on appropriate feeding behaviors to utilize with children \textsuperscript{19}.

Recent research has suggested that children possess the ability to calorically compensate. This means that children of a certain age have the ability to adjust their caloric intake according to fluctuations in their daily diet \textsuperscript{20-23}. This finding implies that the children who are able to calorically compensate would likely choose and consume a diet that is nutritionally adequate if given appropriate food choices \textsuperscript{22, 24}. However, for reasons unknown, there are individual variances in the ability to calorically compensate. Research implies these variances may be due in part to the family environment, feeding styles, and feeding strategies used by parents and caretakers \textsuperscript{20}.

Within the literature surrounding the topic of feeding styles and feeding strategies, there are discrepancies in the terminology. Feeding styles can be defined in the broader context of parenting styles. Feeding styles, like parenting styles, are defined by the level of demand and responsiveness used with the child but set specifically in the feeding environment \textsuperscript{16, 25-27}. The four feeding styles are: authoritative, authoritarian, indulgent, and uninvolved.

Associations between these feeding styles and dietary intakes in children have been shown with implications for growth and weight status. The authoritarian feeding style, characterized by a high demand and low responsiveness to the child, has been
associated with a lower consumption of fruits, vegetables, and juices compared to those children of authoritative parents, who use both high demand and high responsiveness in the feeding environment. These consumption patterns may be implicated with overweight or obesity in childhood and adolescence by an increased caloric intake. However, the research directly examining feeding styles and feeding strategies with weight status, especially weight status over time, shows mixed and limited results.

Feeding strategies are less concrete than feeding styles and may be used by parents or caretakers to obtain a specific outcome in a feeding situation. These strategies may be affected by a child’s age, weight, gender, growth, or behavior. These strategies may include: restriction, pressure or encouragement to eat, the use of bribes or food as a reward, monitoring and control, or using food to pacify a child. These strategies are often used with good intentions to increase consumption of certain foods or food groups, limit the intake of “junk” foods, and to ensure dietary needs for growth are being met. However, they often have unintended and counterproductive consequences such as: forcing a child to eat in the absence of hunger, overriding natural satiety cues, negatively impacting food preferences, and decreasing a child’s ability to calorically compensate.

Similar to feeding styles and weight status, the relationship between feeding strategies and weight status, especially over time, is limited. Most available research is in the form of cross-sectional analysis, which by the nature of the design has limitations. Cross-sectional studies do not allow casual relationships or temporality to be determined. For instance, results of these studies often state that parenting affects child
eating, which affects child weight. However, the same could be said in the opposite direction; child weight could affect child eating, which could affect parenting, potentially in the form of parental feeding style or parental feeding strategies. Additionally, many of the studies regarding feeding style and feeding strategies are done using young, white, female populations over a short period of time. Therefore, results cannot be generalized to larger and diverse populations. Lastly, variances exist in the research with the measurement of feeding practices. To gain a better understanding of this relationship with respect to direction and effect over time, properly designed longitudinal and experimental studies are needed.

Significance

Parents and caretakers play an important role in shaping eating behaviors and food preferences in children and adolescents. Recent research indicates that feeding practices used by parents and caretakers, such as: controlling how much, when, and what types of foods are eaten can affect children and adolescent food preferences and consumption patterns, which have implications for growth and weight status.

Gap

Empirical data in the area of environment, such as feeding strategies, and the development of overweight and obesity in children and adolescents over time is limited. Investigating this environment and controlling behaviors on dietary intake with feeding strategies such as: monitoring and control, restriction, and pressure or encouragement to eat, utilized by parents and caretakers with children and adolescents in relationship to weight status over time, will help more clearly define the relationship.
Purpose

The purpose of this study is to examine the relationship between parental controlling behaviors over dietary intake with the feeding strategies of monitoring and control, restriction, and pressure or encouragement to eat, and weight outcomes in a subsample of black and white female participants over time.

Literature Review

Prevalence of Obesity & Health Related Consequences

In the United States it is estimated that nearly 17% of children between the ages of 2 and 19 years old are obese (defined as a body mass index (BMI) ≥ 95th percentile on a standardized growth chart for children of the same age and sex) 1,35. In this time frame rates of obesity in children ages 6 to 11 years old increased from 6.5% to 19.6%, while adolescents 12 to 19 years old had an increase from 5% to 18.1% 1.

Childhood obesity is a strong predictor for obesity later in life, a fact that has been demonstrated in numerous studies 1, 5, 6, 36. Nader et al (2006) found that children who were overweight in their preschool period almost six times as likely to be overweight by the age of twelve as compared to those children who were not overweight at any of these same ages (OR: 5.9, 95% CI (3.9-8.8)) 6.

A review of epidemiologic literature conducted by Serdula et al. (1993) found that 26-41% preschool aged children became obese adults 5, 37, 38. Similarly, 42-63% of obese school-aged became obese adults, confirming that overweight or obese status earlier in life is likely to continue into adulthood 5, 39, 40. Whitaker et al. (1997) reaffirmed these findings and proved that obesity between the ages of 15 and 17 made it 17.5 times
more likely for an individual to be obese in adulthood when compared to their non-obese adolescent counterparts (OR: 17.5, 95% CI (7.7-39.5)) \(^{36}\).

Overweight or obesity in childhood and adolescence is likely to continue into adulthood, but has also been correlated to many health concerns, including but not limited to: hypertension, dyslipidemia, coronary heart disease, insulin resistance, diabetes, asthma, and psychological issues \(^3,^4,^7,^{41-48}\). With regard to cardiovascular health in particular, one cross-sectional analysis utilizing the National Heart, Lung, and Blood Institute Growth and Health Study demonstrated a positive association between adolescent BMI with known risk factors such as: elevated triglycerides, elevated blood pressure, low HDL-cholesterol, and an increased LDL/HDL cholesterol ratio \(^{44}\). Similar results were reported by Srinivasan et al. (1996) which examined data from the Bogalusa Heart Study. The study followed a biracial, coed sample to examine the association between weight status in adolescence and cardiovascular risk factors in young adulthood. Those categorized as overweight during adolescences were shown to have a higher risk of remaining overweight as an adult (approximately 52-62% chance of remaining overweight as an adult). Additionally, those categorized as overweight in adolescence experienced higher rates of clinically recognized hypertension and dyslipidemia in adulthood. The overweight sample demonstrated an 8.5-fold increase in the prevalence of hypertension \((p < .0001)\) and a 3.1 to 8.3-fold increase in the prevalence of dyslipidemia \((p < .05, p < .01)\) when compared to the lean population. The results of these two major studies demonstrate the importance of weight status in adolescence and its impact on cardiovascular health \(^7,^{44}\).
Risk Factors for Overweight and Obesity

The development of overweight and obesity is considered to be complex and multifactorial. The causes of overweight and obesity in childhood implicated by the Centers for Disease Control and Prevention in 2010 include: genetic factors, behaviors such as energy intake and eating patterns, physical activity and inactivity, and environments such as those in the community, school, and home. Statistics regarding the prevalence and risks of childhood overweight and obesity stress the need for effective prevention and early intervention programs. Often, schools are focused on for their accessibility to children. However, school-based intervention programs thus far have shown little to inconsistent success for producing long-term effects in increasing physical activity, improving dietary habits, and clinically significant, long-term weight loss.

These disappointing results of school-based intervention programs reiterate the need to understand the development of childhood overweight and obesity. A better understanding of the complex development may lend itself to more effective prevention and intervention programs in the future. Of particular interest then, are the home and feeding environments and the role of the parents and caretakers. Parents and caretakers have been shown to play a significant role in the development of eating habits and food preferences in children, both of which have implications for growth and weight status. Some feeding styles and feeding strategies have been linked to eating habits such as: fruit, vegetable, and “junk” food consumption, and eating in the absence of hunger, all of which may affect growth, weight status, weight status over
time, and the risk of becoming overweight or obese through an increased caloric consumption 16, 18, 27-30.

Parenting Styles and Feeding Styles as a Risk Factor for Overweight and Obesity

Research on the development of eating habits has shown that children possess the ability to adjust their caloric intake according to fluctuations in their diet, a behavior known as caloric compensation 20-23. For example, a child that can calorically compensate will naturally decrease the amount of food they consume in response to a calorically dense meal or snack that was eaten earlier. Conversely, a child will increase their caloric intake in response to a decline or absence of calories experienced earlier in the day 20-23. This suggests that children possess self-control and the ability to regulate their caloric and nutrient intake. The research goes on to imply that if a child is provided with a variety of healthy options, a diet that is nutritionally adequate would likely be consumed 22, 24. However, for reasons not fully known at this time, variances in the ability to calorically compensate are seen on an individual basis. One hypothesis for these individual variances is the role of the feeding environment in the home, particularly the feeding styles and feeding strategies utilized by parents and caretakers 20.

Within the literature surrounding this topic, discrepancies in terminology can be found. The term parenting style is a broad term with four distinctions based on the level of demand and response used by the parent or caretaker with the child or adolescent. Parenting styles are generally believed to be stable over time 16, 49, 50. The term feeding style is defined within the context of parenting style and uses the same four
classifications and is also based upon the level of demand and response but specifically in the feeding environment 50.

The four feeding styles related to parenting styles include: authoritative, authoritarian, indulgent, and uninvolved 11, 16, 26, 27, 50. The indulgent (sometimes referred to as permissive) and uninvolved (sometimes referred to as neglectful) feeding styles are similar and are characterized by low demand and little structure. The child is limited only by the availability of foods and can eat what, when, how much, and how often they choose 11, 18, 26, 27, 50. The authoritative feeding style is defined as being highly responsive to a child's behaviors, eating cues, and considerate of food preferences. The parent or caregiver sets both limits and expectations for the child or adolescent while providing them with options and encouraging them to make healthy choices. For example, a parent or caregiver decides which foods are offered and the child decides which foods are eaten 11, 18, 26, 27, 50. Lastly, the authoritarian style is defined as one that does not take into consideration food preferences and may utilize strategies such as control, restriction, and encouragement or pressure to eat more often. For example, highly palatable foods (i.e. those high in sugar and/or fat) are restricted and a child is pressed or encouraged to eat a healthy food instead, like vegetables 11, 18, 26, 27, 50. To be clear though, any feeding style may utilize the above listed feeding strategies. Feeding strategies are specific behaviors and are utilized by a parent or caretaker to achieve a desired outcome 11, 16, 18, 25, 27. Feeding strategies may include: control, restriction, bribery, using food to pacify, and pressure or encouragement to eat. Feeding strategies are less stable when compared to feeding styles and may change according
to a child’s or adolescent’s age or gender, or change according to the feeding situation 11, 18, 25, 27.

Studies examining parenting and feeding styles with regard to dietary intake have shown that the authoritative parenting and feeding style is linked to higher availability of fruits and vegetables in the home as well as higher consumption of these foods and dairy products 27. Furthermore, the authoritative parenting and feeding style has been associated with a decrease in the consumption of “junk” food 27. Conversely, the authoritarian parenting and feeding style has been associated with a decreased availability of fruits and vegetables in the home and decreased intake of fruits, vegetables, and juices 18, 27-29.

The relationship between feeding style and weight outcomes in children and adolescence is not as clear. A longitudinal study conducted by Rhee et al. (2006) showed the authoritarian style to have the highest prevalence rate of overweight children. Specifically, 17.1% of children with authoritarian mothers were overweight compared to children with authoritative, permissive, or uninvolved mothers 3.9%, 9.8%, and 9.9% respectively. Furthermore, children with authoritarian parents were five times more likely to be overweight in first grade compared to those with authoritative parents (OR: 4.88; 95% CI (2.15-11.10)) 51. Berge et al. (2010) yielded similar results with the authoritative parenting style in an adolescent population in a 5 year longitudinal study design 52. Similar studies examining parenting and feeding style to weight outcomes have yielded mixed results. A ten year cohort conducted by Argas et al. (2004) failed to demonstrate a relationship between parenting style and overweight risk 25, 53. Similarly,
Wake et al. (2007) found no association between maternal parenting behavior and child BMI. Interestingly though, children of permissive fathers had a 59% (95% CI 25%-103%) increased risk of higher BMI compared to children of authoritative fathers.

These studies demonstrate a significant, but not entirely clear, relationship between parenting and feeding style and overweight status in children and adolescents. To further complicate matters, many of the studies examining parenting and feeding style and weight outcomes utilize limited study populations (younger children, white, middle-class, small sample sizes), are cross-sectional study designs, and differ in their measurement of parenting and feeding style. These factors present challenges when determining causal relationships and generalizing results to broader populations. Additional studies with proper design and study samples are needed to gain a better understanding of parenting style, feeding style, and weight outcomes in children and adolescents. Similarly, additional studies are needed to better understand feeding strategies such as: control and monitoring, restriction, and pressure or encouragement to eat.

Feeding Strategies as a Risk Factor for Overweight and Obesity

To reiterate, feeding styles are defined in the broader context of parenting style and because of this, are believed to be generally stable over time. Feeding strategies are specific behaviors used to obtain a desired result within the feeding environment. These feeding strategies can differ from child to child, according to gender, according to weight status of the child, and can differ according to the situation. Feeding strategies may include behaviors such as: monitoring and control, restriction,
pressure or encouragement to eat, the use of bribes or food as a reward, or using food to pacify a child \(^{11, 16, 18, 25, 27}\). For example, a parent or caretaker may pressure or force their child to eat certain foods or food groups, such as vegetables in an attempt to ensure nutritional needs are being met for growth \(^{16}\). However, feeding strategies may have unintended and counterproductive consequences. These consequences may include: overriding natural satiety cues by focusing attention to external cues (i.e. how much food is left on the plate), eating in the absence of hunger, and altering the ability to calorically compensate \(^{18, 30}\).

While the relationships between dietary intake and weight outcomes with parenting and feeding styles shows limitations in the research, the studies examining feeding strategies and weight outcomes over time in children and adolescents are also limited \(^{18, 19}\). The existing research on feeding strategies and weight outcomes are often done in the form of cross-sectional data analysis with limited study samples. As mentioned previously, a cross-sectional study design does not allow for causal relationships or temporality to be determined. Limited study populations don’t allow for results to be generalized to broader populations \(^{11, 19, 31, 32}\). To gain a better understanding of the relationship between the home environment, feeding strategies, and weight outcomes in children and adolescents, properly designed experimental studies with large and diverse samples are needed \(^{11, 19}\). For the purposes of this study, the feeding strategies of monitoring and control, dietary restriction, and encouragement or pressure to eat will be examined as risk factors for development of overweight and obesity in children and adolescents.
Feeding Strategies: Monitoring and Control

Parental monitoring and control over dietary intake is often assessed via questionnaire completed by parents and caretakers with questions such as: “my child should strongly be reprimanded for playing or fiddling with food”, “I have to be especially careful to make sure my child eats enough”, and “when my child does not finish dinner, he/should not get dessert” \(^{55}\). These questions aim to assess the amount of control utilized as a feeding strategy and the relationship to their child’s dietary intake and weight status.

With regards to dietary intake, parental or caretaker control and monitoring has been shown to be a strong predictor of children’s ability to calorically compensate and alter children’s food choices. For instance, Johnson and Birch (1994) demonstrated in a preschool population that the best predictor for a child’s ability to calorically compensate was the level of control utilized by mothers at feeding times. More specifically, those mothers who used more control over their child’s intake had children that showed less ability to adjust their energy intake accordingly \(r = .67, p < .0001\) \(^{20}\). Klesges et al. (1991) demonstrated in an observational study that young children when given a variety of food options were more likely to select healthier options when they were informed their mothers would be monitoring \(^{56}\). While these studies do not have direct measures to child or adolescent weight, they do demonstrate a relationship between parental or caretaker control to food choices and the ability to calorically compensate. Both food choices and caloric compensation have implications for growth and weight in children and adolescence \(^{19,20,56}\). In a study examining more specific weight related outcomes and parental or caretaker control, Johannsen et al. (2006) concluded that girls with
more controlling fathers had higher percentages of body fat compared to girls who had less controlling fathers.  

However, the data regarding control and monitoring with weight status appear to be mixed. Robinson et al. (2001) found an inverse relationship between parental control and child BMI ($r = -.12$, $p < .05$) and triceps skinfold measurements ($r = -.11$, $p < .05$). They concluded that girls with more controlling parents were less likely to be overweight than those with more controlling parents. It is important to note though, that this study utilized a sample of diverse third-grade children, while the previously mentioned studies utilized younger and predominantly white children. The differences in these findings implies that the association between parental or caretaker control and child weight is complex and may change as the child ages.

Feeding Strategies: Dietary Restriction

Dietary restriction is a feeding strategy utilized by parents or caretakers in an attempt to limit the availability and access to certain foods. These foods are typically considered to be “junk food” or those high in fat and/or sugar. Parents and caregivers who utilize this feeding style may be attempting to limit the intake of these foods in an effort to increase the consumption of healthier options, such as fruits and vegetables. However, research has consistently shown that dietary restriction is associated with children eating in the absence of hunger, a decrease in the child’s ability to calorically compensate, an increase in the behavioral response, selection, and consumption of a restricted food, over consumption of the restricted food and predicts future weight gain and overweight status. Specifically, Francis and Birch (2000) found that
maternal restriction was a predictor for an inability to calorically compensate ($\beta = 0.26$), weight status ($\beta = 0.24$), and higher energy intakes ($\beta = 0.19$) in daughters between the ages of 4-6 years old $^{19,60}$.

The research on dietary restriction has shown consistent results based on longitudinal and experimental study designs, however, limitations still exist. These studies used predominately white, female children between the ages of 3 and 9 years old. Therefore, these results cannot be generalized to a larger and diverse population $^{19,59-61}$. While the results are promising, research examining parental restriction and weight outcomes in children and adolescents needs to be continued and expanded to better understand the relationship.

**Feeding Strategies: Dietary Encouragement or Pressure to Eat**

Dietary encouragement and pressure to eat is a feeding strategy that involves coaxing to a child to consume more foods, or to consume more healthy foods, such as fruits and vegetables. For instance, a parent or caretaker may tell a child that they are not allowed to leave the table or have dessert until their vegetables have been eaten$^{16}$. Research suggests this feeding strategy may negatively impact the child’s food preferences $^{62-65}$ which can alter dietary intakes, and may have a relationship to total body fat mass, weight gain, and BMI $^{66-68}$.

Research suggests that children who are forced to consume certain foods and certain food groups may ultimately have altered food preferences as a result $^{62-65}$. Batsell et al. (2002) discovered through retrospective analysis that pressure to eat in childhood was associated with negative feelings, mainly anger, memories of conflict, and a current
dislike for the forced food in participants between the ages of 16-46 years old. These feelings and food preferences may have implications for future health and weight status.

Pressure or encouragement to eat has been shown to be associated with weight status in children. Spruijt-Metz et al. (2002) found that while restriction was associated with an increased total fat mass in both male and female participants, pressure to eat was negatively associated with total fat mass in white and black children between the ages of 7 and 14 years old, \( r = -0.22, p < 0.02 \) \(^{66}\). Similarly, Matheson et al. (2006) found an inverse relationship between maternal pressure to eat and BMI scores in Mexican-American children \(^{67}\). The authors of both studies concluded that children who are pressured to eat may actually eat less in response to this feeding strategy. This behavior could explain the lower BMI values seen in these children when compared to children who are not pressured to eat. However, both studies point out that due to their design, a causal relationship and temporality cannot be determined \(^{66},^{67}\).

These results regarding pressure to eat are inconsistent with Lee et al. (2001) who examined dietary intakes, weight outcomes, and the use of feeding strategies in white, female children. Children who either met the Academy of Pediatrics dietary recommendations, or had high fat diets (>30% calories) were studied from the ages of 5 to seven years old. They found that children who consumed high fat diets had mothers that reported a greater use of restriction and pressure to eat. These children went on to experience greater increases in both BMI \( r = 0.17, p = 0.01 \) and skinfold thickness measurements \( r = 0.16, p = 0.02 \) during the duration of the study \(^{68}\).
These studies demonstrate conflicting results in the area of parental feeding strategies. These differences may be due in part to children’s age, gender, race, or ethnicity. Overall the relationship between pressure and encouragement to eat and weight outcomes in children and adolescents is not clear. Similar to the additional research needed on other feeding strategies, future studies on pressure and encouragement to eat should be longitudinal or experimental to demonstrate causal relationships and temporality.

**Research Question**

Hence, the purpose of this study is to examine the following research question: what is the relationship between parental controlling behaviors on dietary intake with the feeding strategies of monitoring and control, restriction, and pressure or encouragement to eat, and weight status over time using a subsample of black and white female participants?

**Hypothesis**

Parental controlling behaviors on dietary intake with the feeding strategies of monitoring and control, restriction, and pressure or encouragement to eat, is a predictor for overweight and obese status in a sample of black and white females over time.

**Methods**

**Study Design**

Secondary data analysis using randomly selected sample from the longitudinal dataset of the National Growth and Health Study (NGHS).
Description of Data Set

The original data included 10 years of follow-up with 2,379 girls (1,213 black and 1,116 white) from ages 9 or 10 years old to 18 to 19 years old. The participants were recruited at three clinical centers for the NHLBI Growth and Health Study: Washington D.C., Cincinnati, Ohio, and San Francisco, California. The Inclusion Criteria: 1) The female participant declared themselves as either Black or White; 2) the female participant was within two weeks of the age 9 or 10 at the time of the first clinical visit; 3) the parent(s)/guardian of the female participant declared themselves to be the same race as the child; 4) parent(s)/guardian of the female participant completed a household and demographic information form and gave consent. Ethnic groups that were not either black or white (i.e. Hispanic), and households that were not racially concordant were excluded from the study. The participants were seen at one year intervals throughout the duration of the study for data collection, including: anthropometric measurements, dietary intake, eating patterns, beliefs about certain aspects of health, and family influences using standard assessment methods and questionnaires. Biochemical and psychosocial measures were also taken.

Sample for This Study

From the original sample, 60 cases that had all data for both BMI and parental control between time points 1 and 5 were selected for this data analysis.

Variables

Weight status was determined by BMI percentiles based on the CDC standardized growth chart. The participants were categorized into one of the following weight statuses: underweight, normal weight, overweight, or obese. For data analysis purposes
a dichotomous variable was generated (overweight or obesity vs. underweight or normal weight).

Parental controlling behaviors were determined from questionnaire responses. Questionnaires were completed by female participants. Listed below are the questionnaire items and the feeding strategy they reflect which were used for analysis:

- My parents try to get me to eat less food (restriction)
- My parents tell me that I can’t eat certain foods/snacks (restriction)
- My parents nag me about the kinds of food I eat (monitoring/control)
- I have to finish all the food on my plate (pressure/encouragement)
- I buy snack food* (monitoring/control)
- I prepare my own food* (monitoring/control)
- I can buy snacks whenever I want* (monitoring/control)
- I can eat as much as I want at meals* (monitoring/control)

The items were responded with one of the following choice: never or almost never (1), sometimes (2), and usually or always (3). Some responses were recoded to ensure directionality. Those questions are marked with asterisk (*). Total parental control scores were calculated based on questionnaire responses. A higher total parental control score indicates that more parent controlling behaviors were perceived by participants, while a lower score indicates less controlling behaviors were perceived. The highest possible total parental control score is 24 and lowest possible score is 8. The inter-reliability (Cronbach’s alpha) of the questionnaire was .395.

Statistical Analysis

SPSS (Statistical Package for the Social Sciences, version 18.0, 2010, SPSS, Inc.,
Chicago, IL) was used for the statistical data analysis. Descriptive statistics were conducted to summarize age, race, weight status, and parents’ education level, and the total score for parental feeding control. Multiple logistic regression models were used to examine whether being overweight or obese was predicted by specific parental controlling behavior with other covariates, such as race and parental educational level. A \( p \) value of <.05 was considered statistically significant.

**Results**

**Demographics**

The sample was comprised of 60 girls, approximately 52% white and 48% black. The average age of the participant at the time of the first completed questionnaire was approximately 10 years old. The majority of the sample (65%) was classified as being “normal weight”, while 15% and 12% were considered to be overweight or obese, respectively. With regard to education, 42% percent of the sample had parents who had attained some college education.

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<td>BMI (Kg/m²), (Mean ± SD)</td>
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<tr>
<td>BMI percentile, (Mean ± SD)</td>
</tr>
<tr>
<td>Race, n (%)</td>
</tr>
<tr>
<td>Black</td>
</tr>
<tr>
<td>White</td>
</tr>
</tbody>
</table>
Parental Controlling Behaviors

The total parental control scores were determined from participant responses to the questions listed above. The highest total parental control scores were seen when participants were the youngest. Further analysis confirmed a statistically significant difference in total parental control scores and time points and a downward linear trend over time. These results imply that as participants aged, parents and caretakers used less controlling behaviors in the feeding environment.

Table 2 Parental Controlling Behaviors Over Time (n = 60)

<table>
<thead>
<tr>
<th>BMI Category, n (%)</th>
<th>Average age</th>
<th>Total parental control score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>9.94 (0.55)</td>
<td>15.95 (2.17)</td>
</tr>
<tr>
<td>Normal Weight</td>
<td>10.93 (0.55)</td>
<td>15.28 (1.91)</td>
</tr>
<tr>
<td>Overweight</td>
<td>11.94 (0.58)</td>
<td>14.97 (2.0)</td>
</tr>
<tr>
<td>Obese</td>
<td>12.91 (0.57)</td>
<td>14.20 (2.45)</td>
</tr>
<tr>
<td></td>
<td>13.92 (0.57)</td>
<td>13.98 (2.22)</td>
</tr>
</tbody>
</table>

a: significant difference between values based on ANOVA (F= 8.181, p <0.001)
b: significant linear trend (F= 32.207, p <0.001)
Parental controlling behaviors were a significant predictor of participant’s overweight and obese status at four out of five time points. For example, at year one, participants were 1.519 times more likely to be overweight or obese if they had a parent or caretaker who utilized controlling behaviors over dietary intake, compared to participants with parents or caretakers who did not utilize controlling behaviors.

**Discussion**

Through secondary data analysis with a selected sample from the longitudinal NGHS, parental controlling behaviors were seen as a significant predictor of weight status for the participants at four out of five time points. The highest odds ratios (ORs) were seen at year one and year four where participants were 1.519 and 1.549 times more likely to be overweight or obese if they had a parent or caretaker who utilized controlling behaviors.
behaviors on dietary intake with the feeding strategies monitoring and control, restriction, and pressure or encouragement to eat, compared to participants with parents or caretakers who did not utilize controlling behaviors on dietary intake. This research provides evidence on the relationship between feeding strategies and weight over time in a sample of female participants.

Total parental control scores reflected a downward linear trend with age. This trend implies parents or caretakers were less controlling over dietary intake as participants aged. Salvy et al. (2011) recently demonstrated in an experimental study that the influences on eating habits differ in childhood compared to adolescence. The study examined food choices in a group of children between the ages of 5 and 7 years old and adolescents between the ages of 13 to 15 years old. The authors concluded that mothers are a greater influence for healthy food selections in female children, while peers are a greater influence for healthy food selections in female adolescents. This finding supports the hypothesis that as children, especially females, transition into adolescence, influences on eating habits change and as a result, parental feeding strategies may also change.

The interest of this present study is the relationship between parental controlling behaviors and participant weight outcomes over time. This study found parental controlling behaviors to be a predictor for overweight and obesity in a biracial female population over time. Both Klesges et al. (1991) and Johannsen et al. (2006) found that parental control was a strong influence in the feeding environment with implications for weight status. Another study demonstrated higher levels of parental control as a...
predictor for a child’s inability to calorically compensate \((r = -.67, p < .00001)\) in a sample of predominately white children between the ages of 3 and 5 years old. This inability was then associated with higher body fat stores \((t = 2.9, p < .006)\) \(^{20}\).

However, parental control has not been consistently associated with child weight in current research, especially to larger and diverse populations \(^{55}\). Robinson et al. (2001) concluded that girls were less likely to be overweight according to BMI \((r = -.12, p < .05)\) and triceps skinfold measurements \((r = .011, p < .05)\) when their parents reported being more controlling in a diverse sample of third-graders \(^{55}\). It appears the relationship between child weight and parental feeding strategies is still unclear, a conclusion Wardle and Carnell drew with their literature review in 2007 \(^{70}\).

Within the literature of parental feeding strategies and weight outcomes, control is often reported by the participating parents or caretakers in cross-sectional study designs. Strengths of this study include parental controlling behaviors assessed from a participant perspective via questionnaire responses. Additionally, parental controlling behaviors were assessed over time with a longitudinal study design. These differences strengthen the current study and add to the existing literature.

A limitation of the present study is the low reliability associated with the questionnaire. Furthermore, the sample size for this study was small with only 60 total cases, entirely female, and either black or white, which limits the ability to generalize results to a broader population including males and other races and ethnicities. Lastly, studies within the existing literature assess feeding strategies via parent or caretaker responses on questionnaires. The present study assessed parental feeding strategies via
participant responses on a questionnaire, a fact that adds to the existing literature and strengthens this study, but presents limitations when making comparisons.

**Conclusion & Implications**

Parental controlling behaviors were seen as a predictor for overweight or obese status in a sample of black and white female participants over time. Participants who reported having a parent or caretaker who utilized control, dietary restriction, and pressure or encouragement to eat, were more likely to be overweight or obese. Higher parental control scores were found when participants were younger; these scores trended downward as participants grew older, implying parents or caretakers used less controlling behaviors in the feeding environment over time.

In the future, to gain a better understanding of the development of overweight and obesity in childhood and adolescence, additional research is needed to confirm the present study’s findings with large and diverse samples. These measurement techniques should utilize both parent/caretaker responses and child/adolescent responses. An improved understanding of overweight and obesity development during childhood and adolescence could assist prevention and obesity intervention programs on instructing parents or caretakers on feeding strategies that could decrease their child’s risk for becoming overweight or obese.¹⁹
Bibliography


