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Predicting Dietary Intake among Children Classified as Overweight or at Risk for Overweight: Independent and Interactive Effects of Parenting Practices and Styles

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Abstract

Using baseline data from a randomized controlled pediatric obesity prevention trial, this study sought to examine general parenting style as a potential moderator of the association between feeding-specific parenting practices and child dietary intake. Four hundred and twenty-one parent-child dyads served as participants (49% girls and 93% mothers). Children were, on average, 6.6 years old and either overweight or at-risk for overweight (mean BMI percentile = 84.9). Data were collected in participants' homes. Study staff measured children's height and weight. Parents completed questionnaires designed to assess general parenting styles (authoritative, authoritarian and permissive) and child feeding practices (restriction and monitoring). Child dietary intake was assessed using a 24-hour recall system. Outcomes were daily servings of fruits and vegetables, sugar-sweetened beverages (SSB), and unhealthy snacks. Results were as follows: Permissive parenting was inversely associated with fruit and vegetable consumption, and parental monitoring was inversely associated with SSB consumption. There were no other main effects of parenting style or feeding practice on child dietary consumption. Authoritarian parenting moderated the association between restriction and SSB intake (a marginally significant effect after correcting for multiple comparisons). Restriction was inversely associated with SSB consumption when authoritarianism was high but unassociated with SSB consumption when authoritarianism was low. Findings indicate that the parenting practice of monitoring child dietary intake was associated with more healthful consumption regardless of parenting style; interventions may thus benefit from encouraging parental monitoring. The parenting strategy of restricting child dietary intake, in contrast, was associated with lower SSB intake in the context of higher parental authoritarianism

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Conflict of interest

The authors declare no known conflicts of interest.

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but inconsequential in the context of lower parental authoritarianism. This exploratory finding warrants further investigation.

Keywords

children; parenting style; sugar-sweetened beverages; restrictive feeding; obesity

Pediatric obesity is a significant public health concern in the United States (Ogden, Carroll, Kit, & Flegal, 2012). For young children, parents play a key role in shaping child food consumption patterns. Feeding practices are defined as “specific techniques or behaviors usually used to facilitate or limit ingestion of foods” (Blissett, 2011). Much attention has been given to two such practices, restriction and pressure to eat, both of which have been found to be counterproductive (Blissett, 2011; Rhee et al., 2015; Rodgers et al., 2013; Vereecken, Legiest, De Bourdeaudhuij, & Maes, 2009; Wardle, Carnell, & Cooke, 2005). For example, experimental research has demonstrated that restricting access to palatable foods results in children’s increased interest in and intake of such food (Fisher & Birch, 1999). In contrast, pressuring children to eat has been found to result in more negative comments regarding and less consumption of the pressured food (Galloway, Fiorito, Francis, & Birch, 2006). Restriction and pressure to eat have also been associated with increased child weight outcomes (Blissett, 2011; Faith, Scanlon, Birch, Francis, & Sherry, 2004; Monnery-Patris et al., 2011), with some exceptions (Farrow & Blissett, 2008; Wang et al., 2013). Less attention has been paid to a third feeding practice, that of parental monitoring. Monitoring refers to keeping track of what one’s child consumes, specifically with respect to sweet, snack or high-fat foods. Research on this food-specific parenting practice suggests that it is adaptive (Haszard, Skidmore, Williams, & Taylor, 2015; Wang et al., 2013). A questionnaire-based study of 2,021 5-year olds, for instance, found that parental monitoring was positively associated with child fiber intake and inversely associated with child sugar intake (Gubbels et al., 2011). In another questionnaire-based study of 203 overweight 4–8 year-olds, monitoring was inversely associated with parent-reported child dietary intake of non-core foods and sweetened beverages; it was also inversely associated with several parent-reported child problem food behaviors such as throwing a tantrum about food, refusing to eat certain foods, and requesting food between meals (Haszard et al., 2015).

Conversely, parenting styles refer to general aspects of parenting behaviors, typically thought of as more static than parenting practices. Parenting styles have been conceptualized in terms of differing levels of warmth and demand (Baumrind, 1966; Maccoby & Martin, 1983), with (a) authoritative parenting being high in both warmth and demand, using structure and expectations in a supportive context; (b) authoritarian parenting being low in warmth but high in demand, expecting ridged adherence to rules; and (c) permissive parenting being high in warmth and low in demand, with few responsibilities or expectations. Research indicates associations between certain general parenting styles and child weight status (Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006). A more authoritative parenting style is generally associated with lower child BMI (Berge, 2009; Berge, Wall, Loth, & Neumark-Sztainer, 2010; Pinquart, 2014), while the reverse is true for permissive and authoritarian parenting styles (Johnson, Welk, Saint-Maurice, & Ihmels,

2012; Rhee et al., 2006). Findings regarding associations between general parenting style and children's consumption of specific classes of foods are less consistent (Vollmer & Mobley, 2013), and effects are small (Pinquart, 2014). On balance, review papers suggest (1) a positive association between authoritative parenting and the consumption of fruits and/or vegetables, particularly among mothers, and (2) an inverse association between authoritative parenting and the consumption of high fat and/or sugar (Berge, 2009; Blissett, 2011; Vollmer & Mobley, 2013).

Two recent review papers note that parenting styles may operate at a broader, more distal level as compared to practices (Kremers et al., 2013; Patrick, Hennessy, McSpadden, & Oh, 2013). For example, Patrick and colleagues (2013) note that styles may function as a moderator of the association between specific parenting practices and child health outcomes, drawing on much earlier work by Darling and Steinberg (1993). Commonly, obesity prevention interventions address either specific parenting practices or general parenting styles. However, effectiveness may be improved by considering the interaction of the two (Patrick et al., 2013). Understanding how these practices and styles work together to influence dietary intake patterns may lead to the design of more efficacious intervention strategies. A cross-sectional study of 383 students (mean age = 13.5 years) lends support for this notion (van der Horst et al., 2007). The inverse association between restrictive food-related practices and adolescent sugar-sweetened beverage (SSB) consumption was stronger among students who rated their parents as highly involved and moderately strict, characteristics of an authoritative parenting style (van der Horst et al., 2007). A second study also speaks to the moderating effects of parenting style. In this longitudinal investigation of 465 Taiwanese children (Tung & Yeh, 2013), parenting styles and practices were measured in 2008, and child weight and height were measured in 2008 and 2009. Twenty-nine percent of the children were considered overweight per gender- and age-adjusted BMI classifications in 2009. The association between maternal monitoring in 2008 and child overweight status in 2009 was moderated by parenting style. Monitoring was associated with a decreased chance of overweight among children of mothers higher in authoritativeness and an increased chance of overweight among children of mothers higher in authoritarianism (Tung & Yeh, 2013). Thus monitoring was adaptive in the context of parenting characterized by high warmth and high demand, and maladaptive in the context of parenting characterized by low warmth and high demand.

In the present study, associations among general parenting styles, specific feeding practices, and child dietary intake were examined in a large sample of parents of overweight or at-risk for overweight children (BMI percentile 70th–95th). Specifically, the independent and interactive contributions of three parenting styles (authoritative, authoritarian and permissive) and two feeding practices (restriction and monitoring) in predicting child dietary intake were examined. Based on the literature, it was hypothesized that feeding practices would be independently associated with child dietary intake, with monitoring associated with the consumption of fewer unhealthy snack and SSB servings, and restriction associated with the consumption of more unhealthy snack and SSB servings. It was also hypothesized, again based on the extant literature, that authoritative parenting style would be positively associated with fruit and vegetable consumption and inversely associated with SSB consumption. Higher-level analyses examined whether associations between parenting

practices and child dietary intake *differed* as a function of parenting style. These analyses were exploratory. It is reasonable to surmise that two competing outcomes might occur. The first is that the effects of parenting practices and styles might be additive, for example, that a child might consume more fruits and vegetables and fewer unhealthy snacks if s/he was monitored by a highly authoritative parent, or that a child might consume fewer fruits and vegetables and more unhealthy snacks if s/he was restricted by an authoritarian parent. On the other hand, styles and practices might serve to offset one another. For example, a child whose parent restricts access to unhealthy foods but who does so with warmth and clear guidelines as to why such foods are restricted might choose to consume more healthful and fewer unhealthful foods.

Method

Participants

This manuscript utilized baseline, pre-randomization data from the Healthy Homes/Healthy Kids study, a randomized controlled trial of a pediatric, primary care-based behavioral intervention designed to prevent unhealthy weight gain among overweight and at-risk for becoming overweight children (Sherwood et al., 2013). Participants (parent-child dyads) were recruited from the population of children scheduled for a well-child visit with a pediatric primary care provider at one of 20 clinics in the greater Minneapolis-St. Paul area. To be eligible, children had to be aged 5–10 years with a BMI placing them in the 70th to 95th percentile for age and gender. Parents needed to be English speaking and willing and able to complete questionnaires. Exclusionary criteria for children were: consistent use of a steroid medication for more than one month, participation in other pediatric health-related research, a chromosomal abnormality, and a chronic condition such as Type I diabetes or cancer. Families planning to move out-of-state in the next 24 months were also excluded.

Eligible and consenting dyads were randomized to either an obesity prevention arm or an attention control arm focused on general health, safety and injury prevention. Both groups received brief provider counseling regarding healthy eating and activity patterns and injury prevention, followed by 14 phone coaching telephone calls to reinforce the provider message and provide family-specific, tailored guidance for their randomized treatment condition. Importantly, baseline assessment preceded the aforementioned meeting with the child's provider. At this meeting, parents were informed of their child's BMI and implications of this value were discussed. The project was framed as emphasizing healthy eating and physical activity versus obesity prevention per se. Relatedly, families were informed that children had to fall within a certain height/weight range to be eligible for the study, but the exact range was not specified. The following verbiage was included in the consent form: "We are asking you to take part in this research because your child is between the ages of 5 and 10. This is an important age because children are developing habits that will help keep them healthy as they grow up, including healthy eating and physical activity habits to help prevent unhealthy weight gain and safety habits to protect themselves from injuries, sun exposure, and secondhand smoke."

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the respective

Institutional Review Boards of the participating institutions. Written informed consent was obtained from all parents and written informed assent was obtained from all children.

Assessments

Anthropometry—Child weight and height were measured by study staff in the family home using a Seca 876 flat scale and Seca 217 stadiometer (Seca Corp., Hanover, MD). Children were instructed to remove shoes and any heavy clothing. Weight and height were measured twice. If the first two measurements differed by more than 0.2 kg for weight or more than 1.0 cm for height, the process was once again repeated. Data for the repeated measurements were averaged. To assess validity, a second trained staff member measured the height and weight of a subset of 42 children. Primary and secondary rater weight and height measurements were highly correlated (intra-class correlation = 0.99). BMI was calculated as weight in kilograms/height in meters². BMI percentile was then calculated using the CDC 2000 Growth Charts.

Parenting Styles and Dimensions Questionnaire (PSDQ)—The PSDQ (Robinson, Mandelco, Olsen, & Hart, 2001) measures three higher-order parenting style factors: authoritative, authoritarian and permissive. The authoritative factor consists of the 5-item connection dimension (warmth and support), the 5-item regulation dimension (reasoning/induction), and the 5-item autonomy granting dimension (democratic participation). The authoritarian factor consists of the 4-item physical coercion dimension, the 4-item verbal hostility dimension, and the 4-item non-reasoning/punitive strategies dimension. The permissive factor consists solely of the 5-item indulgent dimension. Items such as, “I encourage my child to freely express himself/herself even when disagreeing with me” (autonomy granting) and “I spoil my child” (indulgent) are rated on a 1–5 (*never* to *always*) scale. The developers reported Cronbach’s coefficient alpha values of 0.86 for authoritative parenting, 0.82 for authoritarian parenting, and 0.64 for permissive parenting. Values based on the present sample were 0.86 for authoritative, 0.72 for authoritarian, and 0.70 for permissive. Validity of the scale has been demonstrated per appropriate associations with measures of parental affective responsiveness and involvement, and child internalizing and externalizing behaviors (Olivari, Tagliabue, & Confalonieri, 2013; Topham et al., 2011).

Child Feeding Questionnaire (CFQ)—The Child Feeding Questionnaire (CFQ) is a 31-item measure of parental feeding (Birch et al., 2001). Seven factor-analytically derived subscales assess the following constructs: perceived child weight, perceived parent weight, concern about child weight, feeding responsibility, monitoring, restriction, and pressure to eat. We focus here on the restriction and monitoring subscales. The restriction subscale consists of 8 items such as, “I have to be sure that my child does not eat too many high-fat foods” and “I intentionally keep some foods out of my child’s reach.” The monitoring subscale consists of 3 items such as, “How much do you keep track of the high fat foods that your child eats?” and “How much do you keep track of the sweets (e.g., candy, ice cream, cake, pies and pastries) that your child eats?” Items are rated on a 1–5 Likert scale. The developers reported internal consistency values of 0.73 for restriction and 0.92 for monitoring based on a sample of 394 parents of 5–9 year old girls (Birch et al., 2001).

Cronbach's coefficient alpha values based on the present sample were 0.78 for restriction and 0.93 for monitoring.

While conceptually of interest, we chose not to examine pressure to eat because the distribution for this variable was right-tailed or positively skewed. Descriptive statistics were as follows: $M (SD) = 2.20 (0.91)$; median = 2; mode = 1; and skewness = 0.58. The mean and standard deviation are on par with other studies involving parents of young children (Birch et al., 2001; Francis, Hofer, & Birch, 2001; Galloway et al., 2006).

Child dietary intake—To assess child dietary intake, a multi-pass 24-hour recall was administered with parent-child dyads by staff trained and certified to use the Nutrition Data System for Research (NDSR, Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN). If there was a discrepancy in recall between parent and child (an infrequent occurrence) and the child was younger than 7, the parent served as the primary informant. Before the recall, both parents and children were trained to use a two-dimensional food amounts booklet, adapted from van Horn and colleagues (1993), and three-dimensional glasses and bowls to estimate portion sizes. If dyads were unable to report on one or more meals, the dietary recall was deemed unreliable. All unreliable recalls were excluded from analyses ($n = 7$). Recalls were coded and analyzed using NDSR 2013 software to estimate the number of servings of fruits and vegetables, unhealthy snacks, and SSB. Servings of fruits and vegetables excluded servings of fruit juice and white/fried potatoes. Servings of SSB included servings of flavored milk, flavored waters, sweetened tea, soft drinks, fruit drinks (<100% juice), and sweetened meal replacement beverages. Servings of unhealthy snacks included servings of cakes, bars, chips, candy and frozen desserts.

Analyses

Analyses were conducted using Statistical Analysis System 9.3. Measures of central tendency and dispersion characterized the sample. Bivariate associations among predictors, outcomes and covariates (child age, sex and total caloric intake) were assessed using Pearson product moment correlation coefficients for analyses involving continuous variables and point biserial correlation coefficients for analyses involving dichotomous variables. Six general linear regression models predicted each of three child dietary intake outcomes (fruit and vegetable servings, SSB servings, and unhealthy snack servings). Predictors included the aforementioned covariates, one of the feeding practices (restriction or monitoring), one of the general parenting styles (authoritative, permissive or authoritarian), and the feeding practice by general parenting style interaction. If the practice by style interaction was not statistically significant, the interaction term was dropped from the final model. All continuous predictors were standardized. Initial analyses were conducted separately by child weight status (BMI percentile 70–84 versus 85–95), controlling for child age and child sex. Results did not differ by child weight strata, so we collapsed across weight groups and examined relationships of interest in the full sample. To control for multiple comparisons, we used the stepdown Bonferroni procedure described by Holm (1979), the goal of which is to control family-wise error rate. Interactions were graphed and interpreted using methods outlined by Aiken and West (1991).

Results

Sample characteristics are summarized in Table 1. Children were, on average, 6.6 years old. Sex was evenly distributed among children (49% female) but not parents (93% female). The majority of participants were White (72% children and 81% parents) and non-Hispanic (93% children and 96% parents). In keeping with our study inclusion criteria, child BMI percentile ranged from 70 to 97. Seventy-two percent of parents reported having earned a college degree. Turning to psychosocial and behavioral characteristics, mean scores for authoritative parenting style were on par with other reports in the literature (Gamble, Ramakumar, & Diaz, 2007). The sample means for authoritarian and permissive parenting styles, however, fell slightly below those reported in other studies (Gamble et al., 2007; Topham et al., 2011; Winsler, Madigan, & Aquilino, 2005). Mean scores for the two feeding-specific parenting practices, restriction and monitoring, were 3.23 and 3.74, respectively, on the 1–5 scale. Per NDSR data, children consumed, on average, 1768 kcals/day, 2.8 servings of fruits and vegetables, 1.9 servings of unhealthy snacks, and 0.80 servings of SSB's.

Table 2 displays correlations among key variables. Not surprisingly, BMI was positively associated with total caloric intake and daily servings of both SSB and unhealthy snacks. Restriction was positively associated with monitoring, permissiveness and authoritarianism. Monitoring was positively associated with authoritative parenting and inversely associated with permissiveness, authoritarianism and SSB servings. Authoritativeness was inversely associated with permissiveness, authoritarianism and unhealthy snack servings. Lastly, permissiveness was positively associated with authoritarianism and inversely associated with servings of fruits and vegetables.

Predictors of child fruit and vegetable consumption

Table 3 displays results of the six multiple regression models predicting child fruit and vegetable consumption, each involving one of the three parenting styles (authoritative, authoritarian and permissive) and one of the two parenting practices (monitoring and restriction). Two of the six models yielded statistically significant effects per the stepdown Bonferroni procedure. Both models involving permissiveness yielded a main effect of parenting style. The association between permissiveness and child fruit and vegetable consumption was inverse, such that with each unit increase in permissiveness, daily fruit and vegetable consumption decreased by 0.33 servings. None of the models yielded main effects of parenting practice, nor did they yield style $\times$ practice interactions.

Predictors of child SSB consumption

Table 4 displays results of the six multiple regression models predicting child SSB consumption. The three models including monitoring yielded a main effect of this parenting practice, such that with each unit increase in monitoring, child SSB consumption decreased by 0.14 to 0.15 servings across models. None of the models including restriction yielded a main effect of that parenting practice, nor did any of the six models yield main effects of parenting style. The model including restriction and authoritarianism, however, yielded a marginally significant parenting style $\times$ practice interaction ($p = 0.04$). The nature of this

interaction is illustrated in Figure 1. The association between restriction and child SSB consumption differed as a function of parenting style. For typical families at the mean level of authoritarianism (thicker solid line), restriction was unassociated with SSB consumption ($\beta = -0.07$, $p = 0.22$). This was also the case for parents low in authoritarianism as depicted by the thinner solid line ($\beta = 0.04$, $p = 0.56$). For parents high in authoritarianism, in contrast (dashed line), the association between restriction and SSB was inverse ($\beta = -0.17$, $p = 0.03$); greater restriction was associated with the consumption of *fewer* SSB servings.

Predictors of child unhealthy snack consumption

Table 5 displays results of the six multiple regression models predicting child unhealthy snack consumption. None of the models yielded main effects of parenting style or practice, nor interactive effects of the two.

Discussion

This study sought to examine the independent and interactive contributions of specific parenting practices and general parenting styles in explaining child dietary intake. The parenting style of permissiveness was inversely associated with fruit and vegetable consumption (in other words, the higher parents were in permissiveness, the fewer servings of fruits and vegetables their children consumed). While the literature on the relationship between parenting style and child dietary intake is inconsistent, most findings have involved authoritativeness, not permissiveness. The present findings extend the literature on permissiveness and suggest that interventions designed to increase child fruit and vegetable consumption could potentially be targeted to parents scoring high on this dispositional dimension.

The parental practice of monitoring was inversely associated with child SSB consumption (in other words, the more parents monitored, the fewer servings of SSB their children consumed). This is commensurate with at least one other study showing that monitoring reduced risk for the consumption of sweets, a broader category that included regular soda (Wang et al., 2013). It is also notable that monitoring emerged as a main effect in models accounting for parenting style and did not interact with style. Accordingly, interventions aimed at parents to employ the strategy of monitoring may not need to consider dispositional parenting style.

Interestingly, the practice of restriction was not independently associated with child dietary intake. This is in contrast to several prior studies noting its maladaptive correlates (Faith et al., 2004; Fisher & Birch, 1999; Rhee et al., 2015; Rodgers et al., 2013). Restriction *did*, however, predict child SSB intake when authoritarianism was included in the model as a moderator. As stated previously, it was hypothesized for these exploratory analyses that practices and styles might either be additively adaptive or maladaptive, or alternatively, that maladaptive and adaptive styles and practices might serve to offset one another. Counter to both of these hypotheses, restriction (regarded as a generally maladaptive and counterproductive parenting practice), in combination with authoritarianism (regarded as a generally maladaptive parenting style) was associated with a beneficial child outcome, *lower* SSB consumption. In this case then, authoritarianism and restriction were additively

adaptive. Children of parents who were high in restrictive feeding and high in authoritarianism consumed the least amount of SSB. In contrast, children of parents low in restrictive feeding and high in authoritarianism consumed the greatest amount of SSB. A main effect for authoritarianism was not observed, however, suggesting that this parenting style was not deleterious in and of itself with respect to influencing child dietary intake. These data suggest that it may be important clinically to screen for parenting styles and practices. Given that this style $\times$ practice interaction was only marginally significant after controlling for multiple comparisons, however, it is premature to suggest restrictive practices within the context of highly authoritarian parenting. We also hesitate to suggest parental interventions that are, at least per past research, known to be generally deleterious. Further investigation is warranted before suggesting tailored or targeted interventional approaches.

Limitations of this study must be considered. First, the sample was restricted in that all children were overweight or at-risk for overweight, thereby excluding underweight, normal weight and obese children. Replication in a more normally distributed sample is advised. Second, our findings may be unique to our Midwestern sample of young children from a health maintenance organization. Third, the sample as a whole was rather homogeneous with respect to race and ethnicity. Fourth, both parenting practices and styles were assessed via self-report. Future research would benefit from the inclusion of more objective measures of parenting style or even triangulation of the construct from multiple sources: reports from children, reports from spouses or parenting partners, and coder-derived observations of parent behavior.

Fifth, the range of authoritarian parenting scores in this sample was quite restricted (1 to 2.67) and at the lower range of the 1 to 5 scale. Consequently, “high” authoritarianism is perhaps best categorized as moderate. This is essential to take into consideration if using these results to inform the design of targeted interventions for parents of children at-risk for overweight. It is also important to consider the way in which restriction was measured. Questions included items such as, “I intentionally keep some foods out of my child’s reach” and “I have to be sure that my child does not eat too much of his/her favorite foods.” While the restriction subscale was factor-analytically derived (Birch et al., 2001), the former item may be more indicative of covert control and the latter more indicative of overt control (Rodenburg, Kremers, Oenema, & van de Mheen, 2014). This may be an important distinction per findings from a study of 1275 parent-child dyads by Rodenberg and colleagues (2014). In prospective analyses, only covert control predicted child BMI one year later, such that greater covert control was associated with higher BMI. In addition, while theoretically designed to assess feeding practices, i.e., behaviors, some CFQ restriction items appear more cognitively oriented in content. For example, “If I did not guide or regulate my child’s eating, s/he would eat too many junk foods”. To what extent do these items reflect consistent restrictive *practices*? To our knowledge, this measure has undergone validity testing only with respect to child weight. In the initial study conducted by the scale developers, restriction was not significantly associated with child weight-for-height status (Birch et al., 2001). In a subsequent validation study involving Spanish parents, restriction was positively associated with child BMI (Canals-Sans, 2016). Further validation work is needed to demonstrate the extent to which parent-reported restriction correlates with observer-reported restriction.

Despite limitations, findings from the present study, drawn from a relatively large sample and strengthened by the objective measurement of weight and height, extend our understanding of the role of parent factors in pediatric obesity. What remains to be fully elucidated is how feeding practices play out in real-world parent-child interactions around feeding, especially in the context of certain parenting styles. Research in which parent and child behaviors are observationally coded in either laboratory-based or more naturalistic settings may help to explain mechanisms by which certain parenting practices and child dietary intake are linked and, furthermore, potentially moderated by broader, dispositional parenting styles. Ultimately, longitudinal investigations are required to examine the long-term impacts of these patterns on child weight status.

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HIGHLIGHTS

- Previous literature suggests that parental restriction of child food intake is generally maladaptive; less is known about the effects of a different feeding practice, that of monitoring child food intake.
- The effects of specific feeding practices may be moderated by a conceptually more distal factor, dispositional parenting style.
- In this study, the parenting practice of monitoring was adaptive (associated with decreased consumption of sugar-sweetened beverages) and the parenting style of permissiveness was maladaptive (associated with decreased consumption of fruits and vegetables).
- An exploratory finding suggests that restrictive feeding may be beneficial in the presence of higher levels of authoritarian parenting; further investigation is warranted before tailoring or targeting interventions to optimize healthful dietary consumption.

Figure 1.
Child sugar-sweetened beverage intake as a function of authoritarian parenting style and restriction.

Table 1

Descriptive Characteristics of the Sample

	Child	Parent
N	421	421
Age, M (SD)	6.62 (1.67)	37.45 (6.40)
Sex, n/denominator (%)		
Female	208/421 (49.4)	391/421 (92.9)
Male	213/421 (50.6)	30/421 (7.1)
Race, n/denominator (%)		
Asian	14/421 (3.3)	16/421 (3.8)
Black	44/421 (10.5)	41/421 (9.7)
Indian	2/421 (0.5)	1/421 (0.2)
White	301/421 (71.5)	342/421 (81.2)
More than one race	49/421 (11.6)	14/421 (3.3)
Other	0/421 (0.0)	2/421 (0.5)
Unknown	11/421 (2.6)	5/421 (1.2)
Ethnicity, n/denominator (%)		
Hispanic	29/421 (6.9)	15/421 (3.6)
Non-Hispanic	390/421 (92.6)	402/421 (95.5)
Unknown	2/421 (0.5)	4/421 (1.0)
BMI (kg/m ²), M (SD); range	17.82 (1.35); 15.99–22.24	---
BMI percentile, M (SD); range	84.86 (6.93); 69.55–96.51	---
Educational status, n (%)		
High school degree or less	---	31/421 (7.4)
Vocational school	---	26/421 (6.2)
Some college	---	62/421 (14.7)
College degree	---	160/421 (38.0)
Professional training beyond a 4-year college degree	---	139/421 (33.0)
Unknown	---	3/421 (0.7)
Child Feeding Questionnaire, M (SD); range		
Restriction	---	3.23 (0.83); 1–5
Monitoring	---	3.74 (0.99); 1–5
Parenting Styles and Dimensions Questionnaire, M (SD); range		
Authoritative	---	3.95 (0.45); 2–5
Authoritarian	---	1.57 (0.30); 1–2.67
Permissive	---	1.90 (0.51); 1–4
NDSR child dietary intake, M (SD)		
Total energy intake in kcal	1770.25 (561.41)	---
Servings of fruits and vegetables	2.78 (2.42)	---
Servings of unhealthy snacks	1.90 (1.72)	---
Servings of sugar sweetened beverages	0.83 (1.11)	---

Table 2

Correlation Matrix of Key Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Child age in months	1.00											
2. Child sex (0 M, 1 F)	-0.10 *	1.00										
3. Child BMI	0.77 ***	0.01	1.00									
4. Child total kcals	0.36 ***	-0.24 ***	0.28 ***	1.00								
5. Restrictive feeding	-0.02	0.06	0.06	-0.01	1.00							
6. Monitoring feeding	-0.12 *	0.06	-0.06	-0.07	0.25 ***	1.00						
7. Authoritative style	-0.12 *	-0.02	-0.14 **	-0.10	-0.05	0.27 ***	1.00					
8. Permissive style	-0.03	-0.02	0.06	0.02	0.16 **	-0.14 **	-0.23 ***	1.00				
9. Authoritarian style	0.03	-0.10 *	0.02	0.11 *	0.16 **	-0.16 **	-0.36 ***	0.43 ***	1.00			
10. Fruit & vegetable servings	0.06	-0.07	0.05	0.24 ***	-0.10	0.08	0.08	-0.14 **	-0.05	1.00		
11. SSB servings	0.22 ***	-0.09	0.17 ***	0.30 ***	-0.06	-0.16 **	-0.05	0.02	0.05	-0.09	1.00	
12. Unhealthy snack servings	0.22 ***	-0.01	0.13 *	0.45 ***	0.04	-0.06	-0.10 *	0.04	0.05	-0.04	0.15 **	1.00

Note. Based on 414 participants who had reliable NDSR recalls. SSB = sugar sweetened beverages.

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$.

Table 3

Results of Linear Regression Models Predicting Child Fruit and Vegetable Consumption, Controlling for Child Age, Sex and Total Caloric Intake

Parenting practice									
Monitoring					Restriction				
Parenting style	Term	β (SE)	p	Critical alpha	Term	β (SE)	p	Critical alpha	
Authoritative	N = 409				N = 407				
	Intercept	2.83 (0.17)	---	---	Intercept	2.80 (0.17)	---	---	
	ME authoritative	0.21 (0.12)	0.09	0.013	ME authoritative	0.24, (0.12)	0.04	0.010	
	ME monitoring	0.18 (0.12)	0.15	0.025	ME restriction	-0.21 (0.12)	0.08	0.013	
Authoritarian	Interaction	NS/not included			Interaction	NS/not included			
	N = 408				N = 406				
	Intercept	2.85 (0.17)	---	---	Intercept	2.83 (0.17)	---	---	
	ME authoritarian	-0.16 (0.12)	0.19	0.050	ME authoritarian	-0.16 (0.12)	0.20	0.050	
Permissive	ME monitoring	0.21 (0.12)	0.08	0.010	ME restriction	-0.19 (0.12)	0.11	0.017	
	Interaction	NS/not included			Interaction	NS/not included			
	N = 411				N = 409				
	Intercept	2.83 (0.16)	---	---	Intercept	2.81 (0.17)	---	---	
	ME permissive	-0.33 (0.12)	0.005	0.008	ME permissive	-0.33 (0.12)	0.005	0.008	
	ME monitoring	0.18 (0.12)	0.13	0.017	ME restriction	-0.17 (0.12)	0.14	0.025	
	Interaction	NS/not included			Interaction	NS/not included			

Note. ME = main effect. All non-significant (NS) interaction terms were dropped from final models. Critical alpha values were derived using the Holm-Bonferroni procedure (Holm, 1979).

Table 4

Results of Linear Regression Models Predicting Child Sugar Sweetened Beverage Consumption, Controlling for Child Age, Sex and Total Caloric Intake

		Parenting practice					
		Monitoring			Restriction		
Parenting style	Term	β (SE)	p	Critical alpha	Term	β (SE)	p Critical alpha
Authoritative	N = 409				N = 407		
	Intercept	0.84 (0.07)	---		Intercept	0.85 (0.07)	---
	ME authoritative	0.03 (0.05)	0.61	0.017	ME authoritative	-0.02 (0.05)	0.77 0.050
	ME monitoring	-0.15 (0.05)	0.0069	0.010	ME restriction	-0.06 (0.05)	0.29 0.013
Authoritarian	Interaction	NS/not included			Interaction	NS/not included	
	N = 408				N = 406		
	Intercept	0.84 (0.07)	---		Intercept	0.85 (0.08)	---
	ME authoritarian	0.001 (0.05)	0.99	0.050	ME authoritarian	0.03 (0.05)	0.56 0.017
Permissive	ME monitoring	-0.14 (0.05)	0.0065	0.008	ME restriction	-0.07 (0.05)	0.22 0.008
	Interaction	NS/not included			Interaction	-0.11 (0.05)	0.04 0.007
	N = 411				N = 409		
	Intercept	0.84 (0.07)	---		Intercept	0.84 (0.07)	---
	ME permissive	0.003 (0.05)	0.95	0.025	ME permissive	0.03 (0.05)	0.58 0.025
	ME monitoring	-0.14 (0.05)	0.0076	0.013	ME restriction	-0.06 (0.05)	0.26 0.010
	Interaction	NS/not included			Interaction	NS/not included	

Note. ME = main effect. All non-significant (NS) interaction terms were dropped from final models. Critical alpha values were derived using the Holm-Bonferroni procedure (Holm, 1979).

Table 5

Results of Linear Regression Models Predicting Child Unhealthy Snack Consumption, Controlling for Child Age, Sex and Total Caloric Intake

		Parenting practice					
		Monitoring			Restriction		
Parenting style	Term	β (SE)	p	Critical alpha	Term	β (SE)	p Critical alpha
Authoritative	N = 409				N = 407		
	Intercept	1.70 (0.10)	---	---	Intercept	1.72 (0.10)	---
	ME authoritative	-0.08 (0.08)	0.33	0.008	ME authoritative	-0.08 (0.07)	0.26 0.008
	ME monitoring	-0.04 (0.08)	0.57	0.025	ME restriction	0.04 (0.07)	0.58 0.017
Authoritarian	Interaction	NS/not included			Interaction	NS/not included	
	N = 408				N = 406		
	Intercept	1.70 (0.10)	---	---	Intercept	1.72 (0.10)	---
	ME authoritarian	0.01 (0.07)	0.90	0.050	ME authoritarian	0.002 (0.08)	0.98 0.050
Permissive	ME monitoring	-0.06 (0.07)	0.44	0.010	ME restriction	0.04 (0.07)	0.58 0.017
	Interaction	NS/not included			Interaction	NS/not included	
	N = 411				N = 409		
	Intercept	1.73 (0.11)	---	---	Intercept	1.75 (0.11)	---
	ME permissive	0.05 (0.08)	0.50	0.013	ME permissive	0.05 (0.08)	0.53 0.013
	ME monitoring	-0.05 (0.08)	0.55	0.017	ME restriction	0.06 (0.08)	0.46 0.010
	Interaction	NS/not included			Interaction	NS/not included	

Note. ME = main effect. All non-significant (NS) interaction terms were dropped from final models. Critical alpha values were derived using the Holm-Bonferroni procedure (Holm, 1979).