Physical activity in free-living, overweight white and black women: divergent responses by race to diet-induced weight loss

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ABSTRACT

Background: Black women are at greater risk of obesity than are white women, perhaps because of their lower levels of physical activity.

Objective: We compared free-living activity energy expenditure (AEE) in sedentary white and black women (in overweight and normal-weight states) and in never-overweight control subjects.

Design: Subjects included 46 women (23 white, 23 black) studied while overweight and after reaching a normal weight and 38 female control subjects (23 white, 15 black). Diet, without exercise training, resulted in a mean weight loss of 13 kg and a body mass index (in kg/m²) < 25. Body composition, sleeping energy expenditure, free-living total energy expenditure, and the energy cost of activity and aerobic capacity were assessed before and after weight loss under 4-wk, diet-controlled, weight-stable conditions and in the control subjects. AEE was defined as above-sleep energy expenditure.

Results: No significant racial differences in body composition, before or after weight loss, were found. After weight loss, AEE and aerobic capacity increased in the white women and decreased in the black women (P < 0.05 and P < 0.02, respectively). After weight loss, but not before, the white women had a significantly higher mean AEE than did the black women (2448 ± 979 and 1728 ± 1373 kJ/d, respectively; P < 0.05), approximating AEEs in the white (2314 ± 1105) and black (2310 ± 1251) control subjects.

Conclusions: Relative to the responses of the white women to diet-induced weight loss, the black women became less fit and less physically active. Induction of a normal body weight in overweight black women appeared to produce a more obesity-prone state, favoring weight relapse. Am J Clin Nutr 2002;76:736–42.

KEY WORDS Overweight, obesity, weight loss, body composition, energy expenditure, energy economy, physical activity, exercise, African American women

INTRODUCTION

Between 1991 and 1998, the prevalence of obesity, defined as the body mass index (BMI; in kg/m²) ≥ 30, increased in the United States by almost 50% among all racial groups (1). Fifty-five percent of adults are now classified as overweight or obese (BMI ≥ 25), and the prevalence of obesity in black women, at 66%, is 1.4 times that in white women (2). The cause of the rising prevalence of obesity in the general population is unclear, although there is increasing evidence that reduced physical activity may play a major role (3–7).

A number of surveys indicate that black women report engaging in significantly less physical activity, especially leisure-time activity, than do white women (8–13). Several cross-sectional studies measured activity-related energy expenditure by the doubly labeled water method; they showed that black females might be predisposed to obesity by being less physically active (14–16). To our knowledge, only one study has prospectively examined the impact of diet-induced weight change on total daily free-living physical activity (17). The paucity of data based on objective measures of physical activity is due, in part, to difficulties in measuring total daily physical activity in free-living conditions (18), although there is also a general lack of research in racial groups who are at greatest risk for obesity and its co-morbidities (19).

The intent of this study was to examine the effect of diet-induced weight loss, without an exercise intervention, on spontaneous changes in free-living physical activity in overweight white and black women. In an earlier report (17), we found in a subset of these subjects that weight reduction was associated with increased physiologic capacity for exercise. In that smaller sample, we observed no significant racial difference in physical activity patterns with weight loss. However, on the basis of the finding that the physiologic ease of exercise increased, we speculated that, in a larger study sample, both white and black women would show a significant increase in free-living physical activity after weight loss.

SUBJECTS AND METHODS

Subjects

Subjects were white or black premenopausal women aged 20–46 y. Overweight subjects (23 white and 23 black) had a BMI of 27–30 (chosen to increase the likelihood that subjects could be reduced to a normal weight in a reasonable time frame) and a family history of obesity (BMI > 27) in at least one first-degree relative. Never-overweight control subjects (23 white and 15 black) reported always maintaining a BMI < 25 and having no family history of obesity in first-degree relatives (2 black controls did have an overweight first-degree relative, but each also had at least 4 lean first-degree relatives). Classification of subjects as black or white was based on their self-reporting. Normal glucose tolerance was documented by measurement of fasting and 2-h postprandial blood glucose levels after an oral glucose load. Subjects were nonsmokers, were sedentary (defined as exercising < 1 time/wk for the past year), and had normal menstrual cycles. None took medications known to affect energy expenditure or thyroid status. Socioeconomic factors were not assessed or considered in the selection process. Because the subjects were volunteers who expressed an interest in participating in the study, they may not be representative of the general US population. Institutional Review Board for Human Use–approved written, informed consent was obtained before study participation in compliance with the US Department of Health and Human Services Regulations for the Protection of Human Research Subjects.

Study design

Overweight subjects were evaluated in the overweight state and again in the normal-weight state. Study variables were assessed under weight-stable, diet-controlled conditions. Before each evaluation, subjects were maintained in a weight-stable state for 4 wk, and body weight was measured 3–5 d/wk during visits to the General Clinical Research Center (GCRC). During the final 2 wk, meals were provided through the GCRC to ensure weight stability of < 1% variation and to maintain daily macronutrient intake at 20–23% fat, 16–23% protein, and 55–64% carbohydrate. It was during this 2-wk period that doubly labeled water was administered to assess the free-living expenditure of energy. Subjects were then admitted to the GCRC for 4 d, during the follicular phase of the menstrual cycle. After discharge, the GCRC prepared all meals for weight reduction, providing 3350 kJ/d (800 kcal/d) and including Stouffer’s Lean Cuisine entrées twice daily (Nestlé Food Co, Solon, OH). Adherence to diet and body weight were monitored twice weekly until subjects lost ≥ 10 kg and reached a BMI defined as normal (ie, < 25 kg/m²) (20). To compare study variables in the overweight and normal-weight states, only subjects who reached these weight-loss goals underwent further study: 11 (19%) of 57 overweight subjects (5 white and 6 black) failed to reach the normal-weight state. To assess spontaneous changes in free-living physical activity, no attempt was made to alter subjects’ self-selected activity patterns. On reaching a normal BMI, subjects repeated the protocol of 4 wk of energy balance and 4 d of GCRC admission. Never-overweight controls, who were recruited to be similar in body composition to the weight-reduced women, followed the identical protocol of 4 wk of energy balance and 4 d of GCRC admission.

Study variables

Body composition was determined by the 4-compartment model (21), which calculates the percentage of body fat (%BF) from independent measures of total body density, total body water, and bone mineral content. Body density was determined by underwater weighing with residual volume measured simultaneously by closed-circuit oxygen dilution (22). Total body water was determined by isotope dilution using deuterium and 18O-labeled water (23). Samples were analyzed in triplicate for deuterium (off-line zinc reduction method) (24) and 18O (equilibration technique) (25), as previously described (26). Bone mineral content and fat-free mass (FFM) were determined by dual-energy X-ray absorptiometry (DPX-L; Lunar Radiation Corp, Madison, WI), using ADULT software, version 1.33 (Lunar Radiation Corp).

Energy expenditure (EE) was assessed in a room calorimeter, as previously described (27). Sleeping EE was assessed from the time the lights were turned off (2130–2300) until the subjects were awakened at 0630. Radar motion sensors indicated that the subjects were inactive during the period of sleep. EE values were calculated by the equation of de Weir (28). Total daily EE was measured by the doubly labeled water method during the 2-wk period of dietary control and energy balance immediately preceding GCRC admission, using equation 12 of de Weir (28) and a food quotient of 0.88 based on the foods provided. Activity EE (AEE) was estimated by subtracting sleeping EE from total EE after reducing total EE by 10% to account for the thermic response to meals. Hence, AEE (kJ/d) = 0.9 · total EE – sleeping EE. Sleeping EE was used instead of resting EE, because it encompassed a much longer period and had a 45% lower SD, as we previously reported, although results based on both analyses give similar results (17). Because AEE describes the above-sleep level of EE, it encompasses the energy costs of involuntary activities such as maintaining posture and fidgeting, as well as all voluntary physical activities.

Free-living physical activity was derived from AEE (kJ/d), by using the activity-related time equivalent (ARTE) index, as previously described (17). Briefly, the ARTE index (min/d) = AEE (kJ/d)/AEC (kJ/min), where AEC, or activity energy cost, is the measured average above-sleep energy cost of performing 5 standardized tasks in the laboratory. When adjusted for the subject’s body weight, AEC is a measure of the energy economy of performing the standardized exercise tasks. The exercise tasks were selected to reflect typical activities of women in free-living conditions—level walking, grade walking, cycling, stair climbing, and walking while carrying a small load. Thus, ARTE is an index of the portion of the day the subject expends, in free-living conditions, at a level of activity comparable to that required by the 5 standardized tasks. The index is useful for comparing activity levels among subjects with different exercise economies, such as we have found in white and black women (17). Self-reported physical activity, both total and leisure-time, was assessed during GCRC admissions by using the questionnaire of Baekke et al (29).

Aerobic capacity was assessed as $\mathrm{VO}_2\max$ during a maximal modified Bruce graded treadmill protocol (30) and expressed relative to body weight and to FFM. Consumption of oxygen and production of carbon dioxide were measured continuously via open-circuit spirometry and analyzed with use of a metabolic cart (model 2900; SensorMedics, Yorba Linda, CA). Standard criteria
TABLE 1
Age and body-composition characteristics of white and black women measured in the overweight and normal-weight states and of never-overweight control subjects

<table>
<thead>
<tr>
<th>Study variables</th>
<th>Overweight state</th>
<th>Normal-weight state</th>
<th>Control subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>White women (n = 23)</td>
<td>Black women (n = 23)</td>
<td>White women (n = 23)</td>
<td>Black women (n = 15)</td>
</tr>
<tr>
<td>Age (y)</td>
<td>37.0 ± 5.9</td>
<td>35.5 ± 5.9</td>
<td>—</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>79.1 ± 5.0</td>
<td>78.2 ± 8.9</td>
<td>66.0 ± 4.8</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>29.0 ± 1.5</td>
<td>28.7 ± 1.8</td>
<td>24.0 ± 1.1</td>
</tr>
<tr>
<td>Percentage of body fat (%)</td>
<td>39.9 ± 3.7</td>
<td>38.3 ± 3.1</td>
<td>32.3 ± 4.6</td>
</tr>
<tr>
<td>Fat-free mass (kg)</td>
<td>47.4 ± 3.9</td>
<td>48.4 ± 5.2</td>
<td>44.5 ± 3.4</td>
</tr>
<tr>
<td>Fat mass (kg)</td>
<td>31.5 ± 3.7</td>
<td>30.1 ± 4.5</td>
<td>21.3 ± 3.5</td>
</tr>
</tbody>
</table>

1± SD; group sizes vary because not all subjects had values for every variable.
2Repeated-measures ANOVA examining independent effects of weight loss, race, and weight loss × race interaction.
3ANOVA examining independent effects of group differences (weight-reduced, normal-weight women and control subjects), race, and group × race interaction.

for heart rate, respiratory quotant, and plateauing ensured achievement of VO₂max (31).

Statistical analyses

Descriptive statistics were calculated on all outcome variables by racial groups. A 2 × 2 (weight loss × race) analysis of variance with repeated measures on the first factor was used to test independent effects of weight loss and race on outcome variables. Significance was set at P < 0.05. Post hoc analyses were run for variables with a significant interaction term and in the 2 instances in which the interaction term had a significance value of P = 0.06. Bonferroni corrections for additives were used for all post hoc tests. A 2 × 2 (group × race) analysis of variance was used to examine racial differences between weight-reduced subjects and never-overweight control subjects.

RESULTS

Subject characteristics

There were no significant differences between the white and black women in age, weight, or body composition, before or after weight loss (Table 1). The mean (± SD) duration of dietary restriction required for the overweight subjects to achieve a weight loss > 10 kg and a BMI < 25 was 22 ± 7 weeks for the white women and 25 ± 14 wk for the black women (difference between races not significant). Body weight fell an average of 13.1 kg (16.6%) in the white women and 12.6 kg (16.1%) in the black women (difference between races not significant). BMI, %BF, FFM, and fat mass fell significantly (all P < 0.001), with no significant differences in the weight-loss responses of the white and black women. Compared with never-overweight controls, the weight-reduced women had a higher mean age (36 rather than 31 y; P < 0.001) and mean BMI (24.0 rather than 23.4; P < 0.001), although there was no significant difference between the weight-reduced and control subjects in mean %BF (31.0 and 31.7 %, respectively).

AEE, exercise economy, aerobic capacity

The two study groups had significantly different AEE responses to weight loss: a 16% rise in AEE in the white women and a 26% drop in the black women (P < 0.05 for weight loss × race interaction; Table 2). The black women tended to have a slightly higher AEE than did the white women in the overweight state but a significantly lower AEE after weight loss (P < 0.05). Examination of the individual data shows that 70% of the white women increased their AEE in response to weight loss, whereas 67% of the black women decreased their AEEs in response to weight loss. Even though the racial groups had similar mean body weights before and after weight loss, small individual differences in body mass could influence AEEs. This appeared not to be the case, because the response by race was still significantly different when AEEs were adjusted for body weight in the overweight and normal-weight states (P < 0.05 for weight loss × race interaction; data not shown).

Free-living total daily physical activity (as ARTE index) showed a trend for a racially divergent response to weight loss, rising 39% in the white women and falling 6% in the black women (P = 0.06 for weight loss × race interaction; Table 2). This increase in physical activity among the white women was significant (P < 0.02).

Sleeping EE, from which AEE is derived, did not show a significantly different response of the two racial groups to weight loss (P = 0.20 for weight loss × race interaction; Table 2). Absolute levels of sleeping EE fell an average of 9% with weight loss (P < 0.01
RACIAL DIFFERENCES IN PHYSICAL ACTIVITY

TABLE 2
Activity and fitness variables in white and black women measured in the overweight and normal-weight states and in never-overweight control subjects

<table>
<thead>
<tr>
<th>Study variables</th>
<th>White women (n = 23)</th>
<th>Black women (n = 23)</th>
<th>White women (n = 23)</th>
<th>Black women (n = 23)</th>
<th>P2</th>
<th>Control subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity energy expenditure (kJ/d)</td>
<td>2113 ± 1293b</td>
<td>2339 ± 1536b</td>
<td>2448 ± 979b</td>
<td>1728 ± 1373a</td>
<td>0.55</td>
<td>2314 ± 1105</td>
</tr>
<tr>
<td>Physical activity index (activity-related time equivalent, min/d)</td>
<td>123 ± 76b</td>
<td>141 ± 188b</td>
<td>171 ± 72c</td>
<td>132 ± 103b</td>
<td>0.18</td>
<td>168 ± 75</td>
</tr>
<tr>
<td>Sleeping energy expenditure (kJ/d)</td>
<td>6273 ± 510</td>
<td>5637 ± 841</td>
<td>5641 ± 527</td>
<td>5223 ± 632</td>
<td>&lt;0.01</td>
<td>5389 ± 632</td>
</tr>
<tr>
<td>Resting energy expenditure (kJ/d)</td>
<td>6390 ± 670</td>
<td>5767 ± 841</td>
<td>6106 ± 774</td>
<td>5336 ± 657</td>
<td>&lt;0.01</td>
<td>5708 ± 657</td>
</tr>
<tr>
<td>Activity energy cost (mean VO2, mL O2·kg⁻¹·min⁻¹ for 5 tasks)</td>
<td>10.4 ± 0.9b</td>
<td>10.1 ± 0.9b</td>
<td>10.5 ± 1.3b</td>
<td>9.6 ± 1.0b</td>
<td>0.29</td>
<td>10.3 ± 0.9</td>
</tr>
<tr>
<td>Aerobic capacity (VO2max, mL O2·kg⁻¹·min⁻¹)</td>
<td>45.8 ± 4.5b</td>
<td>42.7 ± 5.0b</td>
<td>48.3 ± 6.6b</td>
<td>40.3 ± 8.0b</td>
<td>0.98</td>
<td>51.7 ± 7.4</td>
</tr>
<tr>
<td>Aerobic capacity (VO2max, mL O2·kg⁻¹·body wt·min⁻¹)</td>
<td>27.3 ± 2.8b</td>
<td>26.2 ± 3.1b</td>
<td>32.4 ± 4.8b</td>
<td>28.2 ± 5.3b</td>
<td>&lt;0.01</td>
<td>34.8 ± 6.1</td>
</tr>
<tr>
<td>Self-reported physical activity (leisure time: 1 = lowest, 5 = highest)</td>
<td>2.15 ± 0.49</td>
<td>2.60 ± 0.57</td>
<td>2.40 ± 0.47</td>
<td>2.77 ± 0.77</td>
<td>&lt;0.01</td>
<td>2.91 ± 0.62</td>
</tr>
</tbody>
</table>

1 ± SD; group sizes vary because not all subjects had values for every variable; means with different superscript letters are significantly different, P < 0.05.
2 Repeated-measures ANOVA examining independent effects of weight loss, race, and weight loss × race interaction. When significant, the interaction term indicates that the white and black women responded significantly differently to weight loss.
3 ANOVA examining independent effects of group differences (weight-reduced, normal-weight women and control subjects), race, and group × race interaction. When significant, the interaction term indicates that the white and black women showed significantly different patterns for that dependent variable, depending whether they were in a normal-weight or control group.

for weight loss effect) but remained significantly lower in the black women than in the white women (P < 0.01 for effect of race), despite the absence of significant racial differences in fat mass or FFM. Similarly, resting EE did not show a significantly different response by race to weight loss (P = 0.50 for weight loss × race interaction). Absolute levels of resting EE fell an average of 6% with weight loss (P < 0.01 for weight loss effect) but remained significantly lower in the black women than in the white women (P < 0.01 for effect of race).

Body weight–adjusted AEC, or exercise economy, showed a trend for a racially divergent response to weight loss, rising in the white women and falling in the black women (P = 0.06 for weight loss × race interaction; Table 2). After weight loss, the black women had a significantly lower AEC than did the white women (P < 0.05).

The racial groups had significantly different responses to weight loss in terms of aerobic capacity, whether VO2max was adjusted for FFM or for body weight (both P < 0.02 for weight loss × race interaction; Table 2). There was also a significant effect of race on aerobic capacity, such that mean values of VO2max, whether adjusted for FFM or body weight, were lower in the black women in analyses comparing subjects in the overweight and weight-reduced states and in analyses comparing the weight-reduced and control subjects.

Self-reported leisure-time physical activity

In contrast to the divergent racial responses for AEE and physical activity, both white and black women reported on questionnaire that they had become more active after losing weight (P < 0.01 for weight-loss effect, P = 0.63 for weight loss × race interaction; Table 2). In the comparison of the weight-reduced and control groups, the weight-reduced white women reported being less physically active than their white control counterparts, whereas the weight-reduced black women reported being more physically active than their black control counterparts (P < 0.01 for group × race interaction). Note that self-reports of total physical activity (ie, total of leisure-time, sports, and work-related activity) provided essentially identical results as leisure-time activity and hence are not reported.

DISCUSSION

This study was designed to induce weight loss using an energy-restricted diet, with no recommendations to influence physical activity patterns of these relatively sedentary women. Nor were subjects recruited with regard to any certain attitudes about the importance of physical activity in weight control. In a previous report (17) based on a subset of these subjects (18 white, 14 black), we showed that, as a group, weight loss resulted in a spontaneous increase in physical activity, which was possibly due to improved aerobic capacity and the reduced physiologic difficulty of exercise. Power was inadequate with that smaller sample to show a significant interaction between weight loss and race; hence, we observed no significant racial differences in AEE and...
free-living physical activity in response to weight loss. The current study extends the previous report by 1) increasing the sample size to allow us to examine differences by race in responses to weight loss, 2) including race-matched never-overweight controls, and 3) testing the hypothesis that weight loss results in a spontaneous increase in AEE and free-living physical activity in both white and black women, bringing them to levels comparable to their never-overweight same-race control counterparts.

Although unexpected and unexplained, significantly divergent racial patterns for AEE in response to weight loss were observed: they tended to increase in the white women and decrease in the black women. The net effect of weight loss was that AEE became significantly lower in the black women than in the white women. The rise in AEE in the white women was accompanied by a 39% increase in their physical activity index, from 123 to 171 min/d, with no appreciable change in their AEC (ie, exercise economy).

On reaching the normal-weight state, their mean physical activity level was very similar (±2%) to that of the white control subjects. Unlike the white women, the black women had a drop in AEE with weight loss, which was accompanied by a decrease in both physical activity and AEC. Because AEE is expressed as the above-sleep level of EE, it is important to know that racial differences in sleeping EE in response to weight loss did not explain the observed racial divergence in AEE. Although sleeping EE fell in both racial groups, there was no significant race × weight loss interaction; that is, the races did not differ significantly in their sleeping EE responses to weight loss. Moreover, the mean racial difference in sleeping EE with weight loss was just 218 kJ/d (−632 in white women, −414 in black women), whereas that in AEE with weight loss was 946 kJ/d (+335 in white women, -611 in black women). Hence, it did not appear that the small and statistically nonsignificant racial difference in declines in sleeping EE with weight loss explained the significant racial divergence in AEE.

As judged from their self-reported activity levels, both white and black women perceived that they became more active after weight loss. This perceived increase among the white women paralleled the observed increase in their AEE, whereas the perceived increase among the black women contrasted with the observed decrease in their AEE. A limitation of questionnaires is the potential for racial bias in defining physical activity (32). This should not have accounted for the findings in this study, because self-reports were obtained from the same subjects, before and after weight loss. The findings suggest caution in interpreting self-reported activity data, because responses may differ according to recent changes in body weight.

We also observed a trend for racial divergence in the energy cost of performing exercise (ie, AEC) with weight loss, such that in the weight-reduced state, black women had a significantly lower AEC than did the white women. To our knowledge, this racial pattern in response to weight loss has not been previously reported. In studies that have examined weight-related changes in exercise economy, some investigators have found that the AEC remains unchanged after weight loss (33, 34), and others have found that it falls disproportionately to weight loss (35–37). The findings of our study suggest that such changes (or lack thereof) may have to be considered in the context of potential racial differences in exercise economy.

The results of the current study indicated that weight reduction improved aerobic capacity relative to body weight, regardless of the subject’s race. This finding is in agreement with studies indicating that lean women have better body weight-adjusted aerobic capacity than do obese women (38, 39). However, as we have reported previously (40), this increase in aerobic performance with weight loss was due to the loss of fat mass, because VO_{2\text{max}} did not consistently improve relative to FFM, an index that provides a better physiologic comparison of the ability of tissue to maximally consume oxygen. In comparing the racial groups, it can be seen that the white women had greater aerobic capacity than the black women, whether they were overweight or of normal weight and whether VO_{2\text{max}} was adjusted for FFM or body weight. This racial difference in aerobic capacity has been reported in children (41, 42) and in normal-weight adults (43). In addition to confirming the previously described racial difference in aerobic capacity, a notable new finding was that the white women and black women had significantly different aerobic capacity responses to weight loss. Whereas white women had improvement in FFM-adjusted VO_{2\text{max}}, black women had deterioration in FFM-adjusted VO_{2\text{max}}, a change that paralleled the changes in AEE and physical activity. It is impossible to determine whether the parallel changes in fitness and physical activity were due to influences of activity on fitness or to influences of fitness on activity, although previously reported data suggest that low aerobic fitness may contribute to reduced physical activity (39, 44) and greater weight gain (45). In addition, we recently showed that free-living physical activity increases after resistance exercise training (46).

In the current study, weight loss was diet-induced, without exercise training. This is certainly not the standard approach, and it raises the question of how exercise training might alter the observed responses, especially in the black subjects. If, in fact, fitness does influence physical activity, our findings of concomitantly low aerobic capacity and AEE in the weight-reduced black women suggest that exercise training may be especially important for maintaining a higher level of physical activity in this obesity-prone population.

Subjects in this study were not selected on the basis of socioeconomic status, nor were any potential differences assessed in this study. In addition, these weight-reduced subjects may not be characteristic of persons who lose weight in a conventional weight-loss program. In this study, all subjects had to achieve the normal-weight state to undergo reassessment, and none received exercise training. Although 81% of the study subjects successfully reached a normal body weight, it is still possible that the racially divergent patterns we observed will not reflect those of the average person who undergoes weight reduction, especially if treatment includes an exercise training component.

In summary, the findings of this study indicated that the white women had responses to weight loss that resulted in improvements in aerobic capacity, physical activity, and energy expenditure, which potentially could provide a hedge against weight regain: ie, weight loss → [↑ fitness + ↑ activity] → ↑ AEE → ↓ weight regain. By contrast, in the black women, weight loss to a normal body weight resulted in greater risk for weight regain: ie, weight loss → [↓ fitness + ↓ activity + ↓ activity energy cost] → ↓ AEE → ↑ weight regain. Such speculation about the course of events follows from our preliminary finding that, after 1-y follow-up, the weight-reduced black women tended to regain more weight than did the weight-reduced white women (47). This course of events may also help explain the observations of others that overweight and obese black persons tend to lose less weight than overweight and obese white persons during treatment (48, 49), to regain more weight after treatment (48), and to gain more weight over time.
We recognize that the responses of the subjects in this study may not be representative of their respective racial groups within the general US population, but the results do underscore the potential importance of an exercise training program for obesity-prone persons of both races, and perhaps especially for black women, to improve aerobic capacity, free-living physical activity, and, in turn, weight control.

We express our appreciation to Harry Vaughn and Robert Petri, who provided invaluable technical assistance in the conduct of this study.

REFERENCES


