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Is ideal body image related to obesity and lifestyle behaviors in African-American adolescents?

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Abstract

Background—Childhood obesity epidemic has become a public health issue in the U.S., especially among African-American youths. Research on the association between ideal body image (IBI) and obesity and related lifestyle factors among African-American children and adolescents is limited.

Methods—Data collected from 402 low-income African-American adolescents aged 10–14 years in four Chicago public schools were used. Questionnaires were used to assess IBI, weight perception, weight control practices, and self-efficacy towards food and physical activity. Body mass index (BMI) was calculated using measured weight and height. Associations between IBI and weight perception, overweight/obesity, and lifestyle behaviors were assessed using linear and logistic regression models.

Results—The most frequently chosen ideal body size was the fourth of 8 silhouettes (from thinnest to heaviest) for boys (55%) and girls (49%). Overweight and obese girls selected larger ideal body figures than the others (trend test: $P < 0.001$). Compared to those with middle ideal body figures, girls who selected smaller ones were twice more likely to have an unhealthy diet as indicated by less fruit and milk consumption, the odd ratios (ORs) and 95% confidence intervals (95% CI) were 2.40 (1.15–5.02) for fruits intake ($< \text{once/week}$) and 2.13 (1.06–4.29) for milk consumption ($< \text{once/day}$), respectively. Boys with larger ideal body image were less likely to eat snack often ($\geq \text{once/day}$) (OR = 0.11 (0.02–0.50)). Girls with larger ideal body image were less likely to spend more screen time (OR = 0.12 (0.02–0.70)) and reported better food choice intentions ($P < 0.05$). Overweight and obese boys and girls appeared to have better food choice intentions and food self-efficacy than their non-overweight peers (trend test: both $P < 0.01$).

Conclusions—Ideal body image is associated with weight status, food self-efficacy, and lifestyle behaviors among low-income African-American adolescents.

Keywords

ideal body image; obesity; weight perception; weight control; African-American; adolescent

Introduction

The obesity epidemic disproportionately affects minority and some low-income groups worldwide, including African-American adolescents (Wang and Beydoun 2007, Ogden *et al.* 2010). It has been reported that African-American girls are less concerned about overweight and obesity, and they are less likely than white girls to report that they are overweight

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(Kemper *et al.* 1994, Wilson *et al.* 1994). Overweight and obesity appear to have a less negative impact on self-esteem, weight-related concerns, and body satisfaction in African-American adolescents than white peers (Viner *et al.* 2006). The proportion of weight satisfaction in African-American adolescents has been reported to be higher than in other ethnic groups (Story *et al.* 1995). A good understanding of factors contributing to the ethnic disparities in obesity will help develop effective obesity interventions.

Some previous studies have suggested that African Americans prefer large silhouettes (Barroso *et al.* 2010, Killion *et al.* 2006, Kronenfeld *et al.* 2010, Jones *et al.* 2007), report high levels of body shape satisfaction (Chandler-Laney *et al.* 2009, Kronenfeld *et al.* 2010), or have an underestimation of their body weight (Schuler *et al.* 2008, Wang *et al.* 2009, Kronenfeld *et al.* 2010). For example, a recent study reported that African American women selected a smaller silhouette to represent their current size (lighter than their weight status) and preferred larger silhouettes than White women even after controlling for their actual body weight status (Kronenfeld *et al.* 2010). These cultural influences and norms on ideal body image (IBI) eating attitudes and behaviors in African Americans (Akan and Grilo 1995, Abrams *et al.* 1993) have been shown to be associated with big IBI and may explain the acceptance and tolerance of obesity among African Americans (Barroso *et al.* 2010, Killion *et al.* 2006, Kronenfeld *et al.* 2010, Schuler *et al.* 2008).

There is a paucity of research on weight control practice and psychological concomitants of obesity among minority youths (Viner *et al.* 2006, Gordon-Larsen 2001, Story *et al.* 2001). A major gap in the literature is that our understanding of the impact of ideal body image (IBI) on obesity, weight perception, and lifestyle behaviors among adolescents is limited, particularly for African-American adolescents. IBI may be related to body weight and lifestyle behaviors. In this study, we examined the associations of IBI with obesity, weight perception, eating and physical activity (PA) behaviors, and self-efficacy towards healthy food and PA in urban low-income African-American adolescents (Figure 1). We tested several hypotheses: 1) IBI is related to actual body weight status; 2) IBI is related to weight perception, e.g., those selecting larger body size as ideal are more likely to underestimate their weight status; 3) IBI is related to weight control practice, i.e., those with desirable IBI are less likely to have inappropriate weight control practice; 4) IBI is associated with eating and PA patterns, self-efficacy, and intentions and knowledge; and 5) Obese adolescents have lower self-efficacy to make healthful eating and PA choices than their counterparts.

Methods

Study design

We initiated a randomized intervention trial to test the feasibility and effectiveness of a school-based, environmental obesity prevention program in low-income African-American adolescents. Four Chicago public schools were selected and randomly assigned to the control and intervention groups. More details about the study design and data collection are provided elsewhere (Wang *et al.* 2006, Wang *et al.* 2007). This study was carried out following study protocols approved by the Institutional Review Board at the University of Illinois at Chicago and Johns Hopkins University Bloomberg School of Public Health.

The present study focused on cross-sectional data collected in 2004. In total, 402 students (females: 49.5%) in grades 5th-7th completed the survey including measures of IBI, healthy food knowledge perception, food choice intention, and self-efficacy towards food and PA.

Data collection and measures

Weight status—Anthropometric measures were assessed through direct measurements in schools conducted by trained research staff. Height and weight were measured twice according to standardized protocols. Body mass index (BMI) was calculated from the averaged height and weight. Based on the 2000 CDC Growth Charts (the age-sex-specific BMI percentile), overweight (85^{th} percentile $\leq$ BMI $< 95^{\text{th}}$ percentile) and obesity (BMI $\geq 95^{\text{th}}$ percentile) were defined (Kuczmarski *et al.* 2000).

Information on lifestyle factors, IBI, and psychological factors were collected through self-administrated questionnaires. Most of questions included in the study were validated/used in previous studies (Grunbaum *et al.* 2004, Edmundson *et al.* 1996, Treuth *et al.* 2003, Stevens *et al.* 1999a). Eight gender-specific silhouettes were used to assess IBI.

Lifestyle behaviors—Dietary intake and PA were assessed through asking a number of questions. For example, “On how many of the past 7 days, did you do at least 20 minutes of exercise hard enough to make you sweat and breathe hard?”, “On an average school day, how many hours do you watch TV or videos, or play computer or video games?”. *Ideal body image (IBI)*: Line drawings showing 8-silhouette body sizes ranging from very thin to very heavy used in previous studies (Stunkard *et al.* 1983, Stevens *et al.* 1999a) were adapted in our study. Students were asked three questions: a) “for boys/girls, which one is most healthy?” and b) “which one do you wish that your body looks like?”. For each question, students were instructed to circle only one silhouette from 8 silhouettes. The silhouettes were scored as 1 (thinnest) to 8 (heaviest). Low scores indicated a small body size and high score suggested a large one, while scores toward the middle of the range (i.e., 4) were considered most desirable. We further grouped the 8 silhouettes into three levels: ‘small’ (silhouettes A, B, and C), ‘middle’ (silhouettes D and E), and ‘large’ (silhouettes F, G, and H). The ‘middle’ group served as the reference in data analysis. We focused on results from second question and treated them as adolescents’ IBI. Previous research has shown that the test–retest correlation coefficient for the body size figures was 0.6 (Story *et al.* 2001).

Weight perception and weight control practice—Students were asked to evaluate their weight perception by answering: ‘I think I am: too skinny (underweight), normal weight, overweight’. Intended weight control practice was assessed with the question: ‘Have you ever tried to lose weight? Response choices were ‘yes/no’.

Self-efficacy towards food and PA—A 8-item scale measured students’ confidence to choose foods lower in fat and sugar using a four-point ordinal response set (i.e., I know I can, I think I can, I’m not sure I can, and I know I can’t). For example: I can eat at least a fruit (banana, apple, or orange) every day; at school, I can try a new vegetable. A 5-item scale measured students’ confidence to participate in PA. Sample items included: I can be physically active 3-5 times a week; I can limit my time of watching TV to less than 2 hours on a regular school day; and when there is an elevator and stairs, I can choose to take the stairs.

Food choice intentions—This scale consisted of 10 items written in a dichotomous, forced-choice format in which students were asked which food they would choose in different situations. For each food-choice pair presented, one choice was lower in fat or sugar. Each pair included an artist’s drawing of the food in addition to the name of the food below each drawing. For example: ‘which would you pick for a snack?’ (choice: potato chips or fruits).

Healthy food knowledge and perception—This 6-item scale was composed of the questions, ‘Which food is better for your health?’, followed by six different sets of three answer choices such as ‘regular or whole milk, low-fat or skim milk, don’t know’. Each set included a line drawing of the foods and the names of the foods. A sample item was: ‘Which food is better for your health?’ (choice: whole wheat bread, white bread, don’t know).

Participant’s scores were calculated for food and PA self-efficacy, food choice intentions, and healthy food knowledge perception. Each question of the measures ranged from 0 (least healthy answer) to 1 (the healthiest answer).

Statistical analysis

Using χ^2 tests and Fisher’s exact tests, we examined the differences in silhouette selection by gender and BMI category. We found no differences between adolescents enrolled in the intervention and control schools for IBI and most demographic characteristics. Thus, we combined data from all schools in our analysis. We fit general linear regression models (GLM) to test the means of each measure across BMI status and IBI groups.

Further, we conducted logistic regression analysis to test the associations between IBI, weight status, and weight control practices. Adjusted odds ratios (ORs) and 95% confidence intervals (95% CI) were calculated with controlling for gender, grade, and treatment (intervention/control). Note that we chose not to control for school in models as the results were similar and each treatment group only had two schools. All analysis was conducted using SAS Version 9.1 (SAS Inc, Cary, NC, USA). P-value was set at 0.05 for testing statistical significance.

Results

The prevalence of overweight and obesity was 37.0% (boys: 33.4%; girls: 41.6%). Among overweight and obese adolescents, 68.8% thought they were overweight or obese (boys: 54.4%; girls: 77.6%). Table 1 presents the proportion of students choosing ‘for boys/girls which one is most healthy’ and the mean IBI scores by BMI categories. Approximately 80% and slightly more boys than girls selected the fourth or fifth silhouettes as most healthy. Over half of boys and girls selected the fourth silhouette as the healthiest. For the question ‘for boys which one is most healthy’, no associations were found between silhouette selection and BMI category in boys or girls. Regarding the question ‘for girls which one is most healthy?’, overweight or obese girls had higher mean scores in silhouette selection than non-overweight girls ($P < 0.05$). However, no differences were found in boys. No gender difference was found in the silhouette selection, even after adjustment for BMI.

Table 2 shows the proportion of boys and girls choosing IBI (only for his/her own gender) by BMI, weight perception, and intended weight control practice. Approximately 70% selected either the fourth or fifth as their IBI. The mean score of IBI was 4.13 ($SD=0.89$). No significant differences were found in the mean scores by weight perception or weight control practice in boys or girls. Linear regression models and Fisher’s exact tests show that IBI was significantly and positively associated with BMI in girls (trend tests: $P < 0.05$). Girls with larger IBI were more likely to have elevated BMI ($\geq 85^{\text{th}}$ percentile) than those with middle IBI (OR: 6.71; 95% CI: 1.40, 32.11), see Figure 2.

Table 3 shows that among girls, smaller IBI was associated with lower intakes of fruits (OR: 2.40; 95% CI: 1.15-5.02) and milk (OR: 2.13; 95% CI: 1.06-4.29). Compared to adolescents choosing middle IBI, boys with larger IBI were less likely to eat snack at least once a day (OR: 0.11; 95% CI: 0.02-0.50). Girls with smaller IBI were more likely to participate in PA less than 3 days/week (OR: 2.20; 95% CI: 1.09-4.42). Girls with larger IBI were less likely

to have screen time >2 hours/day than those with middle IBI (OR: 0.12; 95% CI: 0.02-0.70). IBI was not associated with consumption of vegetables, fried foods, or soft drink.

We also compared self-efficacy towards foods and PA, food choice intentions, and healthy food knowledge and perceptions by IBI (Data not shown). Girls with larger IBI had better healthy food choice intentions than their counterparts (trend test: $P < 0.01$), but none of the other differences were significant.

Table 4 shows the comparisons of food self-efficacy, PA self-efficacy, food choice intentions, and healthy food knowledge perception by BMI categories. There was a linear relationship between BMI categories and food self-efficacy in boys and girls (trend test: both $P < 0.01$). Adolescents with higher BMI had higher food self-efficacy. No gender difference was found for food self-efficacy. There were no significant differences in PA self-efficacy in boys or girls by BMI categories. Overweight or obese adolescents reported healthier food choice intentions than non-overweight adolescents (both $P < 0.001$). Boys and girls had similar mean food choice intention scores, although girls had better healthy food knowledge and perception than boys (Mean: 0.72 vs. 0.66, $P < 0.05$). The healthy food knowledge and perception scores varied little by BMI.

Discussion

Our study shows that most of African-American adolescents had the mid-range of IBI. IBI was related to measured body weight and lifestyle behaviors. These findings were summarized in **Appendix A**. The majority (91.5%) of these adolescents selected the 3rd-5th silhouettes of the eight-silhouette scales as their ideal body size. Overall, these are consistent with findings from previous studies conducted in ethnically diverse pediatric populations (Thompson *et al.* 1997, Stevens *et al.* 1999b, Rand and Wright 2000, Robinson *et al.* 2001, Gordon-Larsen 2001). For example, a study of 304 fourth grade Native American children reported that 91% of boys chose the third, fourth, and fifth silhouettes as their ideal body size, while 90% of girls chose the second, third, and fourth silhouettes (Stevens *et al.* 1999b).

We found that mean scores of IBI were 4.12 in boys and 4.11 in girls, slightly higher than in the Healthy U Project of 155 Native American children aged 5-18 years which used the similar 8-silhouette scale (boys: 3.92; girls: 3.18) (Rinderknecht and Smith 2002). Among Canadian Native Indian adolescents aged 10-19 years, the mean score was 3.85 for boys and 3.80 for girls, respectively (Gittelsohn *et al.* 1996). Our findings were consistent with previous studies concerning IBI among different ethnic groups (Kemper *et al.* 1994, Parnell *et al.* 1996). A number of studies have examined the ethnic differences in body image between African-Americans and other ethnic/racial groups (Kemper *et al.* 1994, Wilson *et al.* 1994, Story *et al.* 2003, Neumark-Sztainer *et al.* 2002). African-American adults appear to prefer a larger ideal body size than Caucasians (Gluck and Geliebter 2002, Powell and Kahn 1995). Some research has also suggested that African-American adolescents have a larger ideal body size than White peers (Thompson *et al.* 1994, Thompson *et al.* 1997). In a random sample of 817 children, African-American children selected significantly heavier ideal sizes than White children for self, boy, girl, man, and woman (Thompson *et al.* 1997). Perceptions of ideal body size and preferences for certain levels of thinness or fatness may be culturally determined (Wright and Whitehead 1987).

Our findings show that IBI was related to weight status in African-American girls but not in boys. Girls with larger IBI were more likely to be overweight or obese. A study of 64 urban African-American girls aged 11-15 reported that overweight girls had a larger ideal body size than non-overweight girls (Gordon-Larsen 2001). In contrast, the Pathways Study found

that overweight Native American children in grades 2 and 3 chose a slightly smaller silhouette as the most healthy body size than normal weight children (Story *et al.* 2001). However, another study found that 155 urban Native American children aged 5-18 years chose similar ideal body size regardless of their BMI status (Rinderknecht and Smith 2002). The difference may be due to different sample characteristics. African-American girls express less concern about being overweight and feel less pressured by society to be thin (Wilson *et al.* 1994, Kemper *et al.* 1994). African-American adolescents report greater body image satisfaction and prefer larger body sizes than do other ethnic groups (Altabe 1998, Gluck and Geliebter 2002, Parnell *et al.* 1996, Siegel *et al.* 1999, Thompson *et al.* 1997). The difference in the perception of ideal body size may help explain the disproportionate rate of obesity between African-American and other ethnic populations. Overall, ours and previous studies indicate ethnic and gender differences in the IBI-obesity relationship among American adolescents. The acceptance of larger IBI among African-American adolescents may put less pressure on them for weight control. Our study provides some evidence that IBI may affect diet and PA. We found that girls with smaller IBI were less likely to eat fruits, to drink milk, and to participate in hard PA frequently, which represent unhealthy lifestyles. However, boys with larger IBI were less likely to eat snack, which does not support our hypothesis that larger IBI is related to unhealthy eating and PA. This may be due to the possibility that these boys may have concerned about their body weight and have been trying to reduce their snack consumption for weight control. Girls with larger IBI were less likely to spend time watching TV or playing video game. Overweight girls might have modified their PA patterns to control body weight.

In our study, only 54% of overweight and obese boys reported considering themselves being overweight or obese. However, for girls, it was 78%. A considerable proportion of overweight boys may be at high risk of obesity if they continue to perceive themselves as having normal weight. Previous research has reported gender difference in body image among African American adolescents (Jones *et al.* 2007, Yates *et al.* 2004). African American boys prefer a larger female figure than by girls, and report more body satisfaction than girls. The gender difference in body image may partly contribute to the gender differences in eating and physical activity patterns among African American adolescents.

IBI may affect diet and PA behaviors and thus in turn affect body weight. Assessment of IBI and promoting an appropriate, healthy IBI should be included to enhance the effectiveness of obesity interventions in African American populations. In the development of effective obesity intervention programs, it is equally important to help adolescents and their parents have healthy IBI and to inform them about their body weight status assessed according to national guidelines. In this study, we found that overweight/obese African-American boys and girls had better food self-efficacy and healthier food choice intentions than their non-overweight peers. This indicates that heavier (overweight/obese) adolescents may have a stronger desire to choose foods lower in fat and sugar. However, we cannot exclude the possibility that these adolescents might have reported under the influence of social desirability, i.e., what they reported about dietary intentions and intakes might differ from their actual ones. These need to be confirmed by future longitudinal studies.

In contrast, the Pathways Study of younger Native American children did not find differences between overweight/obese and normal weight children for self-efficacy or healthy food choice intentions (Story *et al.* 2001). We did not find differences in PA self-efficacy and healthy food knowledge perception by BMI status. Heavier adolescents may be aware of the need and express a desire to modify their diet and PA patterns in order to achieve desirable body weight. Thus, overweight adolescents, especially girls, may be more receptive to behavioral modifications. It is important to empower them and facilitate the desirable behavioral changes for obesity prevention and weight loss.

Besides its strengths as described elsewhere (Wang *et al.* 2006, Wang *et al.* 2007), our study has several limitations including its cross-sectional data, and except for measured BMI, other measures are based on self-reported data. With this homogeneous sample, we cannot directly test ethnic difference and this also limits the generalizability. In conclusion, the majority of these urban low-income African-American adolescents have the mid-range of ideal body image that is similar to current norms, but on average they have the perception of larger ideal body image. Girls with larger ideal body image are more likely to be overweight. Overweight African-American adolescents have higher self-efficacy towards desirable eating and PA behaviors, suggesting that they are likely to be receptive to obesity interventions. Longitudinal data are needed to test the associations we detected including to understand how ideal body image may affect actual weight control practice and body weight. Further research is also needed to examine whether programs that help correct inaccurate weight perceptions and increase self-efficacy towards desirable diet and PA behaviors can help prevent obesity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Conceptual framework: Associations between ideal body image, weight status, weight perception, intended weight control practice, and lifestyle behaviors

Figure 2.

Association between ideal body image and measured body mass index (BMI)

* Based on logistic regression models, BMI $\geq$ 85th vs. BMI<85th (reference). Ideal body image ‘middle’ was the reference;

‡ The model adjusted for gender, treatment, and grade;

¶ The models adjusted for treatment and grade.

Table 1

Perception of ideal body image: Percentages of boys and girls choosing 'for boys which silhouette is most healthy' or 'for girls which silhouette is most healthy' and the mean scores by gender and BMI category

	Silhouette selected (%) [*]								% (D+E)	Mean (SD) [†]	Trend test [‡]	Fisher's exact test [§]
	A	B	C	D	E	F	G	H				
For boys which silhouette is most healthy ¶												
Total (n= 395)	0.8	0.8	10.6	56.4	25.7	4.0	0.5	1.3	82.1	4.26 (0.89)		
Boys (n= 168)	0.6	0.6	11.9	58.3	25.6	2.4	0.0	0.6	83.9	4.19 (0.79)		
BMI category												
BMI<85th	0.9	0.9	11.6	56.3	26.8	2.7	0.0	0.9	83.1	4.19 (0.85)	NS	NS
85th≤BMI<95th	0.0	0.0	12.9	54.8	32.3	0.0	0.0	0.0	87.1	4.19 (0.65)		
BMI≥95th	0.0	0.0	10.7	67.9	14.3	7.1	0.0	0.0	82.2	4.18 (0.72)		
Girls (n= 227)	0.9	0.9	9.7	55.1	25.6	5.3	0.9	1.8	80.6	4.31 (0.97)		
BMI category												
BMI< 85th	0.8	0.8	8.3	56.1	28.0	3.8	0.8	1.5	84.1	4.32 (0.91)	NS	NS
85th≤BMI<95th	0.0	0.0	8.3	61.1	27.8	2.8	0.0	0.0	88.9	4.25 (0.65)		
BMI≥95th	1.7	1.7	13.8	50.0	18.9	8.6	1.7	3.5	68.9	4.33 (1.23)		
For girls which silhouette is most healthy ¶												
Total (n= 396)	1.0	2.8	13.7	51.4	25.8	3.8	0.3	1.3	77.2	4.17 (0.97)		
Boys (n= 167)	0.6	2.4	14.4	52.7	27.5	1.8	0.0	0.6	80.2	4.13 (0.85)		
BMI category												
BMI<85th	0.9	2.7	13.6	52.7	27.3	1.8	0.0	0.9	80.0	4.12 (0.89)	NS	NS
85th≤BMI<95th	0.0	3.5	17.2	48.3	31.0	0.0	0.0	0.0	79.3	4.07 (0.79)		
BMI≥95th	0.0	0.0	14.8	55.6	25.9	3.7	0.0	0.0	81.5	4.18 (0.72)		
Girls (n= 229)	1.3	3.1	13.1	50.2	24.9	5.2	0.4	1.8	75.1	4.20 (1.05)		
BMI category												
BMI<85th	1.5	3.0	13.5	55.6	21.1	3.8	0.0	1.5	76.7	4.11 (0.99)	**	**
85th≤BMI<95th	0.0	2.8	13.9	50.0	33.3	0.0	0.0	0.0	83.3	4.14 (0.76)		
BMI≥95th	1.7	3.5	12.1	37.9	27.6	12.1	1.7	3.5	65.5	4.45 (1.29)		

* Percentages calculated for each row within BMI category.

† Scored on a scale of 1 (A: thinnest silhouette) to 8 (H: heaviest silhouette).

‡ Trend test for mean score by measured BMI category; controlled for treatment and grade.

§ Fisher's exact test: silhouettes selected grouped into 3 categories: 'small' (figures A, B, and C); 'middle' (figures D and E); and 'large' (figures F, G, and H).

No significant gender differences were found in the two questions, the tests controlled for BMI, treatment, and grade.

*/

** P<0.05; NS: not significant.

Table 2

Desired body shape for oneself: Percentage of boys and girls choosing 'you wish that your body looks like (which one of 8 silhouettes)' by gender, BMI, weight perception, and intended weight control practice

	%	Silhouette selected (%) [*]								%	Mean (SD) [†]	Trend test [‡]	Fisher's exact test [§]
		A	B	C	D	E	F	G	H				
Total (n= 392)	100.0	0.3	3.3	15.1	51.5	24.7	4.6	0.0	0.5	76.2	4.13 (0.89)		
Boys (n= 168) [¶]	100.0	0.6	3.0	14.9	54.8	21.4	4.2	0.0	1.2	76.2	4.12 (0.94)		
BMI category													
BMI<85th	66.7	0.9	4.5	14.3	55.4	19.6	4.5	0.0	0.9	75.0	4.06 (0.96)	NS	NS
85th≤BMI<95th	16.7	0.0	0.0	14.3	50.0	32.1	3.6	0.0	0.0	82.1	4.25 (0.75)		
BMI≥95th	16.7	0.0	0.0	17.9	57.1	17.9	3.6	0.0	3.6	75.0	4.22 (1.05)		
Weight perception													
Underweight	10.7	5.6	5.6	27.8	50.0	5.6	5.6	0.0	0.0	55.6	3.61 (1.09)	NS	**
Normal weight	64.9	0.0	1.8	10.1	57.8	26.6	2.8	0.0	0.9	84.4	4.22 (0.81)		
Overweight	24.4	0.0	4.9	22.0	48.8	14.6	7.3	0.0	2.4	63.4	4.07 (1.12)		
Ever tried to lose weight													
Yes	46.9	0.0	4.0	14.5	55.3	22.4	4.0	0.0	0.0	77.7	4.08 (0.83)	NS	NS
No	53.1	1.2	2.3	16.3	53.5	20.9	4.7	0.0	1.2	74.4	4.11 (0.97)		
Girls (n= 224) [¶]	100.0	0.0	3.6	15.1	48.9	27.1	4.9	0.0	0.4	76.0	4.15 (0.86)		
BMI category													
BMI<85th	58.5	0.0	3.8	16.0	56.5	22.1	1.5	0.0	0.0	78.6	4.01 (0.77)	**	**
85th≤BMI<95th	16.1	0.0	2.8	22.2	38.9	36.1	0.0	0.0	0.0	75.0	4.08 (0.84)		
BMI≥95th	25.5	0.0	3.6	8.9	39.3	32.1	16.1	0.0	0.0	71.4	4.48 (0.99)		
Weight perception													
Underweight	10.7	0.0	4.2	8.3	58.3	25.0	4.2	0.0	0.0	83.3	4.17 (0.81)	NS	NS
Normal weight	52.7	0.0	3.4	13.6	55.1	27.1	0.9	0.0	0.0	82.2	4.08 (0.75)		
Overweight	36.6	0.0	3.7	19.5	37.8	28.1	11.0	0.0	0.0	65.9	4.23 (1.01)		
Ever tried to lose weight													
Yes	52.7	0.0	5.1	18.0	41.9	27.4	7.7	0.0	0.0	69.3	4.14 (0.98)	NS	NS
No	47.3	0.0	1.9	12.4	57.1	26.7	1.9	0.0	0.0	83.8	4.14 (0.73)		

* Percentages are calculated for each row within BMI category.

⁷ Scored on a scale of 1 (A: thinnest silhouette) to 8 (H: heaviest silhouette).

⁸ Trend test for mean scores by BMI category: controlled for treatment and grade.

⁸ Fisher's exact test: silhouettes selected grouped into 3 categories: 'small' (figures A, B, and C); 'middle' (figures D and E); and 'large' (figures F, G, and H).

⁹ Gender difference: controlled for BMI, treatment, and grade. No gender difference was found in the mean score of ideal body image.

** P<0.01; NS: not significant.

Table 3

Association between ideal body image ('desired body shape for oneself') and dietary intake, physical activity, and screen time *

Study	variables	outcomes	Total: OR (95% CI)		Boys: OR (95% CI)		Girls: OR (95% CI)	
			Small	Large	Small	Large	Small	Large
Dietary intake								
Fruits [†]		<once/day	1.77 (1.01-3.11) [‡]	1.72 (0.60-4.91)	1.17 (0.48-2.85)	4.13 (0.96-17.79)	2.40 (1.15-5.02) [‡]	0.36 (0.04-3.32)
Vegetables [†]		<once/day	1.40 (0.82-2.39)	0.59 (0.18-1.89)	1.30 (0.56-3.01)	1.02 (0.23-4.57)	1.51 (0.74-3.06)	0.32 (0.04-2.81)
Milk [†]		<once/day	1.69 (0.99-2.89)	1.58 (0.58-4.30)	1.23 (0.52-2.94)	3.68 (0.88-15.37)	2.13 (1.06-4.29) [‡]	0.51 (0.09-2.81)
Soft drink [§]		≥once/day	0.96 (0.51-1.83)	0.60 (0.21-1.75)	1.71 (0.59-4.90)	0.74 (0.17-3.31)	0.61 (0.26-1.40)	0.46 (0.09-2.27)
Snack [§]		≥once/day	1.49 (0.64-3.49)	0.34 (0.12-0.99) [‡]	1.33 (0.35-4.98)	0.11 (0.02-0.50) [‡]	1.64 (0.53-5.06)	0.89 (0.17-4.70)
PA [¶]		<3 days/week	1.44 (0.85-2.42)	0.79 (0.28-2.26)	0.80 (0.35-1.85)	0.48 (0.09-2.57)	2.20 (1.09-4.42) [‡]	0.98 (0.24-4.01)
Screen time ^{**}		>2 hours/day	1.27 (0.74-2.18)	0.19 (0.06-0.61) [‡]	0.67 (0.30-1.50)	0.21 (0.04-1.10)	2.15 (0.98-4.73)	0.12 (0.02-0.70) [‡]

* Separate logistic regression models were fit for each outcome variable, respectively; and odd ratios (ORs) and 95% confidence intervals (95% CIs) were reported. Dietary intake and physical activity were assessed using questions to ask about participants' behaviors over the past seven days. Ideal body size 'middle (D & E)' as reference; small (A, B, and C); large (F, G, and H). BMI, gender, treatment, and grade were controlled for in the models; gender was removed in the gender-stratified analysis.

[†] Dietary intake '≥once/day' as reference.

[§] Dietary intake '<once/day' as reference.

[¶] PA: physical activity, '≥3 days/week' as reference.

^{**} Screen time, '≤2 hours' as reference.

[‡] P<0.05.

Table 4

Comparisons of food and physical activity self-efficacy, food choice intentions, and healthy food perception mean scores, by BMI status*

	Total		BMI<85th		85th≤BMI<95th		BMI≥95th		Trend test [†]
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
Total (n= 398)									
Food self-efficacy	0.74 (0.22)	0.71 (0.23)	0.75 (0.19)	0.82 (0.16)	‡				‡
Physical activity self-efficacy	0.83 (0.17)	0.82 (0.18)	0.85 (0.15)	0.84 (0.16)	NS				NS
Food choice intentions	0.40 (0.23)	0.35 (0.20) ^{§¶}	0.42 (0.24) [§]	0.50 (0.24)	‡				‡
Healthy food knowledge and perception	0.70 (0.21)	0.68 (0.20) [§]	0.68 (0.22)	0.74 (0.22)	NS				NS
Boys (n= 171)									
Food self-efficacy	0.75 (0.21)	0.73 (0.22) [§]	0.73 (0.21) ^{§§}	0.87 (0.13)	‡				‡
Physical activity self-efficacy	0.85 (0.17)	0.84 (0.18)	0.86 (0.18)	0.89 (0.10)	NS				NS
Food choice intentions	0.38 (0.22)	0.35 (0.21) [§]	0.42 (0.28)	0.47 (0.21)	‡				‡
Healthy food knowledge and perception	0.66 (0.22)	0.65 (0.21)	0.64 (0.20)	0.73 (0.25)	NS				NS
Girls (n= 227)									
Food self-efficacy	0.73 (0.22)	0.69 (0.24) ^{§¶}	0.77 (0.18)	0.81 (0.18)	‡				‡
Physical activity self-efficacy	0.82 (0.17)	0.81 (0.18)	0.85 (0.12)	0.82 (0.17)	NS				NS
Food choice intentions	0.40 (0.23)	0.36 (0.21) [§]	0.41 (0.22) ^{§§}	0.52 (0.26)	‡				‡
Healthy food knowledge and perception	0.72 (0.21)	0.71 (0.20)	0.73 (0.23)	0.74 (0.21)	NS				NS

* General linear regression models (GLM) were used to calculate the means, and to conduct trend tests. For the scales of food self-efficacy, physical activity self-efficacy, food choice intentions, and healthy food knowledge perception, 0= 'less healthy choice'; 1= 'more healthy choice'.

[†] Trend test for mean scores across measured BMI status: controlled for gender (for total group), treatment, and grade.

NS: not significant, P> 0.05.

[‡] P< 0.01.

[§] P< 0.05, the reference was 'BMI≥95th' group.

[¶] P< 0.05, the reference was '85th≤BMI<95th' group.