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Examining correlates of feeding practices among parents of preschoolers

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Abstract

Background: Parent feeding practices play a critical role in children's eating behaviors. Limited research has explored child-level correlates of parent feeding practices.

Aim: To identify correlates of feeding practices (responsive and controlling) among parents of preschoolers US.

Methods: Participants included parents (n = 273) of preschoolers (3–5 years), recruited from Early Care and Education settings (n = 24) located in a metropolitan city in the US. Analysis included descriptives, correlations, and multiple regression.

Results: For responsive feeding practices, positive associations included child's weight with unintentional modeling (β = .17, 95% CI [0.12, 0.53]), child vegetable consumption with behavioral role modeling (β = 0.22, 95% CI [0.17, 0.44]), and parent monitoring with verbal modeling (β = 0.21, 95% CI [0.12, 0.34]). For controlling

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feeding practices, parent restriction was positively associated with child weight concern (β = 0.22, 95% CI [0.13, 0.39]) and parent monitoring (β = 0.13, 95% CI [0.01, 0.19]), whereas child vegetable consumption was negatively associated (β = −0.16, 95% CI [−0.27, −0.05]). Pressure to eat was negatively associated with child weight concern (β = −0.18, 95% CI [−0.45, −0.09]), child fruit consumption (β = −0.12, 95% CI [−0.37, −0.01]), household income (β = −0.13, 95% CI [−0.30, −0.02]), and parent weight (β = −0.14, 95% CI [−0.60, −0.05]),

Conclusions: Findings highlight the importance of child characteristics when examining correlates of parent feeding practices, demonstrating bidirectional interactions between parent feeding practices and children's eating behaviors. Considering child-level correlates may improve the implementation of responsive feeding practices and reduce controlling feeding practices.

Keywords: Parents, preschoolers, correlates of feeding practices, childhood obesity prevention, responsive feeding practices

Introduction

Childhood obesity remains a serious public health issue in the United States. Nationally, the childhood obesity rate is 13.9% among 2- to 5-year-olds, putting millions of young children at greater risk for serious physical and mental health problems that can last a lifetime (Fryar et al., 2018). Children's poor eating habits are a risk factor for excessive weight gain and most children in the United States have suboptimal dietary adequacy and are not meeting nutritional recommendations (Centers for Disease Control and Prevention, 2014). Parents play an important role in shaping children's eating behaviors and prevent childhood obesity through their feeding practices in several ways including controlling availability and accessibility of foods in the home and by being their role models, agents of change, and educators (Birch and Davison, 2001; Golan, 2006; Hughes et al., 2005; Larson and Story, 2009; Vaughn et al., 2016).

Feeding practices refer to specific behaviors or strategies that parents use to influence children's food choices and acceptance patterns, eating behaviors, and weight status and can be broadly categorized into responsive and controlling feeding practices (Birch et al., 2001; Vaughn et al., 2016). Parents' responsive feeding practices is characterized by caregiver guidance and recognition of children's hunger cues and satiety, and parents' involvement that promotes children's healthy eating behaviors (Hughes et al., 2005). Examples of responsive feeding

practices includes household availability and accessibility of fruits and vegetables (Wyse et al., 2011), allowing children to control the amount of food they eat (Hughes et al., 2005), and modeling healthy eating (Goldman et al., 2012; Palfreyman et al., 2014). On the other hand, parents' controlling feeding practices refers to the extent to which parents show control and supervision in their feeding practices (Hughes et al., 2005), with little regard for the child's choices and preferences (Patrick et al., 2005). Controlling feeding practices may include pressure to eat and food restriction that are linked to negative outcomes in terms of eating behavior and weight status (Birch et al., 2001; Faith et al., 2004). Pressure to eat refers to pressuring children to eat more food and restriction refers to limiting access and intake of high sugar, high fat foods and the child's favorite foods and restricting the total amount of food intake (Birch et al., 2001).

Research has shown that many parental factors are associated with feeding practices such as parent age (Bante et al., 2008), parent education, (Brown et al., 2008), family income and child gender (Francis et al., 2001), feeding attitude and controlling practices (Birch et al., 2001; May et al., 2007), perceived child weight status (Birch and Fisher, 2000), and feeding styles (Hughes et al., 2005). While studies have examined the association between parental feeding practices and children's dietary outcomes and childhood obesity (Birch et al., 2001, Birch and Davison, 2001; Golan, 2006; Haines et al., 2018), the focus of these studies is more on controlling than responsive feeding practices (Birch et al., 2001; Birch and Davison, 2001; Birch and Fisher, 2000). Addressing correlates of feeding practices can be a target for childhood obesity prevention interventions and may help improve parents' use of responsive feeding practices and reduce controlling feeding practices.

Taken together, although feeding practices in the home environment offer opportunities to shape children's eating behaviors (Vaughn et al., 2016), research in this field has predominantly focused on controlling feeding practices than responsive feeding practices and limited research has explored child-level correlates of parental feeding practices. The present study examined the association of responsive and controlling feeding practices with child and parent level characteristics such as child gender, child fruit and vegetable consumption, household income, parent feeding attitudes and monitoring, home meal preparation. The overall purpose of this study was to identify the correlates of responsive and

controlling feeding practices among parents of preschoolers recruited from ECE centers located in a metropolitan city in the US. In this cross-sectional study, correlations do not imply causal relationships.

Methods

Participants and settings

Using a correlational research design (Plano Clark and Creswell, 2010), cross sectional survey data was obtained from parents (n =273) of children ages 3–5 years, recruited from twenty-four Early Care and Education (ECE) centers located in a metropolitan city in the US. The University Institutional Review Board (IRB) approved all protocol and procedures prior to the initiation of this study.

Data collection procedure

The first author obtained the list of ECE centers from the program coordinator of Nutrition and Physical Activity Self-Assessment for Child Care (Go NAPSACC) which included the zip codes of the ECE centers from different parts of the city who had participated in Go NAP SACC. The Go NAPSACC program is an evidence-based intervention which provides ongoing guidance to promote healthy eating and physical activity behaviors across ECE settings. The Go NAPSACC coordinator introduced the first author and the study to the ECE center directors. Finally, the first author contacted the ECE center directors via telephone to confirm their participation and to get the total count of parent packets needed to distribute to parents who had at least one child in the age group 3 to 5 years old enrolled in their center.

Data were collected between June 2015 and November 2016. The first author provided director and parent packets to ECE center directors. Director packets included a letter explaining the study, two flyers advertising the study, a $50 cash incentive for the center, and a receipt. Program directors were asked to post flyers advertising the study in the program and to distribute the surveys to parents. Parent survey packets (n=862) were given to the ECE center directors (n =24) to distribute to parents. Inclusion criteria for parents to participate in this survey

was having at least one child 3–5 years of age. Parent survey packets included the letter explaining study purpose and procedure, a survey, a copy of the consent form, a $1 bill, and fruit and vegetable stickers for preschool-age children. Parents were asked to read and keep the consent form. A waiver of signed informed consent was obtained from the IRB. Parents could opt out of the study by not returning the survey. Of the 862 parent surveys distributed, 273 were completed and returned via postage paid envelope. To ensure confidentiality, each survey was identified with an ID number, and no names appeared on the survey. The researcher asked the ECE center directors to send three email reminders to parents, one every 15 days.

Measures

Demographics. Demographic information of parents and their preschool-age child were collected. These demographic questions included parents' age (in years), gender, birthplace, race/ethnicity, marital status, education of parent and spouse, household income, parents' employment status, child age (in years), and child gender.

Child Feeding Questionnaire (CFQ; Birch, et al., 2001). The CFQ was used to measure parent attitudes, concerns, and practices regarding child feeding. The CFQ is a 28-item self-report parent questionnaire including seven subscales: perceived responsibility (3 items; α=0.89); parent perceived weight (4 items; α=0.71); perceived child weight (3 items; α=0.71); parents' concerns about child's weight (3 items; α=0.77); parent monitoring (3 items; α=0.91), parent pressure to eat (4 items; α=0.77), and parent restriction (8 items; α=0.73). Parent controlling feeding practices were measured by pressure to eat (4 items), and restriction (8 items). All items were measured using a 5-point Likert-type scale, with each point on the scale represented by a word anchor, with 1 indicating parents doing less of the activity and 5 indicating parents doing more of the activity.

Parental Modeling of Eating Behaviors Scale (PARM; Palfreyman et al., 2014). The PARM was used to examine parent responsive feeding practices such verbal, behavioral, and unintentional role modeling of healthy eating behaviors. PARM is a self-report measure consisting of 15 items using a 7-point Likert-type scale with three anchors ranging from "Strongly disagree," "Neutral," to "Strongly Agree" and higher

numbers indicating parental affirmation of the modeling behaviors. This measure includes three subscales: verbal modeling that examines how parents model their eating behaviors through verbal communication (6 items; α = 0.86); behavioral consequences explore mothers' intentionally modeling of healthy eating behaviors that their child then copies (6 items; α=0.82); and unintentional modeling that measures parental awareness of behaviors their children have copied, or have in common with their parent, which parents have not intentionally modeled (3 items; α=0.71).

Families Eat and Activity Overtime Survey (F-Eat Survey; Bauer et al., 2012; Berge, et al., 2012; Bruening et al., 2012). To measure parents' home meal preparation practices, three questions from the F-Eat Survey were completed by parents: The first question asked- who usually prepares food for your family? Parents had to choose all that apply with options such as "Me, Spouse/partner, Child/children, Other adult in the home, Other (please describe)."

The second question asked- how many hours per week do you normally spend preparing food for your family? Parents were asked to provide number of hours per week. The third question asked -how many hours per week does your spouse, partner, or another adult in your household spend preparing food for your family? Parents were asked to provide number of hours per week.

Child fruit and vegetable consumption (USDA Choose MyPlate*).* Children's fruit and vegetable consumption on a typical day was assessed using the USDA Choose MyPlate recommendations. Parents were asked "how many cups of fruit" and "how many cups of vegetables" does your child eat on a typical day.

Statistical analyses

Data were analyzed using SPSS version 26 (IBM Corp, 2020). Means, standard deviations, and frequencies were first used to summarize responses. Independent variables that did not have sufficient variability were not included in further analyses. These variables included marital status (78.5% married), race/ethnicity (88.7% White), participant gender (90% women), education (94.8% some college or more), work status (89.3% work fulltime), and food assistance (1.2–9% of sample are recipients). To evaluate preliminary associations, Pearson correlations

were conducted between demographics, other parental beliefs and practices (e.g. parent weight, child weight concern), and other variables of interest (e.g. meal preparation, child fruit and vegetable consumption) with both responsive and controlling feeding practices. Significant associations ($p < 0.05$) with coefficients greater than 0.10 were noted and included in the regression models. To account for correlations between responsive and controlling feeding practices subscales, in the regression analyses we also included any or all of the four other subscales (there are total of five: verbal modeling, unintentional modeling, behavioral modeling, pressure to eat, restriction) that surpassed the significance threshold during correlation analyses. Non-significant associations were not included in the regression analyses. The dependent variables (feeding practices) included verbal modeling, unintentional modeling, behavioral modeling, pressure to eat, and food restriction. The independent variables (excluding the feeding practices that were controlled for) were selected based on existing literature (Birch et al., 2001, Palfreyman et al., 2014) and from preliminary significant correlations. To account for linearity and multicollinearity, we examined the scatter plots of residuals and reported the variance inflation factor (VIF) for each of the independent predictors.

Results

This study examined the correlates of parent feeding practices (i.e. responsive and controlling feeding practices). Descriptive analyses (Tables 1 and 2) indicated that parents (N=273, M_{age}=34.46 years) use verbal (M= 4.83, SD =1.08), behavioral (M=5.24, SD =1.02), and unintentional (M=3.85, SD =1.15) role modeling practices, and use restriction (M=3.40, SD=0.73) and monitoring (M=3.86, SD =0.97).

Correlations between the variables are located in Supplemental Table S1. Eight independent variables, such as parent age, household income, child weight concern, parent weight, monitoring, child fruit consumption, child vegetable consumption, and time preparing meals, met the significance threshold and were included in the multivariable regression models (Table 3). The feeding practices subscales (i.e. dependent variables) were also correlated with each other (see Supplemental Table S1). Significance threshold were also included in regression

analyses. Results showed that the proposed model was better at explaining variance in verbal modeling (R^2=0.40), followed by behavioral modeling (R^2=0.37), restriction (R^2=0.21), unintentional modeling (R^2=0.25), restriction (R^2=0.22), and pressure to eat (R^2=0.21). Variance inflation factor (VIF) analyses revealed that the independent variables are not multicollinear (VIF=1.01–1.65).[1]

Results indicated three positive associations of responsive feeding practices: child weight concern, parental monitoring, and child vegetable consumption. Child weight concern was positively associated with unintentional modeling (β = 0.17, 95% CI [0.12, 0.53]) and parent monitoring was positively associated with verbal modeling (β= 0.21, 95% CI [0.12, 0.34]). Child vegetable consumption was associated with behavioral modeling (β= 0.22, 95% CI [0.17, 0.44]).

Results indicated more statistically significant associations with controlling than responsive feeding practices. For controlling feeding practices, there were two positive and five negative associations. Child weight concern (β=0.22, 95% CI [0.13, 0.39]) and parent monitoring (β=0.13, 95% CI [0.01, 0.19]) were positively associated with restriction, while child vegetable consumption was negatively associated with parent restriction (β=−0.16, 95% CI [−0.27, −0.05]). Household income (β=−0.13, 95% CI [−0.30, −0.02]), child weight concern (β=−0.18, 95% CI [−0.45, −0.09]), parent weight (β=−0.14, 95% CI [−0.60, −0.05]), and child fruit consumption (β=−0.12, 95% CI [−0.37, −0.01]) were negatively associated with pressure to eat.

Discussion

The purpose of this study was to identify the parent-and child-level correlates of responsive and controlling parental feeding practices for preschoolers in a metropolitan city located in the US. For parent controlling feeding practices (i.e. pressure to eat & restriction), significant correlates were child vegetable and fruit consumption (child-level characteristics), household income, parent weight, parent monitoring, and child weight concern (parent-level characteristics). For responsive feeding practices

1. VIFs exceeding 5 require further investigation and those exceeding 10 have serious multicollinearity problems and require correction.

Table 1. Distribution of potential correlates of parent feeding practices.

Variables	*N*	*%*	*Mean*	*SD*
Parent's gender				
Male	27	10		
Female	244	90		
Parent's age (in years)	270		34.46	5.3
Child gender				
Male	136	50.7		
Female	132	49.3		
Child age (in years)	266		3.95	.75
Marital status				
Single	40	14.8		
Married	212	78.5		
Divorced	14	5.2		
Other	4	1.5		
Race/Ethnicity				
White	235	88.7		
Black or African-American	17	6.2		
Hispanic or Latino	3	1.1		
Other	10	3.7		
Highest grade				
Did not finish high school	5	1.9		
Finished high school or got GED	9	3.3		
Some college or training after high school	46	17		
Finished college	136	50.4		
Advanced degree (MS, PhD, MD)	74	27.4		
Work status				
Work fulltime	241	89.3		
Work part time	21	7.8		
Stay at home caregiver	2	.7		
Currently unemployed	3	1.1		
Not working for pay	3	1.1		
Food assistance				
Food support/stamps	19	7.2		
EBT	24	9		
WIC	15	5.7		
TANF	6	2.3		
SSI	3	1.2		
Annual gross household income				
Less than $45,000	62	23.1		
$45,000 – $90,000	76	28.4		
$90,000 or more	130	48.5		
Persons living in household				
4 or fewer people	206	76		
5 or more people	65	24		

Continued

Table 1. (*continued*)

Variables	*N*	*%*	*Mean*	*SD*
Parent household role				
Mother	239	88.5		
Father	26	9.6		
Guardian	5	1.9		
Child fruit intake (per day)	268		3.41	.8
0-0.5 cups	23	8.6		
1-1.5 cups	133	49.6		
2 cups or more	112	41.8		
Child vegetable intake (per day)	267		2.96	.92
0-0.5 cups	75	28.1		
1-1.5 cups	124	46.4		
2 cups or more	68	25.5		
Who prepares food				
Respondent	246	90		
Spouse	129	47		
Child/children	14	5		
Other adult in the home	4	1		
Other	3	1		
Hours per week preparing food				
Respondent	266		6.61	3.78
Spouse, partner, or other adult	259		3.15	3.34
Child Feeding Questionnaire (CFQ) variables				
Parent responsibility	270		4.33	.65
Parent weight	270		3.15	.40
Child weight	270		2.92	.34
Child weight concern	270		1.38	.62
Parent restriction	270		3.40	.73
Parent pressure to eat	269		2.47	.96
Parent monitoring	269		3.86	.97
Role Modeling Scale (PARM) variables				
Verbal modeling	269		4.83	1.08
Unintentional modeling	269		3.85	1.15
Behavioral modeling	269		5.24	1.02

CFQ items were measured using a 5-point Likert-type scale, with 1 indicating parents doing less of these practices and 5 indicating parents doing more of these practices. CFQ subscales i.e. pressure to eat and restriction represents parent controlling feeding practices. PARM scales were measured using 7-point Likert-type scale with higher numbers indicating parental affirmation of the modeling behaviors. PARM subscales i.e. verbal, unintentional, and behavioral represents responsive feeding practices.

Table 2. Regression of parent feeding practices on correlates.

	Responsive feeding practices (PARM)			Controlling feeding practices (CFQ)	
Variable	Verbal	Unintentional	Behavioral	Pressure to eat	Restriction
			β±standard error		
Parent age	−0.04±0.01	–	–	−0.11±0.01	–
Household income	–	–	–	−0.13±0.07*	–
Child gender	–	–	–	–	–
Child age	–	–	–	–	–
Child weight concern	–	0.17±0.11**	–	−0.18±0.09**	0.22±0.07***
Parent weight	−0.10±.14	–	−0.04±0.13	−0.14±0.14 *	–
Responsibility	–	–	–	–	–
Monitoring	0.21±.06***	−0.08±0.07			0.13±0.04*
Child fruit consumption	–	–	–	−0.12±0.09*	–
Child vegetable consumption	–	–	0.22±0.07***	−0.09±0.08	−0.16±0.06**
Time prepping meals	0.05±.04	0.02±0.05	–	–	–
Verbal modeling (PARM)	–	0.18±0.07**	0.43±0.05***	0.06±.07	0.12±.04
Unintentional modeling (PARM)	0.15±.05**	–	0.23±0.05***	0.06±0.05	0.13±.04*
Behavioral modeling (PARM)	0.42±.06***	0.27±0.07 ***	–	–	–
Pressure to eat (CFQ)	0.08±.06	0.14 ±0.07*	–	–	0.24±0.04***
Restriction (CFQ)	0.11±.08*	0.13 ±0.10*	–	0.29±0.08***	–
Adjusted R^2	0.40	0.25	0.37	0.21	0.22
Variance Inflation Factor (VIF) range	1.06–1.30	1.02–1.65	1.01–1.20	1.11–1.29	1.09–1.31

Variance inflation factors (VIF) under 5 are appropriate and low in multicollinearity. Boxes with dashes (–) indicate non-significance of variable during initial correlation analyses and variables were not included in regression analyses.

* p <0.05 ; ** p < 0.01 ; *** p < 0.001

(i.e. unintentional, verbal, & behavioral role modeling), significant correlates were child vegetable consumption, child weight (child-level characteristics) and monitoring (parent-level characteristics). Findings of the current study adds to the feeding practices literature suggesting that parent feeding practices involves bidirectional interactions whereby feeding practices can influence and/or respond to child eating behaviors and vice versa. A recent study has indicated the importance of considering bidirectional associations between mothers' feeding practices and child eating behaviors (Jansen et al., 2018). Focus should be on correlates to improve or reduce controlling feeding practices.

Although limited, consistent with existing studies (Palfreyman et al., 2014), results of the current study showed that increased child vegetable consumption was associated with increased parent behavioral role

modelling. This is an encouraging and important finding given that existing studies have reported vegetables tend to be among the least preferred types of foods among young children (Cooke et al., 2003) and that children show high levels of food neophobia, which has been associated with lower vegetable intake (Fisher and Dwyer, 2016). It is likely that parents in the current study are consuming vegetables in front of their children (Vereecken et al., 2010). This repeated observational exposure of eating vegetables in front of children by primary caregivers have shown to develop vegetable preferences, acceptance (Fisher and Dwyer, 2016), and consumption (Fisher et al., 2002) among children. Moreover, it is also possible that children are responding and adapting well to eating vegetables which serves as the reinforcement for parents to continue to offer these foods, suggesting that future studies should include child-level factors when examining correlates of feeding practices. Parents avoid repeatedly offering new vegetables to children who show externalizing temperaments (e.g. hyperactive and aggressive) to avoid negative interactions (Vollrath et al., 2012). The current study adds to the feeding practices literature suggesting that parent behavioral role modelling is important for children vegetable consumption in the home setting and that child eating behaviors (e.g. child vegetable intake) is a critical component when examining the correlates of parent feeding practices and targeting interventions to improve children's vegetable consumption.

Increased child weight was found to be associated with increased parents' unintentional role modelling (i.e. children adopting eating behaviors that parents had not actively modelled). While there are no existing studies that support this finding, it is shown that parents unintentionally act as role models for their children's less healthy food (Palfreyman et al., 2014).

Furthermore, results showed that increased parent monitoring was associated with both increased restriction of foods and increased verbal role modeling in consistent with existing studies (Birch et al., 2001; De Lauzon-Guillain et al., 2009). It is likely that parents in this study are monitoring (i.e. keeping track) children's dietary intake by increasing restriction on children's junk foods and practicing verbal role modeling to encourage children to eat healthy foods such as vegetables. Studies have mentioned that mothers have reported greater monitoring of their children's food intake and ate with children more frequently than

fathers (Blissett and Haycraft, 2008). Parents use of monitoring practices need further research because existing studies have indicated that monitoring is a form of controlling feeding practice (Birch et al., 2001) while others have suggested moderate use of monitoring practices is beneficial to children's outcomes (Faith et al., 2004).

Regarding controlling feeding practices, consistent with existing research (May et al., 2007), increased parental concern about child's weight was associated with decreased pressure to eat and increased restriction. Increased parent restriction was related to decreased child vegetable consumption. Additionally, more pressure to eat was associated with decreased child fruit consumption which in consistent with the existing studies (Fisher and Birch, 2002; Fisher et al., 2002). It is likely that parents who consume fewer fruits use more pressure in feeding their children (Fisher et al., 2002). Also as reported in the existing literature, parents use pressure to eat when children are underweight/lighter weight (Keller et al., 2006) or children eat little (Jansen et al., 2017), whereas use of restriction occurs when parents are concerned about children being heavier/overweight (Keller et al., 2006; May et al., 2007), or children have low vegetable intake (Fisher and Birch, 1999a, 1999b) with an intention to improve children's overall nutritional intake (Cachelin and Thompson, 2013; Francis et al., 2001). It may be advantageous in future research to include child's actual weight status (e.g. underweight, normal weight, overweight or obese) and Body Mass Index (BMI) when examining parent feeding practices to gain a clearer picture of parents' concern about child weight.

It is interesting to note that the results of the current study indicated that increased parent weight is associated with decreased pressure to eat, in contrast with the findings of the existing literature (Haycraft and Blissett, 2008). Existing literature has shown that restriction and pressure to eat are predicted by parent's own eating behaviors, their weight status, children's current weight status, and parent concern about their child's future risk of overweight (Birch and Davison, 2001; Haycraft and Blissett, 2008). Given that the current study did not examine parents' actual weight status (e.g. underweight, normal weight, overweight or obese) and their own eating behaviors, future studies should include these variables to better understand parents' attitude about their weight and children's eating behaviors when examining correlates of parent feeding practices.

Furthermore, increased household income was associated with decreased pressure to eat, consistent with the literature (Francis et al., 2001; Power et al., 2015). It is likely that parents with resources are not worried about food waste and therefore may not pressure children to finish food on their plate. On the contrary low-income mothers are more likely to pressure their children to eat as a result of experiencing food insecurity (Power et al., 2015).Therefore, it is likely at times when mothers can provide their child with a good meal, they may pressure their children to eat despite the child has indicated that he or she is all done eating. It is also likely that mothers may want their children to consume enough food to meet their daily energy requirements or they feel confident that know better than their child when the child has eaten enough. Another reason might be low-income mothers may pressure the child to eat is to save time or to make sure that the child does not go to bed hungry. There is limited research both qualitative and quantitative to explore the reasons for such finding. Future studies are needed on how education-level and food insecurity moderate the relationship with household income to predict controlling feeding practices such as pressure to eat.

Child gender was not associated with parent feeding practice in the current study. The fact that we found no association supports previous studies (Blissett et al., 2006, Blissett and Haycraft, 2008) which suggested that mothers and fathers do not differ in their use of pressure and restrictive feeding practices or treat their male and female children differently in feeding settings and that mothers tend to report greater monitoring and eating with children than do fathers (Blissett et al., 2006). However, this does not mean that there are no different relationships between food liking and consumption for male and female children. Studies have indicated that girls like and consume fruit and vegetables more than boys (Cooke and Wardle, 2005). Future studies with larger sample size representative of both mothers and fathers would be required to examine child gender and parent feeding practices.

An important limitation of this study is the self-reported nature of the measures. While self-reporting is the practical way to assess behaviors in a large-scale survey, it may be subject to parents' biases. Another limitation is the cross-sectional design of this study which does not allow us to determine causality. Additionally, while there is limited generalizability of the study results because the sample was from a metropolitan city located in the US, and consisted of highly educated and

primarily White mothers, the results are applicable to similar contexts. While much further work is required with larger datasets to explore this suggestion fully, further examination of responsive feeding practices and child vegetable intake in economically and ethnically diverse samples is warranted. Additionally, given the emerging role of fathers' feeding practices, (Litchford et al., 2020), future studies should also include fathers along with mothers.

Taken together, the results of the current study have implications for Extension and public health professionals (e.g. childhood obesity prevention researchers and nutrition educators) and health professionals (e.g. pediatrician, nurse, dietician). Overall, while we found more correlates of controlling feeding practices (i.e. pressure to eat & restriction) as compared to responsive feeding practices (i.e. unintentional, verbal, & behavioral role modeling), the current study has demonstrated and adds to the feeding practices literature suggesting that child-level correlates of parent feeding practices are important and that parent feeding practices involves bidirectional interactions whereby feeding practices can influence and/or respond to children's eating behaviors and vice versa. Findings of this study underscore the need for considering child-level correlates when planning nutrition programs to improve parental feeding practices. When educating parents about feeding practices, it would be helpful to elicit parents' prior knowledge, belief system, attitude, and assumptions to address misconceptions and offer key reliable sources of educational materials and information on responsive parenting practices and provide feeding advice to parents on how to respond appropriately to children's eating behavior. Parents' responsive feeding practices can establish healthy eating habits among preschoolers early in life which is critical to childhood obesity prevention and the development of children's lifelong healthy eating behaviors whereas controlling feeding practices may be counterproductive and put young children at risk for developing detrimental eating patterns and possible obesity.

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Authors' contributions All authors conceived the overall aims of this study. DS conducted the data collection, wrote the introduction, methods, and discussion sections. LRZ completed all data analyses and wrote the results section with all authors

overseeing all statistical analyses. DAD read, critically reviewed, provided suggestions, and edited the manuscript. All authors contributed to interpretation of the findings. and approved the final manuscript.

Availability of data and materials Data can be made available upon request and after application to the Principal Investigator.

Conflicting interest The authors declare no potential conflicts of interest with respect to this study, the authorship and publication of this study.

Consent and approval This study was approved by the University Institutional Review Board.

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Supplemental Material follows the **References**.

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Supplemental Material follows.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2,3,4
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4,5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	NA
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5,6,7
Bias	9	Describe any efforts to address potential sources of bias	13
Study size	10	Explain how the study size was arrived at	4,5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7,8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7,8
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4,5
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	NA
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA

		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	8,9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13,14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	13,14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.