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Relationships among Fitness, Body Composition, and Physical Activity

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Abstract

Purpose—This study was designed to examine the associations of physical activity and body composition with cardiorespiratory fitness in eighth grade girls.

Methods—A random sample of 1440 eighth grade girls at 36 schools participated in this cross-sectional investigation, which represented an ethnically and geographically diverse group. Cardiorespiratory fitness was assessed using a modified physical work capacity test on a cycle ergometer that predicted workload at a heart rate of 170 beats·min^{-1}. Physical activity was assessed over 6 d in each girl using an accelerometer and body composition was estimated from body mass index and triceps skinfolds using a previously validated equation. Pearson correlations and multiple regression analyses were used to determine the relationships among fitness, physical activity, and body composition.

Results—Significant linear relationships among cardiorespiratory fitness, body composition, and physical activity were found. The combination of fat and fat-free mass along with racial group and a race by fat-free-mass interaction accounted for 18% (R^2) of the variation in physical fitness. Adding moderate-to-vigorous physical activity to the regression model increased the R^2 to 22%. Black girls had somewhat lower fitness levels ($P < 0.05$) especially at higher levels of fat and fat-free mass than other racial/ethnic groups.

Conclusions—Physical activity, fat-free mass, and the interaction between fat-free mass and racial group are significantly associated with cardiorespiratory fitness in adolescent girls.

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Keywords

ADOLESCENT; FATNESS; ACCELEROMETRY; PHYSICAL FITNESS; RACE/ETHNICITY

Physical fitness is known to be a powerful predictor of chronic disease morbidity and mortality. Prospective observational studies in adults have shown that low physical fitness is strongly associated with risk for developing coronary heart disease (1,19,33), hypertension (2), and type 2 diabetes mellitus (28), as well as mortality from cardiovascular disease (7,16), cancer (8, 20,29), and all causes of mortality (3,4). In youth, low physical fitness is associated with unfavorable chronic disease risk factor profiles (10,37). Also, it is known that low physical fitness in adolescence tends to track into adulthood (23,35). Hence, low physical fitness during adolescence is a threat to both immediate and long-term health of young people.

Previous studies have demonstrated that physical fitness in youth is typically observed to be positively associated with physical activity level and negatively associated with body fatness (15,17,24). However, the scientific literature examining these relationships is limited in some important ways. Often, the samples of subjects studied have been small unrepresentative of populations and limited in ethnic diversity. Also, many of the studies have failed to consider the concomitant influences of both physical activity and body fatness on physical fitness. Importantly, many studies have been limited by inadequate measures to assess physical activity, body composition, and/or physical fitness.

The Trial of Activity in Adolescent Girls (TAAG) was a large scale multicenter investigation that tested the effects of a school–community intervention on physical activity in middle school girls (36). Before randomization of schools to intervention and control groups, baseline data were collected in 2003 from a diverse sample of sixth grade girls attending 36 middle schools in six states. Follow-up data were collected in eighth grade girls in the same schools in 2005 and 2006. Well-validated objective measures of physical activity and body composition were included in the TAAG measurement protocol each year; measures of physical fitness were included in the TAAG measurement protocol as part of the eighth grade testing only in the spring, 2005. The purpose of this article is to examine the associations of physical activity and body composition with physical fitness in an ethnically and geographically diverse sample of eighth grade girls.

METHOD

Recruitment and Data Collection

Participants in this cross-sectional investigation were 1148 eighth grade girls selected from a random sample of 1440 in 36 schools. Self-reported ethnicity was initially categorized as either Hispanic (21%), non-Hispanic Black (21%), non-Hispanic white (45%), or non-Hispanic other (13%). Data were collected as part of the follow-up measurements conducted for the TAAG study. TAAG was a multicenter group-randomized trial designed to test an intervention to reduce the usual decline in moderate to vigorous physical activity in middle school girls. TAAG had six field centers (at the Universities of Arizona, Maryland, Minnesota, and South Carolina; San Diego State University; and Tulane University), a Coordinating Center (at the University of North Carolina, Chapel Hill) and a Project Office at the National Heart Lung and Blood Institute (32). The protocol was approved by each institution’s human subjects review board and the TAAG Protocol Review Committee. Parental consent and participant assent were obtained.

Data were collected across four visits that took place within a 2- to 4-wk time period at any given school. At the first visit, trained research assistants assessed body composition and

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distributed accelerometers (physical activity monitors). During the second visit, the research assistants collected the accelerometers and administered a 3-d physical activity recall. The third visit consisted of administration of a survey including demographic (including age, race, and ethnicity), psychosocial, and environmental variables; and the fourth visit was the cardiorespiratory fitness test. The visits did not always follow the same order because of scheduling constraints at the schools; however, research assistants ensured that the order of the visits did not interfere with the data collection procedures. Ethnicity and race were self-reported on a student questionnaire.

Measures

Body composition—Trained research assistants took all anthropometric measures. Height and weight were measured with the participant wearing light clothing and shoes off. Height was measured to the nearest 1.0 cm using a portable stadiometer with the participant's head positioned in the Frankfurt horizontal plane. Weight was measured to the nearest 0.1 kg with a digital scale. The average of two trials was used for both height and weight, unless measures were separated by a minimum of 1.0 cm or 0.5 kg, in which case, two more measures were taken. Body mass index (BMI) was calculated by dividing weight (kg) by height (m^2). In addition, trained research assistants took skinfold measures at the triceps. The triceps skinfold was taken in triplicate to the nearest 0.1 cm on the right side of the body, according to standard procedures (22), and the average of the three measurements was used. If the difference across the three measures was ≥20%, the skinfold was retaken. To ensure that anthropometric characteristics were measured similarly across sites, interrater reliability was assessed against a gold standard (a trained certified specialist) at each field site. Also, the scales and skinfold calipers were calibrated each day before the measurement. Percent fat was computed for each girl from a prediction equation that was developed using DXA and included BMI ($kg \cdot m^{-2}$), triceps skinfold (mm), ethnicity (non-Hispanic Black) = 1, other = 0), age (yr) and BMI × triceps (21). The equation is:

$$\text{Percent fat} = -23.39 + 2.27\,(\text{BMI}) + 1.94\,(\text{Triceps skinfold, mm}) - 2.95\,(\text{race}) - 0.52\,(\text{age, yr}) - 0.06\,(\text{BMI} \times \text{Triceps skinfold, mm})$$

Physical activity—Physical activity was assessed using the ActiGraph accelerometer (model 7164; Fort Walton Beach, FL, USA). Trained research assistants fit the Actigraphs on elasticized belts worn at the waist (just over the anterior superior iliac spine), according to manufacturer's instructions. The monitors were set to collect data in 30-s time increments for a time period of six full days. Data were collected over at least two different calendar weeks within a school to minimize the intraclass correlation between girls within a given school. Once participants returned the monitors, the data were downloaded and sent directly to the coordinating center for processing. For missing data, counts were imputed using a previously described imputation process (6). Based on previously conducted pilot work (30,34), the accelerometry data were expressed as average daily minutes spent in moderate-to-vigorous physical activity (MVPA; ≥4.6 METs), average daily minutes spent in vigorous activity (VPA; ≥6 METs), and average daily MET-weighted minutes of MVPA. More detail regarding the MVPA MET cutpoint is available in a previously published manuscript (25).

Cardiorespiratory fitness—Cardiorespiratory fitness was assessed using a modified physical working capacity test (PWC) on a Monark cycle ergometer that predicted the workload (kilogram meters, kg·m) at an HR of 170 beats·min^{-1} (PWC_{170}). Each test stage lasted 2 min with the initial workload set to 0.25 kg or 0.5 kg, depending on body mass (<50 or ≥50 kg). Pedaling frequency throughout the test was 60 rev·min^{-1}, and the girls were instructed to follow a metronome set to 120 beats·min^{-1} to maintain proper cadence. Research assistants observed carefully to ensure that participants maintained the cadence and recorded cases in which it was not. At the end of each minute of the test, the trained research assistant recorded HR that was measured via a HR monitor (Polar Electro Inc., Lake Success, NY, USA) placed around the chest at the level of the xiphoid process of the sternum. The participant's HR at the end of a stage was used to determine the change in resistance for the next stage, and resistance for each stage was recorded. In most cases, girls completed three stages of testing to obtain a final stage HR of 165 beats·min^{-1} or higher. In some cases, girls could only finish two stages; in other cases, a fourth stage was necessary to meet the 165 beats·min^{-1} criterion. Girls were verbally encouraged to maintain the pedaling frequency throughout the test. Workloads were expressed as absolute values (kg·m·min^{-1}) and values relative to body weight (kg·m·min^{-1}·kg^{-1}). Participants who were not able to participate in regular physical education class or who were taking contraindicated medications were excluded from the cardiorespiratory fitness test. All cycle ergometers were calibrated before each day's testing.

Statistical Methods

Description of sample—Forty girls per school were randomly selected to participate in the fitness test for a total of 1440 eighth grade girls. Of those, 1226 (85%) had parental consent and gave assent to perform the test. Forty consented girls did not complete the test and another 34 had difficulty keeping cadence during the test. After determining no difference in racial distribution, BMI, or activity levels from the girls who successfully completed the fitness test, these 74 girls were removed from the analysis. The final assessment of validity was the R^2 of the line that regressed workloads on the three (or four) HR for each test. If the R^2 was below 0.80 for a given girl, the relationship was considered nonlinear, removing an additional four girls from the analysis, leaving a total of 1148 girls in the fitness sample.

Fitness prediction and imputation—Submaximal fitness was predicted for each girl at a HR of 170 beats·min^{-1}. Although most girls completed three stages (n = 1091), some girls completed only two stages (N = 97) and some girls required a fourth stage to reach a HR of at least 165 beats·min^{-1} (N = 161). Therefore, we inspected the mean fitness level for girls who completed two, three or four stages, and observed that, as the number of stages completed increased, so did the fitness levels. Using only two stages, and thus two data points, to predict fitness at a HR of 170 beats·min^{-1} was not the best estimate of fitness for these girls; however, to eliminate them would also bias the mean fitness estimate of the remaining girls. Therefore, we used a multiple imputation technique to predict a stage 3 HR and workload for the 97 girls, using the non-missing HR and workload at each stage of the girls, as well as their BMI. We created five data sets with imputed values for stage 3 workload and HR. Then, for each data set, each girl's fitness was predicted from a regression line that fit the three (or four) data points from each stage. Each girl's fitness value was then computed as the mean of the five fitness values. To convince ourselves that this imputation strategy worked, we selected a random sample of 100 girls who had either three or four completed stages. For those 100, we then deleted their HR data for the 5th, 6th, 7th and 8th min (stages 3 and 4), then ran PROC MI on the new data set to see how well multiple imputation did in predicting the 5th and 6th min HR. The mean (SD) *imputed* fitness level for the 100 girls was 12.3 (3.4) kg·m·min^{-1}·kg^{-1} and the mean fitness level for the 100 girls using original data was 12.1 (3.2) kg·m·min^{-1}·kg^{-1}. The multiple imputation strategy was successful; thus, we used imputed fitness for those 97 girls for analysis purposes.

Regression analysis—We hypothesized that both body composition and physical activity would be significantly associated with fitness. To decide which body composition parameters were most predictive, we *a priori* chose weight, fat-free mass, fat mass, percent fat, and BMI as potential covariates. Because we know that fat-free mass can have an effect on physical activity independent of total body mass, we decided to assess models with fat-free mass and fat mass together, as well as fat-free mass and percent fat together.

The only difference in fitness by ethnicity was between the non-Hispanic Black group (21%) and all others (79%), so our models included racial group as a dichotomous variable, where 1 = nonHispanic Black, 0 = all others.

Models—Models: Several regression models were developed *a priori* to account for variation in fitness expressed as kg·m·m^{-1}. First, a basic model including racial groups, field center, and intervention effect was generated. Then, other variables were added to the basic model. To determine which model explained the most variance with the fewest number of covariates, we compared the R^2 values from generalized linear models. To estimate the beta coefficients from the final model, we used a mixed model, in order to treat schools and sites as random effects. Continuous covariates were centered at the sample mean to make model coefficients easier to interpret.

RESULTS

The initial sample of 1148 girls provided complete data on body composition and fitness, but 129 girls were missing physical activity assessment by accelerometer. The 129 girls were not significantly different on body composition, fitness variables, or ethnicity/race compared to the remaining 1019. They were significantly older but only by 2 months. The large variation in body fatness (9% to 47%) indicates the diversity of the sample, with higher mean fatness in Hispanic girls and higher fat-free mass in non-Hispanic Black than in the other groups (Table 1). PWC-170 is expressed both as an absolute and relative to body weight with considerable variability among subjects for both fitness indicators (coefficients of variation were 28% to 30% within ethnic/racial groups except for nonHispanic Black at 37%).

The relation between quintiles of fat mass, quintiles of fat-free mass and fitness were examined to study linearity of the relationships (Figs. 1 and 2). A linear relationship was found between fat-free mass and PWC-170 and fat mass and PWC-170. Thus, correlation and linear regression analysis is appropriate for relating fitness to body composition. The statistically significant ($P < 0.05$) correlation coefficient between fat-free mass and physical fitness measured using PWC-170 was $r = 0.26$, and 0.16 between fat mass and physical fitness (Table 2). Higher correlation coefficients between body composition and PWC-170/kg were found ($r = -0.36$ to -0.54).

The relationship between quintiles of MVPA and fitness was also found to be reasonably linear with the less active girls having lower levels of fitness (Fig. 3). The correlation coefficients between physical activity (MVPA and VPA) and absolute fitness (PWC-170) were positive (ranges from 0.13 to 0.16), whereas the correlation coefficients between MVPA and BMI and MVPA and fat mass were inversely related ($r = -0.14$ and -0.12, respectively $P < 0.05$, Table 2).

Several regression models were developed *a priori* to account for variation in fitness expressed as PWC-170 kg·m·min^{-1}. The basic model including racial groups, schools within field centers, field center, and intervention effect accounted for about 5% of the variation in fitness (Table 3). Various body composition variables accounted for as little as 10% of the fitness variance (weight + basic model) to 18% of the fitness variance (fat-free mass + fat mass + fat-free mass × race + basic model) as shown in Table 3. The inclusion of fat-free mass and fat-free-mass interaction with racial groups added considerable predictability to the final model (Table 3). In addition, when MVPA was added to the model, a significant increase to the predictability occurred and the model accounted for 22% of the variance among all girls (complete model). Adding MVPA to complete the model indicates that girls with higher levels of activity had higher fitness levels, holding constant body composition. Similar results were found for VPA and MET-weighted MVPA (data not shown). Thus, for a girl with average fat-free mass and

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fat mass, if her physical activity (MVPA) is one standard deviation below the mean (11.0 min), there is a corresponding decrease in predicted fitness level of 23.1 kg·m·min^{-1} (−3.5%); whereas for a mean body composition and MVPA of one SD above the mean (32.8 min), there is a corresponding higher fitness levels of 23.1 kg·m·min^{-1} (3.5%).

The centered regression coefficients for two models illustrate important contributions by several variables including fat-free mass, ethnic/RG and RG × fat-free mass effects (model 1) and fat mass, RG and RG × fat mass effects (model 2) (Table 4). These models were selected to demonstrate the complex relation between body composition and fitness. The interaction of fat-free mass and racial group (non-Hispanic Black vs others) and FM and racial group make important contributions to the regression models (Table 4). Although blacks have less absolute (not relative to body mass) fitness for a given level of fat-free mass, the relationship is further described by the race × fat-free mass interaction. We chose to look at this complex relationship by first regressing fitness on fat-free mass. Using the residuals from this model, we then regressed the residuals on fat mass for the two racial groups (Fig. 4). We found fitness is lower with higher FM (Fig. 4) and BMI (Fig. 5) for non-Hispanic Black girls, but not for their counterparts from other races.

DISCUSSION

This study is the first to describe physical fitness data in relation to body composition and objectively measured physical activity in a diverse sample of adolescent girls. In this cross-sectional analysis, quintiles of fatness and BMI were associated with fitness (kg·m·min^{-1}·kg^{-1}). The assessment of cardiorespiratory fitness in this study was non-weight-bearing, submaximal test (PWC170). Some researchers have suggested that examining fitness relative to body weight penalizes heavier individuals. In primary analysis, we expressed fitness in terms of fitness (kg·m·min^{-1}·kg^{-1}), and we used fat-free mass to account for size differences among girls in their muscle mass. Accounting for the fat-free mass × race interaction adds significantly to the variation among girls in their fitness level after accounting for differences in fat-free mass.

Consistent with previous research that has included diverse samples, our study findings suggest that black adolescent girls have lower fitness levels than their white counterparts (5,12,13,18, 26,27). Pivarnik et al. (26) examined aerobic fitness levels among black and white adolescents with a mean age 13.5 yr participating in a motorized treadmill exercise test. Their findings suggest that the treadmill time to exhaustion among black adolescents was significantly less than their white counterparts at any fat-free mass. Similar racial trends have been found among younger (18) and older populations (5,12,13).

Our findings indicate that body composition affects fitness, in addition to race. It is clear from the scatter plots (Figs. 4, 5) that the interaction is apparent for higher levels of fat-free mass, fat mass, and BMI, and we speculate that black girls with higher fat-free mass and fat mass may have been less motivated to continue with submaximal testing, resulting in lower PWC-170 than expected based on their body composition. As well, black girls could have had a higher perceived effort which may also contribute to discontinuing cycling at an earlier time. Although not examined in our study, iron deficiency anemia has been associated with reduced physical fitness (14). Some black adolescent girls may have iron deficiency and the lower fitness levels may have been the result. In addition, Shaibi et al. (31) measured aerobic fitness in a multiethnic adolescent group using a progressive treadmill test. Results show a reduced $\dot{V}O_2$ peak in blacks when compared to whites after adjustment for body fat measured by DXA, gender and maturation (31). Thus, there may be factors aside from body composition that are related to lower fitness in black girls.

Our study results suggest that black girls also were engaged in less moderate to vigorous levels of activity than other ethnic groups, findings consistent with other research (9,11). Research by Felton et al. (9) suggests that black adolescent girls report lower physical activity, both vigorous and moderate-to-vigorous intensity, than their white counterparts. The lower activity levels may explain, to some extent, the lower fitness levels also evident in blacks.

There are limitations to our study. First, measurement of fitness occurred only at one time, 2 yr after an intervention was implemented at half of the schools. No fitness measurements were taken at the time of the baseline; thus, we were not able to examine how changes in physical activity were related to changes in fitness or how changes in fitness were related to changes in measures of body composition. Second, measurements were obtained on only a small subset of girls at each school. With a larger study it may have been possible to detect more subtle cross-sectional relationships. Also, differences among other ethnic groups may have been found with a larger sample size. Third, cardiorespiratory fitness as measured with a submaximal test using HR is an indirect fitness measure and has lower validity than direct measurements. Fourth, the fitness test was of rather short duration. Measurements were obtained for only 6 min and were used to predict a workload at a HR of 170 beats·min^{-1}. It is more difficult in the school environment to use a higher duration or intensity fitness test. Finally, it was necessary to provide extra motivation to get girls to exercise to a HR of 165 beats·min^{-1}. Some girls might not have worked as hard as possible.

The findings from our study add to previous adolescent fitness research concerning ethnic differences. The large sample of ethnically and geographically diverse 6th grade girls is a unique contribution. The few studies which have examined physical fitness and the influence of body composition and ethnicity have not also accounted for the interaction of physical activity levels. Additional research examining longitudinal associations with these variables will further enhance our knowledge derived from our cross-sectional study.

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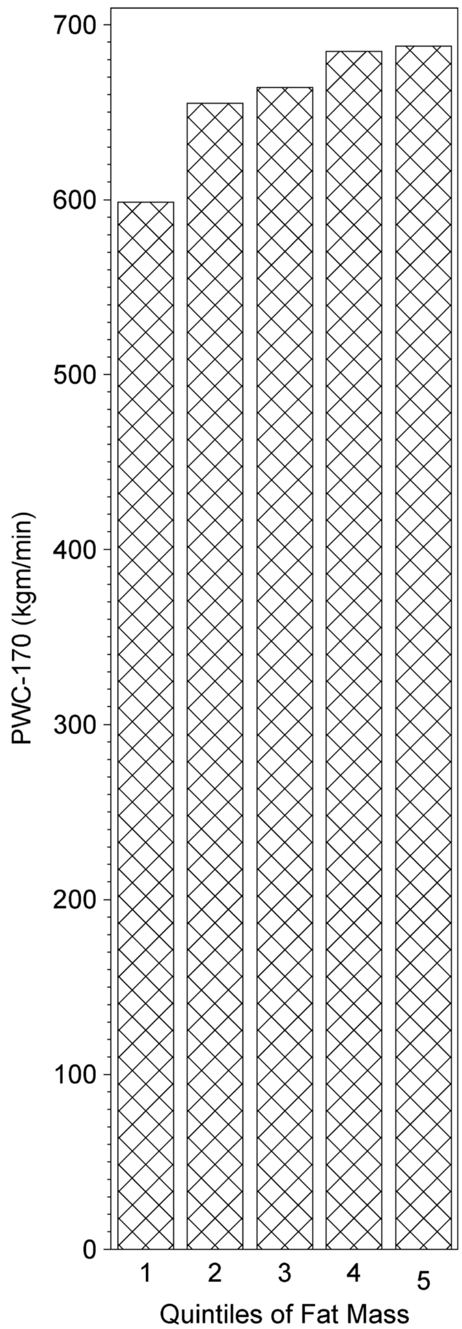

FIGURE 1.
Quintiles of fat mass.

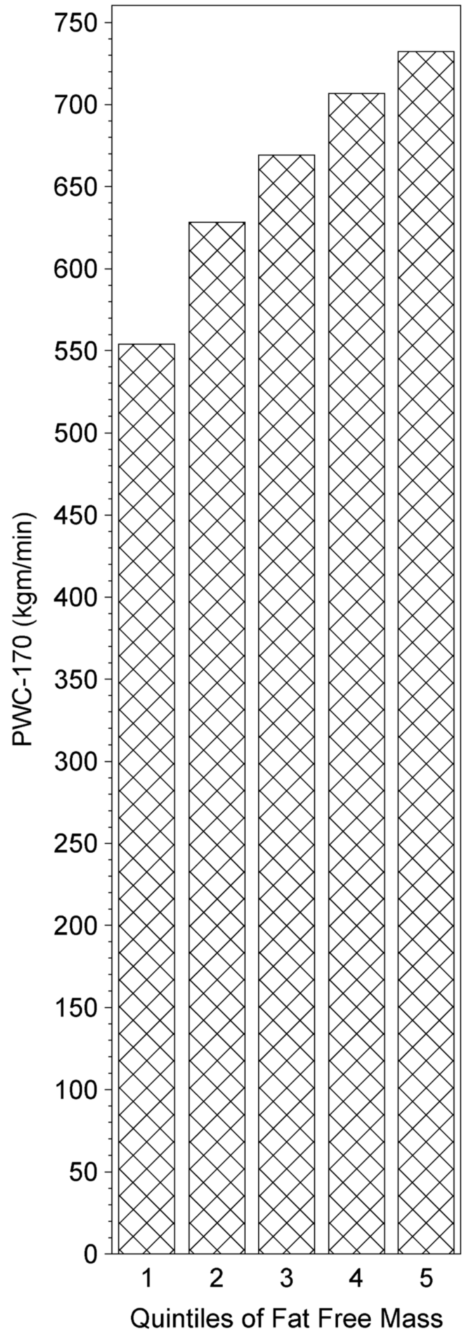

FIGURE 2.
Quintiles of fat-free mass.

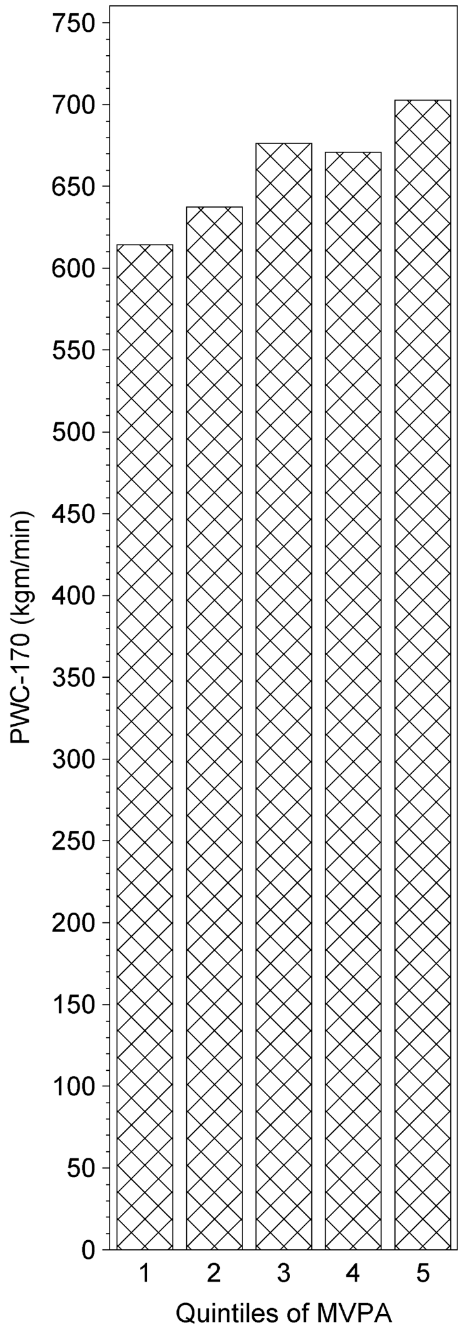

FIGURE 3.
Quintiles of MVPA.

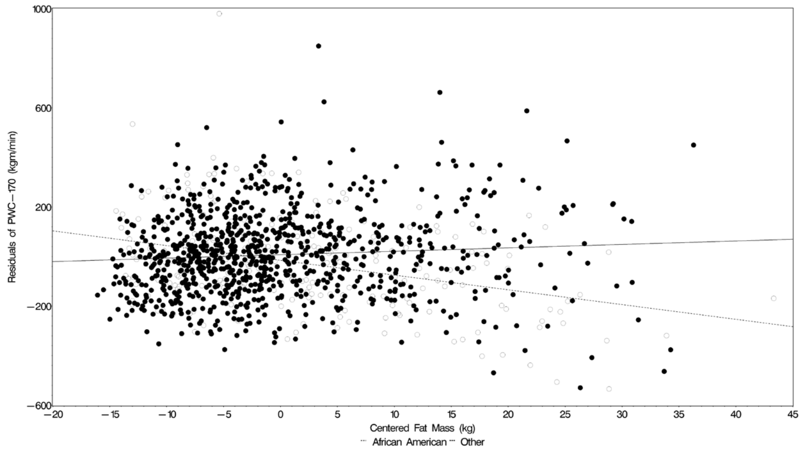

FIGURE 4.

Association of fat mass with PWC-170 by racial group.

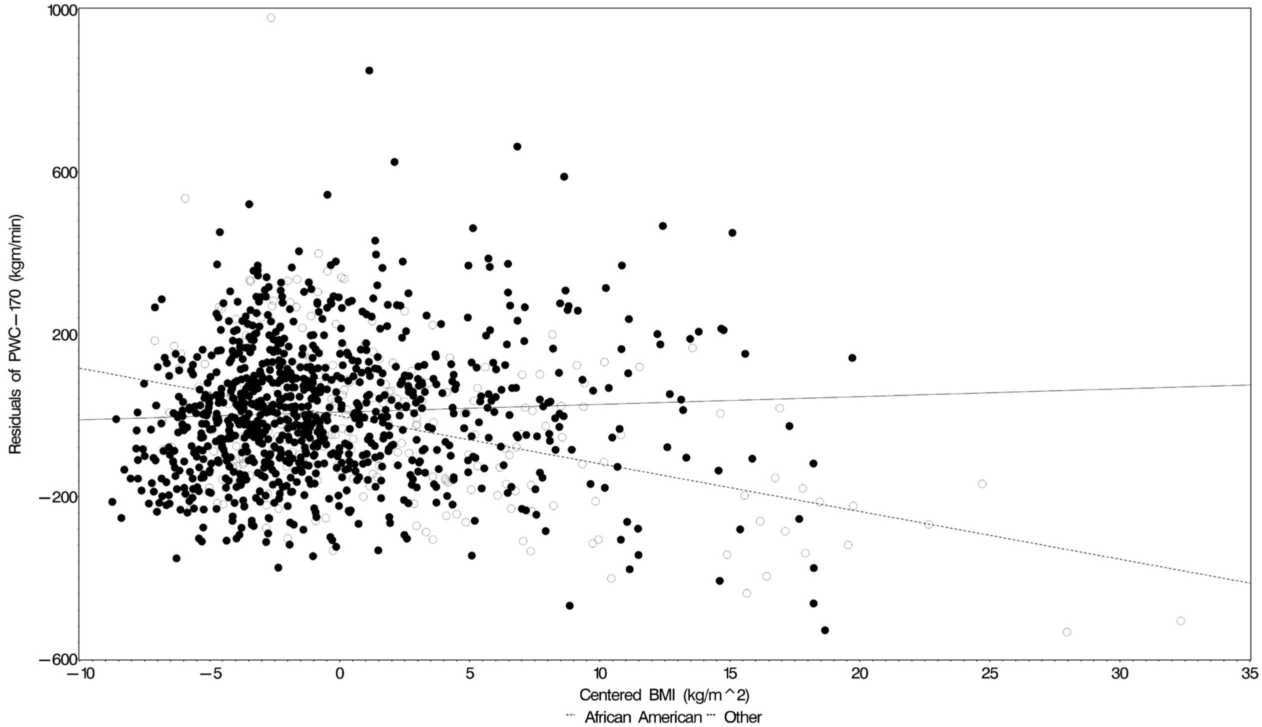

FIGURE 5.
Association of BMI with PWC-170 by racial group.

TABLE 1

Descriptive statistics by ethnicity/race group (RG).

	Ethnicity/RG[a]											
	H		NHBlack		NHOther		NHWhite			Total Sample		
	Mean	Std	Mean	Std	Mean	Std	Mean	Std	N	Mean	Std	Sig.
Age (yr)	13.9	0.53	14.2	0.66	13.9	0.55	14.0	0.45	1148	14.01	0.54	.37
Height (cm)	158.0	6.02	160.7	6.25	159.6	6.80	161.0	6.57	1148	160.14	6.52	.0001
Weight (kg)	57.9	14.52	64.0	18.13	57.2	14.78	56.8	13.71	1148	58.64	15.31	.0001
BMI ($kg \cdot m^{-2}$)	23.1	5.23	24.7	6.56	22.3	4.96	21.8	4.53	1148	22.77	5.34	.0001
Fat-free mass (kg)	37.6	5.37	43.0	8.17	38.2	5.53	38.3	5.38	1148	39.17	6.43	.0001
Fat mass (kg)	20.4	9.72	21.0	10.89	19.0	9.84	18.5	9.11	1148	19.47	9.78	.01
Percent Fat	33.4	8.26	30.9	8.45	31.3	8.43	30.9	8.09	1148	31.48	8.30	.0005
Average daily minutes of MVPA	23.1	11.49	18.9	9.96	21.2	10.23	22.9	10.97	1019	21.87	10.90	.68
Average daily minutes of VPA	5.2	3.85	4.2	3.16	5.2	3.79	5.6	4.50	1019	5.18	4.05	.37
Average daily minutes of MET-weighted MVPA	140.6	72.84	115.3	66.97	131.3	67.39	140.7	74.37	1019	134.13	72.31	.70
PWC-170 ($kg \cdot m \cdot min^{-1}$)	644.9	165.53	632.4	179.49	656.2	185.10	677.0	195.51	1148	658.12	185.59	.85
PWC-170 ($kg \cdot m \cdot min^{-1} \cdot kg^{-1}$)	11.5	3.14	10.5	3.88	11.8	3.39	12.3	3.52	1148	11.68	3.57	.005

[a] H, Hispanic; NHBlack, non-Hispanic Black; NHWhite, non-Hispanic White; and NH other, non-Hispanic all other groups.

TABLE 2

Pearson correlations of body composition, physical activity, and PWC-170 variables.

Variable	Correlations between variables*									
	WT	BMI	FFM	FM	PFAT	CSA_MVPA	CSA_VPA	CSA_WTMVPA	PWC-170 ($kg \cdot m \cdot min^{-1}$)	PWC-170 ($kg \cdot m \cdot min^{-1}$)
Height (cm)	0.43	0.13	0.57	0.30	0.15	0.10	0.074	0.09	0.36	−0.02
Weight (kg)		0.95	0.91	0.96	0.80	−0.10	−0.11	−0.09	0.21	−0.49
BMI ($kg \cdot m^{-2}$)			0.81	0.95	0.83	−0.14	−0.15	−0.12	0.10	−0.54
Fat-free mass (kg)				0.77	0.51	−0.05	−0.06	−0.03	0.26	−0.36
Fat mass (kg)					0.91	−0.12	−0.14	−0.11	0.16	−0.54
Percent fat						−0.12	−0.15	−0.12	0.11	−0.52
average daily minutes of MVPA							0.83	0.97	0.16	0.21
Average daily minutes of VPA								0.91	0.13	0.21
Average daily minutes of MET-wtd MVPA									0.14	0.20
PWC-170 ($kg \cdot m \cdot min^{-1}$)										0.71

* Correlations greater than 0.06 are significant at $P < 0.05$.

TABLE 3

Models tested for relationship of body composition and physical activity and fitness (kg·m·min^{-1}).

Model	R^2	**SEE (kg·m·min^{-1})**
Basic model[a]	0.05	0.98
Weight	0.10	0.95
FFM, %F	0.13	0.94
FFM, FM	0.14	0.93
FFM, FM, RG × FFM	0.18	0.91
FFM, FM, RG × FFM, MVPA	0.22	0.90

[a] All models include the fixed effects of the basic model, which are field center (A, C, D, L, M, or S), intervention (I or C) and racial group (RG: 1 = non-Hispanic African American, 0 = all others).

TABLE 4

Centered coefficients for predicting fitness using difference body composition models.

	Dependent variable is PWC-170 (kg·m·min^{-1})			
	Model 1	T	Model 2	T
Independent variable	coefficients	*P*	Coefficients	*P*
Intercept	684.5	0.0001	677.8	0.0001
FFM	20.0	0.0001	13.8	0.0001
FM	−3.8	0.0001	−0.8	0.36
RG[a]	−44.0	0.007	−61.0	0.0002
RG × FM	—	—	−8.8	0.0001
RG × FFM	−15.0	0.0001	—	—
MVPA	2.1	0.0001	2.3	0.0001
Treatment	−7.6	0.49	−6.6	0.56

[a]RG is a contrast between all others and nonHispanic Blacks.

[b]The interaction of FFM and race and FM and race is the contrast between nonHispanic Blacks and all others.