

Results of Go Girls: A Weight Control Program for Overweight African-American Adolescent Females

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Abstract

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Objective: Go Girls was a church-based nutrition and physical activity program designed for overweight African-American (AA) adolescent females.

Research Methods and Procedures: Ten predominantly middle-socioeconomic churches were randomized to either a high-intensity (20 to 26 sessions) or moderate-intensity (six sessions) culturally tailored behavioral group intervention delivered over 6 months. Each session included an experiential behavioral activity, ~30 minutes of physical activity, and preparation and tasting of healthy foods. In the high-intensity group, girls also received four to six telephone counseling calls. From the 10 churches, 123 girls completed baseline and 6-month post-test assessments. The primary outcome was BMI; secondary outcomes included waist and hip circumferences, percentage body fat estimated by bioimpedance, serum insulin, glucose, and lipids, and cardiovascular fitness at 6-month follow-up. Selected measures were also collected at 1-year follow-up.

Results: At 6-month follow-up, the net difference between the high- and moderate-intensity groups was 0.5 BMI units. This difference was not statistically significant ($p = 0.20$). There were no significant group differences in secondary outcomes. Girls in the high-intensity condition, however,

who attended more than three-quarters of the sessions had significantly lower BMI and percentage body fat relative to girls in the high-intensity group who attended fewer sessions. Findings at 1-year follow-up mirrored those at 6 months.

Discussion: We concluded that the intervention was not effective in reducing adiposity, although there were some positive findings among high attenders. Despite the null result, the intervention was generally well received by participants. Future interventions may require greater dose and a more structured dietary change program.

Key words: African Americans, motivational interviewing, church, health promotion, behavior change

Introduction

Obesity and its medical and economic sequelae have risen dramatically among America's youth over the past 30 years (1–4). For example, among youth 12 to 19 years old, the percentage with BMI above the 95th percentile rose from 6% in the early 1970s to over 16% in the 1999 to 2002 Nutrition Health and Nutrition Examination Surveys (5,6). The prevalence of obesity and the rate of increase are substantially higher among African Americans (AAs),¹ particularly females, than among whites. For example, among youth 12 to 19 years old, 13% of white females have a BMI above the 95th percentile, whereas the rate for black females is almost 24%.

Despite the well-documented excess burden of obesity among AA youth and the clarion call for intervention research, there have been surprisingly few published prevention or treatment studies in this population, and much of what has been conducted have been quasi-experimental or pilot studies (7–13). A large-scale, multisite intervention

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¹ Nonstandard abbreviations: AA, African American; MI, motivational interviewing; BP, blood pressure.

trial for AA preteen girls is currently being conducted, the pilot results of which have recently been published (14–19).

One promising channel for delivering weight control and other health promotion programs to AAs is the black church. Many black churches include health as part of their overall mission, offering health services and programs through special committees and ministries (20–22). Given the potential ease of participant recruitment and tracking, churches also represent an excellent research setting. Several health promotion studies have been successfully conducted in black churches, including some that have addressed dietary behavior (21–29). Another advantage of working in black churches is access to middle and upper socioeconomic AAs, a group often underrepresented in health promotion studies. Although for white adolescents there is a strong inverse association of family education and income with the prevalence of overweight and obesity, among black youth, higher income and education convey little protection (30,31). Given this unique socioeconomic pattern and the fact that less attention has been given to this population segment, we decided to intervene specifically in middle and upper income black churches.

This paper reports the 6-month and 1-year results of a randomized efficacy trial of a church-based obesity intervention for middle and upper socioeconomic AA adolescent females conducted in the Atlanta metropolitan area. The primary aim of the project, called Go Girls, was to develop and test a culturally tailored intervention program for overweight 12- to 16-year-old AA adolescents and their parents.

Research Methods and Procedures

Church Recruitment

Before randomization, a pool of middle and upper income churches was identified by project staff based on prior projects as well as telephone directory and internet searches. Churches were then contacted either by telephone or in person and administered a brief screening instrument that queried their membership numbers and socioeconomic status. Only churches that reported that the majority of members' household income was above \$40,000 were included. To ensure adequate sample size (the target was 15 to 20 girls above the 90th percentile for BMI per church), we initially targeted only churches with >1000 members. Toward the end of the trial, when we had exhausted all of the large churches in the study area, we allowed three smaller churches to participate as an aggregate church, with all intervention activities taking place at one of the churches. This three-church aggregate was considered a single church for analytic purposes. A total of 10 churches (including the aggregate church) were randomized to condition, five treatment (high intensity) and five comparison (moderate intensity).

Participant Recruitment

At each church, a liaison was hired as an hourly employee (\$13 per hour) to recruit eligible girls. Liaisons received 1 to 2 hours of training where they learned about the study aims, eligibility criteria, and consent procedures, as well as practiced weighing girls and computing BMI. The primary eligibility criteria were age 12 to 16 years old and BMI above the 90th percentile for age and gender. Liaisons were asked to recruit at least 15 eligible girls per church and were instructed that group sessions could not begin until they met this quota. All eligible girls attended a qualification session where BMI and age were verified. We used the 90th percentile as our inclusion cut-off point rather than the 85th percentile based on our formative research and pilot studies. We felt that girls on the lower end of the obesity continuum, i.e., 85th to 90th percentile, were different behaviorally and psychologically, and combining girls from the low and high ends of the obesity continuum would adversely affect group cohesion.

Churches received an incentive of \$500 if 15 eligible participants completed the baseline assessment. An additional \$200 was provided if 20 eligible participants completed the baseline assessment.

Formative Research

Before designing the intervention, we conducted eight focus groups with middle-income families (four groups with overweight adolescents and four groups with at least one of their parents) from local black churches. This formative research yielded several potential intervention themes. For example, parents indicated that they have difficulty communicating with their daughters about their weight. They often felt conflicted by a desire to express concern about their daughters' health and their need to lose weight, while at the same time not making them feel unloved or unattractive. Many parents were overweight themselves and felt that they were sending inconsistent messages to their daughters (e.g., encouraging the overweight teen to exercise while the overweight parent did little physical activity). Therefore, in the intervention, we focused several sessions on parent-child communication around weight, diet, and physical activity. Parents also indicated that although they encouraged their teens to become more physically active, they were often unable or unwilling to provide transportation or otherwise support these activities. Parents also reported frequent dining outside of the home (primarily fast food and all-you-can-eat restaurants), using food to celebrate events or as reinforcement/punishment for behaviors, and allowing girls to eat alone.

Focus groups with the adolescent girls indicated that most were cognizant that they were overweight and most expressed an interest in losing weight. They considered "thick" as a generally positive attribute, representing someone who is not skinny or big. The term "big" fell between

thick and obese and was generally viewed as undesirable. Obese was viewed as highly pejorative as was the term nasty fat. We incorporated this terminology throughout the intervention. Similar to parents, adolescents reported consuming large amounts of fast foods, salty snacks, fried foods, and sugared soda. They also reported low rates of exercise and high rates of sedentary behavior at home. Some teens indicated that they avoided physical activity because exercise is unfeminine, they do not like to sweat, they are too busy or tired, they don't like going outside ("too many bugs"), and there are not enough people around their age who exercise.

Intervention Elements

Based on this formative research and prior interventions conducted by our group and others (12,13), we developed a multicomponent program tailored to the population. Two interventions were developed: high intensity (24 to 26 sessions) and moderate intensity (six sessions), with the latter serving as the comparison group. Use of a moderate-intensity comparison group rather than an attention control group was needed to obtain buy-in from potential churches. During recruitment, to agree to randomization, churches requested that the comparison condition receive a meaningful intervention. It was agreed on by the church representatives and study staff that six sessions represented a meaningful intervention of sufficient benefit that would not jeopardize between-group differences.

High-Intensity Intervention. The core of the high-intensity program was weekly group behavioral sessions conducted at the participating churches. The target number of group meetings was 24 to 26 (one per week) over 6 months, although due to factors such as holidays and competing church activities, the actual range was 20 to 26. Girls participated in every session, and parents were invited to every other session. This is described in more detail below. Each group session included an experiential, interactive behavioral activity, at least 30 minutes of moderate to vigorous physical exercise, and preparation and/or consumption of low-fat, portion-controlled meals or snacks.

Target behaviors for the intervention included: increased fruit and vegetable intake, decreased fat intake, decreased fast food intake, decreased sedentary behavior, and increased physical activity. Rather than providing girls with a prescribed diet or prepared meals, girls were taught to reshape their target behaviors using the principles of substitution, moderation, and abstinence. In addition, girls focused their behavior change on target foods or priority behaviors identified at the baseline dietary assessment and selected by the girls. Group sessions were led by a team of two trained staff at the masters level, which included a dietitian and exercise physiologist plus two to four support staff.

At the beginning of each intervention cycle, participants (girls only) attended a 1-day retreat at a national park or similar commercial facility. The goal of the retreat was to create group cohesion and establish basic ground rules for the subsequent 6 months of intervention. During the retreat, participants completed a low ropes course and team building activities, ate healthy portion-controlled meals, and attended a group session on hunger and satiety.

A novel element of the high-intensity intervention was that all girls received a two-way paging device. Messages, developed by the girls based on their target foods and activity patterns, were sent to them throughout the day and, in particular, at key times when they needed reminders about their eating or physical activity. The two-way system allowed girls to respond with either prewritten responses or type their own responses. Girls were instructed to wear their pagers all day, including during school.

Girls in the high-intensity intervention also received four to six motivational interviewing (MI) calls by telephone over the 6 months of intervention. MI is a client-centered counseling style where counselors establish a supportive climate for clients to express their own reasons for and against change and how their current behavior or health status may affect their ability to achieve their personal goals. To achieve these ends, MI counselors rely heavily on reflective listening and positive affirmations (32–35).

Counselors who had either a masters or doctoral degree in psychology or public health received 16 hours of MI training by the principal investigator plus ongoing supervision by doctoral level staff. Counselors attended most group sessions. Telephone calls were synchronized with the group sessions, so that, for example, during the week when the group sessions addressed physical activity goals, the MI call that week focused on participants' plans and progress regarding their personal activity goal(s). Calls lasted 20 to 30 minutes and were generally completed in the afternoon or evening.

Moderate-Intensity Intervention. Moderate-intensity churches were provided with a six-session program, delivered once per month over 6 months. This dose, which was higher than that proposed in the original design, was necessitated to obtain buy-in from churches. The six sessions were selected from the larger pool of sessions delivered to the high-intensity group. Topics in the moderate-intensity group included fat facts, barriers to physical activity, fad diets, neophobia (i.e., fear of new foods), and benefits of physical activity. Girls in the moderate-intensity comparison churches did not receive the two-way pagers, MI phone calls, or kick-off retreat.

Parent Involvement. In both the high- and moderate-intensity groups, parents were invited and encouraged to attend every other session. For the high-intensity group, this entailed ~12 sessions, whereas for the moderate-intensity group, this involved three sessions. When parents attended,

they met alone for approximately one-half of the session, during which a behavioral activity was delivered. After this, they convened with their daughters for the physical activity and food tasting. Both parents were invited to attend, although predominantly it was mothers who attended.

Outcomes

The primary outcome for the study was adiposity, estimated by BMI, at 6-month follow-up. Secondary outcomes included percentage body fat, waist and hip circumferences, blood pressure (BP), serum measures of lipids, insulin, and glucose, and cardiovascular fitness (by Leger shuttle test).

Timing of Assessment. At baseline, girls attended a 4- to 6-hour assessment where we measured height and weight, body fat estimated by bioimpedance, waist and hip circumference, and BP. A fasting blood sample was obtained on arrival to assess glucose, insulin, and lipids. They also completed the shuttle test to assess cardiovascular fitness.

At 6-month follow-up, all baseline measures were repeated. At 1-year follow-up, due to budget limitations and time constraints, we obtained only anthropometric measures, BP, and the shuttle test. No blood samples were obtained.

The study was powered to detect a net difference of 1.5 BMI units at 6-month follow-up assuming an SD of BMI between 4 and 6, which equates to standardized effect size of 0.25 to 0.40. To achieve this effect, it was projected that 10 to 12 churches (five to six per condition) with 15 to 20 girls per church would be needed.

BMI and Percentage Body Fat. Height was measured with a Stadiometer and weight by Tanita scale model TBF-310GS (Tanita Corp., Tokyo, Japan). Shoes, socks, and outer clothing were removed before measurement. The scale also estimated percentage body fat by bioimpedance (36,37). The correlation of BMI with estimated percentage body fat was 0.74 at baseline and 0.79 at both post-test 1 and post-test 2.

Waist and Hip Circumference. Tape measurements were obtained twice per site. Waist was measured at the navel, and hip measurement was taken at the broadest points on the hips and buttocks. A third measure was obtained if the first two measurements varied by >2 cm.

Blood Measures. Lipids and glucose were assayed by microparticle enzyme immunoassay with a fasting blood venipuncture sample using the Beckman Coulter Synchron LX20 (Beckman Coulter, Fullerton, CA). Insulin was assessed by chemiluminescence using the Beckman Access 2.

BP. Measures were taken with a standard desktop mercury sphygmomanometer (WA Baum Co. Inc., Copiague, NY) with the subject in the sitting position. Two readings were recorded, with a third reading taken if the first two readings differed by >5 mm Hg.

Cardiovascular fitness was assessed using a 20-meter shuttle run developed by Leger (38,39). A 20-meter-long

course with multiple lanes (inside each church during cold months, outside in warmer weather) was marked off with measuring tape and cones. A cassette tape was played, delivering beeps that became progressively faster, in 1-minute stages, throughout the test. Participants ran back and forth between the areas marked by the cones, increasing their speed and keeping pace with the speed of the music. Total laps were recorded, and participants stopped when they failed to reach the line for the second time. Several participants were tested simultaneously.

Process Analysis. At the 6-month follow-up, girls in the high-intensity group completed a brief questionnaire that queried their perceptions regarding the overall program and individual intervention elements, e.g., two-way pagers, MI calls, etc. Girls in the moderate-intensity group received a similar questionnaire excluding items addressing elements not included in their condition, e.g., pagers.

Statistical Analyses. Outcomes were analyzed with a mixed model repeated measures ANOVA program, SAS PROC MIXED (SAS Institute, Cary, NC), that allows for adjustment of subject non-independence within churches (40). The initial multivariate model included a fixed effect term for experimental condition and a random effect term for church, nested in treatment condition, and individual nested within church. The primary analytic approach was intention to treat, with all participants included in the experimental condition to which they were assigned. However, as a secondary analytic approach, we examined intervention dose-response effects by comparing results for girls from the high-intensity group who attended more than three-quarters of the total sessions to those completing fewer than three-quarters of the sessions. The definition of high dose as 75% of sessions was set a priori by the investigative team.

Results

As shown in Table 1, participants were ~14 years of age with a mean BMI of ~33. A total of 147 girls completed the baseline assessment, from whom 6-month follow-up data were available for 123 (84%). Compared with girls in the cohort, girls lost to follow-up (defined as missing all data at the 6-month assessment) had lower BMI, weight, percentage body fat, and waist and hip circumferences. There was no evidence of differential attrition, because girls in the moderate-intensity group who dropped out did not significantly differ from drop-outs in the high-intensity group for any of the variables listed in Table 1. With regard to group equivalence, girls in the moderate- and high-intensity groups did not differ at baseline for any of the variables listed in Table 1.

At follow-up 2, 1 year from baseline, anthropometric data were available for 107 (73%) girls, which included 103 who contributed data at baseline and 6-month follow-up and four who contributed data at baseline and 1-year follow-up only.

Table 1. Sample description

	Cohort (n = 123) [mean (SD)]	Lost to follow-up at 6 months (n = 24) [mean (SD)]
Age	13.6 (1.43)	13.9 (1.56)
BMI	32.7 (6.7)	28.7 (4.1)*
Height (inches)	63.9 (3.0)	63.4 (1.74)
Weight (pounds)	190.2 (43.5)	163.5 (23.5)*
Waist (cm)	87.7 (11.9)	80.0 (10.3)*
Hips (cm)	112.5 (12.1)	105.5 (5.8)*
Body fat (%)	43.2 (6.0)	39.1 (4.9)*
Systolic BP (mm HG)	112.0 (11.5)	111.3 (7.0)
Diastolic BP (mm HG)	70.7 (8.8)	71.1 (5.9)
Total cholesterol (mg/dL)	154.9 (32.5)	160.2 (33.5)
Insulin (μ U/mL)	21.3 (17.3)	17.7 (12.3)
Glucose (mg/dL)	82.0 (10.5)	80.4 (8.3)
PACER laps	12.1 (6.5)	13.2 (3.6)

* $p < 0.05$ comparing drop-outs with cohort members.

In the moderate-intensity condition, girls attended, on average, four of the six (66%) sessions, whereas average attendance in the high-intensity group was 13 of 23 (57%) sessions. In the high-intensity condition, an average of four of six MI calls were completed.

At 6-month follow-up, there were no statistically significant differences (i.e., the group \times time interaction was non-significant) between the high- and moderate-intensity groups for BMI or any of the secondary outcomes presented in Table 2. Although not significant, the net difference in BMI was 0.5 units in favor of the high-intensity group. Similarly, there was a net (non-significant) difference of 1.8 pounds and 1.1% body fat in favor of the high-intensity group.

Table 3 presents results among high-intensity group girls by two levels of attendance, $>75\%$ of sessions (~ 17 sessions) and $<75\%$. Girls who attended $>75\%$ of sessions showed a decrease in BMI of 0.8 units, whereas low attenders showed an increase of 0.5 units, and this net difference of 1.3 units was statistically significant. There was a borderline ($p = 0.07$) significant effect on weight, with high attenders losing 1.3 pounds and low attenders gaining 3.7 pounds. A significant effect among high attenders vs. low attenders was also observed for hip circumference and percentage body fat. For lipids, glucose, and insulin, there was a nonsignificant trend favoring the high attenders.

At 1-year follow-up, approximately 6 months from the final intervention session, no significant differences were evident between the high- and moderate-intensity groups. Similar to the 6-month results, girls in the high-intensity group who attended at least 75% of the sessions showed significantly lower BMI (net difference of 2.2 units), weight (net difference of 10.1 pounds), and percentage body fat (net difference of 2.5%). Their waist and hip circumferences were also significantly lower than those of the girls who attended less frequently.

Table 2. Six-month outcomes

	Moderate intensity (n = 70) [mean (SD)]		High intensity (n = 53) [mean (SD)]		p
	Baseline	6 months	Baseline	6 months	
BMI	33.2 (7.3)	33.6 (7.8)	32.0 (5.8)	31.9 (5.5)	0.20
Height (inches)	64.0 (3.0)	64.1 (2.7)	63.7 (3.1)	64.0 (2.9)	0.19
Weight (pounds)	193.8 (46.3)	197.1 (48.1)	185.4 (39.4)	186.9 (38.6)	0.38
Waist (cm)	88.2 (12.4)	90.1 (15.3)	87.1 (11.4)	87.0 (11.7)	0.50
Hips (cm)	113.4 (12.7)	114.6 (14.6)	111.4 (11.5)	111.0 (11.3)	0.33
Body fat	43.1 (6.3)	43.8 (6.0)	43.3 (5.7)	42.9 (5.9)	0.28
Systolic BP (mm HG)	112.9 (12.1)	111.2 (9.3)	110.9 (10.7)	115.4 (10.6)	0.06
Diastolic BP (mm HG)	70.4 (8.6)	70.5 (8.1)	71.0 (9.1)	71.2 (11.8)	0.93
Total cholesterol (mg/dL)	157.1 (31.8)	157.0 (29.2)	151.5 (33.6)	153.5 (31.6)	0.83
Glucose (mg/dL)	81.2 (11.7)	79.2 (8.4)	83.3 (8.1)	83.0 (11.5)	0.75
Insulin (μ U/mL)	22.7 (19.0)	19.6 (15.4)	19.2 (14.1)	17.9 (11.1)	0.81
PACER Laps	12.2 (5.7)	11.5 (5.1)	12.0 (7.4)	11.0 (5.4)	0.86

Table 3. Six-month outcomes by attendance: high-intensity participants only

	Low attendance (<75%) (n = 30) [mean (SD)]		High attendance (≥75%) (n = 23) [mean (SD)]		p
	Baseline	6 months	Baseline	6 months	
BMI	31.6 (5.8)	32.1 (5.8)	32.5 (5.9)	31.7 (5.3)	0.01
Height (cm)	63.9 (3.2)	64.0 (2.9)	63.4 (3.1)	64.0 (2.9)	0.12
Weight (pounds)	184.6 (42.2)	188.3 (42.6)	186.4 (36.3)	185.1 (33.7)	0.07
Waist (cm)	86.5 (12.5)	87.2 (13.4)	87.9 (9.9)	86.7 (9.3)	0.11
Hips (cm)	111.0 (11.2)	111.9 (12.0)	111.8 (12.1)	109.8 (10.5)	0.01
Body fat (%)	42.5 (5.9)	42.6 (6.3)	44.3 (5.5)	43.3 (5.4)	0.01
Systolic BP (mm HG)	110.2 (9.2)	115.1 (9.9)	111.7 (12.4)	115.8 (11.7)	0.85
Diastolic BP (mm HG)	71.9 (9.4)	72.6 (10.7)	70.0 (8.9)	69.4 (13.0)	0.76
Total cholesterol (mg/dL)	147.4 (37.8)	155.2 (38.5)	157.9 (25.5)	151.7 (22.7)	0.07
Glucose (mg/dL)	83.1 (9.0)	85.3 (13.0)	83.6 (6.9)	80.5 (9.4)	0.21
Insulin (μU/mL)	19.0 (15.0)	20.0 (12.1)	19.4 (13.1)	15.6 (9.7)	0.40
PACER laps	13.0 (9.3)	11.1 (6.1)	10.9 (4.3)	10.8 (4.5)	0.85

Discussion

In intention-to-treat analysis, there was no significant group difference for BMI, the trial's main outcome, nor were there significant group effects for any of the secondary outcomes. Several factors may have led to these null results. An initial explanation that might be offered is that the comparison group received a six-session intervention that may have blunted potential between-group differences. However, the comparison group gained 3.3 pounds, the equivalent of 0.4 BMI units, at 6-month follow-up. This is approximately the amount of weight gain that could be expected for adolescent girls in the 90th to 95th percentile (41), which suggests that the comparison intervention was not particularly reactive. Thus, the primary explanation appears to be failure of the high-intensity condition to induce greater weight loss. Several aspects of the high-intensity intervention may have contributed to the weak effects.

One factor may have been our choice not to provide a structured dietary change plan, such as the Stop Light diet (42,43). Instead, we provided girls with a more general decision-making framework based on the rules of substitution, moderation, and abstinence. This decision was based on our formative research that indicated that girls wanted a more individually tailored diet and physical activity change program rather than a structured diet plan. We focused on modifying specific target foods that appeared to account for excess energy intake. Although anecdotally the framework appeared to resonate with girls and they seemed able to grasp and apply it, in retrospect a more structured dietary change program, particularly one that included planned caloric reductions, might have produced greater changes in adiposity than those observed.

Another factor may have been the age of the participants. Several successful weight loss interventions have been reported in children and preadolescents, whereas results among youth ages 12 to 16 have been somewhat mixed (43,44). Additionally, although parental involvement has been shown to improve the efficacy of weight loss interventions in younger children, the benefit of involving parents in adolescent weight loss programs is less clear (9,17,43,44). The latter issue is mitigated in our study by the fact that parents attended only every other session and met alone for most of the time when they did attend. Moreover, 87% of moderate-intensity and 95% of high-intensity group participants agreed or strongly agreed that "it was a good idea to involve parents in the program."

The observed net difference in BMI was 0.5 units in favor of the high-intensity group. This equates to an effect size of ~0.07 (0.5 divided by the pooled SD of 6.9). The study was powered to detect a difference of 1.5 BMI units and an effect size of 0.3 (which assumed a smaller SD of 5). Although the original target sample size was a cohort of 15 to 20 girls in each of 12 churches (six in each condition), and our final sample was ~12 girls in 10 churches, given the effect size achieved, the null effects cannot be attributed to insufficient power.

An ongoing multisite obesity prevention trial being conducted with 8- to 10-year-old AA girls, also known as Girls Health Enrichment Multi-site Studies (GEMS), is powered to detect an effect of 1 BMI unit (E. Obarzanek, personal communication) (19). Similarly, a clinical intervention for overweight adolescents conducted by Saelens et al. (45) reported an effect of ~1.2 BMI units. Our absolute effect of 0.5 BMI units might be considered of modest public health value (despite statistical nonsignificance).

Table 4. One-year outcomes

	Moderate intensity (<i>n</i> = 62) [mean (SD)]		High intensity (<i>n</i> = 45) [mean (SD)]		<i>p</i>
	Baseline	1 year	Baseline	1 year	
BMI	33.2 (7.7)	33.7 (8.4)	32.6 (5.7)	33.3 (5.9)	0.76
Height (inches)	63.8 (3.0)	64.1 (2.7)	63.7 (2.7)	64.1 (2.6)	0.50
Weight (pounds)	192.8 (48.3)	197.2 (51.2)	188.3 (35.8)	194.8 (38.7)	0.45
Waist (cm)	87.5 (12.6)	89.0 (15.8)	88.3 (10.5)	89.1 (11.8)	0.58
Hips (cm)	113.5 (13.1)	116.4 (15.0)	112.3 (10.8)	113.0 (11.3)	0.31
Body fat (%)	42.9 (6.4)	42.6 (7.5)	43.6 (5.9)	44.0 (5.5)	0.27
Systolic BP (mm HG)	112.3 (12.1)	111.1 (10.2)	111.9 (10.5)	112.5 (13.8)	0.58
Diastolic BP (mm HG)	69.7 (8.5)	70.7 (10.5)	70.4 (9.3)	71.7 (7.1)	0.74
PACER laps	12.0 (5.7)	11.5 (5.0)	12.0 (6.4)	11.5 (3.8)	0.67

Although insufficient power does not seem to be a major factor in our null results, we did have difficulty recruiting our sample. Despite the large membership in the churches recruited, we had more difficulty identifying girls with BMI over the 90th percentile than expected. Our church liaisons initially felt that there would be little problem finding girls who met our eligibility criterion. However, finding and enrolling such girls proved more challenging. Another issue was the fact that the intervention required a large number of staff, with a team of five to eight required to conduct each session. This resulted in higher than anticipated staffing costs. Additionally, the large team required at each session combined with scheduling complexities at the churches meant that, at most, we were able to conduct activities in three churches simultaneously. Therefore, we were forced to conduct the intervention in a staggered manner over 3 years, which also consumed resources. Additionally, it was difficult in most churches to conduct activities over the summer, either because girls were away or because churches were occupied in other activities. Carrying staff over the summer, when intervention activities could not be conducted, was another unanticipated major expense. Given that the sponsoring agency was unable to provide any additional funding, we were able to complete the study in only 10 of the projected 12 churches.

An interesting finding was that girls who dropped out were significantly less overweight at baseline. It is possible that this subgroup felt less motivated to participate than the heavier girls. They may also have felt uncomfortable being around heavier girls or that the program was not tailored for their needs. We were aware that this might have occurred, which is one of the reasons we excluded girls between the 85th and 90th percentiles. Nonetheless, this selective drop-out limits generalization. Researchers and program developers may want to consider offering different programs for girls at various levels of overweight.

Although we cannot conclude that the intervention was efficacious, there were some positive lessons learned from the study. First, the activities offered were generally well received. The average rating of session enjoyment was 3.8 on a 4-point scale in the high-intensity condition and 3.5 of 4 in the moderate-intensity condition. Additionally, 92% of moderate-intensity and 94% of high-intensity group participants agreed or strongly agreed that "Overall, I was pleased with the program." And, 86% said they would recommend the program to their friends. Additionally, some of the intervention subcomponents may merit further testing.

For example, the two-way pager system was generally viewed as having a positive impact on behavior, with 85% of high-intensity group participants agreeing with the statement that "the pager messages helped me make healthy choices." However, 33% agreed that the pagers "eventually became boring." This suggests that it might be advantageous to use the devices more selectively during the program. An advantage of this technology is that it allows for delivery of frequent, individually tailored, and strategically timed motivational and behavioral messages that extend participant contact beyond the group sessions. Numerous related technologies exist to deliver similar tailored communications, e.g., e-mail, interactive voice response systems, interactive web sites, personal digital assistants, and cell phones. Despite the null results of our overall intervention, given the positive response from participants and the potential for widespread diffusion and cost effectiveness, the role of such electronic intervention merits further attention.

With regard to the MI component, this was one of the first studies to apply this approach to the treatment of adolescent obesity (32,34,46,47). Overall, girls seemed pleased with the calls, with 21% reporting being somewhat satisfied and 66% reporting being very satisfied. The vast majority of girls, >80%, indicated that their counselors provided the

Table 5. One-year outcomes by attendance: high-intensity participants only

	Low attendance (<75%) (n = 24) [mean (SD)]		High attendance (≥75%) (n = 21) [mean (SD)]		p
	Baseline	1 year	Baseline	1 year	
BMI	32.4 (5.7)	34.1 (6.3)	32.9 (5.9)	32.4 (5.5)	0.01
Height (inches)	63.6 (2.9)	63.9 (2.7)	63.7 (2.4)	64.4 (2.5)	0.11
Weight (pounds)	187.4 (39.1)	198.6 (44.2)	189.4 (32.6)	190.5 (31.9)	0.03
Waist (cm)	88.2 (11.6)	91.2 (13.8)	88.4 (9.5)	86.6 (8.7)	0.01
Hips (cm)	111.6 (10.5)	113.9 (12.3)	113.03 (11.3)	112.0 (10.2)	0.02
Body fat (%)	42.5 (6.4)	44.1 (5.9)	44.8 (5.3)	43.9 (5.1)	0.05
Systolic BP (mm HG)	111.4 (8.1)	114.3 (16.3)	112.3 (12.7)	110.6 (10.8)	0.38
Diastolic BP (mm HG)	71.0 (9.5)	73.8 (6.0)	69.7 (9.2)	69.5 (7.6)	0.45
PACER laps	13.1 (7.7)	10.4 (3.6)	11.0 (4.5)	12.6 (3.8)	0.14

right amount of information, asked them for their opinion the right amount of time, listened to them, and were supportive. Yet, perceived impact was more mixed. Forty-five percent of girls indicated that the calls had a little influence on their eating habits, whereas 47% reported the calls had a lot of influence on their diet. Forty-two percent indicated that the calls had a little influence on their physical activity, and 47% reported the calls had a lot of influence. Only 45% responded “very true” that the calls helped them think differently about their health habits. Thus, although the calls appeared feasible and were generally well received, the perceived impact combined with the overall null results of the trial raises questions about the efficacy of our MI telephone intervention. One issue raised by the counselors was the possibility that some aspects of our MI protocol, such as the values clarification activity, which we have used successfully in several adult trials (48), may not have been developmentally appropriate for this age group. The amount of disclosure and self-discovery elicited by MI may not have been a good fit for this population. Interestingly, ~47% of girls agreed, at least a little, that their counselors asked too many questions.

Despite the null results in the primary intent to treat analyses, the completers analysis indicated some potentially promising effects among the high vs. low attenders. Girls attending at least 75% of the sessions showed favorable changes in BMI, weight, waist/hip circumference, lipids, glucose, and insulin. At 1-year follow-up, the effects among high attenders were sustained or enhanced. One conclusion that can be drawn from these results is that had we provided girls with an intervention of greater dose, i.e., more sessions, or had we been able to encourage better session attendance, significant results might have been achieved. Great caution must be taken not to overinterpret the completers findings because the favorable changes among the high attenders may reflect differences in motivation or other

psychosocial differences that led to greater attendance and/or greater behavior change. However, it remains possible that an intervention of greater intensity might have produced significant outcomes.

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