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Parental control and overconsumption of snack foods in overweight and obese children

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ABSTRACT

The associations between snack food consumption, parent feeding practices and general parenting in overweight in obese children are largely unknown. Therefore, we examined these relationships in 117 treatment-seeking overweight and obese children (10.40 ± 1.35 years; 53% female; 52% Caucasian; BMI-z: 2.06 ± .39). Children consumed a dinner meal, completed an Eating in the Absence of Hunger (EAH) free access paradigm (total EAH intake = EAH%-total; sweet food intake = EAH%-sweet), and completed the Child Report of Parent Behavior Inventory. Parents completed the Child Feeding Questionnaire. Child EAH%-total and EAH%-sweet were positively associated with dinner consumption (p's < .01). Girls had significantly higher EAH%-total compared to boys (p < .05). In separate models, higher EAH%-total was associated with greater use of maternal psychological control (p < .05) and EAH%-sweet was positively associated with parent monitoring (p < .05). In analyses examining factors associated with the consumption of specific foods, EAH snack food, parent restriction, pressure to eat, monitoring, and maternal psychological control were positively correlated with intake of Hershey's® chocolate bars (p's < .05). In summary, parental monitoring is associated with child sweet snack food intake and maternal psychological control is associated with child total snack food consumption. Future research should evaluate the complex relationship between child eating and parenting, especially with regard to subgroups of foods.

1. Introduction

Childhood overweight and obesity affects approximately one-third of all children in the United States, impacting an estimated nine million children (Ogden, Carroll, Kit, & Flegal, 2014). Unfortunately, child eating behaviors and weight status have been shown to remain consistent well into adulthood (Craigie, Lake, Kelly, Adamson, & Mathers, 2011; Singh, Mulder, Twisk, van Mechelen, & Chinapaw, 2008). Although children who are overweight are often assumed to be a homogeneous group, there is a growing interest in defining behavioral phenotypes to ultimately explore etiological mechanisms and to develop targeted treatments (Boutelle et al., 2014; Field, Camargo, & Ogino, 2013). Excessive intake of highly palatable calorie dense foods is one of the most proximal causes of rising obesity rates during the past three decades (Swinburn et al., 2009). The current obesogenic environment, which provides continuous access to highly palatable foods in combination with limited physical activity options, may promote overeating especially among children that experience higher levels of food cue responsivity or have a tendency to engage in disinhibited eating behaviors. Thus, it is crucial to identify the factors that contribute to overeating in children in order to better determine mechanisms to target in prevention and treatment interventions.

Eating in the absence of hunger (EAH), a measure of disinhibited eating, has been implicated in the behavioral etiological pathway of obesity in children (Birch, Fisher, & Davison, 2003a; Faith et al., 2006). EAH is typically measured using a laboratory paradigm

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that evaluates the amount of food consumed during a free access snack session after a meal (Birch, Fisher, & Davison, 2003b). Studies using the EAH paradigm have shown that EAH was positively related to girls' weight-for-height (Cutting, Fisher, Grimm-Thomas, & Birch, 1999) and overweight status among five and seven year old girls, even after adjusting for sex and age-based intake requirements (Fisher & Birch, 2002). In a Hispanic-only sample of 5–18 year olds, overweight children consumed 6.5% more calories during the EAH paradigm than non-overweight children (Fisher, Cai, et al., 2007a; Fisher, Liu, Birch, & Rolls, 2007b). When comparing intake across discordant weight siblings, older overweight and obese siblings consumed more calories in an EAH paradigm compared to both older and younger normal weight siblings (Kral et al., 2012). Finally, longitudinal studies of overweight girls have found that EAH increased over eight years regardless of weight-status (Francis, Ventura, Marini, & Birch, 2007); in addition, greater increases in EAH were observed two (Fisher & Birch, 2002) and four years later (Shunk & Birch, 2004) in longitudinal studies of overweight five-year-old girls. Conversely, some studies have found no significant relationships between EAH and weight gain over a one-year time period after controlling for baseline weight, age, sex, and pubertal status (Butte et al., 2007). For example, several studies with 7–12 year old children (Moens & Braet, 2007) found that increased weight was associated with decreased EAH food consumption. It was speculated that high social desirability, particularly among girls, may explain this inverse relationship (Hill et al., 2008). Given the lack of agreement in studies regarding the relationship between weight and EAH intake (Butte et al., 2007; Hill et al., 2008; Moens & Braet, 2007), and that not all overweight children universally display this behavior (Hill et al., 2008; Sonneville et al., 2013), EAH may represent a unique disinhibited eating behavior within the heterogeneous obese population.

Some limitations in the current cross-sectional and longitudinal studies may explain the mixed findings regarding the association between EAH and weight. For instance, not all studies estimated energy intake equations to calculate energy consumed based on age and sex during the EAH snack paradigm (Fisher & Birch, 2002; Fisher, Liu, et al., 2007b; Kral et al., 2012; Shunk & Birch, 2004). Furthermore, the majority of studies have evaluated EAH across weight status, including both normal weight and overweight children (Birch et al., 2003b; Butte et al., 2007; Faith et al., 2006; Fisher & Birch, 2002; Fisher, Cai, et al., 2007a; Fisher, Liu, et al., 2007b; Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002). Cross-sectional studies that compare overweight and normal weight groups are valuable for illustrating general characteristic differences between these populations, but these studies do not specifically describe the EAH phenotype that may be more pronounced in overweight children. Better understanding this phenotype could help produce more targeted interventions for overweight children.

Parents play a critical role in the development of eating behaviors in children and could be associated with aberrant eating behaviors, such as EAH. Parent feeding practices, such as controlling feeding practices, restriction, and pressure to eat, are common approaches used by parents in an attempt to encourage children to consume a healthy diet (Faith, Scanlon, Birch, Francis, & Sherry, 2004). However, these feeding practices may not be effective in promoting healthy eating behaviors in children (Savage, Fisher, & Birch, 2007). Moreover, controlling food intake, instead of allowing children to respond to their own internal cues of hunger and satiety, may disrupt the child's ability to self-regulate and could lead to disinhibited eating (Rollins, Savage, Fisher, & Birch, 2015). For example, pressuring a child to eat and encouraging a child to eat beyond satiety are feeding practices that are positively associated with overeating in young children (Birch et al., 2003b; Faith et al., 2004; Fisher & Birch, 2002; Kral & Faith, 2008; Remy, Issanchou, Chabanet, Boggio, & Nicklaus, 2015). In a longitudinal study of five year old girls, the use of restrictive feeding practices predicted EAH two years later, even after controlling for Body Mass Index (BMI) and baseline EAH intake (Fisher & Birch, 2002). Another study found that restrictive feeding practices among overweight mothers of five-year-old girls predicted EAH four years later (Francis & Birch, 2005). Other feeding practices such as using food to regulate emotions are also related to increased child consumption of sweet foods in the absence of hunger (Blissett, Haycraft, & Farrow, 2010). These studies suggest the unintentional impact of parent feeding practices on the development of a potentially maladaptive eating behavior.

However, specific parent feeding practices do not act alone and exist within the broader context of general parenting style. It is possible that general parenting style affects child eating behavior via parent feeding practices. General parenting style includes higher-order constructs that contribute to the socio-emotional context of the parent–child interaction (K. Rhee, 2008), and provide a framework for which children interpret the specific parenting practices that parents implement (K. Rhee, 2008). General parenting style, often defined by varying levels of warmth, support, and behavioral and psychological control (Schludermann & Schludermann, 1988), has been associated with child food intake in cross-sectional studies and may promote or maintain maladaptive eating behaviors (Rodenburg, Oenema, Kremers, & van de Mheen, 2012; van der Horst et al., 2007). Cross-sectional studies suggest that an authoritative parenting style, compared to authoritarian parenting style, was associated with lower adolescent caloric intake when combined with limitations on sugar sweetened beverages (van der Horst et al., 2007). In another study, parenting characterized by high levels of warmth and support with clear communication and appropriate boundary-setting has been associated with greater fruit and vegetable intake (Kremers, Brug, de Vries, & Engels, 2003; Schmitz et al., 2002). Firm maternal parenting has also been associated with decreased snacking in overweight children (K. E. Rhee et al., 2015). Conversely, high parental psychological control (control of child's behavior through psychological means such as love withdrawal and guilt induction), combined with low support and low behavioral control, has been correlated with lower fruit consumption in children (Rodenburg et al., 2012). Although these studies suggest that general parenting style may influence child overeating, there is no available research exploring the relationship between general parenting style and aberrant eating behaviors, such as EAH. Given the crucial role that parents play in facilitating healthy eating behaviors and weight change, it is important to examine the unique contribution of both parent feeding practices and general parenting with child EAH.

EAH is measured using a laboratory paradigm, in which the child is fed a meal until full, and then is given free access to a variety of foods. These foods range from sweet and salty snack foods to buffet foods, and very little attention has been paid to overconsumption of specific types of foods in the EAH paradigm. Combining all foods consumed in the EAH is based on the assumption that eating behavior is the same across foods. However, sweet foods may contribute more to overeating as sweet taste preferences are influenced by innate biology and learned experiences (Conner, Haddon, Pickering, & Booth, 1988; Ventura & Mennella, 2011; Drewnowski, Mennella, Johnson, & Bellisle, 2012). Although there is much controversy as to the role of sweet foods in the development of obesity (Benton, 2010), sugar in particular has been studied as a contributor to food addiction, referencing a specific uncontrollable drive to eat sugar (Avena, Rada, & Hoebel, 2008). Foods high in sugar may contribute to overeating through hormonal and

metabolic changes in eating (Ludwig et al., 1999). Furthermore, parents may also behave differently with sweet foods, compared to other foods, especially in overweight and obese children, and may restrict and/or monitor their child's consumption of these foods more than others (Seburg et al., 2014). Currently, no study has uniquely examined the consumption of sweet foods specifically in the EAH paradigm.

Thus, the present study seeks to evaluate the associations between child EAH (EAH-total and EAH-sweet), parent feeding practices and general parenting among a sample of 7–12 year old overweight and obese children and their parents. This study proposes to examine these relationships in an entirely overweight and obese sample (as opposed to a healthy weight or heterogeneous weight sample). Since EAH is a behavioral phenotype more characteristic of overweight and obese individuals, examining a sample within this specific weight range allows for a more focused evaluation of this disinhibited eating behavior to ultimately develop targeted interventions. This study also evaluates these relationships in grade-school aged children instead of younger children, as the majority of weight-loss programs for children are conducted in this age range (A. Ho, Kennedy, & Dimitropoulos, 2012; M. Ho et al., 2013). In line with previous research, we hypothesize that controlling parent feeding practices (characterized as restriction, monitoring, and pressure to eat) will be positively associated with child total EAH and sweet food consumption in our sample. In terms of general parenting, we hypothesize that higher rejection, psychological control, and lax control will be associated with greater child EAH and sweet food intake.

2. Methods

2.1. Participants

Data were obtained at the baseline assessment (prior to treatment) for 117 treatment seeking overweight and obese (BMI > 85th %ile) 7–12 year old children (mean age = 10.40 ± 1.40 years; 53% female; 54% Caucasian; BMI-z: 2.06 ± .39) and their parents (42.40 ± 6.20 years; 91% female; 70% Caucasian; BMI: 31.70 ± 7.00 kg/m^2; see Table 1). Study recruitment took place in the greater Minneapolis/St. Paul area of Minnesota. Physician referrals, direct mailings, and advertisements were all used to recruit participants interested in a research study evaluating a treatment for overeating (Boutelle et al., 2011). Participants were excluded if either parent or child was currently participating in a weight-loss treatment, taking a medication that would affect weight loss or appetite, had any food allergies, did not like to eat cheese pizza, or did not speak English. All participating parents signed an informed consent form and all participating children provided an informed assent. The University of Minnesota Institutional Review Board approved this study. All data analyzed for this manuscript were obtained during the baseline assessment visit.

Table 1
Participant characteristics.

	N = 117 pairs
Child	
Sex (% female)	53%
Mean Age (SD)	10.42 (1.35)
Race	
Caucasian	54%
African American	14%
Multi-Race	20%
Other	12%
BMI	27.22 (4.56)
BMI-Z	2.06 (.39)
EAH (percent of daily caloric needs)	15.22 (11.60)
	Range = .24–96.25
Parent	
Gender (% female)	91%
Marital Status (% currently married)	69%
Education (% college graduates)	58%
Race	
Caucasian	70%
African American	15%
Multi-Race	8%
Other	7%
BMI	31.82 (6.97)

2.2. Measures

Eating in the Absence of Hunger (EAH). EAH was assessed using a free access paradigm. Children were instructed to arrive hungry to the laboratory. All visits took place in the late afternoon or early evening. Upon arriving at the laboratory, each child ate a standard *ad libitum* dinner, which included cheese pizza, carrots, applesauce, and beverage choices of milk, juice, or water with their parent. Child satiety levels were measured using a self-report cartoon representation of three levels of fullness (Faith et al., 2006), in addition to two questions that asked each child about his or her level of hunger and fullness using a 1–5 scale (1: "not at all hungry/full" to 5: "extremely hungry/full") (Boutelle et al., 2011). If a child was not full (rated 4 or 5 on the scale), they were encouraged to eat until they were full. Calories consumed during the dinner were recorded. Ten minutes after the child and parent finished dinner, they were separated and the child was brought to a private room and asked to complete a taste test with small pre-weighed bowls of 11 sweet and savory snack foods (popcorn (277.34 g), Cheez-its® (344.67 g), potato chips (224.33 g), pretzels (302.58 g), Cheetos® (277.34 g), Fig Newtons® (199.90 g), Hershey's® chocolate bars (477.72 g), Skittles® (44.44 g), M & M's® (416.59 g), chocolate chip cookies (223.01 g), and Jelly Belly® jelly beans (459.30 g)) while the parent completed a survey. Following the taste test, the child was left alone for a 10-min free access session, with toys, games, and the snack foods. After 10 min, the research assistant returned to the room, and the remaining food was weighed. Percent of daily caloric needs consumed during both dinner (Dinner%) and the free access paradigm (EAH%-total) was calculated by taking the number of calories consumed by the child and dividing by the child's estimated daily caloric needs based on formulas taking into account weight, age, height, sex and physical activity level. As a conservative measure, a physical activity level of "low active" was used for all children (Trumbo, Schlicker, Yates, Poos, & Food and Nutrition Board of the Institute of Medicine The National Academies, 2002). We also evaluated the percent of daily calorie needs consumed in sweet foods in the EAH paradigm (EAH%-sweet; chocolate chip cookies, M & M's®, Skittles®, Jelly Belly® jelly beans, Hershey's® chocolate bars, and Fig Newtons®).

Parent feeding behavior. Parents completed the *Birch Child*

Table 2
Correlations among EAH%-total, EAH%-sweet, demographics, and dinner. calories.

	1	2	3	5	6	7
1. EAH%-Total	–	**.963*** **	−.099	.031	.152	**.269****
2. EAH%-Sweet		–	−.165	−.049	.147	**.283****
3. Child age			–	.311**	−.012	−.337***
5. Child BMI				–	.338***	−.150
6. Parent BMI					–	.153
7. Dinner %[a]						**–**

*p < .05, **p < .01, ***p < .001.
[a] Dinner calories = calories consumed at dinner as a percentage of daily caloric requirements.

Feeding Questionnaire (CFQ) (Birch et al., 2001), which is a 31-item survey assessing parent attitudes and practices regarding child weight and eating behaviors. Of the seven subscales, *Restriction* (e.g., I have to be sure that my child does not eat too many high-fat foods), *Pressure to Eat* (e.g., My child should always eat all of the food on her plate), and *Monitoring* (e.g., How much do you keep track of the sweets (candy, ice cream cake, pies, pastries) that your child eats?) were included in the analyses. This measure has demonstrated adequate validity and reliability (Birch et al., 2001; Kaur et al., 2006). In the current study, internal consistency was acceptable (Cronbach's α's = .70-.91), except for the pressure to eat subscale (Cronbach's α = .56).

General parenting. Children completed the *Child's Report of Parental Behavior Inventory (CRPBI-30)* (Schludermann and Schludermann, 1988), a 30-item questionnaire that asks the child to rate how much each statement is reflective of their mother's behaviors on a 3-point scale (1 = not like parent, 2 = somewhat like parent, 3 = a lot like parent). Statements load onto three parenting dimensions: acceptance vs. rejection, psychological control vs. autonomy, and firm vs. lax control. These scales have demonstrated good test-retest reliability, as well as significant associations with various aspects of family functioning and child outcomes (B. Collins & Collins, 1990; Schaefer, 1965; Schluder & Schluder, 1970; Steinberg, Dornbusch, & Brown, 1992; Steinberg, Elmen, & Mounts, 1989). In the current study, adequate internal consistency was observed for each subscale (Cronbach's α's = .74 - .88). Because the majority (91%) of the parents who participated in the study and attended the sessions were mothers, we utilized child report of their mother's parenting style on the CRPBI-30.

Anthropometrics. Children were weighed using a calibrated scale, and height was measured using a standard stadiometer, in duplicate. The average weight and height for each child was converted to body mass index (BMI, kg/m^2). BMI and BMI percentiles-for-age were calculated using the Center for Disease Control and Prevention 2000 growth charts (Kuczmarski et al., 2002).

Demographics. Demographics, including child age and gender, were obtained through self-report surveys.

2.3. Analyses

Pearson correlations were used to determine associations between EAH%, EAH%-sweet, Dinner %, child demographics, and child and parent BMI. Correlations with EAH% salty were initially included in order to determine whether or not any relationships with EAH% total were driven by the influence of salty snacks or sweet snacks. However, because the model with EAH%-salty was not significant, further analyses with EAH% salty were not conducted. Separate linear regression models were used to evaluate the relationship between parent feeding practices and child EAH %-total and EAH%-sweet. Similarly, separate linear regression models were used to evaluate the relationship between general parenting styles and child EAH%-total and EAH%-sweet. All regression models controlled for demographic and BMI variables that were significantly correlated with EAH%-total and EAH%-sweet (seeTable 2 and results section for specific variables).

3. Results

3.1. EAH%-total, EAH%-sweet, dinner consumption, parenting and demographics

EAH%-total in this sample of overweight children showed a wide variability as expected, and ranged from .24% to 96% (M = 15%, SD = 12%) of estimated total daily caloric intake requirements. EAH %-sweet ranged from 0% to 93% (M = 12%; SD = 11%). Children consumed an average of 28% (SD = 10%) of daily caloric needs at dinner. The proportion of EAH%-sweet to EAH%-total was .76, thus there was a higher proportion of calories consumed from sweet foods compared to total EAH calories consumed.

Correlations between demographic variables (child age, child BMI, parent BMI), Dinner%, and EAH%-total and EAH%-sweet showed that dinner% was positively associated with both EAH %-total (r = .27, p < .01) and EAH%-sweet (r = .28, p < .01) (see Table 2). Independent samples t-tests showed that girls had significantly higher total EAH%-total than boys, $t(115)$ = -2.009, p = .041 (girls M = 17% (SD = 14%); boys M = 13% (SD = 8%). However, this effect was not significant once the foods were limited to sweet foods only, $t(115)$ = -1.727, p > .05 (EAH%-sweet; girls M = 13% (SD = 13%); boys M = 10% (SD = 6%); p > .05). Thus, subsequent regression analyses with EAH% controlled for child sex and Dinner%. Analyses with EAH%-sweet controlled for Dinner%. No other demographic variables were significantly associated with EAH% or EAH%-sweet in this sample.

We conducted t-tests to examine gender differences in parenting styles and feeding practices received. We found that boys (M = 21.71, SD = 3.489) reported higher maternal firm control than girls (M = 20.28, SD = 3.195), $t(106)$ = 2.216, p = .029. There were no other significant gender differences in parenting styles and feeding practices (all p's > .05). Child age was significantly negatively correlated with maternal acceptance (r = –.246, p = .01) and maternal psychological control (r = –.310, p = .001) and significantly positively correlated with maternal firm control (r = .195, p = .043).

We examined correlations between parent feeding practices and general parenting style and found that only psychological control was significantly positively correlated with pressure to eat (r = .226, p < .05).

3.2. Parent feeding practices and child EAH

Separate multiple linear regression analyses were conducted between parent feeding practices and child EAH%-total and EAH %-sweet (Table 3). The overall model was significant for EAH %-total (F (5,111) = 3.878, p = .003); however, none of the parent feeding practices independently significantly predicted child EAH %-total (all p's > .05). In terms of EAH%-sweet, the overall model was also significant (F (4,112) = 4.778, p = .001) and parent monitoring was significantly and positively associated with EAH %-sweet (β = .181, p = .048).

3.3. General parenting and child EAH

Separate multiple linear regression analyses, controlling for child sex and Dinner%, were conducted for general parenting with child EAH%-total and EAH%-sweet (Table 4). The overall model was significant for EAH%-total (F (5,93) = 3.732, p = .004), as maternal psychological control was significantly associated with EAH%-total (β = .213, p = .039). In terms of EAH%-sweet, the overall model was also significant (F (4,94) = 3.620, p = .009); however, none of the general parenting styles were individually significantly related to EAH%-sweet (all p's > .05).

3.4. Exploratory analyses

Because our results were mixed in terms of the relationship between parent feeding and general parenting and EAH%-total and EAH%-sweet, we decided to post-hoc explore the relationships among the individual foods used in the EAH paradigm to investigate which foods in particular were primarily influencing the associations between parenting and EAH. Notably, there was

Table 3
Linear regression analyses evaluating the relationship between child EAH%-total and EAH%-sweet with child feeding scores (CFQ).

	EAH(%)-total[a]				EAH(%)-sweet[b]			
	B	SE	β	CI[c]	B	SE	β	CI[c]
Restriction	.023	.018	.121	-.011 to .058	.020	.016	.113	-.012 to .051
Pressure to Eat	.009	.015	.057	-.021 to .039	.012	.013	.083	-.015 to .038
Monitoring	.022	.012	.163	−.002 to .047	.022	.011	.181*	.000 to .044

*$p < .05$.
[a] Child sex and dinner calories included as covariates in model.
[b] Dinner calories included as covariate in model.
[c] 95% Confidence interval for B coefficient.

Table 4
Linear regression analyses evaluating the relationship between child EAH%-total and EAH%-sweet with parenting style scores (CRPBI-30).

	EAH(%)-total[a]				EAH(%)-sweet[b]			
	B	SE	β	CI[c]	B	SE	β	CI[c]
Acceptance	−.002	.003	−.062	−.009 to .004	−.001	.003	−.041	−.007 to .005
Psychological Control	.006	.003	.213*	.000 to .011	.005	.003	.182	-.001 to .010
Firm control	.002	.004	−.056	−.009 to .005	−.003	.003	−.090	−.010 to .004

*$p < .05$.
[a] Child sex and dinner calories included as covariates in model.
[b] Dinner calories included as covariate in model.
[c] 95% Confidence interval for B coefficient.

variation between the individual foods on the amount of calories that were consumed (Table 5). This emphasizes the uniqueness of each food and suggests that each food may differentially relate to parenting. Thus, Pearson correlations were utilized to evaluate the relationships between parent feeding variables, general parenting style variables, and percent of daily calories consumed of the sweet foods presented in the EAH paradigm: Fig Newtons®, Hershey's® chocolate bars, Skittles®, M & M's®, chocolate chip cookies, and Jelly Belly® jelly beans. Results showed that Hershey's® chocolate bar intake was significantly positively correlated with restriction ($r = .222$, $p < .05$), pressure to eat ($r = .295$, $p < .01$), monitoring ($r = .197$, $p < .05$), and maternal psychological control ($r = .258$, $p < .01$). There were no other correlations between parenting variables and specific sweet foods (all p's > .05).

4. Discussion

This study is the first to evaluate the association between parenting and EAH%-total and EAH%-sweet in a sample of treatment-seeking overweight and obese children. Results suggest that our hypotheses were partially supported. Both parent feeding practices (i.e., monitoring) and general parenting (i.e., maternal psychological control) were associated with higher levels of child EAH%-sweet and EAH%-total respectively. Girls in this sample ate significantly more of their daily caloric needs in the EAH paradigm compared to boys. Additionally, in contrast to previous weight heterogeneous samples, this sample consisted entirely of overweight and obese sample of children. Notably, EAH ranged from .24% to 96%, suggesting that not all overweight and obese children display this behavior and that individual differences in this variable are particularly important to examine. Exploratory analyses of relationships between parenting and specific foods in the EAH paradigm revealed that child intake of Hershey's® chocolate bars was associated with parental restriction, pressure to eat, monitoring, and maternal psychological control.

We conceptualized that parent feeding practices exist within the broader context of general parenting style. In fact, we found that psychological control was significantly positively correlated with pressure to eat. Thus, it is possible that pressure to eat affects EAH via general parenting. However, not all feeding and general parenting variables were related, suggesting that specific feeding and general parenting might also independently affect child overeating. Results also indicated that monitoring and perceived maternal psychological control were related to increased child EAH %-sweet and EAH%-total respectively. Parent monitoring and maternal psychological control may represent more indirect methods of parental control that are being used in response to the child's eating behaviors. From a developmental standpoint, it is possible that younger children (i.e. younger than 7 years old) may be more responsive to more overt parent control over eating whereas older children (7–12 years old), such as that in our sample, may be more impacted by psychological forms of general maternal control strategies to manage eating behaviors. Psychological control is also seen as a coercive and maladaptive parenting style that may lead to problematic eating behaviors such as EAH. This study's data suggest that children who perceive their mothers as using more coercive practices to reduce their overeating or that those children who perceive more psychological control from their mothers tend to eat more beyond satiety. Thus, controlling feeding practices and maternal parenting styles may have a paradoxical effect on child overeating. In the EAH laboratory paradigm, parents are not present in the room, thus when children perceive parental control as being temporarily lifted during the free access portion of

Table 5
Means and Standard deviations of calories consumed for individual foods presented in EAH paradigm.

EAH food	Mean	Standard deviation
Popcorn	7.28	15.32
Cheez-its®	22.28	34.11
Cheetos®	24.83	38.06
Potato chips	23.07	42.47
Pretzels	5.14	13.56
Skittles®	47.63	67.00
Hershey's® chocolates	98.93	129.88
Chocolate chip cookies	63.25	78.24
Jelly beans	23.23	43.64
M & M's®	33.29	53.58
Fig Newtons®	17.27	36.30

the task, they may overcompensate by eating foods that are typically viewed as "forbidden." In interpreting the results of this study, it is important to consider the bidirectional nature of the relationship between child overeating and parenting. It is also possible to conceive that EAH can likewise elicit greater parental control.

In terms of parental restriction, the results from this study both support and refute previous research. In our sample of overweight and obese children in later childhood/preteen years, restrictive feeding style was not associated with EAH%-total or EAH%-sweet. With the exception of parental monitoring, our findings mirror those of another study of healthy and overweight 8–13 year old children which did not find that parental pressure to eat, monitoring and restriction were associated with child EAH (Moens & Braet, 2007). Both studies included samples of older participants in grade school and middle childhood, which may explain the discrepancy in findings compared to other studies that focused primarily on preschool age children that suggested that restrictive feeding practices are associated with greater EAH or food intake (Birch et al., 2003a; Boots, Tiggemann, Corsini, & Mattiske, 2015; Jansen, Mulkens, & Jansen, 2007; Johnson & Birch, 1994; Sonneville et al., 2013). These studies also examined children across the weight-spectrum and some did not control for BMI at baseline. Therefore, additional research is needed to clarify how reports of restrictive feeding style may differ among parents of overweight and obese children compared to samples of families with children of varying weight status. It is also possible that restrictive feeding style by parents of overweight and obese children does not vary as much as it does in samples of families with children of varied weights. However, likely due to methodological differences, previous research has revealed no consistent pattern in the degree of variation of this scale; studies in children and youth have found variation in this measure that are as low as .1 (Birch & Fisher, 2000) to as high as 1.13 (Joyce & Zimmer-Gembeck, 2009).

It is interesting that girls had higher EAH than boys in our sample. These results are particularly meaningful given that EAH is age- and gender-adjusted, thus the metabolic needs of girls versus boys were accounted for in the analyses. This finding is inconsistent with one other study that reported on sex differences in EAH, which found that boys consumed more than girls in the EAH paradigm (Faith et al., 2006). However, this sample differed from that of our study in that the children were younger (5 years old) and either at-risk or not at-risk for obesity based on maternal pre-pregnancy body weight, which may explain the inconsistency. Regardless of sex, children who consumed more calories at dinner also ate more overall and consumed more sweet foods during the EAH paradigm. The significant positive correlation between dinner calories and EAH% suggests that disinhibited overeating behaviors may cascade into future eating sessions. This is consistent with other data that suggests that overweight and obese children do not compensate for higher calorie consumption earlier in the day (Kral et al., 2012). Considering that caloric intake is one of the targets for weight management programs, it may be important to note that consumption during dinner does not inhibit future eating.

This study is novel as it evaluated overall EAH%-total as well as EAH%-sweet. These analyses produced some interesting considerations. Our data suggest that parental monitoring is associated with child overconsumption of sweet foods in particular, instead of snack foods in general. In a study with healthy and overweight 4–7 year old children, the threat of parental monitoring and actual monitoring was related to children choosing foods lower in sugar, whereas when children were allowed to freely choose their food without parental monitoring (threat or actual), they selected more non-nutritious foods, particularly those high in sugar (Klesges, Stein, Eck, Isbell, & Klesges, 1991). One interpretation is that child consumption of sweet foods may be especially sensitive to parent monitoring and that children may overeat by consuming sweet foods when parent supervision is not present. As these data are cross sectional, the reverse may also be possible: child intake of sweet foods may have been particularly concerning for parents and parents may monitor their children more closely if they displayed this behavior.

In the exploratory analyses, we examined the relationship among the individual sweet foods used in the EAH paradigm and parenting practices to better understand the unique contribution of the individual foods within the EAH%-total and EAH%-sweet composite scores. Interestingly, we found that Hershey's® bars were positively correlated with all three parent feeding practices as well as maternal psychological control. Hershey's® bars are characteristically different from the other snack foods served in a number of ways. Hershey's chocolates had the highest calories consumed and the largest variance, so Hershey's may have had more significant correlations as a result of greater variance. Parents might perceive Hershey's® bars to be more calorically-dense than other snack foods which may then elicit more controlling parenting practices to reduce consumption. Hershey's® bars are typically individually wrapped which may make it more conducive for parents to monitor the intake because the wrappers provide evidence of consumption. Thus, one interpretation is that wrapping and perceived caloric-density may be underlying characteristics of foods that contribute to more controlling parental responses. The above findings on the unique contributions of individual sweet snack foods suggest that the variation in the specific foods provided during the free access session may be contributing to the variability in findings across studies utilizing the EAH paradigm as a measure of overeating (Lansigan, Emond, & Gilbert-Diamond, 2015). Future research should consider the contribution that individual foods have on overall EAH to better understand which foods may elicit overeating. Factors such as cultural and regional food preferences, and a food's nutrient composition, satiety level, shape, texture, or size, may impact parent perceptions of foods and thus their responses and behaviors towards them.

Strengths of this study include the moderate sample size of treatment-seeking overweight and obese children and their parents, and the wide range of EAH%-total (.24%–96%). This population of treatment-seeking children and parents mirrored families that would present for treatment to community clinics and intervention programs. We also used validated measures of parent feeding practices and general parenting style, as well as measuring EAH using the laboratory paradigm. As in all studies, this study also had several limitations. It is possible that there were no significant models with EAH%-salty in this study because only 5 of the 11 EAH foods presented were salty, compared to 6 sweet foods. This may have resulted in there being a higher proportion (76%) of calories from sweet foods consumed. However, this further emphasizes the importance of examining sweet foods in particular in the EAH paradigm as there may be a greater tendency or preference to overeat with sweet foods. The observed internal consistency for the pressure to eat subscale was notably low in our sample. Perhaps because this is a treatment seeking overweight and obese sample, parents may be more conflicted about whether they should pressure their child to eat. Parents may have feeding practices that they grew up with, e.g., must clean your plate, but because their child is overweight, they may hold back on that some times. This might explain some of the inconsistency of their responses within this subscale. However, our study is not unique in finding a low internal consistency for this subscale. A recent 2013 paper examining the relationship between parenting practices and child eating behaviors (overeating, loss of control eating, and disordered eating attitudes) in a sample of 8–12 year old Flemish children also reported poor internal consistency for the "pressure to eat" subscale

(Cronbach's alpha = .56 and .60; Matton, Goossens, Braet, & Van Durme, 2013). Not only does this present a limitation to our current study findings, it also suggests that perhaps additional parenting measures with better psychometric properties should be developed. In addition, this was a cross-sectional sample from which causation cannot be determined. It is also possible that there are no substantive differences between EAH relationships for different parent feeding practices or different parenting styles (please see regression coefficients and confidence intervals in Tables 3 and 4). Future studies should examine other unmeasured variables that may potentially contribute to variance in this study, such as child temperament (Anzman & Birch, 2009; C. Collins, Duncanson, & Burrows, 2014), adrenocortical regulation (Francis, Granger, & Susman, 2013), neurobiological activation of reward pathways (Born et al., 2010), and genetics (Fisher, Cai, et al., 2007a; Provencher et al., 2005).

However, considering the strengths and limitations, this study suggests that there is a relationship between parent feeding strategies and children's eating behavior, with marked variability among an overweight and obese sample. Our findings highlight the importance of controlling for dinner consumption, and to further explore these sex differences and the role sex might play in overeating behavior over time. Furthermore, this study has implications for developing interventions for overweight children, as controlling feeding and parenting practices were associated with higher EAH %-total, particularly for girls. It may be that specific sex-adapted interventions are also needed, considering the noted differences between girls and boys. The environmental contributors (parenting variables) as well as child feeding behaviors are important to evaluate in future studies elucidating the influences on child overconsumption of sweet foods. Research studies in the future could evaluate all of these important variables, in larger samples, over time, to ultimately develop targeted interventions to prevent the development of obesity and eating disorders in children and youth.

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