Fitness

Outcomes of a Home-Based Walking Program for African-American Women

JoEllen Wilbur, PhD, APN, FAAN; Judith H. McDevitt, PhD, RN; Edward Wang, PhD; Barbara L. Dancy, PhD, RN, FAAN; Arlene M. Miller, PhD, RN, FAAN; Joan Briller, MD; Diana L. M. Ingram, PhD; Terry L. Nicola, MD; SuKyung Ju, MS; Hyeonkyeong Lee, PhD, RN

Abstract

Purpose. *As compared with minimal treatment (MT), to determine the effectiveness of a home-based walking intervention enhanced by behavioral strategies targeted and tailored to African-American women (enhanced treatment [ET]) on adherence, physical activity, fitness, and body composition at 24 and 48 weeks.*

Design. *Using a quasi-experimental design, treatments were randomly assigned to one of two community health centers.*

Setting. *The centers were in predominately African-American communities.*

Participants. *Sedentary women (156 ET, 125 MT) 40 to 65 years were recruited within a 3-mile radius of each center.*

Intervention. *Both treatments had the same orientation. The ET group had four targeted workshops followed by weekly tailored telephone calls over 24 weeks.*

Methods. *Generalized linear mixed models were used to test effects of treatments on adherence, physical activity, aerobic fitness, and body composition.*

Results. *Adherence was significantly higher in the ET than the MT group and was related to the number of workshops attended (r = .58) and tailored calls (r = .25) received. On-treatment analysis showed significant postintervention improvement in waist circumference and fitness in the ET group; however, these improvements were not statistically different between the two groups. Intent to treat analysis showed a significant increase in fitness, decrease in waist circumference, and no change in body mass index in both treatments.*

Conclusion. *Findings suggest the potential impact of workshop group support on adherence in African-American women. (Am J Health Promot 2008;22[5]:307–317.)*

Key Words: African-American, Women, Physical Activity, Adherence, Prevention Research. Manuscript format: research; Research purpose: intervention testing; Study design: quasi-experimental; Setting: local community; Health focus: physical activity; Strategy: behavior change; Target population age: adults; Target population circumstances: race/ethnicity

JoEllen Wilbur, PhD, APN, FAAN; Judith H. McDevitt, PhD, RN; Edward Waug, PhD; Barbara L. Dancy, PhD, RN, FAAN; Arlene M. Miller, PhD, RN, FAAN; Diana L. M. Ingram, PhD; SuKyung Ju, MS; and Hyeonkyeong Lee, PhD, RN, are with the College of Nursing, University of Illinois at Chicago. Joan Briller, MD, is with the College of Medicine, University of Illinois at Chicago. Terry L. Nicola, MD, is with Sports Medicine and Rehabilitation, University of Illinois at Chicago Hospitals and Clinics.

Send reprint requests to JoEllen Wilbur, PhD, APN, FAAN, College of Nursing, University of Illinois at Chicago, 846 South Damen Avenue Chicago, IL 60612; jwilbur@uic.edu.

This manuscript was submitted February 13, 2007; revisions were requested May 2, 2007; the manuscript was accepted for publication May 16, 2007.

0890-1171/08/$5.00 + 0

INTRODUCTION

Although physical inactivity is common among women regardless of racial background, the prevalence is much greater in African-American (AA) women compared with white American women (33.9% vs. 21.6%).[1] This inactivity is a prime contributor to the higher incidence of obesity (51.1% vs. 30.7%), hypertension (41.4% vs. 28%), diabetes (13.2% vs. 5.6%), and cardiovascular disease (CVD) (49% vs. 35%) in AA compared with white American women.[1] Despite these disparities, two reviews of research up to the current decade indicate that physical activity intervention trials have not included adequate samples of AA women, have lacked cultural specificity,[2,3] and have tended to include physical activity only as an adjunct to dietary change for weight loss.[2,4]

Eight intervention trials for healthy ethnic minorities have been published since 2000 that included samples with 70% or more women and 60% or more AAs and either focused solely on increasing physical activity[5–9] or provided a balanced intervention between physical activity and nutrition.[10–12] While half of these studies lacked a comparison group,[5,6,8,9] they did demonstrate methods for targeting cultural specificity, such as locating the delivery sites within the community,[5–12] delivering culturally based behavioral strategies such as storytelling[9] and videos,[11] including topics important to AA women[8] such as spiritual strategies[10] in class content, using role models,[12] and using print materials designed to address sociocultural concerns of AAs regarding exercise.[7] Al-

though physical activity measures varied across the identified studies, modest improvements were shown in the three home-based programs that used data from self-reported physical activity[10–12] and the one study reporting exercise log data.[7] The only study that included an objective measure of physical activity adherence found a modest increase (5%) over baseline in the number of steps registered on a pedometer at the end of the intervention.[9]

Sampling issues also varied across the eight studies. The five that included solely physical activity as the intervention had sample sizes of less than 125,[5–9] whereas the three nutrition plus exercise interventions had larger samples (range, 366–1000).[10–12] Although not all studies reported sample retention data, reported retention rates were low to moderate (range, 51%–61%), mostly with participants of lower incomes.[5–7,9,10] Retention was highest (85%) in a socioeconomically diverse church-based sample[11] and in middle-income women (71%) provided with free memberships at a minority-owned gym as an economic incentive.[12]

To address methodologic issues related to single-group designs, self-reported data, and small sample size, we developed a home-based moderate-intensity walking intervention for midlife, moderate- to low-income, Midwestern urban AA women. An enhanced treatment (ET) that included behavioral strategies culturally targeted and tailored to the women was compared with a minimal treatment (MT) for effects on adherence, self-reported physical activity, aerobic fitness, and body composition. The MT was restricted to a one-time orientation to engaging in moderate-intensity walking and had no follow-up with culturally targeted or tailored behavioral strategies. We hypothesized that at the end of 24 weeks (end of adoption phase) and at the end of 48 weeks (end of maintenance phase) ET women compared with MT women would have higher walking adherence (heart rate monitor and walking logbook data), higher self-reported physical activity, and greater improvement in aerobic fitness (time spent on treadmill). Although physical activity alone in the absence of caloric restriction produces minimal weight loss,[13] it is a good predictor of weight maintenance.[14] Therefore, weight loss was not a focus of the intervention, but we secondarily hypothesized that body composition (body mass index [BMI] and waist circumference) would remain stable or decrease slightly in the women who received the ET.

METHODS

Design

The Woman's Walking Program was a 12-month intervention trial with a 24-week intensive adoption phase and a 24-week maintenance phase. A quasi-experimental design was used to randomly assign the ET or MT to two federally qualified community health centers serving low- and moderate-income urban populations. The centers, both located in predominately AA communities (>69%), served as study orientation and data collection sites.[15] Randomly assigning the intervention to community health centers serving noncontiguous communities avoided the problem of participants having acquaintances assigned to the opposite intervention and choosing to walk together or compare notes, causing treatment contamination.

Sample and Setting

Participants in the study were sedentary, midlife AA women between the ages of 40 and 65 years. Sedentary was defined as reporting no participation in regular moderate or vigorous exercise for 30 minutes two or more times per week in the preceding 6 months (preparation and contemplation stage of readiness to change behavior).[16] Exclusion criteria were (1) major signs or symptoms suggestive of pulmonary disease or CVD[17]; (2) history of myocardial infarction, stroke, or type 1 diabetes mellitus; (3) blood pressure (BP) $\geq$160/100 mm Hg[17]; or (4) use of beta blockers, diltiazem, or verapamil, which directly affect the exercise response.[18] Women with type 2 diabetes had to have an HbA1c of <9%, which indicates average daily blood glucose levels of <300 mg/dL, a safer level for exercising.[19]

Recruitment and screening procedures have been described in detail earlier.[20] Participants were recruited within a 3-mile radius of each community health center data collection site. Print materials with site-specific telephone numbers and contact information were distributed throughout each community, and study personnel publicized the study at health fairs and other community gatherings. Further recruitment resulted from social networking by study participants. Volunteers gave verbal consent and were initially screened for eligibility with a telephone questionnaire.[20] Women who met the initial screening were scheduled for a screening health assessment at their respective community health center data collection site. Following written informed consent, a nurse practitioner conducted the history and physical examination focusing on cardiovascular, musculoskeletal and neurologic systems and including a lipoprotein profile, weight, height, and waist circumference. A maximal aerobic fitness test was administered by an exercise physiologist.

Protocol and Intervention

The study received annual approval from the Institutional Review Board of the University of Illinois at Chicago. The ET was guided by the client-professional interaction component of the Interaction Model of Client Health Behavior (health information, decisional control, social support)[21,22] that was used earlier with a mixed sample of AA and white American women.[23] Previously successful behavioral strategies based on Social Cognitive Theory (problem solving, goal setting, self-monitoring, role modeling, supportive feedback) and the Transtheoretical Model were incorporated into the intervention to assist women in moving from contemplation into the preparation and action stages of motivational readiness.[24] All aspects of the intervention were designed to be culturally sensitive to AA women based on findings from focus groups held with community-based women[25] before the study.

Intervention Elements Common to Both ET and MT. All participants had the same individualized orientation that included a tailored walking prescription, health information, problem solving, and goal setting. The prescription was to walk three times per week within the

target heart rate range determined by the baseline maximal aerobic fitness test. Participants gradually progressed to walking 20 to 30 minutes in the target heart rate range in addition to a 5-minute warm-up and stretch and 5-minute cooldown and stretch,[18] with the places and times to accomplish walks to be determined by the woman (decisional control).

All women (ET and MT) received heart rate monitors to wear during walking (to be returned at 24 weeks), walking logbooks for self-monitoring, waist packs with the program logo, magnets imprinted with the toll-free program telephone number, and discount coupons to buy walking shoes. Women returned for individual appointments at 24 and 48 weeks post-baseline for health histories, BP checks, body composition measures, aerobic fitness tests, readjustment of exercise prescriptions, and completion of questionnaires. After each data collection, women were given $50 for their time. Newsletters with walking tips for AA women, staff news, and selected study findings were sent in the December holiday period and in the late spring.

ET Intervention. During the adoption phase ET women attended four weekly targeted workshops held at the ET community health center. The workshops, with approximately 6 to 10 women, lasted for 60 minutes and covered topics identified in prior focus groups[25] as important to AA women's needs, including benefits of walking, overcoming personal and environmental barriers to walking, and anticipating and handling relapses. Each workshop began with a 10-minute video featuring 6 AA female role models from the targeted communities discussing the workshop topic. The video was followed by a 50-minute group discussion facilitated by a staff member of the same ethnicity and having ties with the community.

The workshops were followed by tailored staff telephone calls weekly for 3 weeks (weeks 5 to 7), then every other week for 14 weeks (weeks 10 to 22), and monthly during the maintenance phase (beginning of week 25 to end of week 48). Facilitators assigned to a panel of participants called each woman per the study protocol. During these contacts adherence was reviewed based on the woman's report of walking frequency previously reported through an automated telephone response system (see below), as well as stage of readiness to change walking behavior. Stage-matched supportive feedback was then provided.[26]

MT Intervention. MT women who neglected to report their walking *via* the telephone response system for 3 consecutive weeks were given a reminder call to report their walks. No other contacts other than for appointments were made.

Measures

Members of the measurement team, including the exercise physiologist and nurse practitioner, were different than members of the ET and MT intervention and follow-up teams.

Demographic and Baseline Cardiovascular Characteristics. Demographics measured *via* questionnaire included age, marital status, number of children, income, education, and material hardship (i.e., the hardship measure used in the survey of income and program participation of the U.S. Census Bureau).[27] This measure consists of seven items regarding the ability to meet expenses for housing, utilities, telephone, and medical needs and two items regarding food adequacy. Hardship was scored as having none, one, or more than one.[27] Measures of cardiovascular risk included a history of diabetes and smoking on the questionnaire and total cholesterol, high-density lipoprotein (HDL), and low-density lipoprotein (LDL) determined on fasting venous blood samples at a Centers for Disease Control and Prevention standardized laboratory.[28] Total cholesterol and HDL were measured enzymatically. The ratio of total cholesterol to HDL was also reported. BP was measured by a validated device with appropriate cuff size using guidelines recommended by the National High Blood Pressure Education Program.[17] Systolic and diastolic BP were recorded for each arm after the participant had been sitting for 5 minutes. The two readings were averaged.

Outcome Measures. *Adherence to Walking.* Adherence was measured with the heart rate monitor and walking logbook for both the ET and MT groups. To enable self-monitoring and measure adherence to the exercise prescription, all women were asked to wear a Polar Accurex Plus Heart Rate Monitor (HRM USA, Warminster, Pennsylvania) during each walking session. Each monitor was programmed for target heart rate range based on the individual's baseline maximal aerobic fitness test and set to beep when the heart rate was not in range. Validation studies showed nearly identical recordings by the Polar Heart Rate Monitor and 12-lead electrocardiogram (within 0 to 1 beat per minute).[29] The wrist monitor can store individual data files for 67 hours of information so that each walking session had a minute by minute record of frequency, duration, and intensity.

The walking logs were structured to record the walking sessions for each week. The correlation between heart rate monitor data and walking log data for walking frequency was .87 in a prior study[30] and .83 for this study. All women (both ET and MT) were to report their walking every week from their logs *via* an automated telephone response system with a toll-free number that could be accessed any time and provided prompts for data entry. Progress reports were generated by the system regularly for staff tracking and follow-up by study staff. The correlations between the telephone response system and heart rate monitor data and walking log data were .79 and .73, respectively, for this study.

Adherence to walking frequency was calculated as the percent of the prescribed minimum 68 walks during the 24-week adoption phase (during the first 4 weeks women walked two times per week for conditioning and progressed to three to four times per week) and of 72 walks during the 48-week maintenance phase. Duration of walking (mean number of minutes walked as recorded by heart monitor or reported in walking log or response system) was calculated as the total number of minutes walked for all walking sessions divided by the number of walks reported. Intensity of walking (mean number of minutes walking within the prescribed intensity as in-

dicated by heart rate monitors) was calculated as the total number of minutes spent within the heart rate range for all walking sessions recorded divided by the number of walks recorded.

Physical Activity. Self-reports of physical activity were measured by the Centers for Disease Control behavioral risk factor surveillance survey (BRFSS)[31] module for vigorous and moderate activity, including household, work, leisure time, and transportation in a usual week. Based on the current recommendations for physical activity,[32] women were grouped into (1) meets recommendations (moderately active for $\geq$30 minutes 5 to 7 days per week or vigorously active for $\geq$20 minutes 3 to 5 days per week), (2) insufficiently active (some physical activity but not enough to meet recommendations), or (3) not active (not participating in any moderate or vigorous activity for $\geq$10 minutes at a time in a usual week). Test-retest reliability for a diverse racial/ethnic group of women was .69.[33]

Aerobic Fitness. A symptom-limited, incremental exercise test was conducted using a treadmill and the modified Bruce test protocol designed for use with low-fitness participants.[34] The original Bruce test was modified by adding two 3-minute stages. Time on treadmill was used as a marker of aerobic fitness. The American College of Sports Medicine metabolic equation for walking was used to estimate VO2 max[18] and was interpreted against age profiles for women using the YMCA's *Way to Physical Fitness.*[35]

Body Composition. Standing height (inches) was measured using a stadiometer and reported to .0625 inch. Weight (pounds) was measured using a balance beam (Health O Meter Professional Products, Bridgeview, Illinois) calibrated with standard weights and reported to .25 pound. Height and weight were measured with shoes off and lightweight gym clothing. BMI was calculated by dividing weight (converted to kilograms) by height (converted to meters) squared (kg/m^2).[18] Waist circumference was measured to the nearest .125 inch with a metal tape at the narrowest part of the torso above the umbilicus and below the xiphoid process.[36] Three waist circumference measures were taken and averaged.

Analyses

Before final statistical analysis, preliminary data were analyzed using univariate and graphical methods whenever applicable to facilitate inspecting and interpretation of data. Data were summarized using descriptive statistics (e.g., means and standard deviations for continuous variables; frequency and percentage for categoric variables). Baseline characteristics were compared using *t*-test (for continuous variables) or χ^2 test (for categoric data) to identify differences in demographics and cardiovascular characteristics between the ET and MT groups. In addition, paired *t*-tests and χ^2 tests were conducted to assess change in outcome measures between baseline and 24 weeks and baseline and 48 weeks. Finally, generalized linear mixed models were used to test the effects of the walking intervention on adherence, body composition (BMI and waist circumference), aerobic fitness (time on treadmill), and physical activity (BRFSS) over time. Mixed models permit the use of data to exhibit correlation and nonconstant variability and are superior for handling unbalanced research designs and missing data, enabling us to include all participants (intent to treat approach) in statistical analysis. Significance was established at an α level of .05. All statistical analyses were performed using SAS 9.1 statistical software (SAS Institute Inc., Cary, North Carolina).

RESULTS

Participants

Of 281 women who met the screening criteria, 156 were recruited to the ET community health center and 125 to the MT community health center (Figure 1). As we found during initial screening,[20] multiple attempts were often made to schedule and reschedule missed assessments. Therefore, not all women completed all assessments. As expected, more women had no assessments in the MT group than in the ET group. Overall, the primary reasons for no participation in assessments during adoption or maintenance were due to work (21% MT and 21% ET), personal health problems (16% MT and 29% ET), and family issues (21% MT and 9% ET).

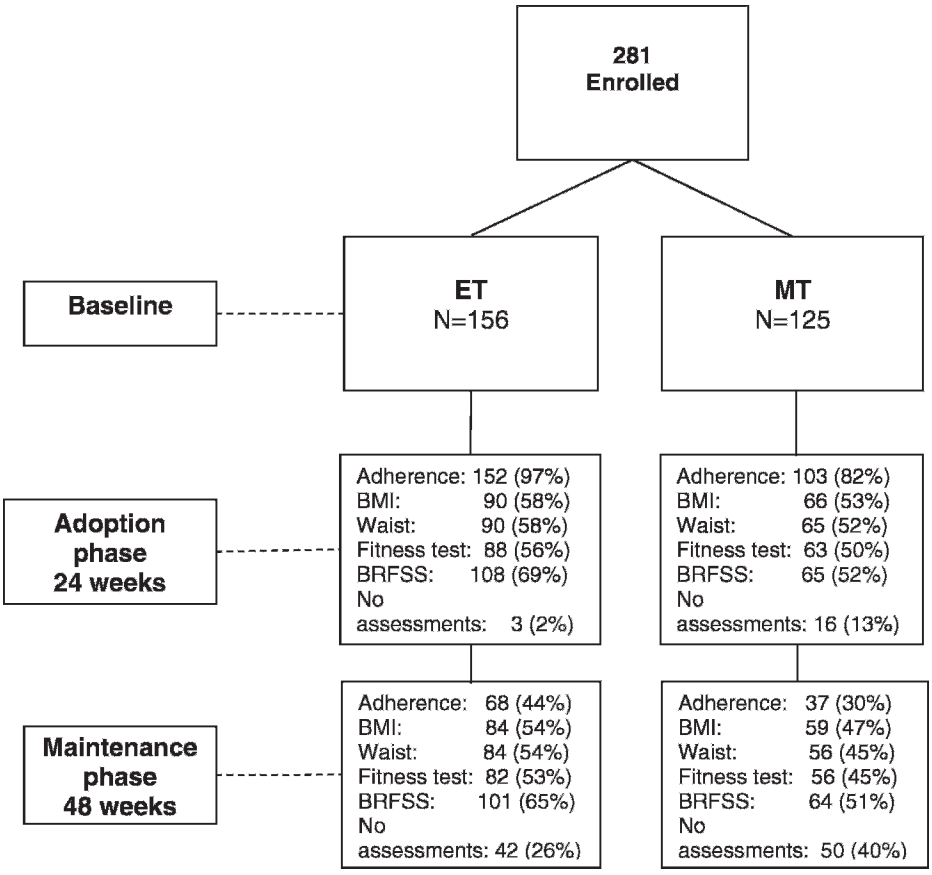
We further compared the baseline characteristics (Table 1) between those with and without assessments at 24 and 48 weeks. At 24 weeks, compared with women who completed assessment, those who did not were poorer (66.7% <\$30,000 vs. 36.9% >\$30,000, p = .05), were more likely to smoke (37.5% vs. 18.0%, p = .05), and had higher total cholesterol (215 mg/dL vs. 196 mg/dL, p = .02). Women missing the 48-week assessment were more likely to smoke than women who participated (26.5% vs. 15.7%, p = .04).

The ET and MT treatment groups did not differ in demographic characteristics (Table 1). At baseline, the women on average were in their late 40s (range, 40–65), fewer than 50% were married, and most had children. With few exceptions, all had finished high school, with just over one-third having college degrees. Most had moderate incomes, and more than 20% had experienced more than one material hardship in the past 12 months.

Total cholesterol was in the desirable range (<200 mg/dL) at baseline, whereas LDL cholesterol was near or above the optimal range (100–129 mg/dL) and HDL cholesterol was between high risk (<40 mg/dL) and optimum ($\geq$60 mg/dL) (Table 1).[37] The mean systolic BP was in the prehypertension stage I classification (120–139 mm Hg), whereas the mean diastolic BP was in the normal range (<80 mm Hg).[17] Thirty-four percent of the women had hypertension, defined as taking antihypertensive medication or having systolic BP $\geq$140 mm Hg or diastolic BP $\geq$90 mm Hg. The ET group had more women with diabetes and lower HDL levels, whereas the MT group on average had significantly higher diastolic BP.

As expected, the BRFSS self-report of all physical activities at baseline indicated that a low percentage of women were meeting recommendations for physical activity. Mean BMI (34.6) for participants was in the class I obesity category (30.0–34.9).[13] Only 9% were normal or underweight (BMI <24.9), whereas 20% were overweight

Figure 1
Study Flowchart



(BMI 25–29.9), 48% obese (BMI 30.0–39.9), and 22% extremely obese (BMI $\geq$40). Waist circumferences (mean, 38 inches) were greater than 35 inches, the cutoff for abdominal obesity.[37] The women averaged 11.5 minutes on the treadmill with the modified Bruce protocol.[34] After estimating VO_2 and adjustment for age, 43% of the women had below average to very poor fitness profiles. There were no differences between the two treatment groups on the baseline measures of the outcome variables.

Adherence to Walking

Adherence to walking during the adoption and maintenance phases was measured at 24 and 48 weeks (there was no baseline walking adherence data). Twenty-six (4 ET, 22 MT) of the 281 women did not return any walking adherence data during the 24-week adoption stage. Statistical tests revealed no significant differences in demographics between those 26 and the other 255. For those who returned walking adherence data at any point, 92% reported *via* automated telephone-response system, 48% *via* the walking log, and 69% *via* heart rate monitor. The data from these three sources were examined and cross-referenced. Walking data corresponding to the date on which walking took place were compared among the three sources, and duplicate data with identical information were eliminated.

At 24 weeks, ET women on average completed 45% of the recommended walks, whereas MT women completed only 29%. Regardless of having adherence data at both times for the women, only a slight decrease in adherence between 24 and 48 weeks was seen for both groups, with ET women completing 43% and MT women completing 24% of the recommended walks. However, when only women with adherence data for both 24 and 48 weeks were included, the decrease in adherence became significant for both groups (Table 2). There were significant group differences in walking adherence at both 24 and 48 weeks, with the ET group illustrating significantly higher walking adherence than the MT group during both adoption and maintenance phases.

There was no significant difference in walking intensity between the two treatment groups. However, compared with the MT group, the ET group averaged slightly longer walking durations during the first 24 weeks (28 minutes per walk vs. 25 minutes, $p = .16$). Overall, average adherence to intensity was only 10 minutes out of the expected 20 minutes for both groups.

Intervention Exposure and Adherence to Walking

During the adoption phase, the ET group attended an average of 2.4 of the

Table 1
Selected Characteristics by Treatment Group at Baseline

	Total (N = 281)	ET (n = 156)	MT (n = 125)	p*
Demographic characteristics				
Mean age, y (SD)	48.6 (6.0)	48.6 (6.3)	48.3 (5.5)	NS
Married, %	40.7	40.1	41.4	NS
Children				NS
Have children, %	88.1	86.9	89.7	
Mean number of children (SD)	2.1 (1.5)	2.3 (1.7)	2.0 (1.3)	
Education				NS
Did not complete high school, %	1.1	1.0	1.7	
Completed high school or GED, %	12.0	10.4	13.9	
Some college or vocational school, %	46.8	52.5	39.2	
Completed college or higher, %	40.1	36.1	45.2	
Work full time, %	69.8	68.6	71.2	NS
Personal annual income				NS
<$30,000, %	38.7	36.7	41.5	
$30,000–$60,000, %	50.0	53.3	45.3	
>$60,000, %	11.3	10.0	13.2	
Hardship				NS
No hardships, %	56.9	55.8	58.2	
One hardship, %	19.9	20.8	18.9	
More than one hardship, %	23.2	23.4	22.9	
Cardiovascular risk characteristics				
Type 2 diabetes, %	8.8	13.8	2.5	0.001
Current smoking, %	19.3	18.50	20.20	NS
Mean lipoproteins				
Total cholesterol, mg/dL (SD)	197.4 (35.7)	197.6 (35.2)	197.2 (36.4)	NS
HDL, mg/dL (SD)	55.6 (14.8)	54.9 (14.8)	58.7 (14.6)	0.033
LDL, mg/dL (SD)	121.3 (36.8)	122.8 (38.4)	119.4 (34.7)	NS
Mean blood pressure				
Systolic, mm Hg (SD)	120.8 (14.1)	120.5 (13.2)	121.2 (15.1)	NS
Diastolic, mm Hg (SD)	76.8 (9.9)	74.3 (8.8)	80.0 (10.20)	<0.001
Physical activity				
BRFSS				NS
Meet recommendation, %	20.1	18.7	21.8	
Insufficiently active, %	60.2	58.7	62.1	
Not active, %	19.7	22.6	16.1	
Mean body composition				
Weight, pounds (SD)	202.3 (43.8)	202.5 (47.2)	202.0 (39.5)	NS
BMI, kg/m^2 (SD)	34.6 (7.6)	34.9 (8.3)	34.1 (6.7)	NS
Waist circumference, inches (SD)	38.0 (5.8)	38.2 (6.0)	37.7 (5.5)	NS
Mean fitness				
Time on treadmill, min (SD)	11.47 (1.42)	11.47 (1.49)	11.46 (1.34)	NS

ET indicates enhanced treatment; MT, minimal treatment; NS, not significant; GED, general educational development equivalent; HDL, high-density lipoproteins; LDL, low-density lipoproteins; BRFSS, behavioral risk factor surveillance survey; and BMI, body mass index.
* *t*-test for continuous variables and χ^2 test for categoric variables.

four workshops and received an average of 7.2 tailored staff telephone calls. By design, contacts were much less frequent for the MT group, which averaged 3.7 telephone calls made only to arrange appointments and follow-up when walking data were not reported *via* the automated telephone response system. During the maintenance phase, the ET group averaged 4.5 tailored staff telephone calls, and the MT group averaged 2.1 telephone calls.

For the ET group, a significant relationship existed between the number of workshops attended and walking adherence at both 24 and 48 weeks ($r = .58$, $p < .001$; $r = .24$, $p = .05$, respectively). A significant correlation also existed for the ET group between the number of tailored staff telephone calls received and adherence at 24 weeks ($r = .24$, $p = .004$); however, the relationship was not significant at 48 weeks ($r = .08$, $p = .51$). For the MT group, there was no significant relationship between the number of staff telephone contacts and adherence at either 24 or 48 weeks.

Body Composition, Physical Activity, and Aerobic Fitness Outcomes

Table 2 illustrates outcome measures of body composition, physical activity, and fitness at baseline, 24, and 48 weeks. Using an on-treatment approach, only women with data on each outcome measure at all three data points were included. A paired *t*-test

Table 2
Outcome Measures by Treatment Group at Baseline, 24 Weeks, and 48 Weeks

	Group	n†	Baseline	24 Weeks	*p**	48 Weeks	*p***
Adherence to walking, %	ET	68	—	67.2	—	42.7	<**0.001**
	MT	37	—	45.8	—	23.6	<**0.001**
p (group difference)***				<**0.001**		<**0.001**	
Body composition							
BMI, kg/m^2	ET	63	35.0	34.3	0.152	34.6	0.513
	MT	41	33.4	33.2	0.214	33.0	0.186
p (group difference)			0.568	0.440		0.207	
Waist circumference, inches	ET	63	37.9	37.5	**0.044**	37.3	**0.001**
	MT	38	37.6	37.2	0.168	37.3	0.527
p (group difference)			0.466	0.564		0.632	
Physical activity							
BRFSS, % meeting recommendations	ET	77	19.5	44.2	<**0.001**	41.6	<**0.001**
	MT	43	23.3	41.8	<**0.001**	34.9	<**0.001**
p (group difference)			0.525	0.705		0.550	
Fitness							
Time on treadmill, min	ET	62	11.5	11.9	**0.011**	11.9	**0.024**
	MT	38	11.7	11.9	0.102	11.8	0.343
p (group difference)			0.575	0.945		0.824	

ET indicates enhanced treatment; MT, minimal treatment; BMI, body mass index; and BRFSS, behavioral risk factor surveillance survey.
† Includes only women with measures at all data points.
* Significance of change between baseline and 24 weeks except for adherence to walking, which had no baseline data.
** Significance of change between baseline and 48 weeks except for adherence to walking, which was significance of change between 24 and 48 weeks.
*** Significance of difference between ET and MT.

revealed no significant changes in BMI from baseline to 24 weeks and 48 weeks for either treatment group, showing trends toward stability of BMI. Whereas there were no significant changes in waist circumference over time in the MT group, the ET group exhibited significant reductions in waist circumference between baseline and 24 and 48 weeks. Both groups showed significant ($p < .05$) improvements from baseline to 24 and 48 weeks in the percent of women meeting recommendations for physical activity on the BRFSS ($p < .05$). In the ET group, there was an increase from 19.5% of the women meeting recommendations for physical activity at baseline to 44.2% at 24 weeks and 41.6% at 48 weeks. In the MT group, women meeting recommendations for physical activity increased from 23.3% at baseline to 41.8% at 24 weeks and 34.9% at 48 weeks. There was a trend toward an increase in time on treadmill over time for both groups, but only the ET group had a significant increase in time on treadmill from baseline to 24 and to 48 weeks.

Mixed Models

We further analyzed our data using the intent to treat approach by applying mixed models for every woman enrolled, regardless of how many assessments were completed, including those for whom there were no assessments at 24 or 48 weeks (Table 3). There was a significant negative time effect on adherence. Overall, walking adherence declined between 24 and 48 weeks for both treatment groups (Figure 2a). The intervention effect on adherence to walking was evidenced by the significant group effect. As hypothesized, the ET group exhibited significantly higher walking adherence than the MT group. The insignificant group × time interaction between the adoption and maintenance phases suggests that there was limited intervention effect on change in walking adherence during the maintenance phase.

Consistent with the on-treatment analysis, mixed models revealed a significant time effect on waist circumference, time on treadmill, and BRFSS self-report. There were positive improvements in waist circumference, time on treadmill, and BRFSS (Figure 2c–e) across the entire sample. Over time, there was a significant reduction in waist circumference and a significant gain in time on treadmill. There was also a significant increase in proportion of women who met the recommended physical activity level (BRFSS) between baseline and 24 weeks for both treatment groups. Whereas the increases in time on treadmill and BRFSS were greater in the ET group than the MT group during the adoption phase (Figure 2d and e), the group × time interaction was not significant. There was no notable change in BMI over time between the two treatment groups (Figure 2b). Although we hypothesized that body composition would remain stable or decrease slightly in the ET group only, we found this to be true for both groups.

DISCUSSION

In comparing the effectiveness of two treatments to increase home-based

Table 3
Mixed Models on Outcome Measures by Group, Time, and Group × Time Interaction

	B	SE	*p*
Adherence			
Group (reference ET)	−16.1165	6.3304	<0.001
Time	−13.6723	3.7596	<0.001
Group × time	−0.3584	6.2827	0.955
Body mass index			
Group (reference ET)	−0.3360	1.0934	0.759
Time	0.1718	0.2418	0.893
Group × time	−0.3935	0.3716	0.291
Waist circumference			
Group (reference ET)	−0.5540	0.7547	0.464
Time	−0.2735	0.1385	0.020
Group × time	0.04632	0.2146	0.829
Time on treadmill			
Group (reference ET)	−0.0943	0.2240	0.674
Time	0.0629	0.0600	0.041
Group × time	0.0649	0.0929	0.486
BRFSS			
Group (reference ET)	−0.2793	0.4464	0.532
Time	0.5311	0.1274	<0.001
Group × time	−0.1779	0.2064	0.389

ET indicates enhanced treatment; and BRFSS, behavioral risk factor surveillance survey.

walking in AA women, we found that adherence as measured by percentage of prescribed walks completed was significantly higher for the ET vs. MT group. Providing indirect support for greater adherence to walking in the ET group in the adoption phase, both treatment groups modestly increased their time on the treadmill (outcome measure using the modified Bruce protocol) from baseline, but the increase was greater for the ET group at 24 weeks. These observations support enhancing a home-based walking program with culturally targeted workshops and tailored telephone calls. However, it should be pointed out that this study did not have a comparison group receiving a nonculturally targeted intervention. Unlike earlier studies relying solely on self-report,[5–8,10–12] this study's use of objective and self-monitoring measures such as heart rate monitors, walking logs, and automated telephone response reporting provided data about the number of walks across the entire time frame. This allowed us to track adherence to the exercise prescription throughout the study, providing a more accurate, finely tuned indication of adherence that revealed differences between our two treatment groups.

Similar to two prior studies in AA women[11,12] in which improvements were found in self-reported physical activity but no difference between treatment groups, we also found self-reported improvements in physical activity with no difference between our treatment groups. The self-report measures might not be sensitive enough to detect differences between two treatment groups. In addition, women may have provided socially desirable responses. Women in both treatment groups came to the community intervention sites for their assessments and received telephone calls to schedule appointments (MT) or received tailored support (ET). Over time, they may have connected personally with their respective intervention staff.

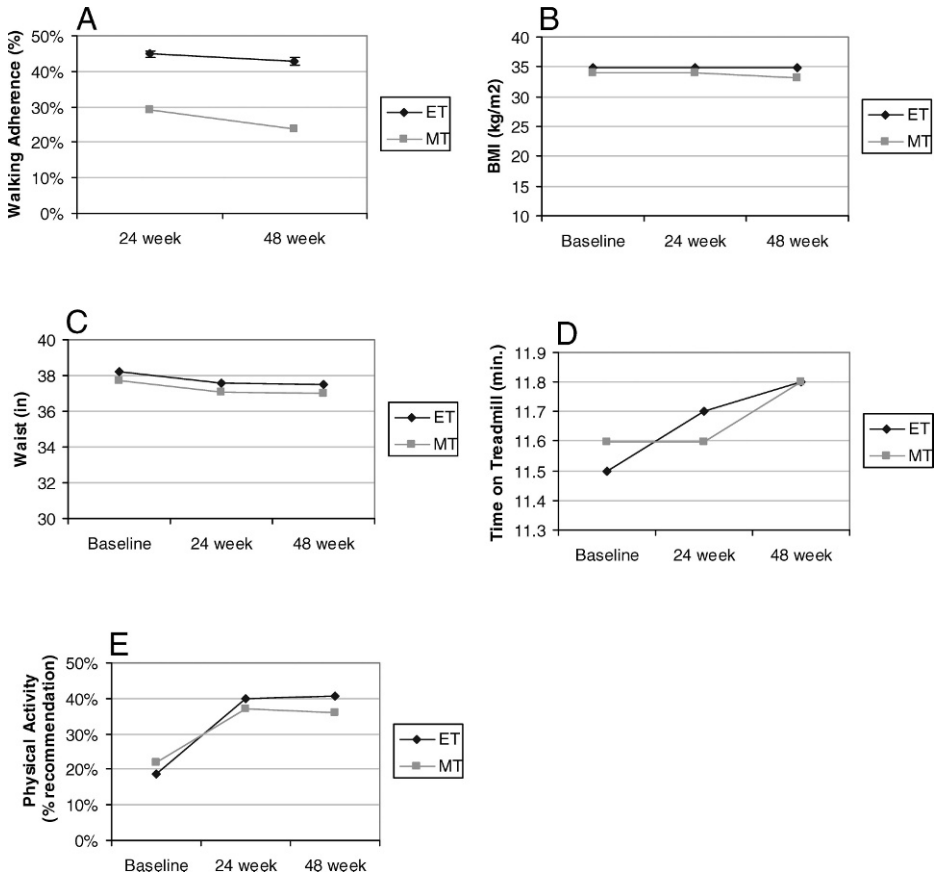
Adherence in the ET group averaged 45% of the expected walks during adoption (first 24 weeks). Since women were assumed not to be walking if no data were reported in any particular week, walks may have been underreported. At assessments during the study and in exit interviews, some women indicated that they walked but did not always register their walks in their logbooks or the automated telephone response system nor did they wear the heart rate monitors. However, there is no reason to suppose that the treatment groups differed in this dynamic.

The ET group showed a notable dose-response effect of workshop attendance on adherence. Moreover, although both groups received telephone calls, the number of tailored calls completed to ET participants influenced their adherence (albeit the effect was less than for workshops); the number of reminder calls completed to MT participants had no effect. The strength of the impact of workshop attendance and telephone calls on adherence supports prior findings showing that AA women look for buddies when adopting physical activity and that group sessions such as workshops and personal calls can facilitate the social support that influences their behaviors.[7,38]

Consistent with physical activity intervention trials in both white American and AA women, in both treatment groups there was a decline in adherence and self-reported physical activity during maintenance (weeks 25 through 48). However, the slope of decline for adherence was less in the ET group than the MT group. This suggests that while there were some residual effects of the intervention during maintenance, the monthly tailored phone calls that continued may not have been enough support for some women. Consideration might be given during the maintenance phase to bringing women back for booster workshops to provide the benefit of group support.

On average, when the women did walk, they walked for the expected duration. However, the average amount of time spent walking at moderate intensity was very low. This may be due to their reported concerns about the effect of perspiration on hair requiring expensive styling or the higher perception of exertion associated with obesity.[39] Evidence that health benefits are gained in the very least active by simply increasing their activity modestly[40] is suggestive that as an initial step, increasing the amount of walking throughout the day rather

Figure 2
Outcome Measures by Treatment Group at Baseline, 24 Weeks, and 48 Weeks*



*Data illustrated in the figure include all women enrolled in the study regardless how many measures they completed.

than completing a moderate-intensity walking session could be more efficacious in increasing physical activity in AA women. If the focus is changed to the amount of daily walking, instrumentation such as a pedometer could provide more expanded feedback than that provided by a heart rate monitor.

As expected with no dietary component in the study, BMI did not change. However, both treatment groups maintained their BMI for the duration of the study and did not gain weight on average. During study participation, there appears to have been some abatement in the chronic gradual weight gain of 1 to 2 pounds per year that middle-aged women experience on average.[41,42] On-treatment analysis showed a modest significant decrease in waist circumference for the ET alone. Using intent to treat analysis, the entire sample illustrated a significant decrease in waist circumference with no significant interaction between treatment group and time. This change is consistent with studies that have shown the positive effect of exercise alone (without dietary intervention) on abdominal fat and surrogate anthropometric measures such as waist circumference.[43] Also, change in abdominal fat can occur in the absence of weight change.[43] Neither the increase in fitness or decrease in waist circumference dissipated over time for either group.

Unlike some studies that have eligibility restrictions such as weight,[44] smoking,[12] and diabetes,[7] this sample closely mirrored the CVD risk factors prevalent in community-based AA women and captured those most in need for intervention. For example, the percentage of women with waist circumferences >35 inches (65.8%) or HDL cholesterol <40 mg/dL (8%) was similar to midlife AA women in the National Health and Nutrition Examination Survey (62.1% and 6.9%, respectively).[1,45] Also, the percentage of women who had hypertension (34%) or diabetes (9%) was only slightly lower, and overweight and obesity (90%; BMI ≥25) were slightly higher than the national average for AA women (41.4%, 13.2%, and 79.6%, respectively).[1]

One strength of this study was including a diverse sample of low- and moderate-income women, allowing subgroup comparisons on participation and further delineating this at-risk population. Similar to Resnicow et al.,[11] we found that women who did not complete assessments had lower incomes than those who completed. Strategies to reach this vulnerable group are needed and require further

investigation. Completion of assessments also was lower in smokers. Simultaneous interventions addressing both smoking behavior and physical activity have shown prior success[46,47] and may be needed to intervene effectively with smokers.

Use of a run-in period has been introduced into intervention trials in an attempt to identify and exclude those least likely to comply before enrollment.[48] We had no run-in; therefore, the barriers to participation in the study protocol were likely to more closely reflect those of most AA women. Participation rates might have been higher if those with the most difficulty meeting the protocol demands were excluded before enrollment. A potential study limitation was the assignment of the intervention to community health center sites. Although the communities surrounding the sites were similar initially, one site gradually changed in community demographics due to urban renewal. This may have created challenges for women to reach the study site if they moved. Another change over time was the movement from telephone land lines to cellular telephones, which may have caused underreporting because women may have been limiting their cell phone minutes.

SO WHAT? Implications for Health Promotion Practitioners and Researchers

In summary, compared with MT, we have shown that the ET with workshops led by AA role models and including culturally targeted videos followed by tailored telephone calls were effective in increasing physical activity in a vulnerable group of women. Evidence of some residual long-term treatment effects for the ET group was shown in that during maintenance, adherence dropped at a somewhat lower rate than in the MT group. Clinicians and researchers should note the potential impact of group support on increasing adherence to physical activity in AA women. However, the optimum number of workshops needed to sustain walking remains unknown. Further attention must be given to weighing the cost-benefit ratio of workshops and tailored staff phone calls vs. MT. This study was among the first to use an automated telephone response system to facilitate and motivate participants to monitor their walking. Testing of this methodology in comparison with personal live telephone calls, as is currently being done in the community health advice by telephone project, warrants study.[49]

Acknowledgment

This project was funded by the National Institute of Nursing Research, National Institutes of Health (RO1 NRO4234) and the Center for Reducing Risks in Vulnerable Populations NIH/NINR P30 NR09014.

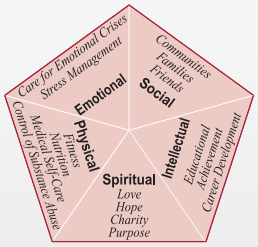
References

1. American Heart Association. *Heart Disease and Stroke Statistics 2007 Update*. Dallas, Tex: American Heart Association; 2006.
2. Krummel DA, Koffman DM, Bronner Y, et al. Cardiovascular health interventions in women: what works? *J Womens Health Gend Based Med*. 2001;10:117–136.
3. Banks-Wallace J, Conn V. Interventions to promote physical activity among African American women. *Public Health Nurs*. 2002;19:321–335.
4. Kumanyika S, Shults J, Fassbender J, et al. Outpatient weight management in African-Americans: the healthy eating and lifestyle program (HELP) study. *Prev Med*. 2005; 41:488–502.
5. Clark D, Stump T, Damush T. Outcomes of an exercise program for older women recruited through primary care. *J Aging Health*. 2003;15:567–585.
6. Keller CS, Robinson B, Pickens L. Comparison of two walking frequencies in African American postmenopausal women. *ABNF J*. 2004;15:3–9.
7. Newton R, Perri M. A randomized pilot trial of exercise promotion in sedentary African-American adults. *Ethn Dis*. 2004;14:548–557.
8. Izquierdo-Porrera A, Powell C, Reiner J, Fontaine K. Correlates of exercise adherence in an African American church community. *Cultur Divers Ethnic Minor Psychol*. 2002;8:389–394.
9. Banks-Wallace J, Conn V. Changes in steps per day over the course of a pilot walking intervention. *ABNF J*. 2005;16:28–32.
10. Yanke L, Becker DM, Moy T, et al. Project joy: faith based cardiovascular health promotion for African American women. *Public Health Rep*. 2001;116:68–81.
11. Resnicow K, Jackson A, Blissett D, et al. Results of the healthy body healthy spirit trial. *Health Psychol*. 2005;24:339–348.
12. Yancey A, McCarthy W, Harrison G, et al. Challenges in improving fitness: results of a community-based, randomized, controlled lifestyle change intervention. *J Womens Health*. 2006;15:412–428.
13. National Heart, Lung, and Blood Institute. *Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults: The Evidence Report*. Bethesda, Md: National Heart, Lung, and Blood Institute; 1998.
14. Jakicic JM, Clark K, Coleman E, et al. American College of Sports Medicine position stand. Appropriate intervention strategies for weight loss and prevention of weight regain for adults. *Med Sci Sports Exerc*. 2001;33:2145–2156.
15. Kouvelis A, Harper D, Thomas S. *Community Area Health Inventory 1992–2002*. Chicago, Ill: Chicago Department of Public Health Epidemiology Program; 2004.
16. Marcus BH, Rakowski W, Rossi JS. Assessing motivational readiness and decision making for exercise. *Health Psychol*. 1992;11:257–261.
17. *Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure*. Bethesda, Md: U.S. Department of Health and Human Services, National Heart, Lung, and Blood Institute; 1997. NHLBI publication 98-4080.
18. American College of Sports Medicine. *ACSM's Guidelines for Exercise Testing and Prescription*. 7th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2005.
19. American Diabetes Association. Physical activity/exercise and diabetes. *Diabetes Care*. 2004;27:S58–S62.
20. Wilbur J, McDevitt J, Wang E, et al. Recruitment of African American women to a walking program: eligibility, ineligibility and attrition during screening. *Res Nurs Health*. 2006;29:176–189.
21. Cox C. An interaction model of client health behavior: theoretical prescription for nursing. *ANS Adv Nurs Sci*. 1982; 5:41–56.
22. Cox C. A model of health behavior to guide studies of childhood cancer survivors. *Oncol Nurs Forum*. 2003;30: E92–E99.
23. Wilbur J, Miller MA, Chandler P, McDevitt J. Determinants of physical activity and adherence to a 24-week home-based walking program in African American and Caucasian women. *Res Nurs Health*. 2003;26:213–224.
24. *Theory at a Glance: A Guide for Health Promotion Practice*. Bethesda, Md: U.S. Department of Health and Human Services, National Cancer Institute; 2005. NCI publication 05-3896.
25. Wilbur J, Chandler P, Dancy B, et al. Environmental, policy and cultural factors related to physical activity in urban, African American women. *Women Health*. 2002;36:17–28.
26. Blair SN. *Active Living Every Day*. Champaign, Ill: Human Kinetics; 2001.
27. Bauman AE, Sallis JF, Dzewaltowski DA, Owen N. Toward a better understanding of the influences on physical activity: the role of determinants, correlates, causal variables, mediators, moderators, and confounders. *Am J Prev Med*. 2002;23:5–14.

28. National Cholesterol Education Program. Second report of the expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel II). *Circulation.* 1994; 89:1333–1445.
29. Ebbeling CB, Ebbeling CJ, Ward A, Rippe JM. *Comparison Between Palpated Heart Rates and Heart Rates Observed Using the Polar Favor Heart Rate Monitor During an Aerobics Exercise Class.* Worcester, Mass: University of Massachusetts Medical School; 1991. Report EPNL-1991-010.
30. Wilbur J, Chandler P, Miller A. Measuring adherence to a women's walking program. *West J Nurs Res.* 2001;23:8–32.
31. Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System. Available at: http://www.cdc.gov/brfss/questionnaires/questionnaires.htm. Accessed July 20, 2007.
32. Pate RR, Pratt M, Blair SN, et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA.* 1995;273:402–407.
33. Evenson KR, Eyler AA, Wilcox S, et al. Test-retest reliability of a questionnaire on physical activity and its correlates among women from diverse racial and ethnic groups. *Am J Prev Med.* 2003;25(3 Suppl 1): 15–22.
34. American Heart Association. *Exercise Testing and Training of Apparently Health Individuals: A Handbook for Physicians.* Dallas, Tex: American Heart Association; 1972.
35. Golding L, Myers C, Sinning W. *Y's Way to Physical Fitness.* Champaign, Ill: Human Kinetics; 2000.
36. Heyward V, Wagner D. *Applied Body Composition Assessment.* Champaign, Ill: Human Kinetics; 2004.
37. *Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III).* Bethesda, Md: U.S. Department of Health and Human Services, National Heart Lung and Blood Institute; 2002. NHLBI publication 02-5215.
38. Walcott-McQuigg J, Chen S, Davis K, et al. Weight loss and weight loss maintenance in African American women. *J Natl Med Assoc.* 2002;94:686–694.
39. Whitt M, DuBose KD, Ainsworth BE, Tudor-Lock C. African American, native American and Caucasian women: the cross-cultural activity participation study. *Health Educ Behav.* 2004;31: 455–565.
40. Blair SN, LaMonte M, Nichaman M. The evolution of physical activity recommendations: how much is enough? *Am J Clin Nutr.* 2004;79:913S–920S.
41. Brown W, Williams L, Ford J, et al. Identifying the energy gap: magnitude and determinants of five-year weight gain in middle-aged women. *Obes Res.* 2005; 13:1431–1441.
42. Hill J, Wyatt H, Reed G, Peters J. Obesity and the environment: where do we go from here? *Science.* 2003;299:853–855.
43. Kay SJ, Singh MA. The influence of physical activity on abdominal fat: a systematic review of the literature. *Obes Rev.* 2006;7:183–200.
44. Wilbur J, Chandler P, Dancy B, Lee H. Correlates of physical activity in urban Midwestern African-American women. *Am J Prev Med.* 2003;253(Suppl 1):45–52.
45. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults. *JAMA.* 2002;287:356–359.
46. Marcus B, Albrecht A, King T, et al. The efficacy of exercise as an aid for smoking cessation in women: a randomized controlled trial. *Arch Intern Med.* 1999;159:1229–1234.
47. Persky I, Spring B, Vander Wal JS, Pagoto S. Adherence across behavioral domains in treatment promoting smoking cessation plus weight control. *Health Psychol.* 2005;24:153–160.
48. Morss GM, Jordan AN, Kinner JS, et al. Dose-response to exercise in women aged 45–75 (DREW): design and rationale. *Med Sci Sports Exerc.* 2004;36:336–344.
49. King A, Friedman R, Marcus B, et al. Harnessing motivational forces in the promotion of physical activity: the community health advice by telephone (CHAT) project. *Health Educ Res.* 2002;17:627–636.

AMERICAN JOURNAL of
Health Promotion

A fusion of the best of science and the best of practice — together, to produce the greatest impact.



DIMENSIONS OF OPTIMAL HEALTH

Definition of Health Promotion

"Health Promotion is the art and science of helping people discover the synergies between their core passions and optimal health, enhancing their motivation to strive for optimal health, and supporting them in changing lifestyle to move toward a state of optimal health. Optimal health is a dynamic balance of physical, emotional, social, spiritual and intellectual health. Lifestyle change can be facilitated through a combination of learning experiences that enhance awareness, increase motivation, and build skills and most importantly, through creating opportunities that open access to environments that make positive health practices the easiest choice."

(O'Donnell, *American Journal of Health Promotion,* 2009, 24,1,iv)

" The *American Journal of Health Promotion* provides a forum for that rare commodity — ***practical and intellectual exchange between researchers and practitioners***. "

Kenneth E. Warner, PhD
Avedis Donabedian Distinguished University Professor of Public Health
School of Public Health, University of Michigan

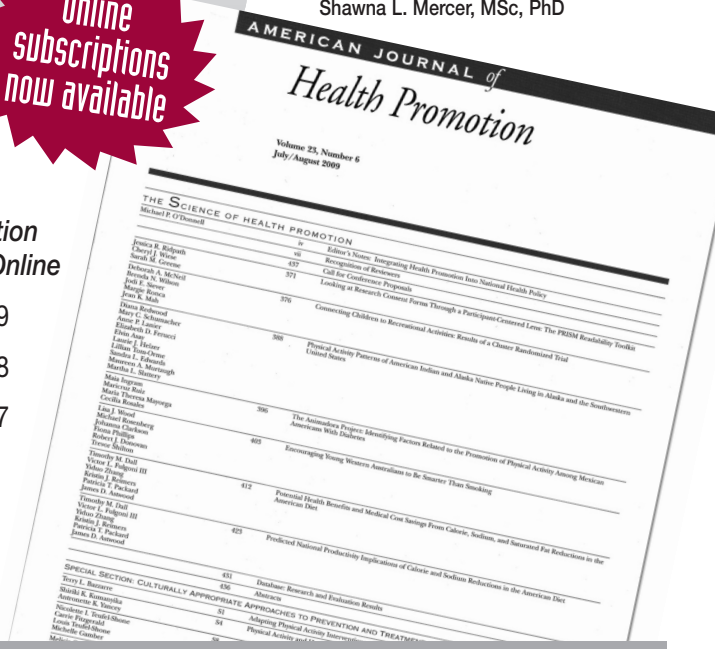
" The contents of the *American Journal of Health Promotion* are ***timely, relevant,*** and most important, ***written and reviewed by the most respected researchers in our field***. "

David R. Anderson, PhD
Vice Programs and Technology, StayWell Health Management

Stay on top of the science and art of health promotion with your own subscription to the American Journal of Health Promotion.

Subscribe today...

Online subscriptions now available



ANNUAL SUBSCRIPTION RATES: (Availalble 1/1/10. Good through 12/31/10)

	Individual Print & Online	*Institution Print Only*	*Institution Online Only*	*Institution Print & Online*
U.S.	$139	$177	$359	$359
Canada and Mexico	$148	$186	$359	$368
Other Countries	$157	$195	$359	$377

CALL 800-783-9913 (U.S. ONLY) or 818-760-8520
OR FIND US ON THE WEB AT
http://www.HealthPromotionJournal.com