

Parent/Adolescent Weight Status Concordance and Parent Feeding Practices

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abstract

BACKGROUND: Previous studies have examined the independent influence of mother's weight status or child's weight status on parents' use of specific feeding practices (ie, food restriction, pressure-to-eat). However, studies have not examined the mutual influence of parents' and adolescents' weight status on parents' feeding practices. This study examines the relationship between parent and adolescent weight status concordance and discordance and parent feeding practices.

METHODS: Data from 2 linked population-based studies, Eating and Activity in Teens (EAT) 2010 and Families and Eating and Activity in Teens (F-EAT), were used for cross-sectional analysis. Parents ($n = 3252$; 63% female; mean age 42.6 years) and adolescents ($n = 2153$; 54% female; mean age 14.4 years) were socioeconomically and racially/ethnically diverse. Anthropometric assessments and surveys were completed at school by adolescents, and surveys were completed at home by parents.

RESULTS: Parents used the highest levels of pressure-to-eat feeding practices when parents and adolescents were both nonoverweight compared with all other combinations of concordant and discordant parent/adolescent weight status categories. Additionally, parents used the highest levels of food restriction when parents and adolescents were both overweight/obese compared with all other combinations of concordant and discordant parent/adolescent weight status categories. Sensitivity analyses with 2-parent households revealed similar patterns.

CONCLUSIONS: Results suggest that parents use feeding practices in response to both their adolescents' and their own weight status. Results may inform health care providers and public health interventionists about which parent/adolescent dyads are at highest risk for experiencing food restriction or pressure-to-eat parent feeding practices in the home environment and whom to target in interventions.

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WHAT'S KNOWN ON THIS SUBJECT: Research has shown that parent feeding practices are associated with adolescent weight status and dietary intake. It is unknown whether certain factors such as parent and child weight status concordance or discordance influence parents' use of specific feeding practices.

WHAT THIS STUDY ADDS: Findings from the current study suggest that parents use the highest levels of pressure-to-eat feeding practices when parents and adolescents are both nonoverweight and the highest levels of food restriction when parents and adolescents are both overweight/obese.

Given the high prevalence of adolescent obesity and the associated increased risk for adverse health problems as adults (eg, hypertension, cardiovascular disease, metabolic syndrome, type 2 diabetes, psychosocial problems),^{1,2} it is important to identify modifiable factors within the home environment that shape the health behaviors of adolescents on a daily basis to prevent childhood obesity.^{3,4} Parent feeding practices (ie, strategies parents use to get their children to eat less or more food) are an important modifiable factor in the home environment that may influence adolescent dietary intake and BMI.⁵⁻⁹ Studies investigating parent feeding practices have distinguished between parent practices of food restriction (eg, encourage child to eat less food) and pressure-to-eat (eg, encourage child to eat more food).¹⁰ Results from prior studies examining parent food-restriction and pressure-to-eat feeding practices have generally found that children whose parents use food restriction and pressure-to-eat are at increased risk for overweight and obesity and less healthful dietary intake,^{8,9,11-28} although not all findings have been consistent.^{27,29-32} To develop effective interventions to shape parent feeding practices, researchers must better understand the predictors of these feeding behaviors, such as child or parent weight status. Limited research has examined whether parents use specific feeding practices based on the child's weight status, their own weight status, or both.^{12,29,33-35} Understanding what role parent and child weight status plays in a parent's decision to use specific feeding practices could be used to inform interventions aimed at reducing the use of food restriction or pressure-to-eat feeding practices. The few studies that have examined both parent and child weight in the feeding environment

have shown inconsistent results, with some research indicating that parent BMI was positively associated with food restriction and negatively associated with pressure-to-eat,^{12,33,34,36} and other studies showing no association.^{29,37} Additionally, some studies have shown that child higher weight status is positively related to parent food-restriction practices^{28,35,38,39} and lower weight status is related to pressure-to-eat practices.^{28,39} However, few studies have examined associations between parent feeding practices and child weight status with adolescents,^{28,40} and no studies have looked at the simultaneous influence of parent and adolescent weight status. Furthermore, no studies that we are aware of have examined whether households with 2 parents use specific feeding practices based on the adolescent's weight status, 1 parent's weight status, or a combination of all 3 weight statuses.

To develop effective interventions targeting parent feeding practices, it is important to understand whether parents use specific feeding practices based on their own weight status (eg, parent is overweight/obese and uses food restriction), their adolescent's weight status (eg, adolescent is overweight/obese and parent uses food restriction), or a combination of both their adolescent's weight status and their own weight status (eg, parent and adolescent are both overweight/obese and parent uses food restriction). Additionally, because it is common to have 2 parents living in a household, it is important to understand whether both parents' weight statuses, in combination with the adolescent's weight status, influence parents' feeding practices. These complex relationships within the household related to parent feeding practices can give a clearer picture of the home feeding environment to inform family-based obesity interventions that target feeding practices as

a modifiable factor in reducing adolescent obesity. Thus, the current study aims to address this gap in the literature by analyzing parent food-restriction and pressure-to-eat practices by parent and adolescent weight concordance (ie, both parent and child are nonoverweight or overweight/obese) and discordance (ie, parent is overweight/obese and child is nonoverweight or vice versa).

Based on family systems theory,⁴¹ which highlights the complexity of parent-adolescent dynamics in the feeding environment, the current study addresses the following research questions: (1) Are parent feeding practices, including pressure-to-eat or food restriction, associated with the parent's own weight status or the adolescent's weight status? (2) When there are 2 parents living in the same household, are parent feeding practices (ie, pressure to eat, food restriction) more strongly associated with 1 parent's weight status, both parents' weight statuses, or the adolescent's weight status? The main hypotheses proposed include that parents will use more pressure-to-eat feeding practices when the adolescent is nonoverweight or when both parents and adolescents are nonoverweight, and that parents will use more restriction feeding practices when the adolescent is overweight/obese or when both parents and adolescents are overweight/obese. Results of the current study may inform which parent/adolescent dyads and triads are at highest risk for experiencing food restriction or pressure-to-eat practices for health care providers to intervene.

METHODS

Study Design and Population

Data for this analysis were drawn from 2 coordinated, population-based studies.^{42,43} Eating and Activity in Teens (EAT) 2010 was designed to examine dietary intake, physical activity, weight control behaviors,

weight status, and factors associated with these outcomes in adolescents. Families and Eating and Activity in Teens (F-EAT) was designed to examine factors within the family and home environment (eg, parent behaviors, family functioning, home food and physical activity resources) of potential relevance to adolescents' weight and weight-related behaviors.^{43,44} Survey development for both EAT 2010 and F-EAT is described elsewhere.^{43,44} Briefly, initial versions of surveys were pretested by 56 adolescents and 35 parents from diverse backgrounds for clarity, readability, and relevance. After revisions, the survey was additionally pilot tested with a different sample of 129 middle school and high school students and 102 parents to examine the test-retest reliability of measures over a 1- to 2-week period. All study procedures were approved by the University of Minnesota Institutional Review Board Human Subjects Committee and the participating school districts.

For EAT 2010, surveys and anthropometric measures were completed by 2793 adolescents from 20 public middle schools and high schools in the Minneapolis/St. Paul metropolitan area of Minnesota during the 2009/10 academic year. The mean age of the study population was 14.4 years (SD 2.0), and adolescents were equally divided by gender (47% males, 53% females). The racial/ethnic backgrounds of the participants were as follows: 18.9% white, 29.0% black, 19.9% Asian American, 16.9% Hispanic, 3.7% Native American, and 11.6% mixed or other. The socioeconomic status of participants included: 39.0% low (family income <\$35 000/year), 21.7% lower middle (\$35 000 to \$49 999), 17.4% middle (\$50,000 to \$79 999), 13.7% upper middle (\$80 000 to \$99 999), and 8.2% high (\geq \$100 000).

For Project F-EAT, data were collected by surveying 1 or 2

parents/caregivers ($n = 3709$) of the adolescents in EAT 2010 by mail or phone. In total, 2382 EAT 2010 (85%) adolescent participants had ≥ 1 parent respond, and there were 2 parent respondents for 1327 adolescents. Parent participants had a mean age of 42.3 years (SD 8.6). More than half (62%) of the parent respondents were mothers or other female parents. Participating parents were ethnically and socioeconomically diverse, similar to the adolescent sample.

For the current study, the analytic sample differed slightly for each research question. For research question 1, the analytic sample included 2153 EAT 2010 adolescents with ≥ 1 parent in the F-EAT study with whom they lived at least half of the time (Table 1).⁴⁵ For research question 2 (the subanalysis), the analytic sample included 979 EAT 2010 adolescents with 2 parents in the F-EAT study with whom they lived 100% of the time.

Measures

Parent Feeding Practices

Pressure-to-eat and food restriction parenting practices were measured using an adapted version of the Child Feeding Questionnaire (CFQ), created

specifically for adolescents.⁴⁶ This adolescent version of the CFQ has been used in other studies.^{28,40,46,47}

Pressure-to-eat parenting practices were measured using all 4 items from the pressure-to-eat subscale of the CFQ, which is designed to measure the degree to which the parent encourages their child to eat more food, typically at mealtimes.³⁹ Self-report items included (1) "My child should always eat all the food on his/her plate," (2) "I have to be especially careful to make sure my child eats enough," (3) "If my child says, 'I'm not hungry,' I try to get him/her to eat anyway," and (4) "If I did not guide or regulate my child's eating, my child would eat much less than he/she should." Individual items were measured using a 4-point Likert scale, with each point on the scale represented by a word anchor (disagree, slightly disagree, slightly agree, and agree). An overall parental pressure-to-eat scale was created by averaging responses to each of these 4 questions to assign an overall pressure score ranging from 1 (low pressure) to 4 (high pressure) (test-retest $r = 0.73$, Cronbach $\alpha = 0.70$).⁴⁰

Food restriction parenting practices were measured using 6 items from the 8-item restriction subscale of the

TABLE 1 Summary Statistics of Adolescent BMI Percentile, Parent BMI, Adolescent and Parent Weight Status and Demographic Characteristics, and Parent Feeding Practices

	Adolescents ($n = 2153$)	Parents ($n = 3252$)
Weight status (overweight/obese)	40 (854)	65 (2108)
Age, y	14.4 (2.0)	42.6 (8.2)
Female	54 (1165)	63 (2002)
Race/ethnicity		
White	22 (464)	30 (958)
Black	26 (568)	24 (742)
Hispanic	17 (371)	17 (556)
Asian American	21 (441)	22 (690)
Hawaiian/Native American/other	14 (303)	5 (159)
Parent education		
Less than high school	—	22 (726)
High school or equivalent	—	19 (632)
Some college	—	27 (894)
College	—	19 (621)
Advanced degree	—	11 (356)
Pressure-to-eat scale (range 1–4)	—	2.2 (0.8)
Food restriction scale (range 1–4)	—	2.5 (0.9)

Values are expressed as n (%) or mean (SD). Numbers do not sum to total because of missing values. —, Measure not completed by adolescents.

CFQ³⁹ which is designed to measure a parent's attempt to control a child's eating by restricting access to palatable foods. Two items from the subscale were dropped based on recommendations from a validation study conducted within a diverse adolescent population.⁴⁶ The 6 self-report items included (1) "I have to be sure that my child does not eat too many high-fat foods," (2) "I have to be sure that my child does not eat too many sweets (candy, ice cream, cake, or pastries)," (3) "I have to be sure that my child does not eat too much of his/her favorite foods," (4) "If I did not guide or regulate my child's eating, he/she would eat too much of his/her favorite foods," (5) "I intentionally keep some foods out of my child's reach," and (6) "If I did not guide or regulate my child's eating, he/she would eat too many junk foods." Individual items were measured using a 4-point Likert scale, with each point on the scale represented by a word anchor (disagree, slightly disagree, slightly agree, and agree). An overall parental food restriction scale was created by averaging responses to each of these 6 questions to assign an overall restriction score ranging from 1 (low restriction) to 4 (high restriction) (test-retest $r = 0.72$, Cronbach $\alpha = 0.86$).⁴⁰

Weight Status

Adolescent height and weight were measured by trained research staff in a private area at school with standardized equipment and procedures. Adolescents were asked to remove shoes and outerwear (eg, heavy sweaters). BMI values were calculated according to the following formula: weight (kg)/height (m)², converted to percentiles, and standardized for gender and age based on Centers for Disease Control and Prevention (CDC) guidelines.^{48,49} BMI percentiles were then categorized into nonoverweight (<85th percentile) or overweight/obese (\geq 85th percentile) based on CDC guidelines.^{48,49}

Parent BMI was assessed using parent self-report of height and weight (test-retest $r = 0.97$). Self-reported height and weight have shown to be highly correlated with objectively measured values in adults.⁵⁰⁻⁵³ Parent BMI was then categorized into not overweight (<25) or overweight/obese (\geq 25) based on CDC guidelines.^{48,49}

Statistical Analysis

Descriptive statistics were computed for all dependent and independent variables. Adolescent and parent concordant/discordant weight status categories were created as a 4-level variable: (1) both adolescent and parent nonoverweight, (2) adolescent overweight/obese and parent nonoverweight, (3) adolescent nonoverweight and parent overweight/obese, and (4) both adolescent and parent overweight/obese.

Linear regression models were used to model either food restriction or pressure-to-eat as the dependent variable and the 4-level adolescent and parent concordant/discordant weight status categories as the independent variable. Because some children had 2 parents in the analysis, we corrected for the within-family correlation using generalized estimating equations with an independent correlation structure. Each linear regression model was adjusted for child's race/ethnicity (white, black, Hispanic, Asian American, Native American, Hawaiian, other), gender (female, male), and the highest educational attainment of either parent (less than high school, high school or equivalent, some college, college degree, advanced degree). Adjusted means of average restriction and pressure were estimated, and differences between concordant/discordant weight status groups were tested.

A subanalysis was conducted to identify concordant/discordant weight status categories within

adolescent households with 2 parents. Specifically, the sensitivity analysis restricted the study sample to only those adolescents who had 2 parents who both responded to the F-EAT survey and with whom the adolescent lived 100% of the time ($n = 979$). Adolescent and parent weight status concordance/discordance groups were categorized as (1) both parents and adolescent nonoverweight, (2) both parents and adolescent overweight/obese, (3) both parents overweight/obese and adolescent nonoverweight, (4) both parents nonoverweight and adolescent overweight/obese, (5) parents discordant on weight status and adolescent nonoverweight, and (6) parents discordant on weight status and adolescent overweight/obese. Average pressure-to-eat or food restriction practices by both parents were regressed on the weight status concordance/discordance variable and adjusted for adolescent gender, race/ethnicity, and age. Additionally, to account for both parents' genders in the model, a 3-category variable was created representing the different combinations of parent gender (ie, both female, both male, 1 male and 1 female). These categories do not assume that parents are partnered; for example, combinations could include a mother and an uncle, or a mother and a grandmother.

RESULTS

Parent Pressure-to-Eat Practices

Parents reported significantly higher levels of pressure to eat (1 = low, 4 = high) when adolescents and parents were both nonoverweight (mean 2.35; 95% confidence interval [CI] 2.29-2.42) compared with when parents and adolescents were discordant on weight status (mean 2.26, 95% CI 2.21-2.30; mean 2.06, 95% CI 1.97-2.14) or when both parents and adolescents were overweight/obese (mean 2.04; 95% CI 1.99-2.10) ($P < .05$), after

adjusting for adolescent race/ethnicity, age, and gender and parent highest level of education and gender (Table 2). Additionally, although parents reported the highest levels of pressure-to-eat practices when adolescents and parents were concordant on nonoverweight status, results also showed that when the adolescent was nonoverweight across all concordance/discordance categories that parents reported significantly more pressure-to-eat (mean 2.26; 95% CI 2.21–2.30) compared with when the parent and adolescent were both overweight/obese (mean 2.04; 95% CI 1.99–2.10) or when the parent was nonoverweight and the adolescent was overweight/obese (mean 2.06; 95% CI 1.97–2.14) ($P < .05$).

Parent Food Restriction Practices

Parents reported significantly more food restriction (1 = low; 4 = high) when parents and adolescents were both overweight/obese (mean 2.74; 95% CI 2.67–2.80) compared with when parents and adolescents were discordant on weight status (mean 2.42, 95% CI 2.36–2.47; mean 2.56, 95% CI 2.46–2.67) or when both adolescents and parents were nonoverweight (mean 2.36, 95% CI 2.30–2.43) ($P < .05$), after adjusting for adolescent race/ethnicity, age, and gender and parent highest level of education and gender (Table 2). Additionally, although parents reported the highest levels of food restriction when adolescents and parents were concordant on overweight/obese status, results also showed that when the adolescent was

overweight/obese across all concordance/discordance categories that parents reported significantly more food restriction practices (mean 2.56; 95% CI 2.46–2.67) compared with when parents and adolescents were both nonoverweight (mean 2.36; 95% CI 2.30–2.43) or when parents were overweight/obese and adolescents were not overweight (mean 2.42; 95% CI 2.36–2.47) ($P < .05$).

Two-Parent Subanalysis Results

Analyses including concordance and discordance on weight status between primary parent, secondary parent, and adolescent showed patterns similar to the full sample analyses. Specifically, parents engaged in the highest levels of pressure-to-eat when parents and adolescents were all nonoverweight and the highest levels of food restriction when parents and adolescents were all overweight/obese (Table 3).

DISCUSSION

These results support our initial hypotheses and suggest that parents use specific feeding practices based on both their adolescents' weight status and their own weight status. For example, results showed that when an adolescent was overweight/obese, but the parent was not (ie, discordant), parents engaged in more food restriction than if the adolescent or parent were nonoverweight/obese. However, when the parent and adolescent were both overweight/obese (ie, concordant), the parent engaged in the highest level of food restriction. Results from the 2-parent

subanalysis confirmed the findings in the full sample.

These findings both support and expand on previous literature. Specifically, findings from the current study confirm prior results indicating that parents use food restriction practices with overweight/obese children and pressure-to-eat practices with nonoverweight children.^{9,18,21,22,27,28} The current study findings also add to the previous literature by showing that both adolescent and parent weight status may be important in understanding why parents use specific feeding practices with adolescents. This finding is consistent with family systems theory,⁴¹ which purports that parent and child behaviors are bidirectional, in that one person's behavior shapes the other person's behavior, which in turn then shapes the first person's behavior. Thus, through a family systems theory lens, findings from the current study suggest that weight status of both parent and adolescent is associated with parents' use of certain feeding practices, which potentially then shapes further weight-related behaviors of the adolescent (and parent) and ultimately influences weight gain or loss over time. However, given that the findings of this study are cross-sectional, it is important for future research to identify longitudinal associations between parent feeding practices and adolescent and parent weight status to identify temporal sequencing of the associations.

Study strengths and limitations should be taken into account when

TABLE 2 Predicted Average Pressure to Eat and Food Restriction by Groups of Parent and Child Weight Status Concordance and Discordance

Factor	Weight Status Concordance		Weight Status Discordance	
	Parent and Child Nonoverweight (n = 680)	Parent and Child Overweight/Obese (n = 898)	Parent Overweight/Obese and Child Not Overweight (n = 1210)	Parent Not Overweight and Child Overweight/Obese (n = 286)
Parent pressure-to-eat scale (1 = low, 4 = high)	2.35 (2.29–2.42) ^a	2.04 (1.99–2.10) ^b	2.26 (2.21–2.30) ^c	2.06 (1.97–2.14) ^b
Parent food restriction scale (1 = low, 4 = high)	2.36 (2.30–2.43) ^a	2.74 (2.67–2.80) ^b	2.42 (2.36–2.47) ^a	2.56 (2.46–2.67) ^c

Values are expressed as adjusted group means (95% CIs). For tests of comparison between group means, values across rows not sharing a superscript letter (ie, a, b, c) are statistically different at $P < .05$. Models were adjusted for child's race/ethnicity and gender and parent's highest level of education and gender. Sample includes adolescents and all parents reporting that the child lives with them at least half of the time.

TABLE 3 Predicted Average Pressure to Eat and Food Restriction by Groups of Weight Concordance and Discordance for Adolescent Participants and Both Parents in F-EAT

Factor	Weight Status Concordance		Weight Status Discordance			
	Both Parents and Child Nonoverweight (n = 94)	Child Overweight and Both Parents Overweight and Child Nonoverweight (n = 181)	Both Parents Overweight and Child Nonoverweight (n = 55)	Both Parents Not Overweight and Child Overweight (n = 135)	Parents Discordant Weight and Child Not Overweight (n = 111)	Parents Discordant Weight and Child Overweight (n = 315)
Parent pressure-to-eat scale (average)	2.44 (2.31–2.57) ^a	2.05 (1.96–2.14) ^b	2.08 (1.91–2.24) ^{bc}	2.26 (2.15–2.37) ^c	2.27 (2.15–2.39) ^c	2.18 (2.11–2.25) ^c
Parent food restriction scale (average)	2.54 (2.18–2.49) ^a	2.72 (2.60–2.83) ^b	2.58 (2.38–2.78) ^{ab}	2.41 (2.28–2.54) ^a	2.45 (2.31–2.60) ^a	2.49 (2.40–2.57) ^a

Values are expressed as adjusted group means (95% CIs). For tests of comparison between group means, values across rows not sharing a superscript letter (ie, a, b, c) are statistically different at $P < .05$. Models were adjusted for child's race/ethnicity and gender, parent's highest level of education and a three-level variable of parent gender (both female, one female and one male). Sample includes adolescents and all parents reporting that the child lives with them 100% of the time.

interpreting the study findings. First, this study was racially/ethnically and socioeconomically diverse, allowing for generalizability of study findings to similar populations. Additionally, data from mothers, fathers, and adolescents were used, and data were collected from each family member individually rather than mother self-report only. One limitation of the study was that self-report BMI was used. Some research shows that adults and adolescents tend to underestimate BMI compared with objectively measured BMI.^{54–56} However, a substudy conducted in a population (ie, same city, race/ethnicity, gender, age) similar to that of the current study showed that self-reported BMI and objectively measured BMI were highly correlated.⁵⁷ Another limitation of this study was the cross-sectional design. Because we were unable to examine longitudinal associations, we cannot determine causality or temporality of associations between parent feeding practices and parent/adolescent weight status concordance/discordance. Additionally, given that the magnitude was small of the mean difference in parent food restriction and pressure-to-eat practices and associations with parent and child weight status concordance/discordance, it is important to interpret findings with caution. However, findings from the current study are consistent with prior studies showing similar mean differences on these measures;^{8,18,19,26,28,32} thus, future research is warranted to further explore parent and child weight status as potential factors of influence on parent feeding practices. It would also be important for future research to examine whether there are any differences in the current findings by race/ethnicity and socioeconomic status.

Results from the current study may inform both clinical practice and intervention research. For example, clinicians working with families or interventionists targeting parent

feeding practices in the home environment may be able to identify the most at-risk parent-adolescent dyads (ie, concordant on weight status) for engaging in these parent feeding practices. Interventions could target these dyads to help them reduce parent food restriction and pressure-to-eat practices in the home environment and engage in other practices that may be more effective.

CONCLUSIONS

Results indicate that when parents and adolescents are concordant on weight status, parents use more pressure-to-eat (parents/adolescents concordant on nonoverweight status) or food restriction (parents/adolescents concordant on overweight/obese status) practices. Additionally, results from the subanalyses with 2-parent households showed that when both parents' weight status and adolescent weight status were concordant, the parents engaged in the highest level of food restriction (triad was concordant on overweight/obese status) or pressure-to-eat (triad was concordant on nonoverweight status). Study results may inform recommendations for professionals that work with parents and adolescents and family-based interventions that focus on utilizing appropriate parent feeding practices with adolescents to prevent adolescent obesity. Specifically, results from this study suggest that it may be helpful to take into account parent and adolescent weight status when intervening with parents regarding feeding practices.

ABBREVIATIONS

- CDC: Centers for Disease Control and Prevention
- CFQ: Child Feeding Questionnaire
- CI: confidence interval
- EAT: Eating and Activity in Teens
- F-EAT: Families and Eating and Activity in Teens

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