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Parenting Characteristics in the Home Environment and Adolescent Overweight: A Latent Class Analysis

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Abstract

Parenting style and parental support and modeling of physical activity and healthy dietary intake have been linked to youth weight status, although findings have been inconsistent across studies. Furthermore, little is known about how these factors co-occur, and the influence of the co-existence of these factors on adolescents' weight. This paper examines the relationship between the co-occurrence of various parenting characteristics and adolescents' weight status. Data are from Project EAT, a population-based study of 4746 diverse adolescents. Theoretical and latent class groupings of parenting styles and parenting practices were created. Regression analyses examined the relationship between the created variables and adolescents' body mass index (BMI). Having an authoritarian mother was associated with higher BMI in sons. The co-occurrence of an authoritarian mother and neglectful father was associated with higher BMI for sons. Daughters' whose fathers did not model or encourage healthy behaviors reported higher BMIs. The co-occurrence of neither parent modeling healthy behaviors was associated with higher BMIs for sons, and incongruent parental modeling and encouraging of healthy behaviors was associated with higher BMIs in daughters. While further research into the complex dynamics of the home environment is needed, findings indicate that authoritarian parenting style is associated with higher adolescent weight status and incongruent parenting styles and practices between mothers and fathers are associated with higher adolescent weight status.

Introduction

The prevalence of overweight among adolescents has more than tripled over the past two decades (1-2). Adolescent overweight and obesity are associated with increased risk for adverse health problems, including hypertension, cardiovascular disease, metabolic syndrome, and type 2 diabetes (3-4). Recent studies have shown that parenting characteristics are associated with adolescent overweight and obesity (5-6). Specifically, parenting style (e.g. authoritative, authoritarian) and parenting practices, such as parental support for healthy eating and physical activity, and parental modeling of healthy eating and physical activity have been linked to adolescent risk for overweight and obesity (5-10). However, findings have not been consistent across studies, with some studies showing associations (5-7,10) and other studies not finding consistent associations (8-9), raising questions about the complexity of parent-adolescent relationships. Previous research has primarily examined the individual relationships between

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parenting characteristics and adolescents' weight status (5-10). Therefore little is known about the association between the presence or absence of multiple parenting characteristics (parenting style and parenting practices) and adolescents' weight status. Additionally, little is known about whether incongruencies between mothers' and fathers' parenting styles and practices are associated with adolescent's weight status.

Parenting style is considered a characteristic of the parent that is stable over time and constitutes the daily environmental and emotional context for child rearing (10). The four classic parenting styles are: authoritative, authoritarian, permissive, and neglectful (11-12). Parenting style typologies are based on two dimensions: (a) the degree of responsiveness and (b) the degree of demandingness of the parent. Responsiveness is the extent to which a parent fosters individuality, self-regulation, and self-assertion in their child by being attuned and supportive of their child's needs and demands (11). Whereas, demandingness is the extent to which parents cultivate self-control and responsibility in their child through parental supervision, rules/structure and disciplinary efforts (11). An authoritative parent balances high levels of demandingness with high levels of responsiveness. An authoritarian parent exhibits high levels of demandingness and low levels of responsiveness. A permissive parent expresses low levels of demandingness and high levels of responsiveness. A neglectful parent exhibits low levels of both demandingness and responsiveness. Thus, authoritative parenting styles provide the structure and support needed for children to internalize and maintain positive behaviors, whereas, authoritarian, permissive and neglectful parenting styles may interfere with children's ability to learn self-regulation, including regulation of eating. Several cross-sectional studies have found an association between authoritative parenting style and lower youth BMI (13-17), and one longitudinal study found that children of authoritarian parents (high demandingness, low responsiveness) had almost a fivefold increase in odds of being overweight (5). However, these studies were conducted with grade school children and/or among mostly white, mid-high income families.

In contrast to parenting styles, parenting practices are considered characteristics of the parent that are state dependent, or change based on the context, and include specific behavioral strategies employed by parents to socialize their children (10). Specific parenting practices include direct (e.g. encouraging) and indirect (e.g. modeling) behaviors such as encouraging your child to eat healthy and modeling healthy dietary or physical activity. Research has found inconsistent relationships between parenting practices and adolescent weight/BMI. Several cross-sectional studies have found a positive association between parental modeling of healthy dietary intake and physical activity and lower adolescent BMI (18-23), although one study found these associations only among older youth, ages 15-18 (23). Other cross-sectional studies have found associations between parenting characteristics and adolescent weight status to be modest to weak in magnitude, or non-existent (23-25).

Another important factor to consider in connection with adolescent weight status is the differential influence of mothers and fathers. For instance, does the relationship between modeling of physical activity and healthy eating and adolescents' weight differ depending on which parent is modeling the behaviors? Additionally, what is the relationship between parenting style and adolescents' weight if the mother and father have different parenting styles? Although there is limited evidence in epidemiological research related to the association between parental gender and adolescent BMI, intervention studies provide evidence that differences between mothers' and fathers' parenting practices and styles may play a role in adolescents' weight status. These studies have found that different sex parent/child dyads have better weight-loss outcomes than same sex dyads (26-27).

Although research suggests that parenting style, parenting practices, and parental gender differences are associated with adolescent BMI, there are limitations with the research and the

co-occurrence of various parenting characteristics and their relationship with adolescent BMI has not been examined. This is important because parenting style and parenting practices are considered to co-occur in the home and have reciprocal influences. Thus, the threefold purpose of this paper is to: (1) examine the occurrence and co-occurrence of parenting characteristics (parenting styles and parenting practices) in the home, (2) examine the separate relationships between parenting characteristics and adolescent BMI and the relationship between the co-occurrence of parenting characteristics and adolescents' BMI, and (3) determine whether the relationship between parenting characteristics and adolescents' BMI differs depending on parent gender.

Methods

Participants

The participants in the present study are part of Project EAT-I (Eating Among Teens), which examined eating and weight-related issues among 4764 adolescents from 31 middle and high schools in Minneapolis/St. Paul, Minnesota (28). Participants were equally divided by gender (50.2% boys, 49.8% girls). The mean age of participants was 14.9 years (s.d. = 1.7), with an age range of 11-18 years. One-third of the participants were in middle school (mean \pm SD age, 12.8 \pm 0.8 years), and two-thirds of the participants were in high school (mean \pm SD age, 15.8 \pm 0.8 years). Participants were 48.5% Caucasian, 19.0% African-American, 19.2% Asian-American, 5.8% Hispanic, 3.5% Native American and 3.9% mixed/other.

Procedures

Adolescents from primarily urban schools in the Minneapolis/St. Paul MN areas during the 1998-1999 academic year were surveyed. Surveys were administered by trained research staff and students were enrolled using approved informed consent procedures. Students completed a food frequency questionnaire and the Project EAT Student Survey. Surveys were completed in health, physical education, and science classrooms in one 90 minute period, or two 50 minute periods. After completion of the surveys, height and weight measurements were collected from students privately using a standardized protocol. Study protocols were approved by the University of Minnesota's IRB and by the research boards of the participating school districts.

Survey Development

The Project EAT-I survey is a 221-item survey assessing a range of socio-environmental, personal, behavioral, and familial factors of potential relevance to nutritional health and obesity among adolescents. The survey was developed by the Project EAT research team. A theoretical framework based on Social Cognitive Theory (29), a thorough literature search, and focus groups with adolescents guided the selection of constructs (30). The survey went through multiple revisions based upon input from a team of experts from diverse professional backgrounds, members of the University of Minnesota Youth Advisory Board, and pilot tests of the survey with students. Two-week test-retest reliability data were collected from 167 adolescents.

Measures

Parenting Style—Four parenting styles (authoritative, authoritarian, permissive, neglectful) were created using adolescents' reports of parenting characteristics and were based on Baumrind (11) and Maccoby and Martin's (12) conceptualization of parenting styles. Parent responsiveness was measured by two items assessing “caring” and “communication”. The caring item asked, separately for mothers and fathers, “How much do you feel your mother/father cares about you?” The communication item asked, separately for mothers and fathers, “How much do you feel you can talk to your mother/father about your problems?” Both

questions had response options ranging from “not at all” to “very much” on a 5-point Likert scale. Students' responses to these two questions were averaged and then dichotomized such that an average response of 4 or higher was considered “high responsiveness” and less than 4 considered “low responsiveness.”

Parent demandingness was measured by the following question, asked separately for mothers and fathers. “Compared to other mothers/fathers, how strict would you say your mother/father is?” Response options ranged from “much less strict” to “much more strict” on a 5-point Likert scale with the pivot value of 3 anchored at “about the same.” Student's responses of 3 or higher were coded as “high demandingness” and less than 3 were “low demandingness”. Parental style categories were then specifically defined as follows: authoritative was high responsiveness/high demandingness, authoritarian was low responsiveness/high demandingness, permissive was high responsiveness/low demandingness and neglectful was low responsiveness/low demandingness.

Parenting practices—Four parenting practices were created based on a latent class analysis (described below). Eight variables measuring modeling and supporting/encouraging healthy eating and physical activity were entered into the latent class analysis for mothers and fathers separately (4 for mothers and 4 for fathers). Students were asked the following questions, separately for mothers and fathers, about modeling behavior. My mother/father cares about: (a) eating healthy food and (b) staying fit and exercising. Response options ranged from “not at all” to “very much” on a 4-point Likert scale. Students were asked the following questions, separately for mothers and fathers, about supporting/encouraging behavior. My mother/father: (a) encourages me to eat healthy food and (b) encourages me to be physically active. Response options ranged from “not at all” to “very much” on a 4-point Likert scale. All items were dichotomized to be “not at all” versus everything else.

Weight status—Adolescents' height was measured using a portable stadiometer and their weight was measured on a portable digital scale. Body mass index was calculated according to the formula, weight (kg)/height (in meters squared).

Gender, age/cohort and ethnicity/race—Students self-reported their gender, age, and ethnicity/race. Ethnicity/race was assessed with the question, “Do you think of yourself as: (a) White, (b) Black/African-American, (c) Hispanic or Latino, (d) Asian-American, (e) Hawaiian/Pacific Islander, (f) American Indian/Native American. Respondents could choose multiple responses; those reporting more than one response (other than white) were coded as “mixed/other” youths. As few youth participants identified their background as “Hawaiian or Pacific Islander” these youth were included in the category “mixed/other.” Age was grouped into two cohorts, 11-14 and 15-18.

Socioeconomic status (SES)—Parental education, employment, student eligibility for free/reduced lunch and family receipt of public assistance were combined to create a 5-level SES variable (Low SES, Lo-Mid SES, Middle SES, Mid-High SES, High SES) (28).

Statistical Analysis

As described above, parenting styles were created based on theoretical evidence from psychology and family science research that indicates the validity of these typologies (11-12).

Parenting practices were created through latent class analysis (LCA) using the Mplus version 5.0 software (31). The underlying premise of LCA is that the responses to a set of observed variables are indicative of an underlying latent variable with a finite number of mutually

exclusive classes or subtypes (31). Thus, in this study, LCA was utilized in order to create a more global measurement of the home/family environment representing weight-related parenting practices by combining individual parenting practice variables into 4 mutually exclusive latent classes. The classes were created based on parameter estimates representing probabilities of responding in the affirmative to particular questionnaire items given specific latent class membership. Items with estimated conditional probabilities of an affirmative response greater than the marginal probability were taken to be indicative of the particular class. Individuals were assigned to one of the latent classes based on their highest posterior probability of class membership derived from their response to the items (31).

Descriptive proportions of each parenting style and practice by father and mother were calculated by gender, SES, ethnicity/race, and age cohort with associations examined using the chi-square test. The conditional probability of each maternal and paternal parenting style by each parenting practice (i.e. the probability of co-occurrence of styles and practices) was calculated and presented in graphical form collapsing over adolescent gender, SES, race and age. Error bars in figure are formed as 95% confidence intervals for each proportion (see figure 1).

Multiple regression models were used to examine the relationship between adolescent BMI and both parenting styles and parenting practices. All regressions were stratified by adolescent gender and controlled for the potential confounders of age/cohort, ethnicity/race, and SES. To investigate the main effects of parenting style and practice on adolescent BMI, two separate models were used, one regressed adolescent BMI on both mother and father parenting styles simultaneously (4 categories for each parent), and the other regressed adolescent BMI on both mother and father parenting practices simultaneously (4 latent classes for each parent). It was important to include both mother and father measures of the respective parenting style or parenting practice simultaneously in the same regression to allow for estimation of their independent associations with BMI controlling for one another. The overall F-test for the ANOVA main effect of the 4 category mother or father parenting characteristic with 3 degrees of freedom (d.f.) was used to determine statistical significance of the respective parenting characteristic. The estimated least squares regression means of adolescent BMI were obtained for each of the 4 parenting styles and practices. Paired comparisons between specific categories of parenting style and practice using least significant difference (LSD) t-tests were only performed when the p-value for the overall F-test for the main effect of parenting style or practice was $<.05$. Effect sizes capturing the differences in adolescent mean BMI were calculated for those post-hoc comparisons found to be statistically significant. Effect sizes were calculated as the difference in least square means divided by the mean squared error estimate of the standard deviation of adolescent BMI controlling for age/cohort, ethnicity/race, and SES.

Additional multiple regression models were run to further examine the relationships among maternal and paternal styles and practices. To examine the effect of co-occurrence of particular mother-father combinations of parenting styles or practices, two more regression models were used that included interactions between mother and father parenting characteristics (one model for styles and one model for practices). In these interaction models, the overall F-test for the interaction between the 4 mother and 4 father categories, with 9 d.f., was used to determine statistical significance for co-occurrence. Post-hoc LSD comparisons were then examined to determine which specific mother-father combinations were significantly different. A multiple regression model including both parenting styles and parenting practices simultaneously was also considered to examine their independent effects when controlled for one another. In addition a regression model including interactions between styles and practices was also examined. Finally, effect modification by ethnicity/race was tested by including an interaction term in each model previously considered. All analyses were conducted using SAS statistical software package (32).

Results

Latent Class Analysis of Parenting Practices

Separate latent class analyses for mothers and fathers found 4 underlying latent classes, including: (1) parents who encouraged and modeled healthy behaviors, (2) parents who modeled but did not encourage healthy behaviors, (3) parents who encouraged but did not model healthy behaviors, and (4) parents who neither modeled nor encouraged healthy behaviors. Descriptions of the latent classes and percentages of adolescents by latent classes are shown in Table 1. For both boys and girls, the first combination of maternal and paternal “modeling and encouraging healthy behaviors” was the most common.

Descriptive Analysis of Parenting Style and Parenting Practices by Sociodemographics

Probabilities of Parenting Style and Parenting Practices—The prevalence of maternal parenting styles did not differ between male and female adolescents; authoritative parenting style was the most common (see Table 2). In contrast, significant differences were found for paternal parenting style across adolescent gender. A higher percentage of fathers of girls were authoritarian (35.6%), as compared to fathers of boys (34.5%) who were authoritative. For both mothers and fathers, authoritative parenting style was more common among higher SES families, while neglectful parenting style was more common among lower SES families. Parenting styles also varied by the adolescents' ethnicity/race and age.

The prevalence of maternal and paternal parenting practices did not differ between male and female adolescents. The “modeling and encouraging healthy behaviors” parenting practices was most common for male and female adolescents. Also, the “modeling and encouraging healthy behaviors” parenting practices was more common among high SES families compared to families with low and middle SES levels. Parenting practices also varied by ethnic/racial group and age/cohort.

Probability of the Co-occurrence of Parenting Style and Parenting Practices—For both mothers and fathers, *authoritative* and *permissive* parenting styles most commonly co-occurred with “modeling and encouraging healthy behaviors” parenting practices (See Figure 1). For mothers, *authoritarian* and *neglectful* parenting style most commonly co-occurred with “no modeling or encouraging healthy behaviors” parenting practices. For fathers, *authoritarian* parenting style most commonly co-occurred with “modeling only, not encouraging” parenting practices, and *neglectful* parenting style most commonly co-occurred with “no modeling or encouraging healthy behaviors” parenting practices.

Associations Between Parenting Characteristics and Adolescent BMI

Parenting Style and BMI—Maternal authoritarian parenting style was significantly associated with higher BMI for sons compared to authoritative and neglectful parenting styles ($M = 22.8$ vs. 22.1 , $p = .007$ and 22.1 , $p = .034$, respectively) (see Table 3) indicating an effect size for both comparisons of 0.16 based on an estimated standard deviation of 4.45 for BMI in sons. There were no significant associations between fathers' parenting style and sons' BMI, or mothers' and fathers' parenting style and daughters' BMI.

An interaction ($F = 2.39$, $d.f = 9$, $p = .019$) was found between mother and fathers' parenting styles and sons' weight such that mothers' authoritarian parenting style and fathers' neglectful parenting style was related to the highest BMI ($M = 24.6$, $p < .001$) for 13 of the 15 tests comparing this mother-father parenting style combination with other combinations. Thus, the co-occurrence of having a mother who used an authoritarian parenting style and a father who used a neglectful parenting style in the home increased the likelihood of sons having a higher BMI.

Parenting Practices and BMI—For sons, mothers' "encouraging only, not modeling healthy behaviors" parenting practices was significantly associated with higher BMI compared to the "modeling not encouraging" and the "no modeling or encouraging" groups ($M = 23.0$ vs 21.6 , $p = .027$ and 21.1 , $p = .011$, respectively), indicating an effect size of 0.31 and 0.43 respectively. Also for sons, mothers' "no modeling or encouraging" was found to be significantly related to lower BMI compared to mothers' "modeling and encouraging" (21.1 vs 22.4 , $p = 0.031$) indicating an effect size of 0.29. There were no significant associations between fathers' parenting practices and sons' BMI. For daughters, fathers' "no modeling and encouraging healthy behaviors" parenting practice was significantly associated with higher BMI than the modeling only or the encouraging only groups ($M = 22.7$ versus 21.6 ($p = .013$) and 21.7 ($p = .043$) indicating effect sizes of 0.25 and 0.23 respectively based on an estimated standard deviation of 4.36 for BMI in daughters. There were no significant associations between mothers' parenting practices and daughters' BMI.

An interaction ($F = 1.97$, $d.f = 9$, $p = .039$) was found between maternal and paternal parenting practices on sons' BMI such that the combination of both maternal and paternal "encouraging only, not modeling healthy behaviors" was associated with higher BMI ($M = 25.7$) compared to all other combinations of parenting practices and it was significantly higher ($p < .01$) in 8 of the 15 comparisons. Thus, the co-occurrence of having a mother and a father who encouraged healthy behaviors, but did not model healthy behaviors themselves increased the likelihood of having a higher BMI for sons. An interaction effect ($F = 2.28$, $d.f. = 9$, $p = .015$) was also found between maternal and paternal parenting practices for daughters' BMI but the specific pattern of the interactions was complex. The paternal "no modeling or encouraging healthy behaviors" parenting practice which in the main effects analysis was associated with significantly higher BMI (simply controlling for maternal practices), was found only to exhibit this relationship with BMI in specific combination with maternal "modeling and encouraging healthy behaviors" or the maternal "encouraging only, not modeling healthy behaviors". Thus, the co-occurrence of having a father who did not model and encourage healthy behaviors and a mother who either modeled and encouraged or only encouraged healthy behaviors, increased the likelihood of having a higher BMI for daughters.

The same main effects for maternal and paternal style and practices were found when styles and practices were simultaneously included in the regression model. Furthermore, we did not find any significant interactions between mother and father parenting style and mother and father parenting practices. This finding indicates that parenting style and parenting practices are independently acting on BMI. Therefore, the relationships previously found between parenting styles and adolescents' BMI were not altered by the presence of specific parenting practices and visa versa.

We also did not find any moderating effects of ethnicity/race for parenting style or parenting practices. Thus, the relationship between parenting style and adolescents' BMI did not vary by the adolescents' ethnicity/race.

Discussion

The main aims of this study were to examine the separate and co-occurring relationships between parenting style and parenting practices and adolescent BMI, and to identify any parent gender-specific patterns related to parenting style and parenting practices. Related to parenting style, we found that maternal authoritarian parenting style was associated with higher BMI among sons. Thus, mothers who were rigid and had low caring/emotional responsiveness in the home created environments that were not protective for lower BMIs in sons. In contrast, findings do not suggest a protective role of paternal parenting style for BMI in sons. These

results confirm previous research findings that indicate that authoritarian parenting style is positively associated with adolescent BMI (6,14-18).

Related to parenting practices, fathers who did not encourage their daughters to have healthy dietary intake and physical activity, nor modeled healthy dietary intake and physical activity, had daughters with higher BMIs. These results suggest the potential value of fathers “doing something” in connection with their adolescent daughters' weight behaviors. Fathers who do not model or encourage healthy behaviors in their daughters may not provide a home environment for their adolescent daughters that is protective against weight problems.

Of particular importance were the findings related to the co-occurrence of parenting characteristics in the home. The co-occurrence of an authoritarian mother and a neglectful father was associated with higher BMI in sons. The co-occurrence of a mother and father who both encouraged but did not model healthy behaviors was associated with higher BMI in sons. The co-occurrence of a father who did not model or encourage healthy behaviors and a mother who either modeled and encouraged, or encouraged but didn't model healthy behaviors, was associated with higher BMI in daughters. Thus, the lack of parental modeling of healthy behaviors and incongruent encouraging of healthy behaviors between parents was associated with higher BMI in adolescents. These are unique findings. We are unaware of other studies that have examined incongruent parenting styles and practices associated with higher BMI in adolescents, therefore these findings are unique. For adolescents, it may be the case that having two parents who are both unresponsive to needs and who have contradicting messages regarding parental demands and modeling and encouraging of health behaviors may create a chaotic or inconsistent environment that effects the regulation of eating or physical activity. Future research should investigate further the importance of congruent parenting style and practices on adolescent BMI.

Another novel finding in our results was the gender-specific associations found between parenting characteristics and BMI among opposite sex parent/adolescent dyads. Specifically, mothers' parenting style was associated with sons' BMI and significant associations between parenting practices and adolescent BMI were found among opposite sex dyads (mother/son and father/daughter) had. These results add support to findings from intervention studies that have shown greater weight loss in opposite sex parent/adolescent dyads (26-27). Taken together, these results suggest that the opposite sex parent plays a unique role in influencing adolescent health behaviors. This is an important finding that future research, both qualitative and quantitative, should investigate further in order to identify underlying causal mechanisms.

Clinical Implications

Results from the current study suggest that it may be important for clinicians to promote more authoritative parenting styles in relation to adolescent sons' weight. High paternal expectations and structure along with caring and emotional responsiveness in the home, rather than parents being rigid, providing less structure and being emotionally unresponsive may create a home environment that is protective against overweight and obesity among sons. Also, findings from the current study suggest that it may be important for clinicians to promote the importance of congruency between parenting practices. That is, when both parents are consistent with both words and actions related to health behaviors, and take action with health behaviors, the home environment supports healthful nutrition and physical activity and is protective against overweight among adolescent sons and daughters.

This study had several strengths, including: the use of a large, diverse, population-based sample, the use of advanced statistical analyses to identify associations between the co-occurrence of parenting characteristics and adolescent BMI, and adjustments for possible third variable confounding of results. There were some limitations to this study that should be taken

into account when interpreting the study's findings. One limitation was our inability to use a standardized measure of parenting style. Using a standardized measure of parenting style would have increased the validity and reliability of this construct, allowing for comparisons across other studies assessing parenting style. Also, we were unable adjust for parental weight, which could be a potential confounder of our results. Finally, while care was taken to conduct statistical tests only for pre-planned comparisons, it is possible that statistical significance was achieved by chance for some associations.

Conclusion

Future research should continue to look at the effect of co-existing parenting characteristics (parenting style and parenting practices) on adolescent BMI to provide new insight into the complex dynamics of the home environment on adolescents' weight status. Conducting longitudinal research would be useful in order to establish temporal ordering of variables. Also, it would be important to examine further the relationship between opposite sex parent/adolescent dyads and weight status and weight-related behaviors.

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Figure 1a

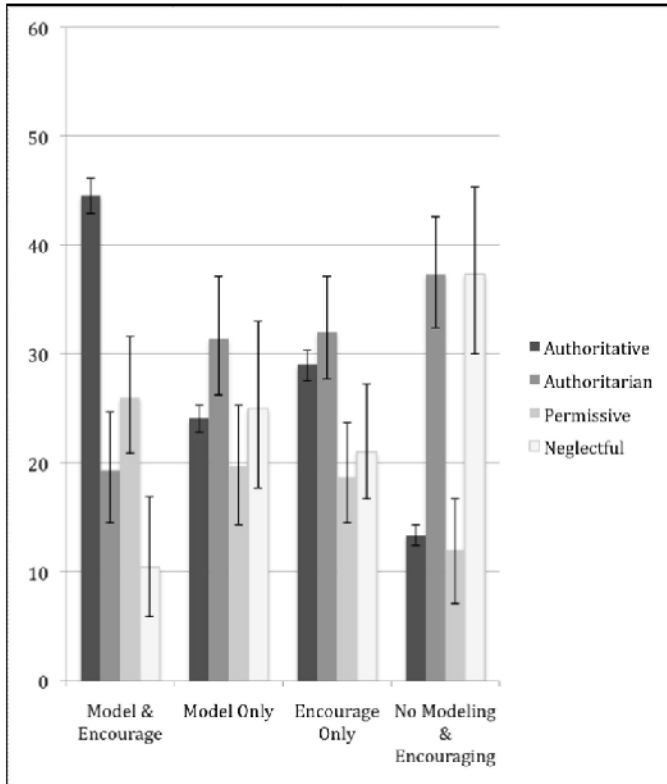


Figure 1b

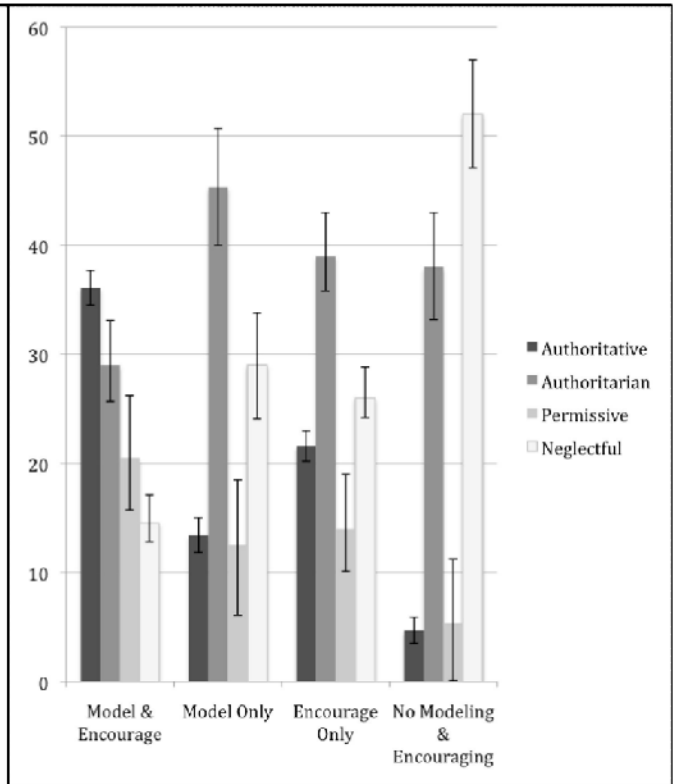


Figure 1. Probabilities of the Co-occurrence of Parenting Style and Parenting Practices
 Figure 1a: Co-occurrence of **Mothers'** Parenting Style and Parenting Practices
 Figure 1b: Co-occurrence of **Fathers'** Parenting Style and Parenting Practices

Table 1
Latent Classes of Parenting Practices by Gender of Parent and Child

Latent Class Name	Adolescent % Gender in Latent Class	Description of Latent Class
<i>Class 1:</i> Mother Modeling & Encouraging Healthy Behavior Father Modeling & Encouraging Healthy Behavior	Daughter/Son 83%; 86% 74%; 79%	Parent models healthy dietary intake and physical activity and encourages healthy dietary intake and physical activity in his/her adolescent
<i>Class 2:</i> Mother Modeling Only, Not Encouraging Healthy Behavior Father Modeling Only, Not Encouraging Healthy Behavior	Daughter/Son 6%; 6% 10%; 6%	Parent models healthy dietary intake and physical activity, but does not encourage healthy dietary intake and physical activity in his/her adolescent.
<i>Class 3:</i> Mother Encouraging Only, Not Modeling Healthy Behavior Father Encouraging Only, Not Modeling Healthy Behavior	Daughter/Son 7%; 5% 5%; 6%	Parent encourages healthy dietary intake and physical activity in his/her adolescent, but does not model healthy dietary intake and physical activity themselves.
<i>Class 4:</i> Mother Not Modeling or Encouraging Healthy Behavior Father Not Modeling or Encouraging Healthy Behavior	Daughter/Son 4%; 3% 11%; 9%	Parent does not model healthy dietary intake and physical, nor does he/she encourage healthy dietary intake and physical activity in his/her adolescent.

Table 2
Probabilities of Parenting Style(%) and Parenting Practices(%) by Adolescent Gender, SES, Ethnicity/Race, and Age

	Gender (%)		SES (%)							Ethnicity/Race (%)					Age (%)		
	Daughter	Son	Low	Lo-Mid	Mid	Mid-Hi	High	White	Black	Hispanic	Asian	Native Am.	Younger (11-14)	Older (15-18)			
			24.3	22.1	24.5	26.1	25.2	24.7	28.0	22.8	23.1	17.1	24.8	23.5		25.1	
Parenting Style:																	
<i>Mother</i>																	
1. Authoritative	42.5	40.6	37.1	37.8	38.9	43.4	51.1	41.7	44.1	41.5	36.3	40.7	44.1	39.5			
2. Authoritarian	20.9	21.8	22.8	22.5	20.9	22.4	16.5	18.5	21.5	19.2	30.9	17.8	20.0	22.2			
3. Permissive	24.3	24.3	22.1	24.5	26.1	25.2	24.7	28.0	22.8	23.1	17.1	24.8	23.5	25.1			
4. Neglectful	12.5	13.1	17.8	15.1	13.9	8.8	7.6	11.6	11.4	16.0	15.5	16.5	12.2	13.0	p = .02		
					p ≤ .0001					p ≤ .0001							
<i>Father</i>																	
1. Authoritative	26.1	34.5	22.7	26.8	30.2	34.3	36.6	32.3	28.6	35.5	27.6	21.4	30.6	30.3			
2. Authoritarian	35.6	27.1	34.0	33.9	30.6	31.9	25.9	30.1	26.3	30.2	40.2	29.2	28.8	32.8			
3. Permissive	15.2	20.8	13.4	15.5	20.1	18.1	23.6	20.4	18.0	14.9	12.6	23.5	20.9	16.5			
4. Neglectful	23.0	17.3	29.7	23.6	18.9	15.5	13.8	17.0	26.9	19.3	19.4	25.7	19.6	20.1	p = .0018		
					p ≤ .0001					p ≤ .0001							
Parenting Practices:																	
<i>Mother</i>																	
1. Modeling & Encouraging	83.2	85.7	79.4	79.4	85.0	89.0	89.4	88.5	77.3	82.0	82.6	83.2	87.0	84.0			
2. Modeling Only, Not Encouraging	6.0	6.5	6.8	8.3	6.1	5.0	4.4	4.7	9.0	8.1	5.5	6.0	6.0	6.2			
3. Encouraging Only, Not Modeling	7.5	5.0	8.5	6.8	5.7	4.5	5.3	4.6	7.4	5.8	8.5	6.5	6.0	6.1			
4. No Modeling or Encouraging	3.7	3.2	5.4	5.5	3.6	1.6	.97	2.2	6.3	4.3	3.5	4.5	2.3	4.0			
					p ≤ .0001					p ≤ .0001					p = .008		
<i>Father</i>																	
1. Modeling & Encouraging	74.0	79.3	67.4	70.3	76.3	82.2	86.3	81.2	66.0	71.4	77.0	80.0	81.5	74.2			
2. Modeling Only, Not Encouraging	10.0	6.1	11.0	9.0	7.5	6.4	5.0	6.0	8.4	9.0	12.0	3.0	7.0	8.2			
3. Encouraging Only, Not Modeling	5.3	6.0	6.2	6.3	6.0	5.0	5.0	5.4	7.0	5.2	4.0	5.2	5.0	6.0			
4. No Modeling or Encouraging	11.4	9.0	15.3	14.5	10.2	6.8	4.0	7.4	19.0	15.0	8.0	12.0	7.0	12.0			
					p ≤ .0001					p ≤ .0001					p = .008		

Table 3
Results of Parenting Style and Parenting Practices Independent Relationships with Adolescent BMI. Adjusted for Ethnicity/Race, SES and age (maternal and paternal predictors of either style or practice are simultaneously included)

Dependent Variable: BMI	DF	F Value	p	Parenting Style Adjusted Mean				Parenting Practices Adjusted Mean			
				1	2	3	4	1	2	3	4
<i>Daughters</i>											
Mother Parenting Style	3	.52	.6671	22.2	22.2	22.2	22.4	22.3	21.9	21.5	22.5
Father Parenting Style	3	.80	.4943	22.3	22.2	22.0	22.5	22.3	21.6 ^a	21.7 ^b	22.7 ^{ab}
Mother Parenting Practices	3	1.82	.1419								
Father Parenting Practices	3	2.65	.0474								
<i>Sons</i>											
Mother Parenting Style	3	2.80	.0389	22.1 ^a	22.8 ^{ab}	22.3	22.1 ^b	22.4 ^a	21.6 ^b	23.0 ^{b,c}	21.1 ^{a,c}
Father Parenting Style	3	1.66	.1735	22.4	22.0	22.3	22.6	22.3	22.0	22.8	22.8
Mother Parenting Practices	3	3.12	.0251								
Father Parenting Practices	3	1.49	.2165								

Key: Parenting Style: 1 = Authoritative, 2 = Authoritarian, 3 = Permissive, 4 = Neglectful Parenting Styles.
 Parenting Practices: 1 = Modeling & Encouraging, 2= Modeling Only, Not Encouraging, 3 = Encouraging Only, Not Modeling, 4 = No Modeling or Encouraging.

Note: Means in rows sharing superscripts are significantly different at p < .05. For all means, higher means indicate higher BMI.