

Maternal and Adolescent Report of Mothers' Weight-Related Concerns and Behaviors: Longitudinal Associations with Adolescent Body Dissatisfaction and Weight Control Practices

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Objective This population-based study examined mothers' weight-related concerns and behaviors (weight status, weight dissatisfaction, dieting, and encouraging child to diet) at baseline, as assessed by both mothers and adolescents, and associations with adolescents' body dissatisfaction and weight control practices 5 years later. **Methods** Adolescents and their mothers ($n = 443$ pairs) were surveyed in 1998–1999; adolescents were resurveyed in 2003–2004. **Results** Baseline maternal report of higher levels of her weight-related concerns/behaviors was associated with greater body dissatisfaction in girls 5 years later, controlling for adolescent weight status and other covariates. Baseline maternal report of weight-related concerns/behaviors was also associated with greater prevalence of trying to lose weight in both boys and girls 5 years later. Baseline adolescent report of higher maternal weight-related concerns/behaviors was associated with a higher prevalence of trying to lose weight 5 years later in girls. **Conclusions** These findings highlight the importance of mothers' weight-related concerns and behaviors for adolescents' weight-related outcomes.

Key words body image; dieting; disordered eating; longitudinal; parent; weight loss.

Introduction

Problematic eating behaviors are prevalent among adolescents. For instance, in the 2007 Youth Risk Behavior Survey (Centers for Disease Control and Prevention, 2008), ~45% of adolescents reported that they were trying to lose weight (although only 30% were actually overweight or obese), 12% reported having fasted, over 6% had used diet pills, powders, or liquids, and 4% had vomited or used laxatives to lose weight, in the 30 days prior to the survey. These patterns of behavior have important consequences for adolescent and adult physical and emotional health, including increased risk of disordered eating (Johnson & Wardle, 2005) and increased weight status over time (Stice, Presnell, Shaw, & Rohde, 2005).

Body dissatisfaction, also highly prevalent at this age, is one of the strongest predictors of problematic eating behaviors (Stice & Shaw, 2002), and is associated with adverse outcomes in its own right, including depression and low self-esteem (Johnson & Wardle, 2005).

Current theories propose multiple sources of influence on the development of disordered eating and body dissatisfaction, including family attitudes and behaviors related to weight and eating (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). However, data linking parental attitudes and behaviors to children's disordered eating outcomes have been inconsistent, leading to uncertainty as to whether it would be helpful to specifically address parents' weight-related attitudes and behaviors in the

treatment or prevention of disordered eating among adolescents.

Some previous studies have found a relationship between parental and child eating and weight-related attitudes, beliefs, and behaviors (Agras, Bryson, Hammer, & Kraemer, 2007; Gardner, Stark, Friedman, & Jackson, 2000; Haines, Neumark-Sztainer, Hannan, & Robinson-O'Brien, 2008). For instance, perceived parental concern about the child's body size longitudinally predicted eating disorder symptoms in both boys and girls in a study of children aged 6–14 years (Gardner et al., 2000). However, other studies have found no association between parent and child eating and weight-related attitudes and behaviors. For instance, one study of adolescents aged 16–17 years found no link between mothers' and son's eating and body image (Elfhag & Linne, 2005). In a study of over 1000 teen girls (The McKnight Investigators, 2003) the authors reported no association between adolescent girls' reports of parents' concern with thinness and teasing about weight, and adolescents' onset of eating disorders or eating disorder symptoms.

In a cross-sectional study using the first wave of data collected for the current longitudinal study, Keery, Eisenberg, Boutelle, Neumark-Sztainer, & Story (2006) found that for both boys and girls, adolescent report of their mothers' dieting, but not maternal report of mothers' dieting or body image, was associated with adolescents' weight concerns and unhealthy weight control behaviors. The authors suggested that the contradictions in the literature noted above might be due to differences between the studies in who was reporting on parents' attitudes and behaviors. They argued that adolescents' perceptions of parental attitudes and behaviors might be as or more important than parents' actual (self-reported) behaviors in predicting negative weight-related outcomes. It is possible, for instance, that adolescents who are focused on weight and eating tend to incorrectly perceive that their family members are also invested in their own or others' weight and eating. Research on descriptive norms for alcohol consumption has shown that older adolescents' alcohol use is strongly associated with misperceptions of more frequent drinking among their peers (Neighbors, Dillard, Lewis, Bergstrom, & Neil, 2006; Perkins, Haines, & Rice, 2005), and it may be that adolescents who are themselves invested in weight control misperceive parents' weight-related attitudes and behaviors in a similar manner. Determining whether parental attitudes and behaviors, or adolescent perceptions of parental attitudes and behaviors, are most closely related to adolescents' own weight-related attitudes and behaviors will help to identify the most

effective targets for the prevention and treatment of eating and weight-related disorders.

We undertook an investigation of the relationships between adolescents' reports of their mothers' weight-related concerns and behaviors, mothers' reports of their own weight-related concerns and behaviors, and adolescents' body image, weight concerns, current weight loss attempts, and unhealthy weight control behaviors 5 years later. Our investigation aimed to replicate and extend the findings of Keery et al. (2006) by examining these variables longitudinally. On the basis of the research reviewed above and the cross-sectional results of Keery et al. (2006), we expected to find that for girls, adolescent report of maternal eating and weight concerns would predict adolescents' weight concerns and unhealthy weight control behaviors, whereas maternal report of her own eating and weight concerns would not. For boys we expected a similar pattern of results, possibly with overall somewhat weaker relationships.

Methods

Participants and Study Design

Data from adolescents and their mothers (443 pairs) were drawn from Project EAT, a school-based prospective study examining eating and weight-related variables in a large, racially and socioeconomically diverse sample of adolescents. Manuscripts using Project EAT data have been published on a variety of weight-related topics (Neumark-Sztainer et al., 2002; Fulkerson, Sherwood, Perry, & Neumark-Sztainer, 2004; Neumark-Sztainer, Wall, Story, & van den Berg, 2008). The majority of the previous manuscripts have not focused on the parent report data, and no papers have examined the research questions addressed here (with the exception of Keery et al. [2006]). The first wave of data ($n = 4,746$) was collected in 1998–1999 from 31 public middle schools and high schools in the Minneapolis-St. Paul area of Minnesota. Participants completed surveys and had their height and weight measured at school. The response rate for student participation was 81.5%. Consent procedures were implemented in accordance with the requests of the participating school districts; in two districts passive consent procedures were used (response rates for the two districts = 88.1 and 91.4%) while in a third district active consent procedures were required (response rate = 80.6%). Both males (50.2%) and females (49.8%) were included, and the mean age of the adolescents was 14.9 years ($SD = 1.7$; range 11–18 years). Approximately one-third of the participants (34%) were in middle school (referred to as the

younger cohort), and two-thirds were in high school (66%; referred to as the older cohort). At Time 1, telephone interviews were conducted with a subsample ($n = 902$) of parents, selected from the full adolescent sample using stratified random sampling by race/ethnicity. The parental response rate was 76.3%. All procedures were approved by participating school districts and the University of Minnesota Institutional Review Board.

The second wave of data was collected in 2003–2004 by mail, and included only adolescent participants. Of the adolescents who had parent data at Time 1, 56% ($n = 509$) also participated in the survey at Time 2. Because one of the items used in the analysis refers to “your biological mother,” only adolescents and their biological mothers were selected for the current analysis, resulting in a sample size of 443 pairs. Approximately 66% of the adolescents were average or underweight, 20% were overweight, and 14% were obese, using CDC criteria (Kuczmarski et al., 2000). Forty-two percent classified themselves as White, 17% as Black, 12% as Hispanic, 19% as Asian-American, and 10% as mixed or of another racial/ethnic category. Socioeconomically, 47% of the adolescents were in the upper middle or high socioeconomic status (SES) categories (generally, at least one parent had a college degree or greater amount of education), 28% were in the middle category (at least one parent had some college or training after high school), and 25% were in the low middle or low SES categories (parents had a high school education or less). Further details regarding the study design have been previously described (Neumark-Sztainer et al., 2002).

Measures

Survey Approach and Treatment of Variables

As is common in large, population-based studies using a public health approach, the goal of the overall study (Project EAT) was to examine a large number of potential correlates and predictors of multiple health behaviors and conditions. Thus, it was necessary to carefully balance breadth and depth of assessment. In order to assess as many risk and protective factors as possible we elected to use fewer items per variable than might be common in clinical settings where the diagnosis of individuals may necessitate the use of extremely precise, well-normed, multi-item diagnostic instruments.

To minimize participant burden, and thus increase response rates and accuracy, we often used fewer items with simpler response options such as yes/no, as opposed to multi-item Likert scales. This approach to survey development often results in categorical variables. One

advantage of using categorical variables is that it is not necessary to assume a linear relationship between the predictor and the outcome. Instead, we directly assessed the shape of the relationship between individual predictors and outcomes (see Statistical Analysis section), and collapsed categories so as to model the observed shape of the relationship, thus avoiding model misspecification.

To the extent possible, we chose validated scales or items from such scales. Where no such scales existed, items were developed based on the expert knowledge of members of the research group, as well as pilot testing and focus groups with adolescents (Neumark-Sztainer, Story, Perry, & Casey, 1999).

Maternal Report Variables

Maternal weight status in terms of BMI was calculated from mothers' self-report of their height and weight, using the formula weight (kg)/height (m²). There were very few underweight mothers, so mothers were categorized as normal or underweight (BMI < 24.9), overweight (BMI = 25.0–29.9), and obese (BMI > 30.0) according to national guidelines (National Heart Lung and Blood Institute, 1998).

Maternal weight dissatisfaction was assessed with the question, “How satisfied are you with your body weight?” with response options ranging from completely satisfied to completely dissatisfied. This item is commonly used in body image research (Mendelson, Mendelson, & White, 2001; Pingitore, Spring, & Garfield, 1997). In factor analysis, it has loaded strongly on a scale tapping dissatisfaction with weight (Mendelson et al., 2001) and has been found to distinguish between chronic dieters and non-dieters among adolescents (Story, Rosenwinkel, Himes, Resnick, Harris, & Blum, 1991).

To assess *mothers' current weight loss attempts*, mothers were asked, “During the past year, have you done anything to lose weight or keep from gaining weight?” Response options were yes and no. For those who answered yes, *maternal frequency of dieting* was assessed with the question “How often have you gone on a diet during the last year? By ‘diet’ I mean changing the way you eat so you can lose weight?” Responses included “Never,” “1–4 times,” “5–10 times,” “More than 10 times,” and “I am always dieting.” This variable was categorized into “Never,” “1–4 times,” and “Five times or more.” This item has demonstrated convergent validity with measures of disordered eating behaviors in previous studies (Story et al., 1991).

In order to assess *mothers' encouragement of dieting*, mothers were asked “To what extent do you encourage [child] to diet to control his/her weight?” Similar items have been found to distinguish between mothers having

a daughter who is or is not bulimic (Moreno & Thelen, 1993; Pike & Rodin, 1991). Responses were dichotomized into “Not at all” versus “A little bit”, “Somewhat” or “Very much”.

Adolescent Report Variables

Adolescent weight status in terms of height and weight were measured by trained research staff using standardized equipment and procedures at Time 1. Height without shoes was measured with a portable stadiometer, using the Frankfort Plane technique, and was recorded to the nearest 0.1 cm. Weight was measured in street clothes without heavy outerwear or shoes. Weight was assessed with a portable digital scale and was recorded to the nearest 0.5 lb. BMI was calculated, and *adolescent weight status* was categorized as underweight or average weight (BMI < 85th percentile) versus overweight or obese (BMI ≥ 85th percentile), using CDC guidelines and age- and gender-specific growth charts (Kuczmarski et al., 2000).

Adolescent report of maternal dieting was assessed with one item: “My mother diets to lose weight or keep from gaining weight.” Response options ranged from “Not at all” to “Very much.” Similar items have been used in previous research, and have demonstrated adequate test-retest reliability in adolescent samples (Shisslak et al., 1999).

Adolescent report of mother’s weight status was assessed with the following question: “Which of the following best describes your biological mother’s weight?” Response options included “very underweight,” “underweight,” “just about right,” “overweight,” and “very overweight.” This question was dichotomized into overweight or very overweight vs. just about right and underweight. No participants reported that their mother was very underweight. This item was developed for the current study.

To assess *adolescents’ report of mothers’ encouragement to diet* participants were asked how often their mother “encourages me to diet to control my weight.” Similar items have demonstrated longitudinal associations with weight loss strategies (McCabe & Ricciardelli, 2005), and have been found to distinguish between young women with and without bulimia (Moreno & Thelen, 1993) in previous research. Responses were dichotomized into “Not at all” versus “A little bit”, “Somewhat” or “Very much”.

Adolescent outcome variables were adolescent reported. Ten items from the Body Shape Satisfaction Scale (Pingitore et al., 1997) were used to assess *body dissatisfaction*. Each item consists of a rating on a 5-point scale of the level of satisfaction with 1 of the 10 body parts (e.g., height, weight, thighs, shoulders, etc.). Cronbach’s alpha

in the full adolescent sample was .92 at Time 1 and .93 at Time 2.

Weight concerns were assessed with three items regarding thinking about being thinner, being worried about gaining weight, and skipping meals due to concern about weight. These questions were developed by the researchers as a result of feedback provided during 21 focus groups with adolescents conducted to develop the Project EAT survey (Neumark-Sztainer et al., 1999), and 25 focus groups examining unhealthy weight control behaviors, dieting, and binge eating among another sample of adolescents (Neumark-Sztainer & Story, 1998). Cronbach’s alpha was .82 at Time 1 and .85 at Time 2.

To assess *current weight loss attempts*, participants indicated whether they were currently trying to lose, maintain, or gain weight, or not doing anything about their weight; this question is similar to that used in the Youth Risk Behavior Survey (Centers for Disease Control and Prevention, 2008). Participants were categorized as “lose” versus the other response options.

To assess *unhealthy weight control behaviors*, participants were presented with a list of nine weight loss practices (e.g., “Skipped meals,” “Used laxatives”) and instructed to endorse the methods they had used during the past year to lose or maintain weight. These items were adapted from measures that have demonstrated adequate reliability and convergent validity in previous research with adolescents and adults (Banasiak, Wertheim, Koerner, & Voudouris, 2001; French, Perry, Leon, & Fulkerson, 1995). For instance, French et al. (1995) found an association between Restrained Eating Scale (Herman & Polivy, 1975) scores and a similar index of unhealthy weight control behaviors. This scale was dichotomized into none versus any of the behaviors.

Sociodemographic Characteristics

Gender, ethnicity/race, and cohort (middle school or high school at Time 1) were based on adolescent self-report at Time 1. For analyses, participants were categorized as white, black, and other racial/ethnic group. SES was based on parent report and was calculated with an algorithm based primarily on parents’ education level; parents’ job status or family eligibility for free lunch or public assistance were used when education was not available (Neumark-Sztainer et al., 2002).

Statistical Analysis

Prior to conducting full analyses, we regressed the predictor variables on the outcome individually and graphed the resulting beta weights against the ordered categories of the predictor in order to identify the shape of the relationship

between the levels of the predictors and the outcome. We collapsed those categories of the predictor variables that had similar beta weights. We also considered the number of participants at each level of a predictor variable in determining how to collapse across levels, so as to achieve more precise estimates.

Prevalences of the adolescent and maternal report variables were calculated and reported, as were simple correlations between the mothers' and adolescents' reports of maternal characteristics and behaviors. Correlations among the Time 1 variables were calculated (data not shown) and examined for multicollinearity; none was found.

A model building approach, in which Time 1 variables were added in blocks, was used to evaluate the separate and combined adolescent and maternal report variables. Four models were tested for each dependent variable: (1) base model, which includes only covariates (adolescent weight status, race/ethnicity, SES, and age cohort) and baseline levels of the outcome variable being predicted; (2a) maternal report model, which is the base model with the addition of the maternal report variables; (2b) adolescent report model, which is the base model with the addition of the adolescent report variables; and (3) full model, which includes the covariates, adolescent report variables, and the maternal report variables. Models 2a and 2b can be conceptualized as similar to "univariate" models, as they are adjusted for covariates but not for the other independent variables. Parameter estimates in Model 3, however, can be interpreted as the unique effect of each variable when the other independent variables are controlled.

All analyses were stratified by gender, based on a priori expectations of gender differences in body image and weight-related variables. For the continuous dependent variables body dissatisfaction and weight concerns, the models were tested using multiple linear regression. The increment in R^2 gained by the inclusion of the additional block of predictors in each model was tested and significance levels and R^2 values are reported, as well as adjusted R^2 values, which take into account the number of predictor variables in a model. Logistic regression was used to examine the dichotomous outcome variables, which included current weight loss attempts and unhealthy weight control behaviors. In evaluating nested logistic regression models, the difference in -2 log likelihood ($-2LL$) values of the two models can be tested to evaluate whether inclusion of the additional variables leads to significant improvement in model fit, above and beyond the more restricted model. Cox and Snell's "pseudo" R^2 values are also reported for each of the models (Nagelkerke, 1991), and can be compared across models predicting the same outcome

(although not across different outcomes). It should be noted that we do not report regression coefficients for the individual maternal report and adolescent report variables, but only provide estimates for blocks of variables, as these are expected to be more reliable than the individual coefficients in models with large numbers of variables.

Non-response at Time 2 differed across sociodemographic characteristics, with Time 2 responders more likely to be White, female, and of higher SES (all p -values $< .01$). Therefore, in all regression analyses participants' responses were weighted to adjust for this differential response rate. The response propensity method (Little, 1986) was used to generate weights, such that an adolescent data point is weighted inversely to the probability that the adolescent responded at Time 2.

Results

Baseline Descriptive Statistics

The final sample included 188 boys and 255 girls and their biological mothers. Fifty-one percent of the mothers reported having dieted in the last year, whereas 62% of the adolescents reported that their mother dieted to lose weight "a little bit," "somewhat," or "very much" (Table I). Thirty-three percent of the mothers and 28% of the adolescents reported that mothers encouraged their child to diet.

Boys' mean body dissatisfaction score at baseline was 21.4 ($SD = 8.3$, range 10–47), whereas their mean weight concerns score was 5.8 ($SD = 2.0$, range 3–12). Girls' mean body dissatisfaction score at baseline was 27.7 ($SD = 9.2$, range 10–50) and their mean weight concerns score was 7.5 ($SD = 2.4$, range 3–12). Of the boys in the sample, 18.9% ($n = 35$) reported that they were currently trying to lose weight at baseline, and 24.3% ($n = 45$) reported having used one or more unhealthy weight control behaviors, whereas the prevalence of current weight loss attempts among girls at baseline was 45.2% ($n = 113$) and the prevalence of unhealthy weight control behaviors among girls was 54.3% ($n = 138$).

Correlations Between Adolescent and Maternal Report of Maternal Weight Concerns/Behaviors

The highest concordance between mother and adolescent report was of mother's weight status, which had a correlation coefficient of .45 ($p < .001$). The correlations between adolescent and mother report of mother's frequency of dieting ($r = .29$, $p < .001$) and mother's encouragement of her child to diet ($r = .26$, $p < .001$) were small to medium in size.

Table I. Frequencies and Percentages of Maternal and Adolescent Reports of Maternal Eating and Weight-related Characteristics, Attitudes, and Behaviors

Maternal report	Total		Boys		Girls		Adolescent report	Total		Boys		Girls	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Mother's BMI category							Mother's weight status						
≤24.9 Underweight/normal	196	46.5	81	45.5	115	47.1	Underweight/normal	280	70.5	119	70.4	161	70.6
25–30 Overweight	120	28.4	49	27.5	71	29.1	Overweight/very over- weight	117	29.5	50	29.6	67	29.4
>30 Obese	106	25.1	48	27.0	58	23.8							
Mother trying to lose weight													
No	154	34.8	66	35.1	88	34.7	^a						
Yes	288	65.2	122	64.9	166	65.4							
Mother's dieting frequency							Mother's dieting frequency						
Never	218	49.4	87	46.5	131	51.6	Not at all	162	37.7	63	34.2	99	40.2
1–4 times	181	41.0	77	41.2	104	40.9	A little bit	112	26.1	51	27.7	61	24.8
5 times to always	42	9.5	23	12.3	19	7.5	Somewhat	93	21.6	43	23.4	50	20.3
Mother's weight dissatisfaction							Very much	63	14.7	27	14.7	36	14.6
Completely satisfied	42	10.3	21	12.1	21	9.0							
Somewhat satisfied	121	29.7	45	25.9	76	32.6	^a						
Neutral	67	16.5	26	14.9	41	17.6							
Somewhat dissatisfied	118	29.0	53	30.5	65	27.9							
Completely dissatisfied	59	14.5	29	16.7	30	12.9							
Encourages child to diet							Mother encourages me to diet						
Not at all	295	66.7	130	69.5	165	64.7	Not at all	314	72.2	119	65.0	195	77.4
A little bit, somewhat, or very much	147	33.3	57	30.5	90	35.3	A little bit, somewhat, or very much	121	27.8	64	35.0	57	22.6

^aParallel items were not included in the adolescent survey.

Table II. Base Model, Maternal Report Model, Adolescent Report Model, and Full Model of Predictors of Continuous Outcomes Body Dissatisfaction and Weight Concerns, in Adolescent Girls and Boys

Model	<i>df</i>	Girls				Boys				
		<i>F</i> ^a	<i>p</i> ^a	<i>R</i> ²	Adj <i>R</i> ²	<i>F</i> ^a	<i>p</i>	<i>R</i> ²	Adj <i>R</i> ²	
Body dissatisfaction				<i>n</i> = 188				<i>n</i> = 134		
Model 1 Base	9			.221	.187			.269	.223	
Model 2a Maternal report	19	3.54	<.001	.355	.287	.87	.568	.318	.213	
Model 2b Adolescent report	14	0.99	.425	.243	.187	.68	.639	.288	.212	
Model 3 Full model	24	2.46	.003	.363	.275	.92	.548	.347	.212	
Maternal report ^b		3.14	.001			1.03	.420			
Adolescent report ^b		0.44	.822			1.02	.411			
Weight concern				<i>n</i> = 188				<i>n</i> = 135		
Model 1 Base	9			.269	.237			.400	.362	
Model 2a Maternal report	19	1.91	.047	.343	.274	.70	.727	.434	.347	
Model 2b Adolescent report	14	3.34	.007	.333	.284	1.17	.329	.427	.367	
Model 3 Full model	24	1.83	.034	.373	.287	.93	.530	.467	.358	
Maternal report ^b		1.07	.387			.82	.606			
Adolescent report ^b		1.61	.161			1.39	.235			

Note. Maternal report variables include mother's report of her own BMI category, whether she is trying to lose weight, her frequency of dieting, her weight dissatisfaction, and whether she encourages her child to diet to lose weight. Adolescent Report variables include adolescents' report of mothers' weight status, mothers' dieting frequency, and whether mother encourages the adolescent to diet to lose weight. Adj *R*² = adjusted *R*², which is adjusted for the number of predictors in the model. Base model includes covariates (adolescent weight status, race/ethnicity, socioeconomic status, and cohort) and baseline level of the dependent variable. Maternal report model is base model with the addition of mother report variables (see text for description of models). Adolescent report model is base model with the addition of adolescent report variables. Full model is base model with the addition of all maternal and adolescent report variables.

^a*F* and *p* values are for the test of the increment in *R*² gained by adding the predictors to the model.

^bMaternal report and adolescent report blocks are mutually adjusted.

Table III. Base Model, Maternal Report Model, Adolescent Report Model, and Full Model of Predictors of Dichotomous Outcomes Current Weight Loss Attempts and Unhealthy Weight Control Behaviors, in Adolescent Girls and Boys

Outcome variable	df	Δdf	Girls				Boys			
			-2LL	Δ-2LL	p	Cox & Snell R ²	-2LL	Δ-2LL	p	Cox & Snell R ²
			n = 187				n = 136			
Current weight loss attempt										
Model 1	Base model	9	225.0			.108	112.4			.201
Model 2a	Maternal report	19	201.8	23.2	.010	.212	96.0	16.3	.090	.291
Model 2b	Adolescent report	14	213.3	11.8	.038	.162	108.1	4.3	.512	.226
Model 3	Full model	24	188.5	36.5	.001	.266	87.1	25.2	.047	.336
	Maternal report ^a			24.8	.006			21.0	.021	
	Adolescent report ^a			13.3	.021			8.9	.113	
			n = 191				n = 137			
Unhealthy weight control behaviors										
Model 1	Base model	9	191.9			.183	125.7			.210
Model 2a	Maternal report	19	176.5	15.4	.118	.248	113.8	11.9	.295	.276
Model 2b	Adolescent report	14	183.8	8.1	.150	.218	120.1	5.5	.355	.241
Model 3	Full model	24	169.7	22.2	.101	.275	107.0	18.7	.229	.311
	Maternal report ^a			14.1	.167			13.1	.216	
	Adolescent report ^a			6.8	.234			6.8	.234	

Base model includes covariates (adolescent weight status, race/ethnicity, socioeconomic status, and cohort) and baseline level of the dependent variable. Maternal report model is base model with the addition of mother report variables (see text for description of models). Adolescent report model is base model with the addition of adolescent report variables. Full model is base model with the addition of all maternal and adolescent report variables.

^aMaternal report and adolescent report blocks are mutually adjusted.

Regression Models

Body Dissatisfaction and Weight Concerns at Time 2 in Adolescents

In predicting Time 2 body dissatisfaction, the base model included adolescent weight status, race/ethnicity, SES, cohort, and Time 1 body dissatisfaction. For girls, these variables accounted for ~22% of the variance (Adj R² = .19, taking into account the number of predictors in the model) in Time 2 body dissatisfaction (Table II). Building upon this model, the maternal report variables (mothers' weight status, weight dissatisfaction, dieting, and encouragement of her child to diet) entered as a block predicted a significant amount of additional variance in body dissatisfaction when entered alone (Model 2a; $F = 3.54, p < .001, \Delta \text{Adj } R^2 = .10$), with higher maternal report of eating and weight-related concerns predicting higher body dissatisfaction among girls. In contrast, adolescent report variables (adolescent report of mothers' weight status, frequency of dieting, and encouragement of child to diet) as a block were not significant predictors when entered alone (Model 2b; $F = .99, p < .43, \Delta \text{Adj } R^2 = .00$). When combined (Model 3, full model), only maternal report variables remained significantly associated with body dissatisfaction for girls (Model 3; $F = 3.14, p < .001, \Delta \text{Adj } R^2 = .09$). Furthermore, the adjusted R² value for the full model (Adj R² = .28) is lower than that of the maternal report model (Adj R² = .29). Since adding the adolescent report variables to the model did not

increase the amount of variance accounted for by the model, the maternal report model appeared to be the best-fitting, most parsimonious model for body dissatisfaction in girls. Neither the maternal nor adolescent report variables were significant predictors of body dissatisfaction in boys.

For weight concerns in girls, both maternal and adolescent report blocks were significant predictors when entered separately (Models 2a and 2b respectively), but neither accounted for significant variance when mutually adjusted in the full model. As with body dissatisfaction, neither maternal nor adolescent report variables were significant predictors of weight concerns in boys.

Weight Loss Attempts and Weight Control Behaviors at Time 2 in Adolescents

The maternal report block of variables explained significant variance in current weight loss attempts for girls compared to the base model, as indicated by the difference in -2LL values between Models 1 and 2a ($\Delta -2LL = 23.2, p = .010$; Table III). As mothers' levels of eating and weight concerns increased, the odds of their daughter reporting she was currently trying to lose weight at Time 2 also increased. The adolescent report block of variables also explained significant variance in current weight loss attempts for girls when entered on its own ($\Delta -2LL = 11.8, p = .038$). In the simultaneous model, both the adolescent and maternal variables were significant predictors of current weight

loss attempts for girls, with a Cox and Snell R^2 of 27%. For boys, neither the maternal report variables nor the adolescent report variables accounted for significant variance in current weight loss attempts when entered singly (Models 2a and 2b). However, in the full model the maternal report block of variables was a significant predictor of current weight loss attempts in boys (Δ Cox and Snell R^2 with the addition of the maternal report variables = 11%).

Results for unhealthy weight control behaviors were similar in boys and girls. Neither maternal nor adolescent report blocks, entered individually or simultaneously in the full model, accounted for significant variance in unhealthy weight control behaviors in either gender.

Discussion

Results of the current study indicated that baseline maternal report of mothers' eating and weight-related concerns and behaviors was significantly associated with greater body dissatisfaction in girls after 5 years, and with current weight loss attempts in both boys and girls 5 years later. For girls, adolescent report of greater maternal eating and weight-related concerns and behaviors at baseline was also associated with a greater prevalence of girls' reporting that they were trying to lose weight at Time 2. All analyses controlled for adolescent weight status, indicating that adolescent boys and girls whose mothers reported greater weight concerns and behaviors at baseline were more likely to report that they were trying to lose weight 5 years later, above and beyond what might be expected or perhaps even considered desirable given an adolescents' actual weight status.

For the most part our results do not support our hypotheses that adolescent report, but not maternal report, of mothers' weight-related concerns and behaviors would predict adolescent weight-related outcomes. Based on the current study, it does not appear that adolescents' perceptions of their mothers' weight concerns and behaviors are more potent predictors of adolescents' later weight-related outcomes than are the mothers' actual concerns and behaviors, as might be suggested by research on descriptive norms and alcohol use (Perkins et al., 2005). Our results differ from studies that found no association between maternal report of weight-related concerns and behaviors, and adolescent outcomes (Elfhag & Linne, 2005; The McKnight Investigators, 2003), including Keery et al. (2006) cross-sectional analysis of the data from the current study. It is possible that proximally in time, adolescents' perceptions of their mothers' attitudes and behaviors are more closely associated with their own weight-related

attitudes and behaviors, but distally over time mothers' actual characteristics (as reported by the mother) may become more important.

Boys' results differed somewhat from those for girls, in that boys' report of greater maternal weight-related concerns and behaviors at baseline was not associated with boys' reporting that they were trying to lose weight at Time 2, and maternal report of mothers' weight-related concerns and behaviors was not a significant predictor of boys' later body dissatisfaction. Regarding body dissatisfaction, it may be that fathers, as same-gender role models, more strongly influence boys' feelings about their bodies. In addition, fathers' influence on body dissatisfaction may include not just encouragement to lose weight but encouragement to increase muscularity, which was not assessed in the current study (McCabe & Ricciardelli, 2005).

Neither adolescent nor maternal report baseline variables were predictive of unhealthy weight control behaviors at Time 2 in boys or girls, indicating that variables other than the maternal characteristics included here or adolescents' perception of their mothers may be more important in explaining the later use of these behaviors. Previous research has implicated weight teasing by family members, peer influences, media exposure, and individual characteristics such as internalization of the thin ideal and general psychopathology as being related to body dissatisfaction and problematic weight loss behaviors (Haines, Neumark-Sztainer, Eisenberg, & Hannan, 2006; Stice, 2002). More research is needed that includes one or more of these types of predictors, in addition to family members' potential influences.

Advantages of the current study include the two informants (adolescent and mother), the diverse sample, the longitudinal nature of the study, and the examination of multiple predictors and outcome variables. However, study limitations are also important to consider. Although using multiple predictors in each block ensured that we were able to assess a range of maternal concerns and behaviors, the inclusion of multiple variables precluded examination of individual maternal report and adolescent report variables, because the estimates for individual predictors in the model were not stable enough to interpret. In addition, some of the variables used were single-item indicators, which may have reduced reliability. Also, attrition from Time 1 to Time 2 was present, and although weighting was used to correct for differences across groups in attrition, the loss of participants still may have affected the study's results.

The results of the current investigation suggest several directions for future research. More detailed assessment of the ways in which parents communicate with their children

about weight and related issues is needed, to better understand the behavior involved when a parent “encourages” their adolescent to undertake eating and physical activity behaviors. Future studies should investigate which ways of encouraging an adolescent to undertake health behaviors are most or least effective, and which may result in unintended negative consequences. Ultimately, this type of research could contribute to the development of interventions to help parents address weight and eating with their adolescents in more effective ways. Also, future studies of parental influences in adolescent eating and weight-related behaviors should include fathers and male guardians in addition to female guardians.

The results of the current study provide support for the role of mothers' concerns and behaviors in predicting adolescents' body dissatisfaction and weight loss attempts. This suggests that it may be useful to evaluate the efficacy of including mothers in prevention efforts addressing body image and weight loss attempts as risk factors for later disordered eating. Potential interventions, that would need to be tested in experimental designs, might include psychoeducation aimed at encouraging mothers (and perhaps also fathers) to decrease the overall amount of importance placed upon thinness and appearance in the family, and to increase their modeling of healthier weight-related behaviors and beliefs. Clinically, in treating adolescents with eating disorders it may be helpful to assess parents' attitudes toward their own and their adolescents' weight and appearance, as well as the ways in which they discuss these issues with their children, bearing in mind that variables other than parental influences are also important in the development and maintenance of clinically diagnosed eating disorders (le Grange, Lock, Loeb, & Nicholls, 2010).

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