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The Development of Associations Among BMI, Body Dissatisfaction, and Weight and Shape Concern in Adolescent Boys and Girls

Jerel P. Calzo, Ph.D.^{1,2}, Kendrin R. Sonneville, Sc.D.^{1,2}, Jess Haines, Ph.D.³, Emily A. Blood, Ph.D.^{2,4}, Alison E. Field, Sc.D.^{1,2,5,6,*}, and S. Bryn Austin, Sc.D.^{1,2,6,7,*}

¹Division of Adolescent and Young Adult Medicine, Children's Hospital Boston

²Department of Pediatrics, Harvard Medical School

³Department of Family Relations & Applied Nutrition, University of Guelph

⁴Clinical Research Program, Children's Hospital Boston

⁵Department of Epidemiology, Harvard School of Public Health

⁶Channing Laboratory, Brigham and Women's Hospital and Harvard Medical School

⁷Department of Society, Human Development, and Health, Harvard School of Public Health

Abstract

Purpose—To examine how the associations among BMI and body dissatisfaction and weight and shape concern evolve from late childhood through late adolescence in boys and girls.

Methods—We analyze data from 9–18-year-olds from the Growing Up Today Study, a national prospective cohort of U.S. Youth ($n=16,882$, yielding 59,750 repeated measures observations during five waves of data collection). Generalized additive models produced curves of association for body dissatisfaction and weight concern across BMI percentiles. Generalized estimating equations (adjusting for correlated within-subject repeated measures, sibling clusters, pubertal maturation, and region of residence) tested main and interactive effects of BMI, age, and gender.

Results—Girls above the 50th BMI percentile reported greater body dissatisfaction than girls below the 50th percentile. By contrast, boys who reported the most body dissatisfaction were either above the 75th BMI percentile (approaching overweight) or below the 10th percentile (approaching underweight). Body dissatisfaction increased with age for both girls and boys, but the gender-specific patterns of BMI effects remained constant. Male and female participants in the overweight/obese BMI range reported the greatest weight concern, but among older adolescents (particularly girls), healthy weight became increasingly associated with greater weight and shape concern.

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Correspondence: Jerel P. Calzo, Ph.D., Division of Adolescent/Young Adult Medicine, Children's Hospital Boston, 300 Longwood Ave, Boston, MA 02115. Phone: 857-218-5462. Fax: 617-630-0004. jerel.calzo@childrens.harvard.edu.

*Joint Senior Authors

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Conclusions—Body dissatisfaction and weight and shape concern intensify across adolescence, but associations between the constructs and BMI remain gender-specific. Findings have important implications for eating disorder risk assessment and prevention.

Keywords

BMI; Body Dissatisfaction; Weight Concern; Adolescence; Overweight; Gender

U.S. and Australian population-based data indicate that adolescent females engage in greater levels of unhealthy weight control behaviors (e.g., purging, fasting, laxative use) than adolescent males, but that engagement in such behaviors has increased among adolescent males across the past decade [1, 2]. Such behaviors increase the risk for eating disorders and future weight gain [3, 4]. In order to prevent the onset of unhealthy weight control behaviors, researchers have focused on body dissatisfaction and its role in shaping weight control behaviors and weight change. Body dissatisfaction is connected prospectively to unhealthy weight control behaviors, binge eating, and lower levels of physical activity [5, 6]. High levels of body satisfaction, on the other hand, may have protective effects. For example, findings from Project EAT (a Minnesota-based observational cohort) revealed that high levels of body satisfaction at baseline (in junior and senior high school) were associated with better dietary habits, healthier physical activity levels, and lower likelihood of being overweight in late adolescence and young adulthood [6–8]. These findings are promising given that modest improvements in body satisfaction in girls and boys are achievable through school-based interventions [9, 10]. Further research on the development of body satisfaction across adolescence and factors that modify this process can contribute to better timed, tailored, and effective interventions.

Cross-sectional and short-term prospective research indicate that body satisfaction decreases across adolescence and that overweight and obese individuals are less satisfied with their bodies than under- and healthy-weight peers [11]. These patterns are generally stronger and more consistent in females than in males, indicating that gender may modify age and weight status effects on body satisfaction. In Western societies, girls are socialized from an early age to be dissatisfied with their physical appearance and to believe that thinness is key to their physical attractiveness [12]. This thin ideal is internalized early -- with girls as young as five years old exhibiting weight concerns and body dissatisfaction [13] -- and may persist across the lifespan [14].

Research on body dissatisfaction and body image in males is limited. Males are generally less dissatisfied with their bodies than females [15], thus contributing to an early tacit assumption in the field that body dissatisfaction was not a serious issue among males [16]. New research increasingly recognizes that body dissatisfaction occurs in a different psychosocial context for males. In contrast to the thin ideal for women, men in Western societies are socialized to strive for muscularity and leanness [17]. Because overweight *and underweight* may be risk factors for body dissatisfaction, early research assuming a linear association between BMI and dissatisfaction may have underestimated body dissatisfaction in males [18]. Consistent with this hypothesis, a recent cross-sectional study of 10- to 11-year-old girls and boys in Canada detected a linear association between increases in BMI and increases in dissatisfaction in girls and a curvilinear association between BMI and dissatisfaction in boys [19]. Similarly, an Australian cross-sectional study found that both overweight and underweight adolescent males reported higher levels of body dissatisfaction than healthy-weight boys [20]. This curvilinear association may persist into adulthood, as one study of young adult college students found that males who report body dissatisfaction either perceived themselves to be too fat or too thin [21].

Overall, research on body dissatisfaction has generally been cross-sectional, focused only on development across short periods of adolescence or adulthood, or focused only on females. This study utilizes longitudinal data spanning ages 9 to 18 years old to analyze how the association between BMI and body dissatisfaction evolves from childhood through late adolescence in both girls and boys. We also investigate the association between BMI and concern with weight and shape to further distinguish between global body dissatisfaction and desire to be thinner. This will allow us to examine whether the absence of a strong linear association between BMI and satisfaction previously seen in males was due to the lack of specificity in the satisfaction construct.

Method

Participants

Data were drawn from the Growing Up Today Study (GUTS), an ongoing longitudinal study begun in 1996. Participants were ages 9–14 years at baseline and were children of women in the Nurses' Health Study II. After receiving parental consent, children were enrolled in the GUTS cohort if they returned completed questionnaires at baseline ($N = 16,882$).

Participants completed questionnaires annually from 1996–2001 and every two years after 2001. At each wave, paper questionnaires were sent to participants at their home addresses. In 2001, online versions of the questionnaires were also made available. The Brigham and Women's Hospital institutional review board approved this study.

The present analysis includes 9–18-year-old male and female participants from the 1996–1999 and 2001 waves who provided at least one wave of height and weight data and concurrent measurements of body satisfaction and weight and shape concern. Of the 9,039 girls who enrolled at baseline, 54 were excluded for missing height and weight data, 11 for missing weight and shape concern data, five for missing body satisfaction data, and one for missing both weight and shape concern and body satisfaction data at all waves. Of the 7,843 boys who enrolled at baseline, 132 were excluded for missing height and weight data, 13 for missing weight and shape concern data, 10 for missing body satisfaction data, and one for missing both body satisfaction and height and weight data for all waves. The analysis sample included 8,968 girls and 7,687 boys contributing a total of 33,696 and 26,054 observations, respectively, across five waves of data collection from 1996 to 2001. The majority of girls and boys included in the analyses completed at least four of the five waves of the data analyzed (77% and 64%, respectively). Approximately 94% of the analysis sample described their race/ethnicity as White. At the beginning of data collection, 14% of participants resided in the Western United States, 35% in the Midwest, 15% in the South, and 36% in the Northeast.

Measures

Body Mass Index (BMI) Percentile—BMI (kg/m^2 , calculated from self-reported weight and height) was converted to age- and sex-specific BMI percentiles and z-scores using U.S. Centers for Disease Control and Prevention reference growth data [22]. Previous research has validated the use of adolescent self-reported weight and height data [23].

Concern with weight and shape—Concern with weight and shape was measured using a subscale from the validated McKnight Risk Factor Survey (MRFS) [24] consisting of a mean of three items assessed on a five-point scale (1= “Never” to 5= “Always”): “In the past year, how often have you (1) felt fat; (2) worried about having fat on your body; (3) thought about wanting to be thinner?” The internal reliability of items was high (Cronbach α range across waves in boys= .90–.92; girls = .93–.94).

Body dissatisfaction—Body dissatisfaction was assessed using a single item from the MRFS: “*In the past year, how happy have you been with the way your body looks?*” with the response categories: *totally, a lot, pretty much, a little, or not at all*. Participants who answered *totally, a lot, or pretty much* were considered to be at least somewhat satisfied with the way their bodies looked and therefore classified as not having body dissatisfaction (0= No). Participants who answered *a little or not at all* to this question were classified as having body dissatisfaction (1= Yes).

Relative Pubertal Maturation—For boys, pubertal development was assessed using Tanner stage based on self-reported pubic hair development (1= No pubic hair to 5= Hair has spread out like that of a grown man) [25]. For girls, pubertal development was assessed using Tanner stage based on self-reported pubic hair development (1–5) and age of menarche. Studies have validated self-assessment measures of maturation [26]. Relative pubertal development was calculated by standardizing age of menarche for girls ($M=0$, $SD=1$) and standardizing Tanner data reported at age 14 for both girls and boys (the youngest age at which all participants could provide a response because the oldest participants were age 14 at baseline). Standardized Tanner values greater than zero indicate more advanced development and values less than zero represent more delayed development relative to other 14-year-olds within the GUTS cohort. For menarche, values less than zero indicate earlier menarche and values greater than zero represent later menarche relative to girls within the GUTS cohort.

Analyses—In order to account for correlations in repeated measures from an individual, as well as correlations between siblings, generalized estimating equations (GEE, SAS PROC GENMOD) [27–29] were first used to estimate BMI effects on body dissatisfaction and weight and shape concern. The results from GEE are similar to those from regression, but GEE approaches use weighted combinations of observations to extract the appropriate amount of information from correlated data to provide population average odds ratios and betas [29]. Subsequent analyses were stratified by gender if significant gender-by-age and gender-by-BMI effects were detected. Generalized additive models (GAM, SAS PROC GAM)[30] next examined the functions of the associations between the proportion reporting body dissatisfaction and BMI percentile and mean weight and shape concern and BMI percentile in girls and boys. GAM relaxes the assumptions of linearity and generates smoothed curves of association with 95% confidence intervals to help examine non-linearity of associations. Based on GAM results, we finally used GEEs including BMI and quadratic and cubic polynomial functions of BMI as predictor of the odds of reporting body dissatisfaction and mean weight and shape concern. The inclusion of age-by-BMI percentile interactions examined whether age modified the associations between BMI, body dissatisfaction, and weight and shape concern. Geographic region of residence and relative pubertal maturation were tested as possible covariates of body dissatisfaction and weight and shape concern. Non-significant covariates were dropped from gender stratified analyses. Due to the limited racial/ethnic diversity of the dataset, race/ethnicity was not tested as a possible covariate.

Results

Tables 1 and 2 present demographic and descriptive statistics for girls and boys, respectively. Geographic region was a significant predictor of body dissatisfaction and weight and shape concern in boys, but not girls. Boys from the Western U.S. reported lower odds of body dissatisfaction (Odds Ratio [O.R.] = .86, 95% Confidence Interval [C.I.] = .74, .98) and lower levels of weight and shape concern ($\beta = -.07$, 95% C.I. = $-.12, -.01$) than boys from the Northeast. Pubertal timing was not a significant predictor of body dissatisfaction and weight and shape concern in boys, but was significantly associated with both outcomes

in girls. Because menarche was a stronger predictor of the outcomes and had fewer missing values than Tanner, relative menarcheal timing was used as the pubertal timing covariate. Later menarche was associated with lower odds of body dissatisfaction (O.R.= .82, 95% C.I.= .78, .85) and lower levels of weight and shape concern ($\beta = -.24$, 95% C.I.= $-.26, -.21$). Due to the association between body weight and menarche [31], additional analyses examined whether pubertal timing was confounded with weight status. Overweight/obese status was associated with earlier menarche ($p < .0001$). However, the magnitudes and directions of the age and BMI effects on girls' body dissatisfaction and concern with weight and shape did not substantially differ when overweight or obese participants were dropped from the analysis (body dissatisfaction O.R. difference = .03; weight and shape concern β difference = .02), thus analyses for girls included all participants.

Boys were less likely to report body dissatisfaction (O.R.= .60, 95% C.I.= .57, .64) and reported lower levels of weight and shape concern ($\beta = -.88$, 95% C.I.= $-.91, -.85$) than girls. For participants overall, each unit increase in BMI percentile was associated with greater likelihood of reporting body dissatisfaction (O.R.= 1.021, 95% C.I.= 1.020, 1.022) and greater levels of weight and shape concern ($\beta = .0158$, 95% C.I.= .0153, .0162). Relative to 9–10-year-olds, older age was associated with significantly higher body dissatisfaction and weight and shape concern (all p 's $< .0001$). Significant gender-by-age and gender-by-BMI interaction effects indicated that gender modified the associations between age, BMI, and both body dissatisfaction and weight and shape concern. Subsequent analyses were stratified by gender adjusting for gender-specific covariates of body dissatisfaction and weight and shape concern (pubertal maturation for girls; geographic region of residence for boys).

GAM analyses of body dissatisfaction indicated significant quadratic and cubic associations between BMI percentile and body dissatisfaction for both girls and boys of all age groups (Figure 1). Similarly, GAM analyses of weight and shape concern indicated significant quadratic and cubic association effects of BMI percentile for girls and boys (Figure 2). GEE models adjusting for sibling clusters, the correlations of repeated observations within individuals, and gender-specific covariates detected a significant quadratic BMI effect on body dissatisfaction in girls and a significant cubic BMI effect on body dissatisfaction in boys (p 's $< .0001$). As displayed in Figure 1, girls reported high body dissatisfaction beginning at the 50th BMI percentile, with the odds of reporting body dissatisfaction above the 50th BMI percentile being 1.96 times the odds of reporting body dissatisfaction below the 50th percentile (95% C.I.= 1.85, 2.09). By contrast, boys reported high body dissatisfaction below the 25th BMI percentile (i.e., approaching the underweight range), relatively less body dissatisfaction at the 50th percentile (in the healthy weight range), and dramatically greater body dissatisfaction above the 75th percentile (approaching overweight and obesity). The odds of reporting body dissatisfaction were greater for boys below the 25th percentile (O.R.= 1.55, 95% C.I.= 1.41, 1.72) and above the 75th percentile (O.R.= 2.83, 95% C.I.= 2.59, 3.08) relative to boys between the 25th and 75th BMI percentiles. Although age did not modify the associations between BMI and body dissatisfaction, 9–10-year-old boys reported less body dissatisfaction than all groups of older adolescent boys ($p < .0001$), and each successively older age group among the girls reported greater body dissatisfaction than preceding age groups ($p < .0001$).

A significant age-by-quadratic BMI interaction effect on weight and shape concern was detected among girls ($p < .0001$). As displayed in Figure 2, high BMI and older age were associated with greater weight and shape concern among girls. However, the effects of age were particularly strong for older adolescent girls in the healthy BMI range (between the 10th and 75th percentiles). A complex age-by-cubic BMI interaction effect on weight and

shape concern was detected in boys ($p < .05$). Older adolescent boys reported greater weight and shape concern at lower BMI percentiles than 9–10-year-old boys.

Discussion

Extensive research indicates that body dissatisfaction and concern with weight and shape predict disordered weight control behaviors and eating disorders. Consistent with previous research [11], we found that higher BMI percentiles and older age predicted greater body dissatisfaction and weight and shape concern. However, the overall associations between BMI, body dissatisfaction, and weight and shape concern were non-linear and differed profoundly by gender and age. Both overweight/obese *and* underweight boys are at risk for body dissatisfaction and girls in the healthy weight range may become increasingly at risk for weight and shape concern as they approach late adolescence. The results have important implications for understanding the psychosocial context, assessment, and prevention of eating disorder risk.

The curvilinear association between BMI and body dissatisfaction among boys is in line with previous research. Bolstering the findings presented by Austin and colleagues (2009) -- who studied 10- to 11-year-old Canadian youth -- we detected a U-shaped association between BMI and body dissatisfaction among both the 9–10-year-old and 11–12-year-old boys in our sample. Consistent with Kostanski and colleagues (2004), we found that boys' body dissatisfaction increased with age. However, the greater body dissatisfaction seen in both the under- and overweight boys compared to the healthy weight boys was consistent across all ages. Our work expands on these earlier studies by examining all age groups from late childhood to late adolescence and by having the power to display smoothed, curvilinear BMI and body dissatisfaction associations across all BMI percentiles.

By examining the associations between BMI and weight and shape concern, we were able to further distinguish body dissatisfaction -- a global construct -- from concerns specifically about body fat and desires to be thinner. In an early review of the body dissatisfaction literature it was suggested that the combined proportion of boys who want to be either thinner or bigger may be comparable to the proportion of girls who want to be thinner, and thus body dissatisfaction might be approaching equal prevalence among boys and girls [32]. In the current study, boys reported less body dissatisfaction than girls. Boys also reported lower overall levels of weight and shape concern than girls, but like girls, older adolescent boys in the healthy BMI percentile range reported greater weight and shape concern than younger adolescent boys in the healthy BMI percentile range. Older boys may report greater weight and shape concern because their bodies are closer to full adult physical maturation, and any increase in BMI may be indicative of risk for overweight (a culturally-perceived negative outcome) as opposed to an indicator of physical maturation (a potentially positive outcome). In conjunction with the results linking underweight status to body dissatisfaction, the findings regarding boys' concern with weight and shape are consistent with previous research on the socialization and internalization of lean muscular ideals among males in Western societies. High dissatisfaction among underweight boys may reflect desire for stature and bigger muscles, and high dissatisfaction and weight and shape concern among overweight and obese boys may reflect desire for leanness and muscle tone.

Researchers have recognized that the phenomenology of body dissatisfaction and weight and shape concern differs for males and females, but little research has examined how these differences emerge. The analysis of age group differences provided rich information about how the associations between BMI, body dissatisfaction, and weight and shape concern develop across all periods of adolescence. Gender development theories propose that adolescents become more stereotyped in their preferences, thoughts, and behaviors as they

prepare to assume adult gender roles -- a process known as gender intensification [33]. Gender patterns in body dissatisfaction and weight and shape concern may intensify across adolescence as youth identify with adult ideals of physical attractiveness [34]. The results support gender intensification theory in that dissatisfaction and weight and shape concern increase with age and that the gender-specific patterns of association between BMI, body dissatisfaction, and weight and shape concern remain generally consistent across time. We found that the association between BMI and weight and shape concern in girls differed profoundly by age. Among 9–10-year-olds, girls in only the overweight and obese BMI percentile ranges reported high mean levels of weight and shape concern. By late adolescence, all girls—except those who were underweight—reported high mean levels of weight and shape concern. The results of the GAM analyses provide a powerful visualization of the steady development of weight and shape concern among healthy weight girls across adolescence.

Notable strengths of this study are that it examines both body dissatisfaction and weight and shape concern in a large, national cohort of adolescent girls and boys. The data provided power to test gender-by-age and gender-by-BMI interactions and provided enough observations to explore the associations between gender, BMI, body dissatisfaction, and weight and shape concern throughout adolescence. However, there are several limitations that must be addressed in future research. First, the sample was limited in racial/ethnic and socioeconomic diversity, thus it is unclear whether the results are generalizable to racial/ethnic minority or lower SES populations. Second, weight and shape concern was assessed via three items and body dissatisfaction was assessed via a single item; future research should utilize more in-depth measures of body image concerns and measure different dimensions of body dissatisfaction, such as dissatisfaction with specific body parts, aspects of physical condition (e.g., fat, muscularity), and physical ability (e.g., coordination). Taking such dimensions into account may yield additional information about gender differences in the expression of body image concerns. Third, we studied the effects of weight status using BMI percentiles. It is possible that this method may have led to some misclassification, given that highly muscular individuals may be ranked in high BMI percentiles because of muscle mass, rather than body fat.

Beyond contributing novel information about how the associations among BMI, body dissatisfaction and weight and shape concern evolves across adolescence in girls and boys, our findings have important developmental, clinical, and public health implications for assessing and preventing risk for disordered weight control behaviors. The results provide valuable information about how risk for body dissatisfaction and weight and shape concern changes from early to late adolescence for boys and girls across the entire BMI continuum. Thus, findings are of practical importance to health care providers. Both overweight/obese and underweight adolescent boys are at risk for body dissatisfaction, and as girls age, those within the healthy BMI percentile range become increasingly at risk for weight and shape concern. Greater levels of body satisfaction have been found to have protective effects against the development of disordered weight control behaviors and weight gain [6–8] and school based interventions indicate that body satisfaction may be modified successfully [9, 10]. The results provide powerful evidence regarding the need for gender-specific preventive interventions for body dissatisfaction and weight and shape concern and when to time such interventions.

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References

1. Chao YM, et al. Ethnic differences in weight control practices among U.S. adolescents from 1995 to 2005. *International Journal of Eating Disorders*. 2008; 41(2):124–133. [PubMed: 18008319]
2. Hay PJ, et al. Eating disorder behaviors are increasing: findings from two sequential community surveys in South Australia. *PLoS One*. 2008; 3(2):e1541. [PubMed: 18253489]
3. Field AE, et al. Relation Between Dieting and Weight Change Among Preadolescents and Adolescents. *Pediatrics*. 2003; 112(4):900–906. [PubMed: 14523184]
4. Stice E, Burton EM, Shaw H. Prospective relations between bulimic pathology, depression, and substance abuse: unpacking comorbidity in adolescent girls. *J Consult Clin Psychol*. 2004; 72:62–71. [PubMed: 14756615]
5. Field AE, et al. Family, Peer, and Media Predictors of Becoming Eating Disordered. *Archives of Pediatrics and Adolescent Medicine*. 2008; 162(6):574–579. [PubMed: 18524749]
6. Neumark-Sztainer D, et al. Does Body Satisfaction Matter? Five-year Longitudinal Associations between Body Satisfaction and Health Behaviors in Adolescent Females and Males. *Journal of Adolescent Health*. 2006; 39(2):244–251. [PubMed: 16857537]
7. Haines J, et al. Personal, behavioral, and environmental risk and protective factors for adolescent overweight. *Obesity*. 2007; 15(11):2748–2760. [PubMed: 18070766]
8. van den Berg P, Neumark-Sztainer D. Fat 'n happy 5 years later: is it bad for overweight girls to like their bodies? *Journal of Adolescent Health*. 2007; 41(4):415–417. [PubMed: 17875468]
9. Levine, MP.; Smolak, L. *The prevention of eating problems and eating disorders: theory, research, and practice*. Mahwah, NJ: Lawrence Erlbaum; 2006.
10. Neumark-Sztainer D, et al. Prevention of body dissatisfaction and disordered eating: what next? *Eating Disorders*. 2006; 14:265–285. [PubMed: 16873144]
11. Eisenberg M, Neumark-Sztainer D, Paxton S. Five-year change in body satisfaction among adolescents. *Journal of Psychosomatic Research*. 2006; 61(4):521–527. [PubMed: 17011361]
12. Paxton SJ, et al. Body Dissatisfaction, Dating, and Importance of Thinness to Attractiveness in Adolescent Girls. *Sex Roles*. 2005; 53(9–10):663–675.
13. Davison KK, Markey CN, Birch LL. Etiology of body dissatisfaction and weight concerns among 5-year-old girls. *Appetite*. 2000; 35:143–151. [PubMed: 10986107]
14. Tiggemann M, Lynch JE. Body image across the life span in adult women: the role of self-objectification. *Developmental Psychology*. 2001; 37(2):243–253. [PubMed: 11269392]
15. McCabe M, Ricciardelli L. Body image dissatisfaction among males across the lifespan: a review of past literature. *Journal of Psychosomatic Research*. 2004; 56:675–685. [PubMed: 15193964]
16. McCreary DR, Sasse DK. An exploration of the drive for muscularity in adolescent boys and girls. *Journal of American College Health*. 2000; 48:297–304. [PubMed: 10863873]
17. Pope, H.; Phillips, KA.; Olivardia, R. *The Adonis Complex: The Secret Crisis of Male Body Obsession*. New York: Free; 2000.
18. Presnell K, Bearman SK, Stice E. Risk factors for body dissatisfaction in adolescent boys and girls: A prospective study. *International Journal of Eating Disorders*. 2004; 36(4):389–401. [PubMed: 15558645]
19. Austin SB, Haines J, Veugelers PJ. Body satisfaction and body weight: gender differences and sociodemographic determinants. *BMC Public Health*. 2009; 9(1):313. [PubMed: 19712443]
20. Kostanski M, Fisher A, Gullone E. Current conceptualisation of body image dissatisfaction: have we got it wrong? *Journal of Child Psychology and Psychiatry*. 2004; 45(7):1317–1325. [PubMed: 15335351]
21. Muth JL, Cash TF. Body image attitudes: what difference does gender make? *Journal of Applied Social Psychology*. 1997; 27:1438–1452.

22. CDC. National Center for Health Statistics Centers for Disease Control (CDC) Growth Charts, United States. 2000; 2000 Available at: <http://www.cdc.gov/growthcharts/>.
23. Goodman E, Hinden BR, Khandelwal S. Accuracy of teen and parental reports of obesity and body mass index. *Pediatrics*. 2000; 106(1):52–58. [PubMed: 10878149]
24. Shisslak CM, et al. Development and evaluation of the McKnight Risk Factor Survey for assessing potential risk and protective factors for disordered eating in preadolescent and adolescent girls. *International Journal of Eating Disorders*. 1999; 25:195–214. [PubMed: 10065397]
25. Tanner JM, Whitehouse RH. Clinical longitudinal standards for height, weight, height velocity, weight velocity, and stages of puberty. *Archives of Disease in Childhood*. 1976; 51:170–179. [PubMed: 952550]
26. Neinstein L. Adolescent self-assessment of sexual maturation. *Clinical Pediatrics*. 1982; 21:482–484. [PubMed: 7083719]
27. Liang K-Y, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika*. 1986; 73:13–22.
28. Ballinger GA. Using Generalized Estimating Equations for Longitudinal Data Analysis. *Organizational Research Methods*. 2004; 7(2):127–150.
29. Hanley JA, et al. Statistical Analysis of Correlated Data Using Generalized Estimating Equations: An Orientation. *American Journal of Epidemiology*. 2003; 157(4):364–375. [PubMed: 12578807]
30. Hastie, TJ.; Tibshirani, RJ. *Generalized additive models*. London: Chapman & Hall/CRC; 1990.
31. Wang Y. Is obesity associated with early sexual maturation? A comparison of the association in American boys versus girls. *Pediatrics*. 2002; 110(5):903–910. [PubMed: 12415028]
32. Smolak L. Body image in children and adolescents: where do we go from here? *Body Image*. 2004; 1:15–28. [PubMed: 18089138]
33. Hill, JP.; Lynch, ME. The intensification of gender-related role expectations during early adolescence. In: Brooks-Gunn, J.; Petersen, AC., editors. *Girls at Puberty: Biological and Psychosocial Perspectives*. Plenum Press; New York: 1983. p. 201-228.
34. Wichstrom L. The emergence of gender difference in depressed mood during adolescence: the role of intensified gender socialization. *Developmental Psychology*. 1999; 35(1):232–245. [PubMed: 9923478]

Implications and Contribution

Body dissatisfaction and weight concern are risk factors for disordered weight control behaviors. This study reveals that overweight/obese and underweight adolescent boys are at risk for body dissatisfaction. As boys and girls age, those with healthy body weight become increasingly at risk for weight and shape concern.

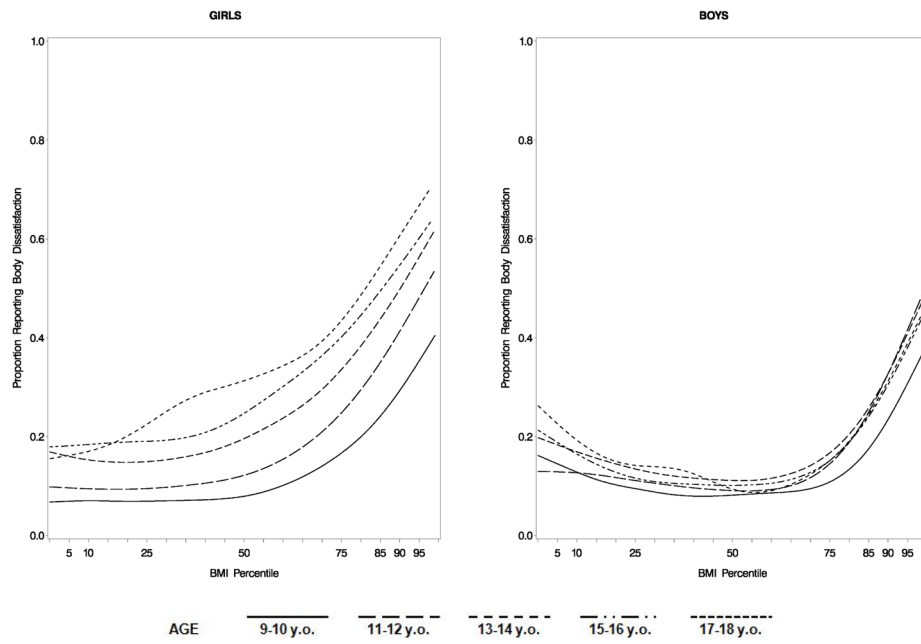


Figure 1. Results from GAM analyses indicating the proportion reporting body dissatisfaction in the past year by BMI percentile and age in girls and boys from the Growing Up Today Study

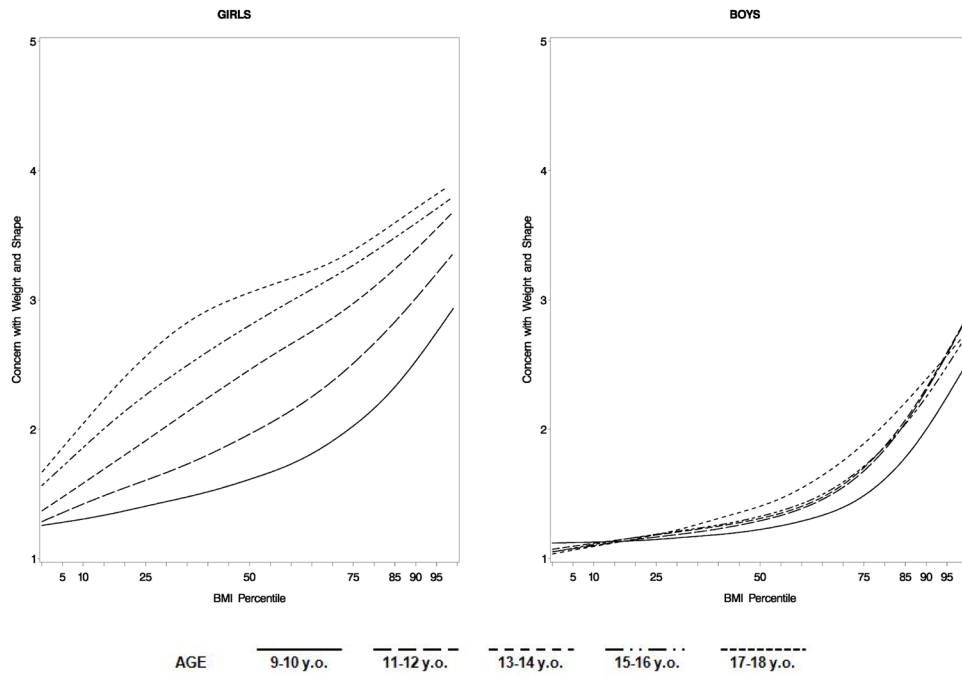


Figure 2. Results from GAM analyses indicating mean past-year weight and shape concern (1= never to 5= always) by BMI percentile and age in girls and boys from the Growing Up Today Study

Table 1

Demographic Characteristics and Descriptive Statistics for Girls in the Growing Up Today Study, 1996–2001 Waves (Participants $n = 8,968$; Observations $n = 33,696$)

Key Variables	Age Group				
	9–10 y.o. (Obs. $n = 3,438$)	11–12 y.o. (Obs. $n = 8,640$)	13–14 y.o. (Obs. $n = 10,325$)	15–16 y.o. (Obs. $n = 7,726$)	17–18 y.o. (Obs. $n = 3,567$)
BMI (M / SD)	17.85 (3.01)	18.98 (3.23)	20.34 (3.18)	21.32 (3.09)	22.00 (3.05)
Body Dissatisfaction (% [n])	14.7% (501)	20.1% (1695)	27.6% (2711)	31.9% (2234)	35.4% (991)
Weight and Shape Concern (M / SD)	1.83 (.96)	2.14 (1.11)	2.57 (1.20)	2.86 (1.19)	3.03 (1.19)
Covariates					
Age of Menarche (M / SD)	12.23 (1.14)	12.26 (1.17)	12.30 (1.19)	12.32 (1.20)	12.33 (1.21)
Geographic Region (% [n])					
West	14.1% (484)	14.5% (1250)	14.2% (1468)	13.9% (1072)	15.2% (543)
Midwest	35.7% (1226)	34.2% (2956)	35.6% (3677)	36.4% (2810)	35.3% (1259)
South	14.3% (492)	14.9% (1285)	14.8% (1525)	15.0% (1157)	14.8% (529)
Northeast	36.0% (1236)	36.5% (3149)	35.4% (3655)	34.8% (2687)	34.7% (1236)

Table 2

Demographic Characteristics and Descriptive Statistics for Boys in the Growing Up Today Study, 1996–2001 Waves (Participants $n = 7,687$; Observations $n = 26,054$)

Key Variables	Age Group				
	9–10 y.o. (Obs. $n = 3045$)	11–12 y.o. (Obs. $n = 7286$)	13–14 y.o. (Obs. $n = 8120$)	15–16 y.o. (Obs. $n = 5308$)	17–18 y.o. (Obs. $n = 2295$)
BMI ($M[SD]$)	18.17 (3.06)	19.25 (3.26)	20.49 (3.31)	21.87 (3.33)	22.69 (3.18)
Body Dissatisfaction (% [n])	15.2% (460)	18.5% (1314)	19.7% (1475)	18.0% (816)	18.2% (282)
Weight and Shape Concern ($M[SD]$)	1.52 (.81)	1.64 (.90)	1.64 (.90)	1.62 (.87)	1.65 (.89)
Covariates					
Tanner Pubertal Stage ($M[SD]$)	1.58 (.73)	2.69 (1.10)	3.88 (1.13)	4.41 (1.26)	4.17 (1.79)
Geographic Region (% [n])					
West	13.7% (416)	13.9% (1010)	14.5% (1173)	15.3% (814)	17.0% (389)
Midwest	35.9% (1094)	35.8% (2611)	35.5% (2885)	35.7% (1897)	34.0% (781)
South	13.1% (398)	13.9% (1015)	14.7% (1193)	14.5% (768)	15.1% (346)
Northeast	37.3% (1137)	36.4% (2650)	35.3% (2869)	34.5% (1829)	33.9% (779)