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Associations of anthropometric, behavioral, and social factors on level of body esteem in peripubertal girls

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Abstract

Objective—Lower body esteem may decrease self-esteem and lead to adverse health effects in children. This study explored the role of anthropometric, behavioral, and social factors on body esteem in peripubertal girls.

Method—We evaluated associations of body esteem (measured by the Revised Body Esteem Scale) with body mass index (BMI), mother's BMI, puberty, physical activity, role models for appearance, and screen time among girls (ages 9 and 10) participating in the Jersey Girl Study ($n=120$). Linear models were used to evaluate differences in body esteem scores.

Results—Overweight/obese girls had a significantly lower mean body esteem score compared to underweight/healthy weight girls [14.09 (95% CI 12.53–15.27) vs. 17.17 (95% CI 16.87–17.43)]. Girls who were physically active for at least 7 hours per week had a significantly higher body esteem score than those who were less active, after adjusting for BMI [17.00 (95% CI 16.62–17.32) vs. 16.39 (95% CI 15.82–16.86)]. Girls whose mothers were overweight/obese, who had entered puberty, and who cited girls at school or females in the media as role models had lower body esteem scores, but differences disappeared after adjusting for girl's BMI. A trend of higher body esteem scores was found for girls whose mothers were role models.

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Conclusion—Lower BMI and higher levels of physical activity are independently associated with higher body esteem score. Having classmates or girls/women in the media as role models may detrimentally affect girls' body esteem, but having mothers as role models may have a positive effect.

Keywords

body image; self-esteem; puberty; physical activity; role models

INTRODUCTION

Body esteem can be defined as an individual's level of satisfaction with his or her own body or physical appearance. While factors associated with body esteem have been studied in adolescents and adults, less is known about body esteem in peripubertal children. Anthropometric factors such as body mass index (BMI) and puberty, behavioral factors such as physical activity and media exposure, and social factors such as role models, may all play an important role in influencing a child's body esteem. Studies have revealed that overweight children, particularly girls, have lower body esteem compared to their normal weight counterparts.¹ Although associations have been shown to differ depending on gender, age, and developmental stage, lower body esteem in overweight children has been observed as early as 5 to 7 years of age.² This has significant implications, as it may be related to developing self-worth and overall self-esteem,^{3,4} lead to risky behaviors such as dieting and eating disorders,⁵ and delay growth or have other adverse health effects.

Since puberty involves changes to body size, shape, and physical appearance, it can also affect body esteem, especially when the timing of puberty differs from that of peers.⁶ Hypotheses have been posed for both early and late maturation, relative to peers, being related to decreased body esteem. Breast development, in particular, may be a factor in decreased body esteem for early maturing girls.⁶ However, body image and weight may be important independent mediating factors between timing of puberty and body esteem.⁶ The relationship between physical activity and body esteem is complex; it is possible that more exercise increases psychological well-being,⁷ or that individuals with low body esteem increase their physical activity in order to lose weight. Previous research has been inconclusive, and the postulated relationship between physical activity and body esteem in a peripubertal population remains uncertain.^{5,7-9}

Likewise, the association between media exposure and body esteem among peripubertal girls is not well understood,^{10,11} and appearance role modeling is an additional factor which has not been well studied in relation to body esteem in girls younger than age 12. These factors are encompassed in the Tripartite Influence model, which posits that peers, parents, and media are three primary influences that explain the development of body image and eating disturbances in young adults.¹² The impact of these factors is mediated by social appearance comparison and internalization of media, and social comparison has been linked to higher body dissatisfaction,¹³ but most of this research has been in adolescent and young adult populations. Social Learning Theory also proposes that learning occurs in one's social context through processes such as observation, imitation, and modeling, and parents, peers,

and the media can influence body esteem via this framework.¹⁴ By asking girls who they consider to be role models for their appearance, we have a direct measure of their conscious appearance comparisons.

Longitudinal studies have shown that low body satisfaction in early adolescence is predictive of later low self-esteem and depression,^{15,16} and current interventions regarding body esteem may occur too late in the developmental process to be of optimal effectiveness. Thus, it is imperative to understand as much as possible about the factors which may contribute to low body esteem at a young age, so appropriate interventions can be implemented to foster healthier body esteem in young girls, and avoid deleterious consequences. This study aimed to evaluate the associations of anthropometric, behavioral, and social factors on level of body esteem, measured by score on the Revised Body Esteem Scale¹, among girls participating in the Jersey Girl Study.

METHODS

Study Population

The Jersey Girl Study is an ongoing longitudinal study of puberty in New Jersey girls, and is described in detail elsewhere.¹⁷ In brief, the study included girls who were 9 or 10 years of age at baseline, with no cognitive impairments, who could speak and read English, were not twins, and had no major medical/surgical conditions known to affect their ability to thrive, stature, the timing of puberty, or to cause amenorrhea. Girls were recruited from pediatric practice and community recruitment efforts. Data collection involved an interview by phone with the mothers and a clinic visit during which questionnaires (completed at home) were collected from mothers, and daughters completed the body esteem questionnaire, saliva and urine samples were collected, and body measurements were taken as described in more detail below. This was a secondary analysis of cross-sectional baseline data from the Jersey Girl Study (2006–2014), from a subset of 120 girls who had completed the study appointment, main questionnaire (completed by mothers), and body esteem questionnaire (completed by girls). The body esteem questionnaire was introduced when data collection was already ongoing, and thus those data are available on only a subset of the 200 total participants in the study. The study has been approved by Rutgers University's Institutional Review Board.

Measures

Outcome—The outcome for this study was body esteem score, calculated using the Revised Body Esteem Scale by Mendelson, et al. (two items were dropped from the 20-item scale based on their 1996 factor analysis),¹ which was completed independently by girls at their study appointment. This 18-item self-reported measure assesses children's attitudes and feelings about their body and appearance. Girls answered yes or no to items such as: "I'm pretty happy about the way that I look," "I really like what I weigh," and "Other people make fun of the way I look." One point was added to the score for a 'yes' response for each positive assertion about the body or a 'no' response for each negative statement. In this study we examined the total body esteem score, which could range from 0-18, with higher scores indicating greater body esteem (Cronbach's alpha 0.81).

Anthropometric Factors—Girls' body mass index (BMI) status (underweight/healthy weight and overweight/obese) was based on the CDC BMI calculator for children.¹⁸ This tool assigns a weight status category from BMI percentile rank, which is based on height and weight, specific to a child's sex and age. Girls' height and weight were measured during the baseline study visit using a rigorous protocol.¹⁷ Mother's BMI was based on self-reported weight and height and computed as weight in kilograms (kg) divided by the square of height in meters (m), and categorized according to the CDC Adult BMI classifications¹⁹ into underweight/healthy weight and overweight/obese. Puberty was defined as a Tanner stage score of 2 or higher for breast and/or pubic hair development.²⁰ Tanner staging was taken from physician examination at the study visit, or, if not available, from mother/daughter self-report, as previous analyses showed high agreement (kappa: 0.7, 95% CI 0.6–0.8 for breast development and 0.8, 95% CI 0.7–0.9 for pubic hair).²¹

Behavioral Factors—Physical activity was ascertained in the main questionnaire, completed by mothers, by asking about hours spent per week in school physical education classes, organized activities (e.g., sports, dance classes), and playing outside. Total physical activity, in hours per week, was computed by summing the number of hours spent in each type of activity. Total physical activity was categorized into <7 vs. 7 or more hours per week, based on the CDC's recommendation of one hour per day of physical activity for children.²² Time spent watching television or playing video games was also taken from the main questionnaire (completed by mothers), and was categorized into < 2 hours or 2 hours or more per day, based on recommendations of screen time for children by the American Academy of Pediatrics.²³

Social Factors—Girls were also asked a series of yes/no questions regarding role models for their appearance: "Which of the following are role models for your appearance?": girls at school, mom, other adult women, TV/movies, video games, music videos, or the internet. Role models in the media (TV, video games, music videos, and/or internet) were combined into a composite response for analysis.

Demographics—Demographic variables were collected during an eligibility phone interview with mothers and included child's age, race, annual household income and mother's level of education (high school through associate degree level, bachelor's degree level, master's degree level, and professional/doctoral degree level).

Statistical Analysis

A series of linear models were used to examine the association between the predictors of interest and body esteem score. First, crude models were fitted separately for each predictor of interest. These were subsequently adjusted for potential confounders: Model #2 adjusted for girl's age, mother's education, and girl's physical activity, and model #3 additionally adjusted for girl's BMI in order to further elucidate the influence of BMI, a previously established predictor of body esteem.^{1,24–26} Models were not adjusted for other predictors of interest, except for girl's BMI and physical activity, as described above. While race and income were initially considered as covariates, they did not result in significant changes (> 10%) in effect estimates, and were excluded from final models. Due to the skewed

distribution of body esteem scores in this sample, the scores were first reversed and log-transformed before running linear models, and the geometric means and confidence intervals estimated by the models for each group were reverse-transformed to determine body esteem scores on the original scale.

All analyses were conducted using SAS Software (Version 9.3; SAS Institute, Inc., Cary, NC).

RESULTS

Characteristics of study subjects are presented in Table 1. Overall, most participants were White, 9 years of age, a healthy weight, had reached puberty, and were living in high-income households. A majority of mothers reported that their daughters were physically active for seven or more hours per week and spent less than two hours per day watching television or playing video games. Nearly half of mothers were overweight or obese, with overall high levels of education. Most girls cited their mother as a role model for their appearance, while half cited role models in the media, and fewer cited other girls in school as role models for their appearance. The mean body esteem score was 15.85 (S.D., 2.80) and median body esteem score was 17.

Results from the linear models fitted for the main predictors of interest are shown in Tables 2 and 3. Girls who were overweight/obese had significantly lower body esteem scores vs. girls who were underweight/healthy weight in both the crude and fully adjusted models [estimated score of 14.09 (95% CI 12.53–15.27) vs. 17.17 (95% CI 16.87–17.43) from the fully adjusted model]. The association persisted when the model was adjusted for child's age, mother's education, and physical activity. Girls who had reached puberty (particularly breast development), and those whose mothers were overweight/obese, also had significantly lower body esteem scores in models #1 and #2, but this association disappeared after adjusting for girl's BMI (model #3). As shown in model #3, girls who were physically active for seven or more hours per week had significantly higher body esteem scores than those who were less active [17.00 (95% CI 16.62–17.32) vs. 16.39 (95% CI 15.82–16.86)]. This association was only significant after adjusting for girl's BMI, suggesting that BMI was an important negative confounder in the association between physical activity and body esteem. Time spent watching television or playing video games did not have a significant impact on body esteem score in this analysis.

Results from the linear models fitted for role model predictors are shown in Table 3. Inverse associations between having role models from media or other girls in school and body esteem scores, shown in model #1 and #2, were attenuated when further adjusting for girl's BMI. Although not statistically significant, girls who said their mothers were role models for their appearance tended to have higher body esteem scores than those who did not [16.88 (95% CI 16.53–17.18) vs. 16.41 (95% CI 15.68–16.98) in model #3].

DISCUSSION

In this study, lower child's body mass index (BMI) and higher levels of physical activity were independently associated with higher body esteem score in 9- and 10- year old girls.

Additionally, other factors including puberty, having a mother with a high BMI, and having role models from school or from the media were all associated with lower body esteem score in this sample of peripubertal girls, but these associations were no longer significant after adjusting for girls' BMI. Time spent watching television or playing video games did not have a significant impact on body esteem score in this study. While not statistically significant, seeing one's mother as a role model for appearance also showed an association with higher body esteem scores.

Consistent with other studies,^{24–26} BMI was negatively associated with body esteem. Furthermore, our results indicated that puberty was associated with lower body esteem, but this relationship was likely a function of increased BMI, as it was attenuated when BMI was included in the model. The increased adiposity usually accompanying the onset of puberty is at odds with the cultural bias toward a “thin ideal,” which may lead girls to be dissatisfied with their bodies. This also coincides with the so-called “deviance hypothesis” that maturing earlier than peers may result in diminished body esteem,⁶ due to both self-evaluation and potentially being teased by peers or family members; this is evident in our finding that the significant association with lower body esteem is seen for the externally visible domain of breast development, but not pubic hair development. The relationship seen between girls whose mothers were overweight/obese and lower body esteem was attenuated when adjusting for the girl's own BMI, and was likely driven by the relationship between child's and mother's BMI.

The association between higher body esteem and a higher level of physical activity may reflect a positive influence of exercise on overall psychological wellbeing,^{5,9} and adds to a limited body of literature that supports such a hypothesis. Another study of adolescent females found a statistically significant association between lower body satisfaction and low levels of physical activity after adjusting for BMI,⁵ and an intervention study in a small group of children aged 10–11 years found a 6-week circuit training program to improve body esteem scores, independent of changes in BMI.⁹ An Australian study found a positive relationship between exercise and body satisfaction among men and women 16–60 years of age, but in women age 21 and younger, there was a negative relationship; they concluded that differences in reasons for exercising were not sufficient to explain differences in the correlation.⁷ A study of third-grade students did not find body esteem to differ by physical activity, but the assessment of activity in this study was limited to a one-weekday recall and may not have been an accurate and complete representation of each child's activity level.⁸ The results of our study provide further evidence that interventions encouraging increased physical activity among children may have beneficial effects independent of effects on BMI.

Looking to girls at school or in the media for appearance role models was negatively associated with body esteem score in this study. This further supports a limited amount of research that indicates there is a relationship between media exposure and appearance-related input from peers, and body dissatisfaction.¹⁰ Clark and Tiggemann (2006) did not find a direct relationship between media exposure and body dissatisfaction in 9–12-year-old girls, but that media influenced conversations with peers, which in turn affected body dissatisfaction.¹⁰ Suchert, et al. found a negative association between “screen time” and body dissatisfaction among 12–17 year-old students,²⁷ whereas no such association was

found in our study among peripubertal girls. However, our definition of “screen time” did not include computer usage since it was not measured separately in the Jersey Girl Study, and it may be a significant contributor to overall “screen time” as well as a medium for potential appearance-related comparisons. Our mean daily “screen time” was over 30 minutes less than that reported in the Suchert study.²⁷ Taylor et al. discovered that trying to look like girls/women from television and magazines, along with BMI and the importance of weight and eating to peers, were the strongest predictors of weight concerns among adolescent and preadolescent girls, which agrees with our results.¹¹ Carey, et al. also found that body comparisons with both models and peers were positively associated with body image concerns among 14- and 15-year-old girls.²⁸ Our study covers a younger population, in the critical period around the onset of breast development. The negative relationship between peer or media role models and body esteem may suggest evaluative, “upward” social comparisons with role models, which would be associated with more negative body esteem.

Several studies found an association between girls’ mothers’ body dissatisfaction and their own body image,²⁹ but this was not measured in our study. However, a relationship between one’s mother as a role model and higher body esteem was seen, although not statistically significant. This makes sense in the context of previous research that implicates family members as playing a vital role in development of body image and identity, which could occur in both reactionary and role-modeling capacities,³⁰ particularly at this developmental stage. The mother-daughter relationship appears key in the development of gender-role identity, body image, and self-esteem in adolescent girls, as mothers serve as both role models and sources of information and guidance.³⁰ In our study, all girls lived with their biological mothers as an inclusion criterion, so this influence would certainly be relevant, although its specifics were not investigated further. It is likely that comparison with one’s mother as a role model could lead to more self-enhancement relative to other potential role models, since it would seem more innately probable to attain a likeness to one’s biological mother than to other girls or women. A study of adolescent German girls found parents’ negative comments about a girl’s weight and/or eating behaviors to be significantly associated with body dissatisfaction, but comments by peers, other relatives, and teachers were not significant predictors; over one-third of girls had heard their mothers and/or fathers make such negative comments.³¹ Unfortunately, we did not have such information on comments made in the girl’s social environment.

Several limitations should be acknowledged. First, the sample was predominantly White, with generally highly educated mothers, which may limit the generalizability of the findings to other populations. However, previous research has shown that these are factors associated with thinner ideal body size and greater body dissatisfaction at this age,³² and thus comprehending the factors which contribute to low body esteem in this group in particular may be even more important. The sample size was relatively small, which affected the statistical power of some analyses. Although the physical activity variable was comprehensive, it was not the main focus of the parent study, and thus, objective measures, such as accelerometers, were not used, in order to minimize participant burden. Information on role models was also limited to that collected for the parent study, which did not use a validated measure. Instead, a simplified questionnaire was used, as simple questions were

more appropriate to this age group than questions requiring a more sophisticated understanding and awareness of the concept of social comparisons.³³ Finally, our study has the limitations inherent in using primarily self-reported, cross-sectional data.

The results of this study agreed and expanded upon previous literature regarding the association between various factors and body esteem in children. It confirmed a negative relationship between BMI and body esteem score, and also observed an independent positive association between physical activity level and body esteem. While our findings suggested that viewing classmates and women in the media as role models may have detrimental effects on girls' body esteem, having positive role models such as girls' mothers may help to mitigate more unfavorable influences. Future studies should investigate longitudinal changes in body esteem and how various factors influence body esteem at different stages of development. The influence of anthropometric, behavioral, and social factors on girls' body esteem, as well as resulting potentially harmful behaviors, is concerning, and further research is needed to fully elucidate the combined impact of these factors during the delicate phase of pubertal development.

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Table 1

Subject Characteristics (N=120)

	N (%)
Body esteem score (mean, s.d.)	15.85 (2.80)
Body esteem score (median)	17
Child age	
9	67 (55.83)
10	53 (44.17)
Breast Development	
Yes (Tanner stage 2+)	75 (62.50)
No	45 (37.50)
Pubic Hair Development	
Yes (Tanner stage 2+)	52 (43.33)
No	68 (56.67)
Puberty (breast and/or pubic hair Tanner stage 2+)	
Yes	81 (67.50)
No	39 (32.50)
Race	
White	101 (84.17)
Other	16 (13.33)
Income (per year)	
< \$70,000	13 (10.83)
\$70,000–\$84,999	8 (6.67)
\$85,000–\$99,999	13 (10.83)
\$100,000+	83 (69.17)
Mother's education	
High school-Associate degree	24 (20.00)
Bachelor's degree	43 (35.83)
Master's degree	34 (28.33)
Professional/doctoral degree	19 (15.83)
Total physical activity (per week)	
< 7 hours	52 (43.33)
7+ hours	67 (55.83)
Child BMI category^a	
Underweight	8 (6.67)
Healthy weight	87 (72.50)
Overweight/obese	25 (20.83)
Mother's BMI category^b	
Underweight (< 18.5 kg/m ²)	3 (2.50)
Healthy weight (18.5–24.9 kg/m ²)	52 (43.33)
Overweight/obese (≥ 25.0 kg/m ²)	56 (46.67)

	<i>N</i> (%)
Total time watching TV/playing video games	
< 120 min/day	72 (60.00)
120 min/day	47 (39.17)
Role models in school	
Yes	53 (44.17)
No	67 (55.83)
Mom as a role model	
Yes	88 (73.33)
No	32 (26.67)
Role models in the media (TV, video games, music videos, and/or internet)	
Yes	61 (50.83)
No	57 (47.50)

^abased on CDC BMI chart for children

^bbased on CDC BMI categorization for adults

Categories may not total 100% due to missing values

Table 2

Mean Body Esteem Score and 95% Confidence Intervals According to Main Predictors of Interest, Estimated from Linear Models as Described Below

	Mean body esteem score (95% CI)		
	Model #1	Model #2	Model #3
Predictor of interest			
Child's BMI category			
Underweight/healthy weight (ref.)	17.18 (16.90–17.41)	17.17 (16.87–17.43)	N/A
Overweight/obese	13.95 * (12.37–15.15)	14.09 * (12.53–15.27)	
Change in BE score per unit change in child's BMI	–1.13 * (–1.18, –1.09)	–1.13 * (–1.18, –1.09)	N/A
Puberty			
No (ref.)	17.26 (16.76–17.64)	17.30 (16.77–17.70)	16.81 (16.18–17.30)
Yes (breast and/or pubic hair Tanner stage 2+)	16.45 * (15.97–16.85)	16.42 * (15.92–16.84)	16.74 (16.34–17.08)
Breast development			
No (ref.)	17.28 (16.84–17.63)	17.34 (16.87–17.70)	16.92 (16.37–17.36)
Yes (Tanner stage 2+)	16.34 * (15.83–16.78)	16.30 * (15.77–16.75)	16.67 (16.23–17.03)
Pubic Hair development			
No (ref.)	16.78 (16.30–17.17)	16.78 (16.28–17.19)	16.50 (16.02–16.91)
Yes (Tanner stage 2+)	16.70 (16.13–17.16)	16.62 (16.01–17.11)	17.06 (16.62–17.42)
Mother's BMI category			
Underweight/healthy weight (ref.)	17.12 (16.68–17.49)	17.05 (16.57–17.44)	17.00 (16.57–17.35)
Overweight/obese	16.32 * (15.68–16.83)	16.33 * (15.68–16.85)	16.54 (16.03–16.96)
Total physical activity (per week)			
< 7 hours (ref.)	16.38 (15.73–16.89)	16.41 (15.74–16.94)	16.39 (15.82–16.86)
7 hours	16.99 (16.56–17.34)	16.92 (16.45–17.29)	17.00 * (16.62–17.32)
Total time watching TV/playing video games			
< 120 min per day (ref.)	16.87 (16.43–17.23)	16.87 (16.41–17.25)	16.90 (16.51–17.22)
120 min per day	16.53 (15.88–17.04)	16.45 (15.75–17.00)	16.53 (15.96–17.00)

* $P < 0.05$ level

A separate series of models (#1–3) was fitted for each predictor of interest; models were not mutually adjusted for other predictors of interest except as indicated below

Model #1: unadjusted GLM model

Model #2: adjusted for child age (yrs), mother's education & child's physical activity (hours per week)

Note: Model #2 was not adjusted for child's physical activity where it was the predictor of interest

Model #3: Model #2 was further adjusted for child's BMI (kg/m^2)

Note: Model #3 was not adjusted for child's physical activity where it was the predictor of interest

Table 3

Mean Body Esteem Score and 95% Confidence Intervals for Role Model Predictors of Interest, Estimated from Linear Models as Described Below

	Mean body esteem score (95% CI)		
	Model #1	Model #2	Model #3
Predictor of interest			
Role models in school			
No (ref.)	17.06 (16.65–17.40)	17.03 (16.61–17.38)	16.95 (16.57–17.27)
Yes	16.27 * (15.62–16.80)	16.18 * (15.46–16.75)	16.46 (15.90–16.92)
Mom as a role model			
No (ref.)	16.31 (15.45–16.97)	16.26 (15.34–16.95)	16.41 (15.68–16.98)
Yes	16.88 (16.50–17.21)	16.87 (16.45–17.22)	16.88 (16.53–17.18)
Role models in the media (TV, video games, music videos, and/or internet)			
No (ref.)	17.06 (16.61–17.42)	17.01 (16.53–17.39)	16.91 (16.47–17.26)
Yes	16.33 * (15.74–16.82)	16.30 * (15.66–16.82)	16.53 (16.02–16.95)

* $P < 0.05$ level

A separate series of models (#1–3) was fitted for each predictor of interest; models were not mutually adjusted for other predictors of interest except as indicated below

Model #1: unadjusted GLM model

Model #2: adjusted for child age (yrs), mother's education & child's physical activity (hours per week)

Model #3: Model #2 was further adjusted for child's BMI (kg/m^2)