

Obesity-Related Knowledge, Attitudes, and Behaviors in Obese and Non-obese Urban Philadelphia Female Adolescents

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Abstract

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Objectives: To examine relationships between knowledge, attitudinal and behavioral factors, and obesity and to determine how these factors influence obesity status in west Philadelphia female adolescents.

Research Methods and Procedures: A matched-pairs study was conducted with 32 stature- and age-matched pairs of obese (body mass index and triceps skinfold ≥ 95 th percentile of National Health and Nutrition Examination Survey I) and non-obese (body mass index and triceps skinfold between the 15th and 85th percentiles of National Health and Nutrition Examination Survey I) female African American adolescents (aged 11 to 15 years), selected from a school-based study sample, based on obesity status and matching criteria. Adolescents were compared on the following measures: physical activity, inactivity, dietary intake, eating attitudes, health behavior knowledge, body image, self-esteem, and maturation status. Differences between obese and non-obese females were tested using paired *t* tests and Wilcoxon matched-pairs signed-rank tests.

Results: Physical activity, inactivity, and perception of ideal body size emerged as the most important contributory factors to obesity status. There were no statistically significant matched-pair differences in macronutrient and micronutrient intakes, self-esteem, eating attitudes, health behavior knowledge, or maturation status of these adolescents. Obese adolescents had significantly lower levels of physical activity, higher inactivity, and a larger perception of ideal body size than non-obese adolescents.

Discussion: Knowledge and attitudinal factors (with the exception of perception of ideal body size) had far less association with obesity than activity-related behavioral factors. These findings suggest that future intervention strategies should pay particular attention to physical activity, inactivity, and body image attitudes.

Key words: adolescent obesity, African American, physical activity, inactivity

Introduction

Adolescence is a period of heightened concern regarding obesity. The incidence of obesity increases during this age period (1–3) and tends to persist into adulthood (4,5). Ethnic differences in obesity prevalence, absent in infancy and childhood, begin to appear during adolescence (3,6,7), with increased prevalence in African American females that continues through late adolescence (8) and adulthood (9,10).

Overweight prevalence has increased in all ethnic groups in the United States. This trend is particularly significant for African American adolescents (11,12). Previous work in the west Philadelphia population in which this study is based shows a high prevalence of obesity (17.6%, ≥ 95 th percentile; 34.9%, ≥ 85 th percentile; National Health and Nutrition Examination Survey [NHANES] I) (13) that has increased between 3-fold and 4-fold over the last two decades (14).

Obesity is inextricably linked to the surrounding environmental, sociocultural, and behavioral context. Ultimately, energy balance plays a critical role in obesity. Increased intake of foods that are high in energy and fat, low physical activity, and high levels of inactivity are suspected as major contributors to rising levels of obesity. In addition to biological influences on obesity, cultural factors such as dietary knowledge, attitudes and behaviors, and sociodemographic factors may play a central role in the etiology of obesity (15). Understanding the knowledge, attitudes, and behaviors surrounding dietary and physical activity patterns as well as body shape and size can play an important role in guiding

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intervention strategies aimed at maintaining energy balance and reducing obesity prevalence.

This study investigates the obesity-related behavioral (diet, physical activity, and inactivity) and knowledge and attitudinal (self-esteem, body image attitudes, eating attitudes, and health behavior knowledge) correlates to determine whether these factors promote obesity in adolescent females at high risk for developing obesity. In addition, this study attempts to determine whether obesity is adversely associated with poor self-esteem, body image, and attitudes toward food and with a limited knowledge of health behavior. Maturation status is also examined because early sexual maturation is related to increased body weight in adolescents and young adults (16). This study takes a multidisciplinary approach to investigate the influence of physical activity and dietary patterns as well as sociocultural factors on obesity to determine potential candidates for obesity reduction intervention strategies in this and similar populations.

Research Methods and Procedures

Sample

The cross-sectional analytic sample consists of 32 obese and non-obese matched pairs of females attending an urban middle school in west Philadelphia that serves an economically disadvantaged population, with >84% of students from low-income families; all students are eligible for free school meals under Chapter I funding (17). The school population is 99% African American. The females were drawn from a larger obesity prevalence study that has been described elsewhere (14).

Stature, weight, and triceps skinfold measures were taken according to standardized techniques (18). Obesity was defined using body mass index (BMI) and triceps skinfold values relative to age- and sex-appropriate percentiles of NHANES I (13). Obese (BMI and triceps skinfold \geq 95th percentile) and non-obese (BMI and triceps skinfold \geq 15th and \leq 85th percentiles) females were matched according to age and stature. All females were between the ages of 11 and 15 years. Data were collected following informed consent procedures established by the institutional review board of the University of Pennsylvania. The sample is described in Table 1.

Questionnaires were used to elicit information on the behavior, knowledge, and attitudes of the west Philadelphia adolescents. All questionnaires are standard instruments that have been published and widely used.

Self-Concept

The Piers–Harris Children’s Self-Concept Scale (19,20) is an 80-item self-report instrument designed to measure self-esteem; a high score reflects high self-esteem. The Piers–Harris Scale has demonstrated adequate convergent

Table 1. Sample description: mean (SD) by obesity status

	Obese (N = 32)	Non-obese (N = 32)	p
Age	13.56 (0.93)	13.59 (0.91)	NS
Stature (cm)	158.92 (6.98)	159.39 (5.87)	NS
Weight (cm)	78.42 (16.43)	49.77 (5.90)	0.0001
BMI (wt/ht ²)	31.53 (6.11)	19.57 (1.86)	0.0001
Triceps skinfold	44.39 (13.26)	15.21 (4.09)	0.0001

NS, not significant.

and discriminant validity (21) and has been used with African American children and adolescents (22,23).

Eating Attitudes

The Children’s Eating Attitudes Test (24) is a 26-item self-report measure that assesses eating attitudes, dieting behaviors, and food preoccupation in children and discriminates between normal dieters and individuals with obesity, anorexia, and bulimia (25). The Children’s Eating Attitudes Test has been shown to be reliable and valid in children between 8 and 13 years of age (24). A score of \geq 20 is generally considered to be consistent with the diagnosis of an eating disorder.

Body Image

Body image was assessed using the body image assessment methodology developed for African American adolescents (26). Students were given a series of nine randomized cards with black-and-white line-drawn silhouettes of a female ranging from very thin to obese. Students were asked to indicate which drawing most resembled their current figure (current body size) and the figure they wished most to resemble (ideal body size); a high score indicates larger body size. A body dysphoria score was derived from the discrepancy between current and ideal figures. A high score indicates greater discrepancy between ideal and current body size.

Health Behavior Knowledge

The Child Health Behavior Knowledge Scale is a nine-item instrument that assesses behavioral capability related to cardiovascular health-related diet and exercise behaviors and has acceptable reliability in assessing knowledge related to dietary sodium, fat, and exercise among children (27). A high score indicates greater health behavior knowledge.

Dietary Intake

Three 24-hour dietary recalls were collected by personal interview using the *Nutrition Consulting Enterprises Food*

Portion Visual (28) and spread across the school week to reduce the possibility of a systematic day of the week effect. Data were compared with published coefficients of variation (29) and examined in terms of total energy intake and percentage of kilocalories from fat.

Physical Activity

The interviewer-administered, 7-day Physical Activity Recall (30,31) was used to elicit the recall of both leisure and school-related activities. The 7-day Physical Activity Recall has demonstrated adequate test-retest reliability in adults (31) and has demonstrated adequate validity in comparison with electronic monitoring (32). Data were collected on a range of intensity of physical activity. Light to moderate activity was used in this analysis because participation in moderate to vigorous activity was low (8.3%).

Inactivity

Hours of inactivity over a 1-week period was assessed using the television-viewing recall survey, which listed all shows on television for each half-hour period of the day (33). In addition, participants reported the total number of videos and cable television shows watched and the number of hours engaged in playing video games.

Maturation Status

Age at menarche was recalled and recorded by day, month, and year. Analyses use both age at menarche and years postmenarche.

Data Analysis

Statistical analyses were performed using the Stata statistical package (Stata Corporation, College Station, TX) (34). Data were analyzed using Wilcoxon matched-pairs signed-rank tests and ANOVA to compare behavioral, attitudinal, and knowledge factors of obese relative to non-obese adolescents.

Test-Retest Reliability

A subsample ($n = 31$) of adolescents was given a duplicate set of questionnaires. Differences between the original and reliability samples were assessed using paired t tests. No significant differences were found for any of the measures.

Results

Attitudinal and Knowledge Factors

There were no significant obese–non-obese intergroup differences in self-esteem, eating attitudes, and health behavior knowledge (Table 2). The Philadelphia adolescents scored higher on the Piers–Harris Self-Concept Scale than the published mean of 51.8 and were considered to have a self-concept that was “above average” (20). Similarly, study participants scored above the 50th percentile (8.0) of a

distribution of published Eating Attitudes Test scores (35), indicating a low degree of disordered eating behavior. In addition, study participants scored slightly higher than the published mean (4.3) on the Child Health Behavior Knowledge Score (27), indicating adequate knowledge of health behavior.

Statistically significant differences were found for the three body image measures (Table 2). Obese and non-obese females had mean current body size scores that fell well above the 50th percentile of reference norms (26). There were significant intergroup differences for current body size and body dysphoria, with greater dissatisfaction with body size for obese females. Both groups, but particularly obese females, had smaller ideal relative to current body size perceptions.

Behavioral Factors

Although weekly physical activity was low ($\bar{x} = 1.13 \pm 1.19$ hours) and inactivity was high ($\bar{x} = 32.52 \pm 15.0$ hours) for the total sample, obese females spent significantly less time engaged in light to moderate physical activity over a 1-week period and significantly more time engaged in weekly inactivity than did non-obese females (Table 3). Caloric consumption did not increase substantially with inactivity. Mean daily caloric consumption was 2716.65 for adolescents with low inactivity (4 to 30 hours per week) and 2899.64 for adolescents with high inactivity (40 to 60 hours per week). There was a minimal and nonsignificant negative association between reported hours of inactivity and level of physical activity (Spearman $r = -0.29$, $p = 0.82$).

Age at menarche was not significantly different for obese and non-obese females (Table 3). Total sample mean age at menarche was 12.0 ± 0.94 years, which is lower than the national average and 0.44 years earlier than Philadelphia African Americans measured in the 1970s (36). Seven females (three obese and four non-obese) in this sample had not yet reached menarche and were categorized as being zero years postmenarche.

Coefficients of variation for dietary data were comparable with published data (29). There were no significant differences between the obese and non-obese females in energy intake or percentage of energy from fat (Table 3). Both obese and non-obese females had a higher percentage of energy from total dietary fat than the recommended daily allowance (37) and NHANES III African American reference data (38).

Examining energy intake and percentage of kilocalories from fat per kilogram of body weight yielded different results than the raw data. A two-way ANOVA showed that body weight had a significant impact on energy intake ($p \leq 0.0001$). Mean daily energy intake per kilogram of body

Table 2. Means (SD) and matched-pair differences in knowledge and attitudinal survey response: Philadelphia adolescents by obesity status

Factor	Obese (N = 32)	Non-obese (N = 32)	Prob > z *
Self-concept	59.47 (±13.37)	62.03 (±8.66)	NS
Eating attitudes	8.63 (±5.51)	8.84 (±6.37)	NS
Body image: current body size	5.91 (±1.33)	3.88 (±0.91)	0.00001
Body image: ideal body size	4.19 (±0.82)	3.63 (±1.10)	NS
Body image: body dysphoria	1.72 (±1.44)	0.25 (±1.19)	0.0002
Health behavior knowledge	4.81 (±1.53)	4.77 (±1.49)	NS

NS, not significant.

* Wilcoxon matched-pairs signed-rank test (probability > |z|).

weight was lower for the obese (37.04 kcal) relative to the non-obese (55.40 kcal) females. Intergroup differences were not significant for mean energy intake per centimeter of height.

Discussion

This article contrasts the pattern of relationships between obese and non-obese female adolescents in behavioral, knowledge, and attitudinal correlates of obesity. The major

finding of this research is that knowledge and attitudinal factors, with the exception of ideal body size perception, had far less impact on obesity than activity-related behavioral factors. This research suggests that physical activity and inactivity are candidates for modification in future efforts to reduce obesity in this and similar populations.

Overall, these west Philadelphia adolescents had low physical activity levels that were below national recommendations (39) and high levels of inactivity similar to those found for African American adolescents in the United States

Table 3. Mean values (±SD) and matched-pair differences in behavioral survey response: Philadelphia adolescents by obesity status

Factor	Obese (N = 32)	Non-obese (N = 32)	Prob > z *
Energy intake	2,865.77 (±829.02)	2,802.66 (±635.91)	NS
Percentage of energy from fat	37.24 (±4.63)	36.57 (±4.50)	NS
Energy intake per kilogram of body weight	37.46 (±11.15)	56.96 (±13.72)	0.00001
Energy intake per centimeter of stature	17.99 (±4.94)	17.60 (±3.95)	NS
Hours of light to moderate physical activity	0.70 (±0.71)	1.57 (±1.40)	0.0008
Hours of inactivity	36.16 (±14.34)	28.89 (±14.98)	0.04
Age at menarche	12.06 (±0.82)	11.95 (±1.06)	NS
Years postmenarche	1.50 (±1.37)	1.29 (±0.83)	NS

NS, not significant.

* Wilcoxon matched-pairs signed-rank test (probability > |z|).

as a whole (40). This pattern of activity and inactivity is similar to findings from national-level research (40,41). These findings have important health implications, because physical activity habits, and specifically inactivity, track significantly from adolescence to young adulthood (42).

Furthermore, the low level of physical activity coupled with an overall low knowledge of exercise-related behavior found in this study has important implications for national, state, and local policy for quality physical education classes in minority populations. These findings highlight the critical need for increasing physical education efforts, particularly because participation in school physical education is considerably low for adolescents in the United States (43) and physical education has been shown to positively impact physical activity patterns in adolescents in the United States (44). Physical education programs are particularly valuable in communities, such as this west Philadelphia community, without extensive resources and opportunities for physical activity.

Although physical activity had a substantial negative association and inactivity a substantial positive association with obesity, findings for dietary behaviors were less appreciable. The lack of a statistically significant difference between obese and non-obese adolescents in kilocalories and percentage of kilocalories from fat found in this study is similar to findings reported previously (45,46). The lack of a statistically significant difference between the two groups could, in fact, be biologically meaningful, because small increases in energy intake over an extended period of time have been suggested to result in increased body weight (47). Conversely, actual differences may not have been detected due to nondietary confounders, measurement error, study design, or methodological flaw. Interestingly, the obese females had lower energy intake per kilogram of body weight (but not height) than non-obese females, which is logical given the low physical activity and high inactivity for the obese relative to the non-obese adolescents.

In terms of obesity-related attitudes and knowledge, the Philadelphia adolescents had high levels of self-esteem that did not vary significantly by obesity status, which confirms findings from other studies (22,48,49), particularly for African Americans (50). Similarly, the results regarding positive eating attitudes support previous findings (22), whereas health behavior knowledge was higher than that found in other research (27). Comparable with findings for other African American adolescents, perception of ideal body size was similar across obesity status (51). Findings for the total sample were also similar to those for >100 male classmates of the study participants, suggesting that both males and females appreciated a medium-size body shape; this supports previous findings for African American adolescents (51) and adults (52). However, the fact that obese females had a higher perceived current body shape and size and lower perceived ideal body size (i.e., some

degree of body shape dysphoria) suggests that there is likely to be some interest in appropriately framed obesity-reduction efforts in obese females in this population.

This study presents strong findings for the association of obesity and physical activity and inactivity and contributes valuable information regarding the influence of knowledge, attitudes, and behaviors surrounding adolescent obesity. Moreover, the multidisciplinary approach taken in this study allows the determination of differential associations between knowledge, attitudes, and behaviors and obesity status. However, this study is limited by its small sample size and is not representative of adolescents in the United States as a whole. Important directions for future research include measures of energy expenditure and attention to familial patterns of diet and physical activity.

In summary, the present research suggests that these west Philadelphia adolescents had positive self-esteem, eating habits, and health behavior knowledge regardless of obesity status, whereas physical activity, inactivity, and perception of ideal body size were likely to play a central role in the obesity of these adolescents. Future health-promotion efforts should be aimed at increasing physical activity and reducing inactivity in this population and should be phrased within the appropriate sociocultural context, taking into account the knowledge, attitudes, and behaviors of the community. This research sheds light on behavioral, knowledge, and attitudinal factors related to obesity that can be used to formulate appropriate intervention strategies in this and similar populations.

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