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Effects of a primary care weight management intervention on physical activity in low-income African American women

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EFFECTS OF A PRIMARY CARE WEIGHT MANAGEMENT INTERVENTION ON PHYSICAL ACTIVITY IN LOW-INCOME AFRICAN AMERICAN WOMEN

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Table of Contents

Abstract

Although physical inactivity is associated with numerous medical conditions, most individuals do not engage in recommended levels of physical activity. Certain subgroups of the population are particularly inactive, including women, African Americans, and individuals with lower income and less education. While research suggests that interventions targeting physical activity can produce significant improvements in activity and cardiorespiratory fitness, there is less research examining physical activity interventions for these at-risk groups. In particular, there is a lack of research examining primary care physical activity interventions among low-income, African American women. The purpose of the current study was to examine the effects of a physician-delivered physical activity intervention that served as part of a multi-component weight loss intervention for predominantly low-income, African American women.

Current results suggest that the primary care intervention did not produce significant improvements in physical activity as measured by self-reported activity. Also, the intervention was not associated with improved cardiorespiratory fitness as measured by heart rate recovery following a brief exercise. However, a significantly greater proportion of intervention participants achieved current activity recommendations of at least 150 minutes per week of moderate-intensity physical activity. Over 90% of intervention participants achieved this level of activity at post-treatment compared with approximately 77% of standard care participants, $\chi^2(1, N = 139) = 4.70, p < .03$. These mixed results highlight the need for continued research examining physical activity interventions implemented in primary care settings as well as programs targeting low-income, African Americans.

Introduction

Physical Activity and Health

Physical activity, defined as bodily movement resulting in increased energy expenditure above that achieved during sedentary behavior, is associated with a number of important health outcomes, including all-cause mortality. Individuals who engage in at least moderate levels of physical activity and/or who have better levels of cardiorespiratory fitness have lower overall mortality rates than inactive individuals (Blair, Kohl, & Barlow, 1993; Paffenbarger, Lee, & Leung, 1994). Prospective studies have shown that sedentary individuals have twice the risk of dying over follow-up intervals that have varied from several months to several years (U.S. Department of Health and Human Services, 1996). Improvements in physical activity levels have been associated with decreased risk, as inactive individuals who increased their activity levels and cardiorespiratory fitness demonstrated decreased mortality risk at follow-ups (Blair et al., 1995; Paffenbarger et al., 1993).

Among specific disease types, cardiovascular disease (CVD) has been the most extensively studied for its relationship with physical activity. A number of epidemiological studies have demonstrated an inverse, dose-response relationship between physical activity levels and mortality due to CVD (U. S. Department of Health and Human Services, 1996). Physical activity has been associated with several specific forms of CVD, including coronary heart disease (e.g., myocardial infarction, angina pectoris) and hypertension (HTN). Coronary heart disease (CHD) shares a significant, dose-response relationship with physical activity, and one meta-analysis indicated a nearly 2-fold increase in CHD risk for inactive versus highly active individuals (Berlin & Colditz, 1990). Although the risk of CHD can be reduced by physical activity, some evidence suggests this relationship may be mediated by other effects of physical activity, such as improvements in cholesterol, blood pressure, and body mass index (Rodriguez et al., 1994). Longitudinal studies have shown that higher levels of physical activity are associated with a 30% decreased risk of developing HTN at follow-up among men and women (Folsom, Prineas, Kaye, & Munger, 1990; Paffenbarger, Wing, Hyde, & Jung, 1983).

Physical activity has been implicated in the etiology of other medical conditions as well, including colon cancer, type-2 diabetes mellitus (non-insulin dependent), and osteoporosis. Several longitudinal studies have indicated a significant, inverse relationship between physical activity levels and incidence of colon cancer. The risk of developing colon cancer has been associated with both occupational physical activity (Brownson, Chang, Davis, & Smith, 1991; Fraser & Pearce, 1993) and leisure-time physical activity (Gerhardsson, Steineck, Hagman, Rieger, & Norell, 1990; Giovannucci et al., 1995; Longnecker, DeVerdier, Frumkin, & Carpenter, 1995) among men and women. For type-2 diabetes mellitus, research indicates individuals with low levels of physical activity were significantly more likely to develop the disease than those with higher levels of activity (Kaye, Folsom, Sprafka, Prineas, & Wallace, 1991; Manson et al., 1991). Osteoporosis, which involves the diminishment of bone mass and structure, may be combated with physical activity as well. Physical activity serves to build and maintain bone mass, which may be particularly important for women since they are at greater risk of developing osteoporosis later in life (U.S. Department of Health and Human Services, 1996).

Physical inactivity is related to overweight and obesity (Ching et al., 1996; French et al., 1994), which is a significant risk factor for a number of chronic medical conditions, including type-2 diabetes, HTN, and elevated cholesterol. Physical activity is commonly recommended as a component of weight loss interventions (U.S. Department of Health and Human Services, 1996). While diet restriction is more successful in attaining initial weight loss, research suggests that physical activity is important in maintaining weight and preventing weight regain (Leermakers, Dunn, & Blair, 2000). Jakicic, Winters, Lang, and Wing (1999) found that women who participated in a weight loss intervention and maintained recommended levels of physical activity after treatment were more successful in preventing weight regain, while women whose physical activity declined showed significant regain.

In addition to physical health outcomes, physical activity can have positive effects on mental health and functioning as well. Research with cross-sectional community samples has suggested that physical activity is associated with decreased incidence of depressive and anxiety symptoms (Ross & Hayes, 1988; Stephens, 1988). Longitudinal studies have also indicated that lower levels of physical activity were predictive of subsequent depressive symptoms (Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991; Farmer et al., 1988; Paffenbarger et al., 1994). In addition, physical activity has been positively associated with health-related quality of life, including self-esteem, positive affect, perceived physical functioning, and self-efficacy (U.S. Department of Health and Human Services, 1996).

Prevalence of Physical Activity, Inactivity, and Medical Conditions

Despite the numerous health benefits of physical activity, few individuals report a physically active lifestyle. According to several recent national surveys, approximately 25% of U.S. adults are physically inactive during leisure-time activities. Certain sub-groups of the U.S. population are more inactive than others. Inactivity is more prevalent among women, ethnic minorities, older individuals, and individuals with lower income and less education (King et al., 1992; Sallis et al., 1985; U.S. Department of Health and Human Services, 1996). For example, 22% of Caucasians report no leisure time physical activity while 33% of African Americans report being inactive. In addition, overweight and obese individuals are less likely to engage in physical activity compared with normal-weight individuals (King et al., 1992). Geographical comparisons of physical activity indicate that Louisiana has the highest rates of physical inactivity in the U.S., with 34% of the state's population reporting no leisure-time activity (Centers for Disease Control and Prevention, 2004). In contrast to physical inactivity, about one-fifth of U.S. adults engage in appropriate levels of regular, sustained activity. Again, rates of regular physical activity are lower among ethnic minorities, women, and individuals from lower educational and economic backgrounds. In a review of the literature, King et al. (1992) concluded that African American women, those with less education, overweight individuals, and the elderly are among the most inactive individuals in the U.S.

Ethnic and socioeconomic differences are also apparent in the prevalence rates of various chronic medical conditions associated with inactivity. Death rates from heart disease are 30% higher among African Americans compared with Caucasians, and death rates due to stroke are 43% higher among African Americans relative to Caucasians (NCCDPHP, 2004). Of all ethnic groups, African Americans have the highest death rates due to colorectal cancer (Centers for Disease Control and Prevention, 2004). Further, the prevalence of diabetes and hypertension is higher among African Americans compared with Caucasians (NCCDPHP, 2004). Overweight and obesity are more prevalent among African Americans, which serves as an additional risk factor for the previously mentioned chronic diseases (Flegal, Carroll, Ogden, & Johnson, 2002). Lower income and education are also risk factors for increased rates of heart disease, diabetes, and obesity (Pleis, Benson, & Schiller, 2003). These chronic conditions are associated with lower levels of physical activity, which is particularly problematic for ethnic minorities and individuals of lower socioeconomic status. Therefore, the need to promote physical activity among these at-risk populations is particularly important for researchers and clinicians.

Definition and Recommendations for Physical Activity

As mentioned previously, physical activity involves bodily movement that results in increased energy expenditure above that achieved at rest. Physical activity is commonly categorized into types dependent on location and purpose of the activity. Physical activity can include occupational, household, and leisure-time activities. Leisure-time activities can be further separated into competitive sports, non-competitive recreational activities, and exercise training. Therefore, exercise is a sub-type of physical activity. While exercise is performed for the sole purpose of increasing physical fitness, physical activity is a broader construct that includes structured activities as well as activities not specifically intended to improve fitness levels (Pate et al., 1995; U.S. Department of Health and Human Services, 1996).

Current physical activity guidelines endorsed by the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) suggest that individuals should engage in a minimum of 30 minutes of at least moderate physical activity on most days of the week that results in at least 150 minutes of weekly activity. Although this is the minimum amount of physical activity recommended, these guidelines also state that daily physical activity would be preferable to achieve greater health benefits (Pate et al., 1995; U.S. Department of Health and Human Services, 1996). It is recommended that currently sedentary individuals gradually increase their activity over time until the outlined level of activity is achieved. Contrary to earlier recommendations, it is advisable for sedentary individuals to engage in short-duration activities with the goal of increasing the duration of activity until recommended guidelines are reached. A lifestyle change approach to achieving appropriate levels of physical activity (e.g., taking the stairs instead of elevator, parking farther away when shopping) have also become increasingly recommended. However, more traditional, structured approaches to physical activity (e.g., aerobic classes, swimming, jogging) are still recommended, particularly in conjunction with the lifestyle approach (Pate et al., 1995).

Measurement of Physical Activity

There are a number of approaches to measuring physical activity that have been utilized in clinical and epidemiological research. The most commonly used method has been self-report of physical activity patterns. More direct measures of physical activity include supervised observation of activity or the use of monitoring equipment that records bodily movement. Another technique in physical activity research is to gather data on participants' cardiorespiratory fitness to determine if physical fitness improves as a result of increased physical activity. Wood (2000) concluded that no self-report or objective indicator of physical activity completely and accurately measures this construct. Therefore, it may be advisable to utilize more than one type of measure to better assess physical activity (Wood, 2000).

Self-report of Physical Activity

A number of self-report measures have been created to assess physical activity, which include structured interviews, daily diaries, or self-report surveys. Among different types of self-report measures (e.g., interviews, self-administered surveys, activity diaries), Sallis and Saelens (2000) suggest that interview-based measures have shown the strongest validity when measured against more objective measures of activity. Self-report measures of physical activity have shown significant correlations with other objective measures of physical activity such as physical/aerobic capacity tests (Booth, Owen, Bauman, & Gore, 1996) and physical activity data obtained from mechanical devices worn to record activity (Hayden-Wade, Coleman, Sallis, &

Armstrong, 2003; Matthews & Freedson, 1995). Self-report measures have also demonstrated strong test-retest reliability (Sallis & Saelens, 2000). The greatest disadvantage of self-report measures of physical activity includes the potential bias (whether purposefully or due to errors in memory) respondents may use in reporting activity levels.

One of the most commonly used self-report measures of physical activity is the Physical Activity Recall (PAR; Sallis et al., 1985). The PAR is a structured interview administered by trained personnel that assesses the duration and intensity of physical activity over a one-week period. Based on the respondent's self-reported activity, daily energy expenditure associated with the activity can be calculated. The PAR assesses activities divided into categories of light, moderate, hard, and very hard activity. The interview also provides the participant with examples of activities that would fall into each of the categories assessed to ensure the correct classification of activity and to prompt respondents to recall all appropriate activities. Because of its relative ease and low cost of administration and its established psychometric properties, the PAR has been used as a primary outcome measure in a number of epidemiological and clinical studies on physical activity (e.g., Baranowski et al., 1990; Bock, Marcus, Pinto, & Forsyth, 2001; Sallis et al., 1985).

Other Measures of Physical Activity

Other objective measures of physical activity and energy expenditure have also been utilized. Mechanical or electronic devices that can be worn by individuals that record the person's movement provide an objective index of physical activity levels. One such device is the accelerometer, which can collect data on movement in one plane (uniaxial) or three planes (triaxial). Uniaxial accelerometers are typically worn on the hip to measure body acceleration (usually vertical acceleration). Triaxial accelerometers measure horizontal, vertical, and mediolateral movement (Freedson & Miller, 2000). Accelerometers can be equipped with memory capacity that allows for recording activity over a specified period of time. However, these devices do not provide information on the type and pattern of physical activity. Accelerometers also may not accurately capture certain types of activity, such as cycling or uphill walking/jogging (Freedson & Miller, 2000; Jacobs, Ainsworth, Hartman, & Leon, 1993). Monitoring devices also have the potential to malfunction. Perhaps the most salient limitation of such measures is the cost associated with them, making them impractical for many research and clinical settings. Because accelerometers have shown high correlations with self-report measures of physical activity, some researchers have suggested that self-report measures are more feasible for most research settings (Miller, Freedson, & Kline, 1994).

Heart rate monitors can also be used as an objective measure of physical activity. Monitors equipped with internal clocks allow for recording heart rate over specified time intervals, which can be totaled to calculate an estimate of energy expenditure. However, heart rate can fluctuate independent of physical activity in response to changes in body temperature, environmental humidity, and emotional stress, all of which can introduce error into this measurement (Freedson & Miller, 2000). Another objective and more accurate measure of energy expenditure includes the doubly labeled water technique (Ravussin, Harper, Rising, & Bogardus, 1991; Starling, 2002). This procedure is based on the finding that O_2 levels in body water are comparable to O_2 levels in respiratory CO_2, which provides an index of energy expenditure. Thus, O_2 in body water can be tracked and measured to determine CO_2 production and energy expenditure. In this procedure, hydrogen and oxygen isotopes are enriched with a tracer compound and their elimination is measured through urine samples. This is used to calculate daily CO_2 production, which serves as a measure of energy expenditure (Starling, 2002). While very accurate, this procedure is impractical for most studies due to the cost and time required by personnel and participants.

Measures of Cardiorespiratory Fitness

As mentioned previously, physical activity has demonstrated a strong association with cardiorespiratory fitness. Therefore, measurement of changes in cardiorespiratory fitness can be a useful means of assessing physical activity levels. This often involves having participants complete graded treadmill or stationary bicycle exercises. Another activity used to measure physical fitness has been step-tests, which do not require as much equipment or time as treadmill or cycling exercises. During step-tests, participants step up and down from a step of specified height for a brief period. In physical activity tests, participants are often instructed to engage in the activity over a specified time period until an age-specific heart rate is achieved. While maximum capacity tests have patients attempt to reach this maximum predicted level, submaximal tests have patients reach a pre-specified percentage of this level (e.g., 75% of maximum heart rate level).

During such work capacity tests, expired air can be collected from individuals, which is used to determine levels of O_2 and CO_2. VO_{2max} is defined as the maximum amount of oxygen an individual can use while exercising. Improvements in VO_{2max} can be used as an indication of improved cardiovascular functioning following increased physical activity (Fletcher et al., 1992). Other measures include recovery of heart rate or other indices of cardiovascular functioning (e.g., blood pressure) following such activities. Measures are taken before and at various intervals following the exercise, which provides a measure of cardiovascular recovery following activity. Heart rate and systolic blood pressure increase during physical activity linearly with oxygen consumption, and the recovery of these measures can be used as an indicator of cardiovascular functioning (Fletcher et al., 1992). Heart rate recovery following exercise termination has proven to be an important indicator of mortality. Specifically, a delayed heart rate recovery after exercise was predictive of increased risk of all-cause mortality up to six years later even after controlling for various cardiovascular risk factors (Cole, Blackstone, Pashkow, Snader, & Lauer, 1999).

Theoretical Basis of Physical Activity Interventions

Given the importance of physical activity to various health outcomes, the low rates of current physical activity, and the growing ability to accurately measure activity, it is important to develop interventions that increase physical activity among sedentary individuals. A number of psychological theories have been applied to physical activity behavior change, and many interventions have been based on one or more of these theoretical frameworks. Two of the most common theories used in developing physical activity interventions include Social Cognitive Theory and the Transtheoretical Model of behavior change. In addition, the Elaboration Likelihood Model has been used to explain the rationale for tailored interventions in general and why tailored materials can be effective in producing behavior change.

Social Cognitive Theory

Social cognitive theorists assert that behavior change occurs as a function of several factors, including environmental variables and individuals' attitudes and behaviors (Bandura, 1977; Bandura, 1986). Environmental variables include social support and modeling of healthy and/or unhealthy behaviors. Observational learning plays an important role in the adoption of behaviors in this theory. Personal factors are a very important component of Social Cognitive Theory (SCT) and include self-efficacy and outcome expectancies. Self-efficacy is defined as an individual's belief in his or her ability to complete a specific behavior. Expectancies deal with an individual's attitude about the expected outcome of a given behavior (e.g., lowered blood pressure following increased physical activity) and how important this outcome is for the individual. Techniques based on SCT that have been used in physical activity interventions include goal-setting, feedback, self-monitoring, self-reinforcement, stimulus control, and social support (King et al., 1992; Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998).

The Transtheoretical Model

One of the models most frequently applied to physical activity interventions is the Transtheoretical Model (TTM) of behavior change. TTM is based on the notion that individuals differ in their motivational readiness to engage in specific health behaviors. The goal of interventions based on this theory is to tailor the intervention experience to the individual, taking into account his/her motivational readiness for change. Individuals differing in their readiness for behavior change generally receive different messages or assignments with the goal of moving them toward increased readiness for change and ultimately behavior change itself. TTM is based on several constructs, including stages of change, processes of change, self-efficacy, and decisional balance (Prochaska, DiClemente, & Norcross, 1992).

According to this theory, individuals progress through five stages of change when adopting or changing health behaviors. The first stage, precontemplation, includes individuals who have not considered and/or have no intention of making changes to their physical activity levels. Individuals in the second stage (contemplation) are more aware of the benefits of physical activity and have considered increasing their activity levels but have not started making any changes. In the third stage (preparation), individuals are aware of the need to make changes and are making plans to do so in the next month. The fourth stage, or action stage, includes the individuals who have actually started making changes to their physical activity. The final stage of maintenance involves adhering to the behavior for at least six months. Avoiding the relapse of slipping back to earlier stages is a primary goal of the maintenance stage. Individuals do not necessarily progress through these five stages in a linear fashion but instead may go back and forth between stages and/or cycle through stages at various points in time (Prochaska et al., 1992).

The processes of change as conceptualized in TTM include different techniques used by individuals in different stages of change (Prochaska & DiClemente, 1983). For example, individuals in earlier stages of change are more likely to use more cognitive techniques such as consciousness-raising (e.g., gaining new information about the benefits of physical activity). Behavioral processes of change are more likely to be used in later stages of change such as action and maintenance. These processes include techniques such as counter conditioning (e.g., substituting alternative behaviors for previously unhealthy behaviors), reinforcement management (e.g., rewarding oneself for making changes to behavior), and stimulus control (e.g., avoiding triggers that have previously resulted in unhealthy behaviors).

Other important constructs included in TTM are decisional balance and self-efficacy. Decisional balance refers to the process individuals engage in when weighing the pros and cons of behavior change. Although self-efficacy was originally included in SCT, this construct has been incorporated into TTM as well. Research indicates that self-efficacy and decisional balance are related to stage of change, suggesting that self-efficacy and pros for change increase as individuals progress through the stages of change (Marcus & Owen, 1992; Marshall & Biddle, 2001). Level of physical activity has shown to differ across the stages of change, suggesting these constructs can be appropriately applied to physical activity research (Marcus & Simkin, 1993; Marshall & Biddle, 2001).

Elaboration Likelihood Model

Regardless of the particular theoretical orientation of a given intervention, the Elaboration Likelihood Model (ELM) has been used to explain the rationale for tailored behavioral health interventions in general. According to ELM, individuals are more likely to elaborate upon or process at a deeper level (i.e., central-route processing), information perceived to be more personally relevant to them (Cacioppi, Strathman, & Priester, 1994; Petty & Cacioppi, 1981). It has been suggested that individuals are more likely to actively and thoughtfully process tailored information because it is more personally relevant, resulting in greater consideration of recommendations and increased likelihood of behavior change. In fact, research suggests that tailored interventions produce greater behavioral changes relative to non-tailored materials (Skinner, Campbell, Rimer, Curry, & Prochaska, 1999).

Interventions to Increase Physical Activity

A growing amount of research highlights the potential efficacy of physical activity interventions for increasing participants' physical activity levels and cardiorespiratory fitness. These interventions have taken place in a variety of settings, including communities (Young, Haskell, Taylor, & Fortmann, 1996), participants' homes (King, Haskell, Young, Oka, & Stefanick, 1995), workplaces (Marcus et al., 1998), health centers (Baranowski et al., 1990), and medical settings (Calfas et al., 1996). Research has shown that interventions based on the Transtheoretical Model and Social Cognitive Theory are effective in increasing participants' readiness for behavior change and result in increased physical activity (Bock et al., 2001; Dunn et al., 1999; Marcus et al., 1998a; Marcus et al., 1998b). In a recent meta-analytic review of physical activity interventions, Dishman and Buckworth (1996) reported a "moderately large effect" of interventions, particularly those including behavioral techniques (e.g., stimulus control, self-reinforcement). Overall, interventions resulted in a three-quarter of a standard deviation improvement in physical activity when sample sizes were unweighted in analyses and a two standard deviation improvement in activity when samples were weighted by size.

While some interventions target physical activity only, other interventions attempt to increase physical activity as a component of more global changes in behavior (e.g., diet, smoking), usually to treat diseases such as coronary heart disease or obesity. The efficacy of one approach over the other is uncertain at this time, although both single component and multi-component interventions have demonstrated effectiveness in clinical trials. Some authors have suggested that physical activity be incorporated into multiple risk factor programs given the important role of physical activity in a variety of health problems (King et al., 1992). While research results have pointed to the efficacy of physical activity interventions, less is known about the maintenance of physical activity following treatment termination (Marcus et al. 2000). Another limitation of previous research is that less work has been completed with at-risk populations such as low-income, African American individuals. There is also a need for more research on physical activity interventions delivered in primary care settings, since this is a commonly accessed and familiar source of health care advice and instruction.

Interventions with African American and Low-income Samples

Baranowski et al. (1990) examined the utility of a center-based multi-component intervention designed for lower income, African American families. This intervention included weekly aerobic classes at a community center as well as other lifestyle modification classes. Participation in the physical activity sessions was low (approximately 20%). Despite this, the intervention group demonstrated significantly greater improvements in energy expenditure based on self-reported physical activity as compared to a no-treatment control group. However, the groups did not differ on post-treatment cardiovascular fitness. Based on the mixed results and low participation rates, Baranowski and colleagues suggested that center-based physical activity programs may not be the most effective treatment delivery method for low-income African Americans.

Lewis et al. (1993) also examined community-based physical activity interventions for low-income African Americans. This intervention involved physical activity programs (group exercise activities) delivered by designated community residents trained by study personnel. One-year results indicated that the effectiveness of the community-based program varied greatly across different study communities. Some communities were more organized (e.g., held regularly scheduled and well-attended resident counsel meetings, low turnover of group leaders) than other communities. Lewis et al. (1993) also achieved mixed results, as organized communities demonstrated better exercise program attendance and significant increases in self-reported physical activity compared with unorganized communities, which showed no improvement.

Another multiple risk factor study aimed at predominantly low socioeconomic status communities found positive results for this community-based intervention (Brownson et al., 1996). In this study including large representations of African Americans, some communities received funding from the government to implement various strategies, such as running newspaper articles, providing walking clubs and exercise classes, creating walking trails, and sponsoring community physical activity events. Specific events varied across communities and were left to community leaders to coordinate with the assistance of health advisors. Communities with these coalitions were compared to communities without a coalition, and results indicated that coalition communities had significant improvements in physical activity compared with communities with no such coalition.

Other physical activity interventions with African Americans have taken a group or fitness center approach rather than intervening at the community level. For instance, Kanders et al. (1994) examined the efficacy of a 10-week weight loss program for African American women that included group sessions focused on nutritional and physical activity changes. A unique characteristic of this study was that materials were designed to be culturally appropriate and specific to the target population. This program resulted in significant increases in self-reported walking from 4 minutes per week at baseline to 132 minutes per week at the end of treatment. In an ethnically diverse sample of women (approximately 40% African American), Chen et al. (1998) examined the effects of two brief interventions designed to increase walking. While one group received a behavioral intervention that included individually-tailored written materials and six telephone follow-up sessions, the other group received a brief educational intervention including standardized, written materials and one brief telephone follow-up. These researchers found that both interventions resulted in increased walking at two-month, five-month, and 30-month follow-ups, although there were no significant differences between the two groups.

Cardinal and Sachs (1996) examined the effects of a stage-matched intervention that included the use of mailed materials to a predominantly African American (63%), female sample. Intervention materials included lifestyle change recommendations (i.e., small increases in routine daily activities), structured activity recommendations (i.e., organized, timed bouts of specified activities such as swimming or jogging), or control materials that had no specific exercise recommendations. One month after the mailing of intervention materials, women in all three groups demonstrated improvements in physical activity. However, women who received stage-appropriate, lifestyle intervention materials demonstrated significant improvements in self-reported physical activity compared with women in the control condition. These results suggest that any attention to physical activity may be beneficial, but stage-matched lifestyle recommendations may be the most effective.

A recent study examined the outcome of a primary care referral to free exercise classes among female, urban, predominantly African American patients (Damush, Stump, Saporito, & Clark, 2001). The exercise classes were provided by community health centers located in inner-city neighborhoods. Only 28% of the non-volunteer sample attended at least one exercise class and only 9% were attending the classes one year after the referral from their primary care physician. Such low rates of participation led these researchers to conclude that physician referrals to community resources may have limited utility in this population. However, it is important to note that this single-group intervention did not include any type of counseling provided by the physician.

A review of physical activity interventions with ethnic minority groups and individuals of lower socioeconomic status (Taylor, Baranowski, & Young, 1998), as well as a review of interventions with African American women specifically (Banks-Wallace & Conn, 2002), revealed several commonalties among studies. First, many studies failed to produce significant or consistent improvements in physical activity. However, these researchers concluded that physical activity interventions can achieve limited success for low-income and African American samples, although much work is still required to better understand what types of interventions are most effective. The reviews also highlighted the lack of controlled, randomized trials in most of the studies and called for more rigorous methodological designs in future research. Other limitations of previous research included very brief follow-up intervals, no theoretical basis for intervention materials, and no use of established physical activity measures. Finally, the majority of the reviewed studies were community-oriented, and there is a lack of interventions delivered in the primary care setting with this population, which could be an effective method of increasing physical activity.

Primary Care Interventions

Recommendations from the CDC and ACSM suggest physicians should regularly counsel patients on increasing physical activity levels (Pate et al., 1995). However, surveys of physicians indicate that they counsel less frequently on physical activity as compared to other modifiable health behaviors such as smoking, diet, or alcohol use (Lewis, Clancy, Leake, & Schwartz, 1991; Mullen & Tabak, 1989). Wells, Lewis, Leake, Schleiter, and Brook (1986) reported that only 15% of surveyed physicians counsel most of their sedentary patients about increasing their physical activity. A more recent, population-based survey of patients supported the conclusion that most primary care physicians still fail to provide physical activity counseling to patients. Specifically, only 34% of patients who saw their physician in the past year reported receiving physical activity advice during an office visit (Wee, McCarthy, Davis, & Phillips, 1999). Of further concern, sedentary individuals and those with lower income and education were counseled less often than more active individuals and those of higher socioeconomic status.

Barriers to regular physician counseling include inadequate knowledge of physical activity recommendations and benefits, insufficient training in physical activity counseling, perceived ineffectiveness of counseling, lack of time, lack of reimbursement, and lack of knowledge of referral options for physical activity follow-up (Pate et al., 1995; Pinto, Goldstein, & Marcus, 1998; Williford, Barfield, Lazenby, & Olson, 1992). Despite the low rates of physician counseling for physical activity, research suggests that patients would prefer to receive physical activity advice from their physician or other health professional (Booth, Bauman, Owen, & Gore, 1997) since physicians are viewed as credible sources of health-related information.

Although most physicians do not provide physical activity counseling to patients, several studies suggest primary care interventions can be effective in increasing activity levels. Lewis and Lynch (1993) conducted one of the earlier evaluations of primary care interventions for physical activity. This intervention involved brief physician advice (i.e., 2-3 minutes), provision of a patient handout, and a one-month telephone follow-up conducted by a medical staff member. Patients receiving the physician advice demonstrated significantly greater increases in minutes of exercise per session and minutes of exercise per week as compared to a control group receiving no specified protocol. Although the intervention group showed increases in exercise duration, they failed to demonstrate an increase in exercise frequency.

Bull and Jamrozik (1998) compared a no-treatment control group with a physical activity intervention delivered by primary care physicians. The intervention included 2-3 minutes of verbal advice from the physician as well as a pamphlet outlining the benefits of physical activity. Following this one-time intervention, significantly more intervention patients reported being currently active (40% of intervention group versus 31% of control group) using intent-to-treat analyses. This difference remained at the six-month follow-up (38% versus 30%), although by the 12-month follow-up there was no longer a significant difference between the intervention and control groups. At the one-month follow-up, 22% of the control group and 36% of the intervention group reported engaging in the recommended number of physical activity sessions (i.e., five or more sessions per week of moderate activity). However, this significant group difference disappeared at subsequent follow-ups.

Some studies have examined the efficacy of a written physical activity "prescription" provided by primary care physicians. Swinburn, Walter, Arroll, Tilyard, and Russell (1998) compared the effects of verbal advice only or verbal advice plus a written prescription for physical activity delivered by primary care physicians. While both groups showed increases in physical activity six weeks after the intervention, there was an added benefit to providing both verbal and written advice for physical activity. Specifically, the proportion of patients who reported engaging in any recreational physical activity increased from 51% to 86% in the combined condition, while the proportion in the advice-only condition increased from 56% to 77%. This study was limited by use of a non-random sample, as physicians were able to choose which patients they felt would most likely benefit from the physical activity advice. Smith, Bauman, Bull, Booth, and Harris (2000) compared standard care, use of a physical activity prescription, and a prescription plus a stage-matched, mailed pamphlet. Intent-to-treat analyses showed few significant group differences in physical activity at 6-10 week or 7-8 month follow-ups. However, initially inactive patients received the most benefit as they demonstrated significant improvements in physical activity, particularly those receiving the more intensive intervention. These researchers suggested that a more intensive physician intervention beyond a one-time session may be needed to achieve significant improvements in physical activity (Smith et al., 2000).

One of the first primary care interventions for physical activity based on the Transtheoretical Model was the Physician-based Assessment and Counseling for Exercise (PACE) program (Calfas et al., 1996). Based on an initial evaluation completed in the primary care office, patients were categorized by their reported stage of change for increasing physical activity. Physicians delivered stage-targeted interventions lasting approximately 3-5 minutes during patients' office visit. The physician advice was followed by a telephone follow-up conducted by a health educator. Compared with the control group, intervention patients reported significant increases in physical activity at the four to six-week follow-up. However, this study was limited by potential selection bias, as physicians delivering the intervention as well as patients receiving the intervention were volunteers.

Marcus et al. (1997) built on the methodology of the PACE project by examining the effectiveness of a stage-matched physician intervention. This intervention also included physical activity prescriptions, stage-appropriate patient manuals, and provision of a follow-up physician visit devoted to physical activity counseling. This small pilot study found that the primary care intervention was associated with increased physical activity at a six-week follow-up. However, the larger randomized, controlled trial based on this pilot data did not yield encouraging results (Goldstein et al., 1999). At the six-week and eight-month follow-ups, the intervention group did not differ from the control group on the proportion of patients achieving CDC/ACSM physical activity recommendations. There were also no group differences on self-reported physical activity at either follow-up assessment. These authors concluded that more intensive physician interventions may be necessary to achieve significant improvements in physical activity when self-selected patient and/or physician samples are not utilized (Goldstein et al., 1999).

Norris, Grothaus, Buchner, and Pratt (2000) also expanded on the original PACE findings by examining the effects of this intervention at a six-month follow-up after utilizing a controlled, randomized design. In addition to an initial physician appointment and a one-month telephone follow-up, some intervention patients received additional booster telephone calls and mailings each month for five months as well. However, the two levels of intervention were combined in analyses, which indicated that the intervention did not result in significant improvement in physical activity compared with standard care. Norris et al. (2000) suggested that unusually high baseline levels of physical activity may have suppressed improvement in physical activity in their sample.

A recent examination of a primary care intervention involved a brief, motivational interviewing based session delivered by primary care physicians (Elley, Kerse, Arroll, & Robinson, 2003). This initial session was followed by three monthly telephone contacts by an exercise specialist along with quarterly newsletters. Compared to a usual care control group, the intervention group demonstrated significant improvements in leisure-time physical activity and total energy expenditure one year after the intervention. The intervention group also showed significant improvement in blood pressure, although this improvement did not differ significantly from that of the control group.

The Activity Counseling Trial (ACT; Writing Group for the ACT Research Group, 2001) is one of the most rigorous and comprehensive studies of physical activity interventions in a primary care setting. The ACT was a two-year, randomized, controlled trial examining three levels of primary care intervention, including an advice group, an assistance group, and a counseling group. The least intensive group was the advice group, which received 2-4 minutes of physician advice during a regularly scheduled office visit followed by an on-site visit with an exercise health educator. This same format was followed during subsequent follow-up appointments to the clinic. In addition to this intervention, the assistance group received a lengthier initial session with the health educator as well as one follow-up telephone contact with the educator and monthly newsletters. The counseling group received all components of the assistance condition plus telephone calls from the health educator on a biweekly to monthly basis as well as weekly classes provided by the educators covering topics relevant to maintaining physical activity. For women, the assistance and counseling interventions resulted in significant improvements in cardiorespiratory fitness as compared to the advice condition. There were no significant differences in self-reported physical activity among men or women in the three intervention groups, although all three groups demonstrated increases in physical activity over time.

Although several studies suggest physical activity interventions implemented in primary care settings can effectively improve patients' physical activity, it is also important to consider the acceptability of such efforts by both physicians and patients. The limited findings on this topic have been encouraging. For example, Long et al. (1996) found that the large majority of physicians involved in the PACE project reported that the intervention was helpful for their patients. Patients also reported that the intervention was helpful, and they desired future advice from their physician regarding physical activity. The majority of physicians in the ACT study reported that the physical activity intervention did not add substantial time to normally scheduled visits nor cause a burden for the normal operation of their clinics (Albright et al., 2000).

Several recent reviews have summarized the literature on primary care physical activity interventions, with some researchers drawing more positive conclusions (Eakin et al., 2000; Pinto et al., 1998; Simons-Morton et al., 1998) than others (Goldstein, Whitlock, & DePue, 2004; van Sluijs, van Poppel, van Mechelen, 2004). For instance, van Sluijs and colleagues (2004) concluded there was limited evidence for the efficacy of primary care physical activity interventions based on the Transtheoretical Model specifically. However, these researchers also pointed out that conclusions were complicated by the wide variability in the primary care interventions regarding delivery method (e.g,. in-person, telephone, mail), as well as frequency and duration of contacts. In reviewing primary care interventions for multiple health behaviors, Goldstein et al. (2004) concluded that the efficacy for primary care interventions targeting physical activity is less established than interventions implemented in the primary care setting that deal with other behaviors, such as smoking or excessive alcohol consumption.

Other reviews indicate that physical activity interventions implemented in the primary care setting can be effective in moderately increasing self-reported physical activity and cardiorespiratory fitness in adult outpatients (Eakin et al., 2000; Pinto et al., 1998; Simons-Morton et al., 1998). These researchers concluded that the majority of brief physician-delivered interventions resulted in significant improvement in physical activity levels at follow-ups, although long-term effects were less pronounced than short-term effects. Interventions including the assessment of participant characteristics (e.g., stage of change, baseline activity, activity preferences) and subsequent tailoring of intervention materials may produce more positive outcomes (Eakin et al.; Goldstein et al., 2004). Further, programs providing written materials in addition to physician counseling may be more effective (Eakin et al.). Limitations of some of the reviewed studies included lack of randomized, controlled research design, low or unreported follow-up rates, failure to use intent-to-treat analyses, and limited follow-up intervals. Other common limitations included lack of measurement of cardiorespiratory fitness, use of non-validated measures of self-reported physical activity, and under-representation of ethnic minorities (Simons-Morton et al., 1998).

Summary and Rationale

Physical activity has been related to a number of health outcomes and disease. However, most individuals in the U.S. do not achieve adequate physical activity levels. This is particularly problematic for certain subgroups of the population, including women, African Americans, and individuals of lower socioeconomic status. Controlled clinical trials have demonstrated the potential efficacy of single and multi-component interventions in increasing participants' physical activity. Several studies have indicated that physical activity interventions delivered in primary care settings have the potential to increase activity levels and cardiorespiratory fitness, and the overall impact of such interventions could be pronounced even if a relatively small number of inactive patients are responsive to such advice (Pinto et al., 1998; Goldstein et al., 2004).

Previous primary care research on physical activity has several methodological limitations, including few controlled, randomized trials. Results have been mixed, with some studies reporting significant improvements in activity while other studies have found no such changes. The effectiveness of physician advice without other intervention components (e.g., health educators, telephone follow-ups, etc.) in increasing activity levels is also uncertain. In fact, the ACT Writing Group (2001) recommended future randomized trials examining physician advice independent of follow-ups with or referrals to other health care providers. Another limitation of previous research has been the lack of African American or low-income samples in primary care interventions, which has been cited as a need for future research (Norris et al., 2000; Simons-Morton et al., 1998). Regardless of the ethnicity of participants, less is known about the maintenance of physical activity following treatment termination, as many studies only examined immediate or short-term changes in activity (Marcus et al. 2000). Given the findings and limitations of previous research, the purpose of the current study was to examine the effects of a primary care, tailored weight loss intervention on physical activity and cardiorespiratory fitness among predominantly low-income, African American overweight women. The following aims and hypotheses were examined:

Primary Aim and Hypothesis

1. The primary aim of this study was to determine whether a primary care intervention increases self-reported levels of physical activity among the sample of overweight women. It was hypothesized that a tailored, multi-component, primary care weight loss intervention would result in significantly greater levels of self-reported physical activity compared with standard care at post-treatment.

Secondary Aims and Hypotheses

2. To support the validity of findings regarding self-reported levels of physical activity (Hypothesis 1), the cardiorespiratory fitness of participants as measured with a three-minute step-test was also examined. It was hypothesized that a tailored, multi-component, primary care intervention would result in improved cardiorespiratory functioning compared with standard care at post-treatment.
3. Another aim of the study was to examine the maintenance of physical activity following the intervention. It was hypothesized that the tailored primary care intervention would result in maintenance of physical activity levels such that the intervention group would continue to demonstrate significantly greater levels of physical activity at six-month follow-up.
4. Also related to the maintenance of intervention effects, it was hypothesized that the tailored primary care intervention would result in maintenance of improved cardiorespiratory functioning such that the intervention group would continue to demonstrate significantly improved fitness at six-month follow-up.
5. Another secondary aim was to examine the proportion of participants who achieved physical activity levels consistent with current national recommendations (i.e., at least 150 minutes of moderate activity per week). It was hypothesized that the tailored, primary care intervention

would result in a greater proportion of participants meeting current physical activity recommendations compared with the proportion of standard care participants meeting such recommendations.

Method

Participants

All participants for the current study were recruited as part of a grant-funded study entitled "Primary Care Office Management of Obesity" (RO1DK57476), funded by the National Institutes of Health. Participants included 158 overweight or obese women recruited from two primary care clinics to participate in a weight loss study implemented in the office of their primary care physician. Eligibility criteria included women who were aged 18 to 65, overweight (BMI ≥ 25 kg/m^2), low income (less than $16,000 annually), clinic attendees for at least one year, and free of serious or uncontrolled medical conditions. Women with well-controlled chronic diseases (e.g., hypertension, diabetes, hyperlipidemia) were included if their medication regimens were not weight-altering. Exclusion criteria included use of weight loss or weight altering medications, clinic employee, participation in another weight loss study, pregnancy or lactation, severe psychiatric illness, alcohol intake greater than 14 drinks per week, and serious illness (e.g., renal or hepatic failure, cancer, immunological disease, uncontrolled hypertension, medically recommended dietary plan conflicting with study recommendations). The two primary care clinics included in this study serve a predominantly low-income, African American population. Therefore, it was expected that the majority of recruited patients would include African American women.

Measures

Physical Activity Recall (PAR)

The PAR (Sallis et al., 1985) is a self-report measure of physical activity that assesses intensity, duration, and type of activity and is commonly used in research protocols. The PAR is administered by an interviewer and typically takes less than 20 minutes to complete. The PAR assesses amount of moderate, hard, and very hard physical activity performed during the past five weekdays and two weekend days. Moderate activity is defined as activities similar to how one feels when one is walking at a normal pace. Very hard activity is defined as activities similar to how one feels when running, and the hard category includes activities that fall between moderate and very hard. Respondents are also asked about the amount of sleep they have received during the past seven days. The total number of hours of each type of activity is calculated, and the remaining hours in the week are considered to be light activity.

An estimate of energy expenditure is calculated by multiplying the number of hours in each activity category by an individual's weight and a caloric value based on the activity's intensity. This caloric or metabolic value of energy expenditure (MET) is conceptualized as a ratio of energy expenditure above that achieved at rest and is calculated as the ratio of work metabolic rate over resting metabolic rate. As a reference point, 1 MET is estimated to be the energy expended by an individual while sitting at rest (Sallis et al., 1985). Sleep is estimated at 1 MET, light activity is 1.5 METs, moderate activity is 4 METs, hard activity is 6 METs, and very hard activity is 10 METs. MET values are multiplied by the number of hours engaging in these activities to provide a total measure of energy expenditure. Dividing this total figure by 7 and multiplying it by an individual's weight yields a daily index of energy expenditure, or kcal/day (Blair et al., 1985). The PAR was administered by trained study personnel at baseline, post-treatment, and the six-month follow-up.

Reliability and validity of the PAR have been established in several previous studies. In initial validation studies of the instrument (Sallis et al., 1985), two-week test-retest reliability was .66 for total energy expenditure. Rauh, Hovell, Hostetter, Sallis, and Gleghorn (1992) found significant test-retest reliability (r = .69) over a two-week period among Latino individuals. The

PAR also has shown sensitivity to detect changes in physical activity following interventions and exercise programs (e.g., Blair et al., 1985; Dishman & Steinhart, 1988). Significant correlations between the PAR and other measures of physical activity have also been established. For example, Dishman and Steinhart (1988) reported that 7-day recall of physical activity was significantly related to a daily diary of activity (r = .81). Hayden-Wade et al. (2003) reported moderate correlations between the PAR and accelerometer readings for moderate, hard, and total activity (r = .33, .43, and .41, respectively). Moderate to high correlations were achieved between the PAR and accelerometer for very hard activity (r = .74). Correlations were not affected by the activity level of individuals, suggesting the PAR was equally valid across a variety of activity levels (Hayden-Wade et al., 2003). Other researchers have reported significant correlations between the PAR and accelerometer readings ranging from .57 to .79 (Matthews & Freedson, 1995; Miller et al., 1994; Rauh et al., 1992). The PAR has also shown significant associations with physiological indexes of physical fitness, including improvements in VO_{2max} and lipoprotein profiles (Blair et al., 1985; Dishman & Steinhart, 1988) and heart rate monitoring data (Sallis, Buono, Roby, Micale, & Nelson, 1993).

Cardiorespiratory Fitness

A step-test was used to measure physical fitness, which consisted of participants stepping up and down on a bench with a height of 16.25 inches. Patients were instructed to step at a rate of 22 steps per minute for three minutes, and a metronome was used to establish this rate for participants to follow (McArdle et al., 1972). Heart rate was measured immediately before the step-test and at one-minute intervals for five minutes following the step-test. The one-minute post-exercise heart rate was used as an indicator of physical fitness similar to the protocol used in previous studies (Fardy, Maresh, & Abbott, 1975; Woolf-May et al., 1998). Heart rate recovery following exercise has proven to be a significant indicator of cardiovascular fitness (Fletcher et al., 1992). Exercise physiologists trained in the study protocol administered the step-test and measured heart rates. Heart rate was assessed by placing a stethoscope against participants' wrists to measure palpitations. The step-test was completed at baseline, post-treatment, and six months following treatment termination.

Skubic and Hodgkins (1963) originally modified the step-test for women, and they reported that a three-minute step-test was effective in producing heart rate changes. Furthermore, female athletes showed significantly lower heart rates during and after the step-test compared to non-athletes. Athletes demonstrated faster recovery heart rates compared with non-athletes. One-week test-retest reliability was found to be .82 for heart rate recovery (Skubic & Hodgkins, 1963). In further validation of this procedure, McArdle et al. (1972) found that heart rate recovery following the three-minute step-test was negatively correlated (r = -.75) with VO_{2max} obtained during a graded treadmill exercise. These researchers concluded that heart rate recovery following a brief step test was comparable to VO_{2max} as an indicator of aerobic capacity, although it is less expensive and time consuming than treadmill and oxygen consumption testing.

More recent researchers have also concluded that step-tests are sensitive and valid measures of cardiorespiratory fitness. These studies have included a variety of samples, including men, women, the elderly, heart failure patients, and individuals participating in physical activity interventions (Asakuma, Fujiwara, Ohyanagi, & Iwasaki, 1999; Petrella, Koval, Cunningham, & Paterson, 2001; Tammelin, Nayha, Rintamaki, & Zitting, 2002; Woolf-May et al., 1998). Petrella et al. (2001) pointed out that step-tests have the additional benefits of being easy to implement, have low risk of adverse events, are low in cost, and require less time. Such benefits make step-tests more practical than other tests of physical fitness in applied settings such as the primary care office.

Other Measures

Participants completed demographic questionnaires at baseline, which included variables such as age, marital status, income, employment status, education level, and ethnicity. At each assessment period, participants were also weighed and heights were measured on calibrated scales in the primary care office. Weight and height were used to calculate body mass index (BMI) for each participant.

Procedure

Recruitment and Randomization

Study participants were recruited from clinic attendees at two primary care clinics in the Baton Rouge area. The weekly lists of clinic appointments for the study physicians at each clinic were reviewed by research personnel to initially screen potential participants for basic criteria (i.e., female gender, aged 18 to 65). For patients meeting these criteria, medical records were reviewed for additional inclusion information, including weight, medical conditions, severe mental illness, substance abuse, and length of time as clinic patient. Based on these reviews, patients potentially eligible for participation were approached during their scheduled clinic visit and were provided with a brief description of the study. If patients verbally agreed to participate, they were asked to complete a reading screener to ensure they could read at the 6^{th} grade level or above. They were questioned about their income status to ensure they did not exceed the maximum annual income criteria. They also completed the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) at this time to screen for depressive symptoms, and any patient scoring higher than 20 was excluded from participation. Finally, they were questioned about other inclusion criteria (e.g., pregnancy, intention to become pregnant, clinic attendance duration, current weight loss treatments, medical conditions) to confirm eligibility status.

Following this initial screening process, eligible patients provided written informed consent and were scheduled for an assessment with study personnel to complete baseline weight measures and psychosocial questionnaires. Initial and follow-up assessments were completed in the primary care office. Enrollment proceeded until each physician had a maximum of 20 patients. Eight physicians were included in this study and were randomly assigned to provide either a tailored weight loss intervention or standard care. Participants were assigned to receive one of the two interventions based on the random assignment of their physician.

Physician Training

All study physicians received two hours of instruction on the clinical practice guidelines of the National Institutes of Health – National Heart, Lung, and Blood Institute for the evaluation and management of overweight and obesity (NHLBI, 1998). The four intervention physicians received an additional five hours of training in the assessment of stage of change, motivational interviewing, and cognitive-behavioral techniques for the modification of caloric intake and physical activity. This included techniques such as self-monitoring, contingency management, stimulus control, cognitive restructuring, and increasing social support.

Intervention Protocol

Tailored intervention participants received six monthly, 15-minute treatment visits with their physician. The investigators provided physicians with protocols for each visit that included an outline of topics to be covered during that session. Handouts were provided to patients at each visit that summarized the topics discussed by their physician. Thus, patients received both oral and written recommendations from their physician. While each of the six visits had a different focus, every session included a review of current dietary and physical activity habits and plans for future behavior change. Topics of the monthly meetings included caloric balance (month 1), decreasing dietary fat (month 2), increasing physical activity (month 3), overcoming weight loss barriers (month 4), making healthy choices when eating out and shopping (month 5), and staying motivated following treatment (month 6).

Regarding physical activity, each of the monthly sessions included advice on incorporating lifestyle activity into daily routines (e.g., taking the stairs, parking farther away). In addition to lifestyle changes, patients received recommendations to begin a walking program with the goal of reaching 150 minutes per week. Those patients who were sedentary were encouraged to start with 10 minutes per day three days a week and increase to most days. Based on their performance, this was gradually increased to 150 minutes per week (Pate et al., 1995). For patients with physical conditions making regular walking difficult (e.g., arthritis, knee injury), other types of comparable activity such as swimming or cycling were suggested. Each month physicians assessed patients' progress, and new goals were established based on the previous month's activity. As necessary, barriers to physical activity were discussed. In addition to the monthly discussion of physical activity promotion, the third monthly intervention focused on increasing physical activity. This session included more extensive elaboration on informal, lifestyle changes to physical activity, more formal physical activity interventions, and dealing with barriers and motivation for physical activity.

The intervention materials were individually prepared and tailored to each patient by the investigators (physician, health psychologist, registered dietician, and exercise physiologist). Materials were based on information provided by participants during the initial assessment as well as feedback provided to physicians at the monthly visits. The recommendations were also tailored to each participant by taking cultural and regional preferences into account when formulating dietary plans, providing educational materials prepared specifically for African-Americans, and giving low-cost alternatives when making diet and physical activity recommendations. Intervention materials were tailored to the individual based on cultural, ethnic, medical, and psychosocial factors to make the information more personally relevant and to facilitate deeper processing of the materials, in line with the Elaboration Likelihood Model (Cacioppi et al., 1994).

In addition, the tailored intervention included a number of components from both Social Cognitive Theory (Bandura, 1986) and the Transtheoretical Model (Prochaska et al., 1992). For instance, self-efficacy was targeted by providing participants with suggestions for dealing with any high-risk situations they had identified as getting in the way of their physical activity. Outcome expectancies were addressed by having physicians discuss the particular benefits and need for physical activity specific to each patient based on their medical conditions. This also provided an opportunity for the physician and patient to discuss benefits and barriers (i.e., decisional balance) of physical activity. Participants were encouraged to reward themselves for achieving physical activity goals, which is a common behavioral process of change included in the Transtheoretical Model. They were also encouraged to bolster social support by finding exercise partners as appropriate. In line with both psychological theories, participants were provided with regular feedback on progress, and they were encouraged to self-monitor and set specific goals related to their physical activity.

Standard Care Protocol

Standard care physicians were instructed to provide their usual obesity management conducted during a typical office visit. Standard care physicians provided no structured information on diet or physical activity to patients. Standard care participants were seen as needed for regular medical care. Information provided by standard care participants during the initial assessment was not used during any office visits.

Reimbursement

Participants received monetary reimbursement for study participation, including $10 for monthly visits and $35 for baseline and post-treatment assessments. Reimbursement was provided to defray the expenses associated with visits, which could be problematic to study participation (e.g., cost of transportation and childcare). Physicians received reimbursement for office visits consistent with state Medicaid policies.

Statistical Analyses

Descriptive analyses were conducted to summarize demographic and other relevant baseline variables. Repeated measures analysis of variance (ANOVA) was used to examine changes in physical activity between baseline, post-treatment, and the six-month follow-up. In this analysis, treatment group assignment served as a between-subjects factor (two levels), while time served as a within-subjects factor (three levels). The interaction of these two variables was examined, providing information on whether changes in physical activity differed between the intervention and standard care groups across time. A similar repeated measures ANOVA was conducted with treatment group and time serving as the independent variables and cardiorespiratory fitness serving as the dependent variable. Chi-square analyses were used to examine relationships between categorical variables including treatment group and achievement of CDC/ACSM physical activity recommendations.

All primary analyses used an intent-to-treat approach with last observation carried forward. For participants who failed to complete the study, it was assumed that no change in physical activity or cardiorespiratory fitness occurred. Therefore, baseline (or post-treatment) physical activity and cardiorespiratory data were carried forward to post-treatment (or follow-up) for participants with incomplete data. Intent-to-treat analyses have been used in prior physical activity intervention trials (e.g., Marshall, Leslie, Bauman, Marcus, & Owen, 2003; Writing Group for the ACT Research Group, 2001). Further, this approach has been considered a particular methodological strength (Eakin et al., 2000), since it assumes no change in variables occurred and is thus a more conservative procedure.

Power Analysis

Dishman & Buckworth (1996) conducted a meta-analysis of physical activity interventions including 127 studies with approximately 131,000 participants. They reported that physical activity interventions produced 0.75 standard deviation change in activity. However, this effect varied depending on several factors, such as treatment setting, sample, and study design. For example, this effect size was larger in healthcare settings and with women, although the effect was smaller in randomized designs and with African Americans. Taking these various factors into account, a more conservative effect size of 0.50 standard deviation change was estimated for the current primary care intervention. Based on this effect size, 51 participants per group (N = 102) would be required to achieve power levels of .80 with an alpha value of .05. In other words, with 102 participants there is approximately an 80% chance of detecting an expected effect size of 0.50 standard deviation change. This power analysis indicates that the current sample was adequate for the proposed analyses.

Results

Participant Enrollment and Baseline Characteristics

Study personnel approached 256 clinic attendees for potential participation. Of those screened, 51 (19.9%) were ineligible to participate for various reasons (see Figure 1). Twenty-one of the women screened and approached for the study refused to participate, which represented an 8.2% initial refusal rate. There were 26 women (10.1%) who agreed to participate but discontinued prior to their initial assessment. Therefore, 158 women entered the study and were randomized to one of the two treatment conditions, which resulted in 61.7% of approached women who were randomized into the study. The demographic characteristics of the study sample are summarized in Table 1. In regard to self-reported levels of physical activity at baseline, participants reported an average of 9.79 hours (*SD* = 11.30) of at least moderate-intensity activity over the past seven days.

Participant Attrition and Missing Data

Physical Activity Recall

It became apparent during study proceedings that nine participants developed medical conditions (e.g., hypothyroidism, pregnancy) or were placed on weight-altering medications in violation of study inclusion criteria. Therefore, these nine women were excluded from all study analyses. In addition, seven women did not have PAR data because of their inability to initiate or complete the physical activity protocol. Finally, three women never completed the PAR at baseline due to unavailability of the exercise physiologist. Therefore, 139 participants completed the baseline self-report of physical activity (PAR) and were included in analyses, which represented 88% of the overall sample.

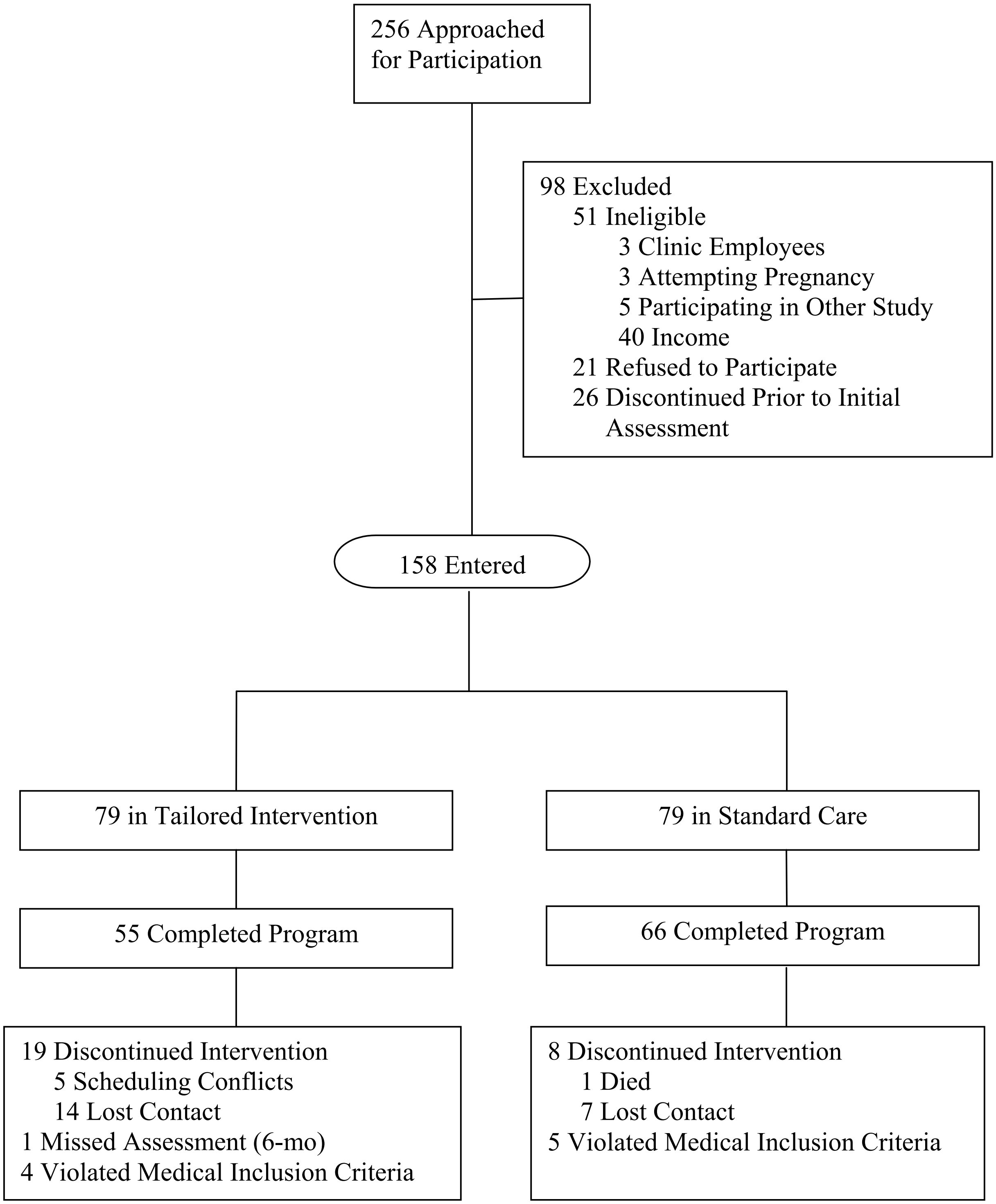


Figure 1. Participation flow.

Table 1. Participant baseline characteristics (N = 158).

	M	*SD*
Age	41.73	12.25
Weight (kg)	100.96	19.46
BMI (kg/m^2)	38.72	7.89
Weekly physical activity (hours)	9.79	11.30
	N	*%*
Ethnicity		
African American	144	91.9
Caucasian	13	8.2
Hispanic	1	0.6
Marital Status		
Married	44	27.8
Single	66	41.8
Separated, Divorced, Widowed	48	30.4
Graduated High School	116	74.3

Cardiorespiratory Fitness

As mentioned, nine women were excluded from analyses for medical reasons, and 29 additional women were not medically cleared to complete the step-test or were unable to complete the step-test despite initial clearance. Three women did not complete the baseline step-test due to the exercise physiologist being unavailable during the assessment. Therefore, 117 participants completed the baseline step-test and were included in analyses, which represented 74% of participants.

Comparison of Participants with and without Physical Activity Data

While 158 women were randomized into the weight loss intervention, 139 completed the PAR while 117 completed the step-test at baseline. Since the physical activity measures were not completed by the entire sample, the characteristics of participants who had physical activity data were compared with the characteristics of participants who did not complete the physical activity protocol using independent samples t-tests for continuous variables and chi square analyses for categorical variables. No differences in baseline characteristics were obtained between participants with completed PAR data and those who did not complete the PAR. When comparing participants who completed the baseline step-test and those who did not, results indicated that women who did not complete the step-test were significantly older (M = 48.05, SD = 11.43) compared with women who completed the test (M = 40.75, SD = 12.12), $t(156) = 2.58$, $p < .02$. No other group differences were observed regarding status of step-test completion. Therefore, the evidence suggests that women included in the physical activity analyses (particularly analyses of the PAR) were generally representative of the sample as a whole.

Comparison of Study Completers versus Non-Completers

Participants who completed the post-treatment assessment were compared to those lost to attrition during treatment using independent samples t-tests for continuous variables and chi square analyses for categorical variables. Analyses indicated significant group differences for age, with program completers being significantly older ($M = 43.62$ years, $SD = 11.70$) than women who did not complete the program ($M = 35.53$ years, $SD = 12.16$), $t(147) = 3.58$, $p < .001$. The average last grade finished by study completers was 11.28 ($SD = 1.39$), while women who dropped out of the study reported an average last grade completed of 11.86 ($SD = 1.10$), which represented a significant group difference, $t(145) = 2.29$, $p < .03$. Therefore, women completing the program had significantly less education than women who dropped out prior to program completion. No other differences were obtained between program completers and those lost to attrition, including no differences in baseline weight, marital status, ethnicity, or income. Attrition at post-treatment was also independent of group assignment (tailored intervention versus standard care).

Similar comparisons were completed between participants who completed the six-month follow-up and those who dropped out of the study prior to this follow-up assessment. Again, women completing the follow-up assessment were significantly older ($M = 44.04$ years, $SD = 11.44$) than women who failed to complete the follow-up ($M = 36.96$ years, $SD = 12.63$), $t(147) = 3.34$, $p < .001$. However, there were no longer group differences on education level between follow-up completers versus non-completers. Unlike the post-treatment assessment, attrition at follow-up was related to group assignment, such that differentially more women dropped out of the intervention group compared with standard care, $\chi^2(1, N = 149) = 7.39$, $p < .01$.

Comparison of Physical Activity Outcomes

Energy Expenditure

A two-way repeated measures analysis of variance (ANOVA) was conducted with treatment group assignment and time serving as independent variables and daily energy expenditure as measured by the PAR serving as the dependent variable (Hypotheses 1 and 3). Mauchly's test of sphericity was significant ($p < .01$), indicating that the covariance of the within-subjects variable across time was not homogeneous. Therefore, an adjusted degrees of freedom statistic provided by Greenhouse-Geisser correctional formula was utilized to account for this violation of the sphericity assumption.

Analyses indicated no significant effect of treatment group, $F(1, 137) = .22$, $p = .64$. There was also no significant effect of time, $F(1.61, 220.17) = .64$, $p = .49$. Regardless of treatment group, there was no significant change in daily energy expenditure between any of the three assessment periods. Finally, the interaction of group by time was not significant, $F(1.61, 220.17) = 2.91$, $p = .07$. Therefore, the tailored intervention group did not differ from the standard care group on energy expenditure at any time period as initially hypothesized. Figure 2 illustrates the non-significant changes in energy expenditure across time for the two treatment groups.

The primary outcome of interest was the post-treatment comparison of the two treatment groups (Hypothesis 1). However, the previously reported repeated measures ANOVA included all three time points (i.e., baseline, post-treatment, and follow-up). Since the assumption of sphericity was violated with these analyses and a revised test statistic was utilized, a repeated measures ANOVA was conducted for two levels of the repeated measure (baseline and post-treatment) without examining follow-up data. Sphericity was not required for these analyses,

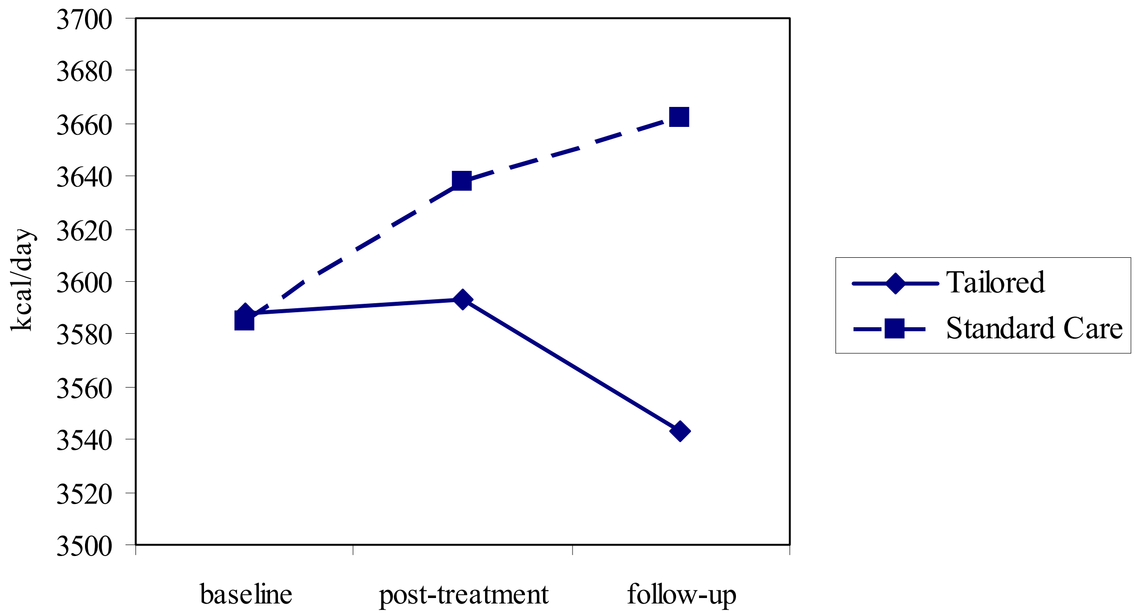


Figure 2. Changes in energy expenditure for intervention and standard care groups.

although results remained non-significant. There was no significant effect for group assignment, *F*(1, 137) = .03, *p* = .86; time, *F*(1, 137) = 1.05, *p* = .31; or the interaction of group by time, *F*(1, 137) = .72, *p* = .40.

Hours of Physical Activity

Since the PAR also provides information regarding the amount of time engaged in physical activity, this variable was examined to provide additional detail of participants' reported physical activity levels. Again, Greenhouse-Geisser correctional formula was used to correct for the lack of homogeneity of covariance. Similar to the ANOVA examining daily energy expenditure, this exploratory analysis demonstrated no significant effect for treatment group, *F*(1, 137) = .61, *p* = .44; time, *F*(1.62, 221.43) = .44, *p* = .60; or the interaction of these two variables, *F*(1.62, 221.43) = 1.68, *p* = .19. Figure 3 illustrates the non-significant changes in physical activity levels of the two treatment groups across time.

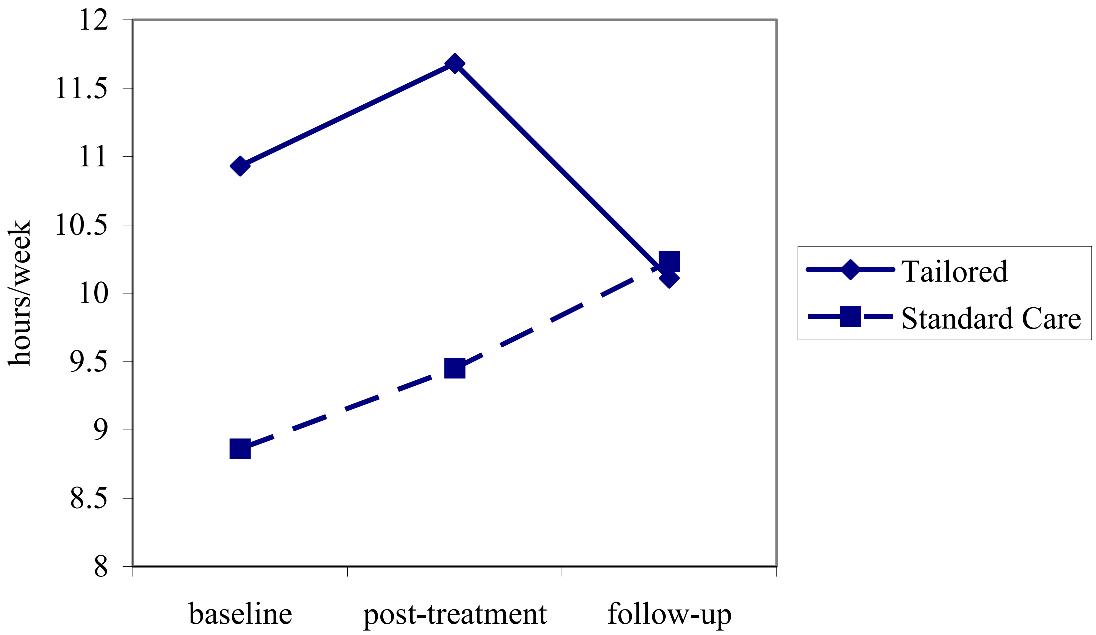
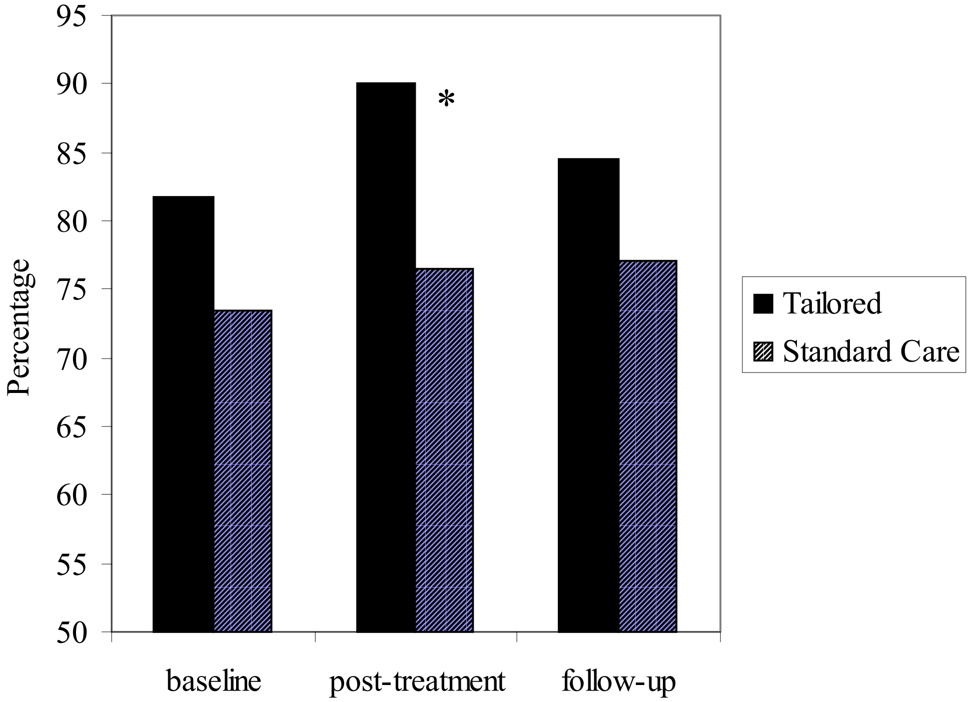


Figure 3. Changes in physical activity for intervention and standard care groups.

Proportions Achieving Physical Activity Recommendations

The amount of time engaged in physical activity during the past week as assessed by the PAR was dichotomized to create a variable indicating whether participants achieved current physical activity recommendations of 150 minutes or more per week of at least moderate-intensity activity (Pate et al., 1995). The proportions of participants meeting this standard at post-treatment and follow-up were compared between the two treatment conditions (Hypothesis 5). Analysis indicated that 90.1% of tailored intervention participants reported achieving at least 150 minutes of weekly activity at post-treatment, while 76.5% of standard care participants reportedly met this recommendation. This represented a significant group difference, $\chi^2(1, N = 139) = 4.70, p < .03$. The proportion of participants meeting this criteria at the six-month follow up (84.5% and 77.1% of tailored intervention and standard care, respectively) did not significantly differ between groups, $\chi^2(1, N = 139) = 1.24, p = .27$ (see Figure 4).



* $p < .03$.

Figure 4. Proportion of participants achieving recommended activity levels of 150+ minutes per week.

Comparison of Cardiorespiratory Fitness Outcome

A two-way repeated measures analysis of variance (ANOVA) was conducted with treatment group and time serving as independent variables and the one-minute heart rate recovery following the step-test serving as the dependent variable (Hypotheses 2 and 4). Mauchly's test of sphericity was significant ($p < .01$), indicating that the covariance of the within-subjects variable across time was not homogeneous. Therefore, an adjusted degrees of freedom statistic provided by Greenhouse-Geisser correctional formula was utilized to account for this violation of the sphericity assumption. Analyses indicated no significant effect for group assignment, $F(1, 115) = .20$, $p = .65$. No significant effect of time was observed, $F(1.74, 199.61) = .53$, $p = .59$. The interaction of these two variables also failed to demonstrate a significant relationship, $F(1.74, 199.61) = 1.02$, $p = .35$. Therefore, the heart rate recoveries of the two groups did not differ across time as hypothesized. Figure 5 illustrates these non-significant changes in cardiorespiratory fitness in the two treatment groups.

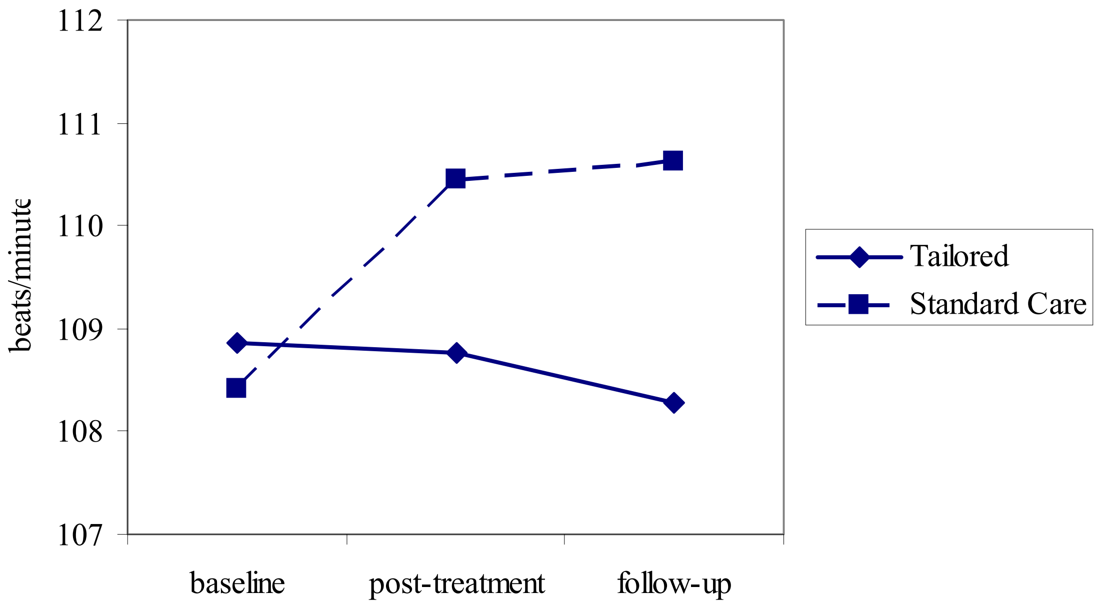


Figure 5. Changes in cardiorespiratory fitness (heart rate recovery) for intervention and standard care groups.

Discussion

Treatment Effects on Physical Activity and Cardiorespiratory Fitness

The primary care intervention targeting physical activity and dietary behaviors did not result in significant improvements in physical activity or cardiorespiratory fitness as hypothesized. Participants in the tailored intervention group did not change significantly over time, nor did they significantly differ from participants in the standard care condition. These non-significant differences were observed for several outcomes, including daily energy expenditure as measured by the PAR, hours of weekly activity as measured by the PAR, and heart rate recovery following a three-minute step-test. Therefore, Hypotheses 1 and 3 regarding group differences in physical activity changes at post-treatment and follow-up were not supported. Similarly, Hypotheses 2 and 4 regarding changes in cardiorespiratory fitness at post-treatment and follow-up were not supported by these analyses.

Regarding post-treatment physical activity levels, it is interesting to note that both groups reported increases in activity during treatment. These changes included approximately 45 minutes of increased activity among intervention participants and approximately 35 minutes of increased activity for standard care (see Figure 3). Although the reason for the increased activity among standard care is unclear, it is possible that the training all physicians received prior to the program (i.e., two hours of training on NHLBI obesity treatment guidelines) led to improved clinical practices for standard care physicians. Alternatively, prompting patients with an interview about their current activity habits could have increased awareness and generated improved activity levels. Another explanation is that asking participants about physical activity could have elicited socially desirable responses on this topic.

The trends observed with the follow-up data were also somewhat surprising. Data suggest a downward trend in the activity of the intervention group, while the standard care group continued to increase activity at follow-up. While this trend did not reach significance, it is interesting to explore possibilities for why such directions were observed. It could be that intervention participants found it difficult to maintain increased activity in the context of other behavioral changes (e.g., dietary fat reduction, increased fruit/vegetable consumption) necessary for weight loss and maintenance. In contrast, standard care participants did not have this same level of behavioral "demands".

When examining the percentage of participants achieving recommended physical activity levels as outlined by the CDC and ACSM (Pate et al., 1995), results indicated that a significantly greater proportion of participants in the tailored intervention achieved these recommended levels. Specifically, over 90% of intervention participants achieved at least 150 minutes of moderate-intensity physical activity per week at post-treatment compared with approximately 77% of standard care participants. While more intervention participants continued to achieve this recommended level of activity at the follow-up compared with standard care (approximately 85% versus 77%), this represented a non-significant group difference. Therefore, only Hypothesis 5 (regarding the proportion of intervention and standard care participants achieving current activity guidelines) was partially supported by the current analyses.

In examining cardiorespiratory fitness outcomes, there was little change in heart rate recovery for either group at post-treatment or follow-up (Figure 5). While intervention participants demonstrated virtually no change in heart rate recovery at post-treatment or follow-up, the standard care condition showed very slight but non-significant increases in heart rate recovery. This trend is particularly interesting because increased heart rate recovery is suggestive of poorer physical fitness. Since some women were unable to complete the step-test for medical reasons, one can only speculate whether the inclusion of these additional women would have elevated the heart rate recoveries of this sample even further.

There are several points worth noting about the physical activity data. Results should be interpreted cautiously given the elevated levels of activity and energy expenditure reported by this sample. At baseline, participants reported expending nearly 3,600 kcal/day in activity, which was equivalent to over nine hours per week of physical activity, or over an hour per day of activity. Nearly 78% reported engaging in at least 150 minutes of moderate-intensity activity per week at baseline. Considering epidemiological data regarding physical activity in the population overall (e.g., U.S. Department of Health and Human Services, 1996) as well as the particular characteristics of this sample (e.g., obese, predominantly ethnic minorities), such high rates of physical activity were unexpected.

However, higher-than-expected rates of activity have been reported among African American women in other studies as well. Approximately 67% of African American women and 74% of Caucasian women from rural communities in Alabama reported achieving at least 150 minutes of weekly, moderate-intensity activity (Sanderson et al., 2003). Evenson and colleagues (2003) reported that nearly half of their ethnically diverse female sample reported being sufficiently active by meeting current activity recommendations, which is a more modest although still high level of regular activity. In another study, 67% of older African American women (and 72% of women overall) reported engaging in at least 300 minutes of weekly activity (twice the current rates), when all types of physical activity (e.g., occupational, household) were considered (Brownson et al., 2000).

There are several potential explanations for the current sample's elevated activity levels. First, it is possible that the PAR, the physical activity measure utilized in this study, is not a valid indicator of physical activity for this population. Although there are no published validation studies using this measure with this particular population, it is a very commonly used measure in physical activity research (Bock et al., 2001; Blair et al., 1985). It is often considered the gold-standard of self-report measures and has been validated against objective measures of physical activity, including accelerometer data (Hayden-Wade et al., 2003), VO_{2max} (Dishman & Steinhart, 1988), and heart rate monitors (Sallis et al., 1993). It has also been validated in at least one ethnic minority sample (i.e., Latinos), but the applicability of those findings to the current sample is uncertain (Rauh et al., 1992). Although there is a lack of research examining the validity of the PAR with African Americans, one study interestingly used the PAR as the "reference" measure of activity in order to validate a newly created physical activity questionnaire among African Americans (Singh, Fraser, Knutsen, Lindsted, & Bennett, 2001). In general, there has been very limited study of the psychometric properties of any physical activity measure with this population, precluding the use of a better alternative for the current study. In fact, a review of physical activity interventions for African American women reported that only seven of 18 reviewed studies included a previously developed instrument such as the PAR, as most prior studies have included non-validated measures created for a specific project (Banks-Wallace & Conn, 2002).

Self-report of physical activity may have been complicated by several specific characteristics of this sample. For instance, many participants were unemployed and commonly endorsed activities such as housework and childcare. It is possible that participants found it difficult to estimate the intensity and duration of such activities, which do not represent typical, structured exercise (e.g., jogging, cycling). This difficulty may have resulted in inflated estimates of weekly activity. In fact, research with African American women suggests that a large proportion of this group's physical activity is accounted for by non-traditional exercise, such as household chores and occupational activities (Banks-Wallace & Conn, 2002; Whitt, DuBose, Ainsworth, & Tudor-Locke, 2004), while men are more likely to engage in structured, recreational physical activities (Singh et al., 2001) that may be more easily quantified. An alternative explanation to the elevated physical activity levels could be related to social desirability, which is an inherent limitation of most self-report measures. This may have been even more pronounced in the current study if individuals were seeking to please their primary care physicians regarding their health status and health behaviors.

Despite the potential limitations of the physical activity measure, the lack of significant improvements in physical activity could be explained in other ways as well. The intervention was a weight loss program targeting both physical activity as well as dietary behaviors, such as dietary fat reduction, calorie restriction, fruit and vegetable consumption, and healthier food preparation. While physical activity was addressed at each treatment visit with the physician, just as much (if not more) attention was given to dietary behaviors. Therefore, targeting multiple health behaviors could have suppressed the effects on the individual behavior of physical activity. It has also been suggested that non-significant effects for physical activity interventions could be due, in part, to the complexity of physical activity behavior itself. While some health behaviors (e.g., dietary behaviors) can be broken down and measured by simpler behaviors (e.g., dietary fat reduction), it is more difficult to break down physical activity in this way (Van Sluijs et al., 2004), making activity more difficult to measure and perhaps more difficult for participants to achieve. Also, participants completing this program tended to be older and have less education. Research suggests that both age and limited education are risk factors for physical inactivity (King et al., 1992). Thus, participants remaining in the program may have represented a more difficult to treat population achieving limited success.

Comparison with Other Physical Activity Interventions

In order to put the current results in context, it is important to compare them with other interventions targeting physical activity in the primary care setting. Primary care interventions for physical activity have produced rather variable increases in weekly activity, including 16 minutes (Smith et al., 2000), 34 minutes (Calfas et al., 1995), 54 minutes (Norris et al., 2000), and 109 minutes (Lewis & Lynch, 1993). The current intervention produced a 45-minute increase in weekly activity, which is consistent with these previous primary care interventions. These comparisons are particularly relevant considering that the current sample included a traditionally difficult-to-treat and understudied population (e.g., low-income, ethnic minority women), whereas most other primary care interventions have included predominantly middle-income, Caucasian participants. In the current study, standard care participants demonstrated an increase of 35 minutes per week of activity as well. Many of the previous primary care studies did not include comparison conditions. Among those that did have a comparison group, results were mixed about whether treatment conditions differed significantly from controls. Also, many previous interventions used very simplistic and global measures of physical activity, such as dichotomous variables of active versus inactive (e.g., Bull & Jamrozik, 1998; Swinburn et al., 1998), complicating comparisons of prior studies with current findings.

Given the unique characteristics of this sample, it is also important to compare current results with previous physical activity interventions targeting low-income and/or predominantly African American samples. One weight loss program addressing diet and physical activity for

African American women produced a 128-minute increase in weekly physical activity among participants. Other interventions with this population have resulted in more modest improvements. For instance, Cardinal and Sachs (1996) reported that a stage-matched, print-based physical activity intervention produced a 12-minute increase in weekly activity among a predominantly African American sample of women. Other community-based programs have produced mixed results (e.g., Damush et al., 2001; Lewis et al., 1993). A review of physical activity interventions for ethnic minority and low-income groups concluded that interventions typically produced variable improvements with many interventions resulting in non-significant changes in physical activity (Taylor et al., 1998). Although there were many unique aspects to the current intervention (e.g., individually-tailored, theory-based materials, use of primary care physicians, use of verbal and print-based materials), this program failed to produce significant improvements in activity among predominantly low-income, African American participants.

Strengths and Limitations

There were several limitations to the current study. As previously mentioned, the sample reported unexpectedly high levels of physical activity, which leads one to question the accuracy of the PAR with this population. Also, analyses indicated that women completing the step-test tended to by younger than women who were unable to complete the test or who were not medically cleared for the test. While this is a logical group difference, it certainly limits the generalizability of the findings regarding cardiorespiratory fitness as measured by heart rate recovery. In contrast, women completing the overall weight loss program were significantly older and less educated than women lost to attrition. However, attempts were made to account for these group differences, at least in part, by the use of intent-to-treat analyses in which the last observation was carried forward. Therefore, younger and more educated women's earlier data were carried forward. This is a more conservative estimate of treatment effects, particularly since younger and more educated individuals tend to have more success with physical activity (King et al., 1992; U.S. Department of Health and Human Services, 1996).

Despite these limitations, there are several strengths specific to the current project. This is the first known, published examination of a physical activity intervention implemented in a primary care setting that targets this particular population (i.e., low-income, predominantly African American women). From a methodological and theoretical perspective, the current study has several additional strengths, including the use of an extended follow-up period, standardized and established outcome measures, use of multiple outcome measures (i.e., self-reported physical activity and cardiorespiratory fitness), intent-to-treat analyses, and theory-based, tailored intervention materials. Previous researchers have pointed out the importance of incorporating such procedures into physical activity research protocols (Banks-Wallace & Conn, 2002; Simons-Morton et al., 1998; Taylor et al., 1998).

Clinical Implications and Future Research

The current results suggest that a primary care intervention for physical activity may have limited efficacy with low-income, African American women. While the intervention resulted in increased physical activity, participants receiving standard care demonstrated increased activity as well. As mentioned previously, this could suggest that relatively basic training of physicians (i.e., two hours of general education on guidelines for obesity treatment) may be sufficient in improving physicians' treatment of diet and exercise, resulting in improved activity for their patients. Similarly, results could suggest that monthly contact including tailored physical activity information is unnecessary for physical activity promotion. Instead, minimal, unstructured, and non-tailored contact could achieve similar results. Other interventions with ethnic minority women have also shown that participants receiving a minimal, brief control condition demonstrate comparable improvements in physical activity as compared to intervention participants (Cardinal & Sachs, 1996; Chen et al., 1998). Simply prompting patients with an interview about current activity levels could also raise awareness and result in increased physical activity.

Since the tailored intervention did not produce significant improvements in physical activity, it is possible that interventions targeting multiple health behaviors (e.g., diet and physical activity) are not conducive to the primary care setting. This would be a reasonable argument given the time constraints and competing demands present during a primary care office visit. It is also possible that having patients focus on changing multiple health behaviors may be difficult or overwhelming for some individuals. The benefit of interventions targeting single versus multiple health behaviors is uncertain (King et al., 1992). Clearly, further research is needed to address these issues.

In fact, the current project highlights the need for several areas of future research. First, it would be helpful to examine a primary care intervention targeting only physical activity with this high-risk population to see if focusing on this single behavior would result in significant increases in activity. Second, it would be useful to examine the effects of a physical activity intervention among participants with a wide range of weight status. The current sample represented a very obese group, and it would be interesting to see how a similar physical activity program would affect obese as well as overweight and normal-weight individuals. Third, future research is needed to explore the most appropriate frequency and duration of treatment visits to obtain significant behavior change while still remaining feasible for clinical settings. In this regard, it would be helpful to examine interventions that include physician contact as well as other forms of adjunctive therapy, such as print-based or telephone-based follow-up. While previous studies have begun to explore such possibilities (e.g., Calfas et al., 1996; Norris et al., 2000; ACT Writing Group, 2001), these protocols have not included underserved populations. Finally, researchers must examine the psychometric properties of the PAR with this population and setting. Given the widespread use of this instrument and the unexpectedly high levels of activity endorsed by current participants, this is a particularly important area of future research.

Conclusion

In summary, the tailored physical activity intervention did not produce significant improvements in physical activity or cardiorespiratory fitness as compared with standard care. However, significantly more participants receiving the intervention achieved recommended physical activity levels compared with participants in the standard care condition. Therefore, results were somewhat mixed and were also tempered by the high rates of physical activity reported by the sample prior to treatment. These findings provide a new and unique contribution to the literature on physical activity promotion. Specifically, this project examined the efficacy of an intervention targeting physical activity that was implemented in the primary care setting and included an understudied and high-risk group (i.e., low-income, predominantly African American women). Current results highlight the need for continued research examining the measurement and promotion of physical activity in the primary care setting among this underserved group of patients.

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