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A stage targeted physical activity intervention among a predominantly African American low income medical population

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A STAGE TARGETED PHYSICAL ACTIVITY INTERVENTION AMONG A PREDOMINANTLY AFRICAN AMERICAN LOW INCOME MEDICAL POPULATION

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Abstract

Despite the numerous health benefits, there is a high prevalence of physical inactivity and associated chronic diseases in the U.S., particularly among low income African Americans. Past studies indicate that mailed, stage-matched physical activity promotion materials are effective, low cost, and show potential for reaching hard to reach groups. However, this has not been examined in a low-income African American population. The current study utilized a low-cost, mailed intervention to promote physical activity among a low income African American primary care population (N=207). The sample was predominantly female (82.6%), African American (69.1%), and overweight (81.3%). At baseline, all participants completed a demographic questionnaire, a 7-day physical activity recall (PAR), and stage of exercise scale (SOES). The participants were then randomly assigned to either the intervention (n=105) or control group (n=102). During the next week, the intervention group received individually tailored, stage-matched physical activity information and the control group received a brochure on the benefits of a low-sodium diet. Intervention group participants (M=6.39, SD=12.09) reported significantly larger increases in physical activity than the participants in the control group (M=-1.66, SD=9.63) from baseline to one month follow-up ($t(142)=4.383$, $p<.001$ Intervention participants were more likely to report stage progression through the exercise stages of change from baseline to follow-up than the control group participants ($X^2(1, N=207)=17.7$, $p<.001$). These results suggest that individually tailored stage-matched mailed written materials can serve as a low-cost, minimal effort method for promoting physical activity among low-income African Americans.

Introduction

A Stage Targeted Physical Activity Intervention Among a Predominantly African American Low Income Medical Population

Physical activity is now considered a key component of chronic disease prevention (Pate et al., 1995; U.S. Department of Health and Human Services, 1996). Past research has shown that regular physical activity can reduce the likelihood of dying from heart disease. It can decrease the risk for diabetes, colon cancer, and hypertension. Physical activity also helps control weight, relieve arthritis, and maintain healthy bones, muscles, and joints. It can even reduce symptoms of anxiety and depression and result in fewer hospitalizations, doctor visits, and medications.

Despite the numerous health benefits, there is a high prevalence of physical inactivity and associated chronic diseases in the U.S., particularly among African Americans, individuals with low income and academic achievement, and Louisiana residents. Approximately sixty percent of American adults engage in less than the recommended amount of physical activity and another 25 % of American adults are completely sedentary (U.S. Department of Health and Human Services, 1996). The high prevalence of physical inactivity and associated chronic diseases in the U.S. has led to the development of a variety of physical activity promotion interventions.

While many physical activity promotion interventions have been developed and implemented, several gaps in the literature remain. Low income African Americans are a group at high risk for physical inactivity and chronic disease; however, few interventions aimed at increasing physical activity in this particular group have been completed. Also, rather than focusing on expensive, time consuming interventions with questionable generalizability, more research is needed in the area of mailed, stage-matched physical

activity promotion materials. This technique has been found effective, low cost, and shows potential for reaching hard to reach groups. Thus, the current study utilized a low cost, mailed intervention to promote physical activity among a low income African American medical population.

Health Benefits of Physical Activity

Physical activity is defined as "bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level" and has long been regarded as an important component of a healthy lifestyle (U.S. Department of Health and Human Services, 1996). In fact, individuals participating in moderate to high levels of physical activity have a lower overall mortality rate than those who are sedentary. Several studies (Slattery & Jacobs, 1988; Slattery, Jacobs, & Nichaman, 1989; Leon & Connett, 1991; Stender, Hense, Doring, & Keil, 1993; Sandvik et al., 1993; Chang-Claude & Frentzel-Beyme, 1993; Kaplan, Seeman, Cohen, Knudsen, & Guralnik, 1987; Arraiz, Wigle, & Mao, 1992; Paffenberger et al., 1993) have reported that sedentary participants have between a 1.2- and 2-fold greater risk of dying during the follow up interval than the most active participants. Paffenberger et al. found that, among middle-aged Harvard alumni who reported being sedentary in 1962 or 1966, the participants that began engaging in regular, moderate intensity sports during the eleven year follow up had a 23 % lower mortality rate than those that remained sedentary.

Past research has also shown that regular physical activity can reduce the likelihood of dying from heart disease. Blair et al. (1995) demonstrated that men with low cardiorespiratory fitness who increased their physical activity had a reduced risk of dying from heart disease than men who remained unfit. In fact, there was an 8.6 % decrease in

the adjusted cardiovascular disease mortality risk for each minute of improvement in exercise test time. Two meta-analyses of studies on physical activity and coronary heart disease by Berlin and Colditz (1990) and Powell, Thompson, Caspersen, and Kendrick (1987) also indicated that physical activity is inversely and causally related to the incidence of coronary heart disease. While this relationship was consistently observed, the methodologically stronger studies reported larger benefits of physical activity than less well-designed studies.

Physical activity also decreases the risk for diabetes, colon cancer, and hypertension. Additionally, PA can significantly reduce blood pressure levels in people previously diagnosed with hypertension. A study of University of Pennsylvania male alumni revealed that the least physically active participants had a 30 % higher risk of developing high blood pressure (Paffenberger, Wing, Hyde, & Jung, 1983). Results from Kaye, Folsom, Sprafka, Prineas, and Wallace (1991) reported that the most active female participants between the ages of 55-69 years had a 30 % reduced risk of developing high blood pressure and were half as likely to develop non-insulin dependent diabetes mellitus as the sedentary participants. Furthermore, Helmrich, Ragland, Leung, and Paffenbarger (1991) indicated that every additional 500 kilocalories of exercise per week was associated with a 6 % reduction in risk for developing non-insulin dependent diabetes mellitus among male college alumni. In addition, results from eight studies (Gerhardsson, Steineck, Hagman, Rieger, & Norell, 1990; Slattery, Schumacher, Smith, West, & Abd-Elghany, 1988; Severson, Nomura, Grove, & Stemmermann, 1989; Gerhardsson, Floderus, & Norell, 1988; Whittemore et al.1990; Lee, Paffenbarger, & Hsieh, 1991; Giovannucci et al., 1995; Longnecker, DeVerdier, Frumkin, & Carpenter, 1995) suggest

an inverse relationship between physical activity and the risk of colon cancer with similar results across genders.

Exercise can help control weight, relieve arthritis, and maintain healthy bones, muscles, and joints. Many cross-sectional studies (DiPietro, L., 1995; Ching et al., 1996; Williamson et al., 1993; French et al., 1994; Folsom et al., 1985; Dannenberg, Keller, Wilson, & Castelli, 1989; Slattery et al., 1992; Gibbons, Blair, Cooper, & Smith, 1983; Voorips, Meijers, Sol, Seidell, & van Staveren, 1992) found lower weight, body mass index, and skinfold measures among participants that reported higher levels of physical activity. In addition, several review articles (Oscai, 1973; Stefanick, 1993; Thompson, Jarvie, Lahey, & Cureton, 1982; Wilmore, 1983) and meta-analyses (Ballor & Keesey, 1991; Epstein & Wing, 1980) conclude that (1) exercise promotes fat loss while increasing lean mass, (2) the rate of weight loss is positively associated with the frequency and duration of physical activity, and (3) increased physical activity and dieting are more effective in controlling weight in the long term than dieting alone. There is also research to support the ability of regular moderate intensity exercise to reduce joint swelling, and improve function among participants with both osteoarthritis and rheumatoid arthritis (Ettinger & Afable, 1994; Fisher, Pendergast, Gresham, & Calkins, 1991; Fisher, Kame, Rouse, & Pendergast, 1994; Fisher & Pendergast, 1994; Puett & Griffin, 1994; Allegrante, Kovar, MacKenzie, Peterson, & Gutin, 1993).

Physical activity has shown psychological benefits in addition to physical improvements. Not only does physical activity reduce symptoms of anxiety and depression, it can even result in fewer hospitalizations, doctor visits, and medications. Sedentary participants are twice as likely to report depressive symptoms as more

physically active participants, according to the U.S. Department of Health and Human Services. Two cross-sectional studies, Ross and Hayes (1988) and Stephens (1988), found inverse associations between physical activity and depressive and anxiety symptoms. Exercise can also decrease hospitalizations, doctor visits, and medications by controlling and preventing chronic diseases (National Center for Chronic Disease Prevention and Health Promotion, 2002).

Physical activity does not have to be strenuous or time-consuming in order to reap the health benefits. Moderate amounts of physical activity can prevent and control chronic disease. While more protection from chronic disease is achieved by increasing the frequency, intensity, and duration of the exercise, recent efforts to promote physical activity have shifted the emphasis from high intensity endurance exercise towards regular short bouts of moderate-intensity physical activity, such as brisk walking. In fact, the Centers for Disease Control and Prevention and the American College of Sports Medicine (1995) recommendations call for "thirty minutes or more of moderate-intensity physical activity on most, preferably all, days of the week" in order to receive substantial health benefits. The rationale is that smaller increases in physical activity are easier to achieve and sustain for many years than more drastic changes for sedentary individuals, who are at the greatest risk for related chronic diseases. The recommendations also provide encouragement for individuals who are already physically active to continue to strive for further health benefits by increasing the intensity, duration, and frequency of their exercise.

Prevalence of Physical Activity and Related Chronic Diseases in the U.S.

Despite the numerous health benefits to be derived from low levels of moderate-intensity physical activity, the U.S. population is disturbingly inactive. Approximately sixty percent of American adults engage in less than the recommended amount of physical activity and another 25 % of American adults are completely sedentary. As a result, Americans suffer from high rates of chronic diseases. Approximately 13.5 million people have coronary heart disease, 8 million people have Type II diabetes, 50 million have high blood pressure, and over 60 million people, or a third of the population, are overweight. (U.S. Department of Health and Human Services, 1996). The prevalence of heart disease, diabetes, hypertension, and obesity are especially high among the less physically active groups in the U.S., particularly African Americans, individuals with low income and academic achievement, and Louisiana residents.

High Risk Groups For Physical Inactivity and Related Chronic Diseases

African Americans report consistently higher levels of physical inactivity and chronic disease than Caucasians. African Americans were 36 % more likely than Caucasians to report no leisure time physical activity in 2000. Thus, the rates of death from heart disease and prevalence of diabetes were also higher (29 % and 70 %, respectively) among African Americans than Caucasians (National Center for Chronic Disease Prevention and Health Promotion, 2002). African Americans reported an increased prevalence of hypertension compared to Caucasians. Specifically, 38 % of African American males versus 28.9 % of Caucasian males, and 41 % of African American females versus 24.7 % of Caucasian females reported a history of hypertension. Additionally, there are ethnicity differences for obesity. 28.5 % of African

Americans versus 20.4 % of Caucasians are obese (National Center for Health Statistics, 2002, 1999).

Kumanyika (2001, 2002) suggests that many cultural differences could account for decreased physical activity among African Americans. For example, African Americans may experience less social pressure to exercise as a result of a positive cultural value for large body size. Another study examining barriers to exercise found that care giving duties and the presence of unattended dogs in the neighborhood are independently associated with African American women being less physically active, suggesting that increased family duties and dangerous neighborhoods are barriers to exercise. Another possible explanation offered by Kumanyika (2001) is that previous generations of African Americans, who endured excessive manual labor during the years of slavery, could have passed down a cultural perspective that rest better promotes health and survival than additional physical activity.

Low income is also a risk factor for physical inactivity and chronic disease. The National Health Interview Survey (NHIS) and Behavioral Risk Factor Surveillance System (BRFSS) found that adults making less than $10,000 a year (23.6 % versus 28 % and 17.6 % versus 23.5 %) were also less likely to report participating in regular exercise than adults making over $50,000 a year. There are also slightly higher rates of heart disease, diabetes, and hypertension among individuals classified as poor or below the Census Bureau's poverty threshold (6.5 % versus 4.3 %, 7.6 % versus 4.6 %, and 20.4 % versus 17.3 %, respectively), compared to those participants having incomes equivalent to 200% of the poverty threshold or greater. Individuals with a family income less than $20,000 a year (22.2 % versus 17.5 %) were also more likely to be obese than individuals

family income greater than $75,000 a year. There are many possible reasons for such a discrepancy. The poor may have less access to health spas, exercise equipment, and neighborhoods in which it is safe to exercise outdoors.

Low academic achievement is also a risk factor for physical inactivity and chronic disease. The NHIS and BRFSS found that adults with less than 12 years of education (18.1 % versus 28.5 % and 15.6 % versus 23.5 %, respectively) were not as likely to report regular, sustained physical activity as adults with 16 or more years of education. Individuals with less than a high school diploma (25.5 % versus 15.6 %) were also more likely to be obese than individuals with a college degree. An explanation for these differences is that low academic achievement may result in less exposure to health education.

The Louisiana population is even less physically active and more likely to suffer from related chronic diseases than the overall U.S. population. In fact, Louisiana has the second highest percentage of adults (36.2 %) reporting no participation in leisure-time physical activity, the highest rate of death due to diabetes, and fifth highest rate of death from heart disease (29 %) among all U.S. states (National Center for Chronic Disease Prevention and Health Promotion, 2002). There were also slightly higher percentages of hypertension and obesity among Louisiana residents (26 % versus 23 % and 23.6 % versus 20.6 %, respectively) than the overall American population (Louisiana State Center for Health Statistics, 2002; Centers for Disease Control and Prevention, 2000). The increased prevalence of physical inactivity and chronic disease in Louisiana could be due to environmental factors that limit physical activity, such as warmer climate, increased humidity, and extended summers.

The previously discussed ethnic and socioeconomic trends in physical activity and chronic disease prevalence in the U.S. are also seen in the state of Louisiana. African Americans in Louisiana reported a higher prevalence (41.7 % versus 34.7 %) of not participating in leisure-time physical activity, had an 156 % greater chance of dying from diabetes, and were also more likely to report high blood pressure (36 % versus 25 %) and obesity (31.6 % versus 20.4 %) than Louisiana Caucasians (National Center for Chronic Disease Prevention and Health Promotion, 2002). Also, individuals in Louisiana with less than a high school diploma (52.9 % versus 18.2 %, 12.5 % versus 6 %, and 42 % versus 21 %, respectively) and an income less than $15,000 a year (54.7 % versus 16.8 %, 12.55 % versus 4.1 %, and 43.4 % versus 21.8 %) were more likely to report physical inactivity, diabetes, and hypertension than individuals with a college degree and income greater than $50,000 a year (National Center for Chronic Disease Prevention and Health Promotion, 2002; Centers for Disease Control and Prevention, 2000).

The costs of physical inactivity in the U.S. are devastating. Physical activity can control and prevent chronic diseases, which have now reached epidemic proportion and account for at least 70 % of all deaths in the U.S. (National Center for Chronic Disease Prevention and Health Promotion, 2003). Published estimates of the number of U.S. deaths per year due to physical inactivity range from 200,000 for physical inactivity alone and 300,000 for inactivity and poor diet combined (U.S. Department of Health and Human Services, 1996). The direct medical cost of physical inactivity was nearly $76 billion in 2000 (National Center for Chronic Disease Prevention and Health Promotion, 2003). Promoting physical activity is of great medical and financial importance in the

U.S., especially among less active groups such as African Americans, individuals with low income and academic achievement, and Louisiana residents.

Models of Health Behavior Change

As the health benefits of physical activity have become well-established, there is an increased need for interventions that promote this health behavior among the sedentary U.S. population. Psychological theories and models of human behavior often serve as the foundation of such interventions and guide their development and modification. Since there are many theories on how to promote health behavior change such as physical activity, this paper will limit its discussion to three popular theories in this area: social marketing, social cognitive, and transtheoretical.

Social Marketing Theory

Social marketing theory argues that behavior change is effectively promoted through mass media campaigns and innovations in the social and environmental settings of the participants. There is an emphasis on tailoring the design and delivery of mass media health communication to the characteristics and context of the target audiences. It also advocates the provision of services and settings that increase health behavior opportunities (Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998). Several studies have attempted to use social marketing techniques to make physical activity a more accessible and enjoyable option with limited success.

The National Heart Foundation of Australia utilized the social marketing theory to increase the proportion of the Australian population regularly engaging in moderate intensity physical activity in its Heart Week 1990 and 1991 campaigns. Both interventions involved paid national television advertisements, public service

announcements on the radio, distribution of a professional paper, posters, pamphlets, stickers, t-shirts, sweat shirts, publicity tours by two health experts, activity days, competitions, and magazine articles. The 1990 campaign ("Exercise: make it part of your day") was successful in increasing the prevalence of reported walking for exercise, particularly among the elderly and less educated. The 1991 campaign ("Exercise: take another step") built on the previous campaign and encouraged maintenance of increases in physical activity. While the 1991 campaign reinforced the behavior among those who had already adopted physical activity, there were no significant increases in physical activity (Owen, Bauman, Booth, Oldenburg, & Magnus, 1995). The authors speculate that perhaps those individuals who were considering participating in exercise already did so in response to the 1990 campaign.

The Minnesota Heart Health Program also used social marketing strategies, such as mass media, community events, and community leader involvement, to increase physical activity over a five to six year period in six Midwestern communities (three intervention, three comparison). Results suggest that there was a steady increase in self-reported physical activity in all communities over the course of follow ups regardless of condition. The education communities exceeded the comparison communities only at the last follow up (63.6 % versus 58.6 %, respectively) (Luepker et al., 1994).

The Stanford Five-City Project involved an intervention similar to the Minnesota Heart Health Program, however it was conducted in California over six years. There were two pairs of matched communities and one surveillance only community. This study utilized print materials, newspaper columns, talks, seminars, workshops, community walking events, TV news segments, and worksite exercise programs. Results indicated

that men in treatment cities reported modest increases in vigorous physical activity, while women reported modest increases in moderate activity (Young, Haskell, Taylor, & Fortmann, 1996). In summary, while several large scale projects have utilized social marketing techniques, the small gains in physical activity achieved do not necessarily justify such expensive and time-consuming interventions.

Social Cognitive Theory

The Social Cognitive Theory (SCT) has also been used to generate health behavior change. This theory proposes that the adoption of new health behaviors is affected by environmental influences, personal factors, and the characteristics of the behavior itself. Self efficacy is the main concept of the theory and involves the individual's belief in his/her own potential for behavior change. Another important factor is the participant's perception of the consequences associated with the adoption of a health behavior (U.S. Department of Health and Human Services, 1996). Interventions based on SCT rely typically on techniques such as goal setting, decisional balance, relapse prevention, stimulus control, and social support to increase levels of physical activity (Owen et al., 1995). Several studies using SCT have successfully achieved short term increases in the adoption of exercise.

King, Taylor, Haskell, and DeBusk (1988) conducted a six month physical activity promotion intervention based on SCT that included face-to-face training, videotape, and staff phone calls. Results indicated significantly increased cardiorespiratory fitness, measured by VO_2 peak, among participants who received phone contacts as compared to participants receiving no phone contact. Another SCT-based intervention lasted one year and compared the efficacy of structured to lower- or higher-

intensity home-based exercise programs with print materials and telephone contacts. All three groups improved in treadmill exercise test performance, but the adherence rates were better for home-based groups (King, Haskell, Taylor, Kraemer, & DeBusk, 1991). Osler and Jespersen (1993) used SCT to implement a year long mass media campaign with community events ("Slangerup-a Heart Healthy Town") that produced small increases in physical activity and motivational readiness to exercise among both intervention and control communities.

Transtheoretical Model

While there are many theories on increasing the adoption of health behaviors, the transtheoretical model is currently one of the dominant models of physical activity promotion. The transtheoretical model, or TTM, (Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992; Prochaska & Velicer, 1997) is an integrative model of behavior change that has led to the development of effective health promotion interventions in many areas, such as smoking cessation, low fat diet, condom use for HIV protection, weight control, stress management, use of sunscreen to prevent skin cancer, medical compliance, mammography screening, and exercise. TTM focuses on recognizing individual differences in motivational readiness to adopt new health behaviors and explains behavior change in terms of four main constructs: stages of change, processes of change, self efficacy, and decisional balance.

Behavior change involves progressing though five stages of motivational readiness to adopt a health behavior, or stages of change, known as precontemplation, contemplation, preparation, action, and maintenance. In the Precontemplation stage, individuals have no intention of adopting the health behavior in the future. Individuals in

this stage are often completely unaware of or lack a proper appreciation of the benefits of the health behavior. Individuals in Contemplation are aware of the benefits of adopting the health behavior and are considering adopting it, but have not committed to change. The Preparation stage involves awareness and intent to take action in the next month. Individuals in this stage have often made unsuccessful attempts to adopt the health behavior in the past year. The action stage is when behavior change actually occurs. Maintenance consists of adhering to the health behavior for at least six months and attempting to avoid relapse. The TTM suggests that interventions be matched to the individual's current stage of change and that most people go through the cycle of stages several times before achieving successful behavior change.

The processes of change are the techniques, methods, and interventions that individuals utilize to progress through the various stages of change. The ten processes can be divided into two groups: cognitive and behavioral processes of change. The cognitive processes include consciousness raising, dramatic relief, environmental reevaluation, self reevaluation, and social liberation. Consciousness raising involves gaining new information and understanding about oneself and health behaviors through observations, confrontations, and reading. A physician counseling an overweight patient on the benefits of walking would constitute an example of consciousness raising. Dramatic relief is the process of expressing feelings about the health problem and discussing potential solutions through such methods as role playing. Environmental reevaluation involves considering how the behavior affects the physical and social environment. This concept could involve concerns over exposing others to secondhand smoke or serving as a (positive or negative) role model. Self-reevaluation is the assessment of an individual's self image in relation to

a particular health behavior through techniques such as value clarification or imagery. Social liberation is increasing the opportunity for alternative, healthier behaviors in society. For example, recent changes in communities, like more parks and walking tracks, have made it easier for people to engage in physical activity.

The behavioral processes include counter conditioning, helping relationships, reinforcement management, self liberation, and stimulus control. Counter conditioning is typically achieved by substituting alternatives for the problem behavior. A common counter conditioning technique is to take a walk rather than eat unhealthy snacks when feeling stressed. Another important aspect to effective behavior change is helping relationships. Maintaining a strong social support network (e.g., family, friends, group therapy) can prevent discouragement and increase the chance of success. Reinforcement management refers to rewarding oneself or receiving rewards from others for making changes. Self-liberation involves committing to adopting the health behavior and increasing confidence in one's ability to change. A well-known self-liberation technique is the New Year's resolution to start exercising regularly. Stimulus control involves avoiding or countering triggers for unhealthy behaviors and prompting healthy behavior. Patients often use stimulus control to increase physical activity by placing their walking shoes in a highly visible spot the night before so they will be prompted to walk in the mornings. (Velicer, Prochaska, Fava, Norman, & Redding, 1998). Thus, while the stages of change describe *when* shifts in intent and behavior occur, the ten processes describe *how* these changes occur.

Previous studies on increasing physical activity indicate that participants used different processes of change depending on their current stage of change.

Precontemplators were the least likely group to use any of the processes of change. While individuals in the stages of Contemplation and Preparation were equally likely to use cognitive processes, individuals in the preparation stages were more likely to use behavioral processes. Individuals in the Action stage were more likely to use both types of processes than participants in the Preparation stage. Individuals in the Maintenance stage reported using less cognitive processes than, but similar numbers of behavioral processes as, those in the Action stage (Marcus et al., 1992). Such results indicate that process-oriented interventions targeted to the participant's stage of change can facilitate progress towards the Action and Maintenance phases of exercise behavior.

Decisional balance is another important construct in the Transtheoretical model. It involves weighing the pros and cons of behavior change. Narrative reviews of physical activity studies indicate that the pros of behavior change increase with advancing stage, reaching a peak in the Action stage, while cons decrease across the stages of change. The decisional balance construct is an important predictor of stage progression, particularly between precontemplation, contemplation, and preparation, but less so for action and maintenance.

Self efficacy is a concept borrowed from the social cognitive theory that describes the individual's level of confidence in his/her ability to adopt health behaviors and cope with high-risk situations without relapsing to unhealthy habits. Many studies based on TTM have revealed a consistent positive linear relationship between exercise self efficacy and stage of change (Marshall & Biddle, 2001). TTM argues that the constructs of processes of change, decisional balance, and self efficacy have a strong influence on the progression through the stages of behavior change.

The stages of change theory is one of the dominant models of physical activity promotion. This model displays exceptional applicability and appropriateness in many aspects of behavior change interventions, particularly in the areas of recruitment, retention, progress, process, and outcome. Interventions based on TTM have achieved very high participation rates. TTM recognizes that individuals in different stages of change require varying interventions. The acceptance of individual differences encourages participation. In contrast, interventions based on other models often presume that individuals are prepared to make immediate, permanent changes in health behavior. When recruitment strategies reflect these assumptions and studies appear to be overly demanding, participation rates suffer. Dropout rates for studies based on TTM are also lower. The increased level of personally relevant content can often inspire more adherence and retention in the participants.

The transtheoretical model is also sensitive to small increases in progress. Its measures of cognitive, emotional, and behavioral indictors of change are well suited for detecting the slight improvements in physical activity that are so monumental to achieving health benefits. Surprisingly small amounts of physical activity are required to prevent and control chronic disease, thus other models that treat behavior change as an "all or nothing" phenomenon often overlook clinically significant increases in progress.

Another advantage of TTM is that the clearly defined relationships between the constructs lend themselves to process analysis. For example, analyzing patterns of stage progression can reveal whether an intervention is more effective among contemplators than pre-contemplators. This is important as interventions often vary greatly in their

degree of effectiveness among different groups. The well-developed structure of TTM allows for process analysis, which can guide amendment of the intervention process.

Interventions based on TTM can also have a substantial impact on the community. The impact of an intervention equals the recruitment rate times the efficacy. Effective interventions with high dropout rates do not generate a strong impact upon the population, while slightly less effective interventions with better participation rates can make more of a difference (Velicer et al., 1998). Studies based on TTM often achieve high efficacy and lower dropout rates by tailoring the interventions. Thus, there is potential for considerable impact, especially since results suggest that motivationally tailored physical activity interventions are most effective among sedentary and less active participants (Marcus, Owen, et al., 1998). Interventions based on TTM are likely to increase the physical activity levels of at risk groups, reduce chronic disease rates, and improve the health of the population.

Previous Physical Activity Promotion Studies Based on the Transtheoretical Model

Previous efforts to increase physical activity using the transtheoretical model have been conducted and indicate that the TTM is an effective model of exercise promotion. Marcus et al. (1992) applied the stages of change model to a six-week community intervention ("Imagine Action") to increase adoption of physical activity. There was no control condition and the intervention consisted of stage-targeted written materials, a resource manual describing physical activity opportunities in the community, weekly fun walks, and activity nights. Findings revealed that 30 % of the participants in the Contemplation stage and over 60 % of those in the Preparation stage at baseline reported progressing to the Action stage at the six week follow up. Also, another 30 % of those in

Contemplation at baseline reported advancing to the Preparation stage. Such progress is noteworthy because previous research on TTM suggests that participants who are able to progress at least one stage are twice as likely to be successful in adopting the health behavior in the near future. Marcus et al. significantly increased physical activity among community volunteers by using a TTM-based intervention.

Another study, "Jump Start to Health", involved a randomized controlled trial comparing the efficacy of a stage-targeted physical activity intervention to a standard physical activity intervention in the workplace. Employees received printed self-help exercise promotion materials that were either matched to their level of motivational readiness or were standardized materials. The participants who received interventions matched to their individual stage of change were significantly more likely to report stage advancement (37 % versus 27 %) and less likely to report stage maintenance (52 % versus 58 %) or regression (11 % versus 15 %) at three month follow up than the participants who received the standard physical activity intervention (Marcus, Emmons, et al., 1998). This study argues that interventions based on the transtheoretical model are more effective in promoting physical activity than standard interventions.

Physician counseling interventions based on TTM have also been successful in promoting exercising adoption. Project PACE (Provider-based Assessment and Counseling for Exercise) compared an intervention group of 12 primary care physicians, who were trained to provide physical activity counseling based on the stages of change model, to a control group of 10 doctors, who were trained in hepatitis B detection. At the four to six week follow up, participants in the intervention group were significantly more

likely to show increases in physical activity (52 % versus. 12 %) and motivational readiness to exercise than the control group (Calfas et al., 1996).

A study by Marcus et al. (1997) also examined the efficacy of a physician exercise counseling intervention based on the TTM. The main differences between these two trials are that Marcus et al. included older participants (the average age was 67 years, while the average age in PACE was 39 years), recommended moderate physical activity throughout the day rather than continuous vigorous exercise, distributed more comprehensive motivation-matched self instructional print materials, included participants in the stages of precontemplation, contemplation, and preparation (not just contemplation), and conducted follow up visits in the office with physicians (rather than by phone with health educators). The intervention program was administered by four physicians and consisted of physician training on physical activity counseling, 5 minutes of patient counseling, behavior change materials based on TTM, office support system, and follow up. Control participants completed the study before the physicians received training on physical activity counseling. Both groups of patients reported increases in their physical activity at the six week follow up, but greater increases were reported among patients who received more physician counseling on exercise. This study demonstrated that a physician delivered intervention based on TTM produced short term increases in the physical activity level among sedentary older adults.

Low Cost Mailed Physical Activity Promotion Interventions

While studies based on the transtheoretical model were achieving success, another problem faced by physical activity researchers is the cost-prohibitiveness of exercise interventions. Many recent physical activity studies, like the Activity Counseling Trial

(ACT), have grown implausible to replicate due to their financial, technological, and personnel demands. The ACT trial compared the effects of two physician physical activity counseling interventions with current recommended care and involved 51 physicians, two physician assistants, and one nurse practitioner from eleven primary care facilities. The participants were inactive volunteers who were randomly assigned to an advice, assistance, or counseling group. The advice group received recommended care, which includes physician advice and written educational materials. The assistance group received the recommended care plus interactive mail and behavioral counseling at physician visits. The counseling group received all the interventions previously mentioned in addition to regular telephone counseling and behavioral classes. Results indicated that both physician counseling interventions significantly improved cardiorespiratory fitness, assessed as measured maximal oxygen uptake (VO_2max) by a graded maximal exercise test on a treadmill, among women. There was an approximately 5% higher VO_2max among women in the physician counseling groups than among the women receiving recommended care at the two year follow up. Neither physician counseling intervention was more effective than recommended care for men. Compared with the advice group, the incremental cost of the assistance group was around $500 a participant and the incremental cost of the counseling group was $1100 a participant (Simons-Morton et al., 2001). While the ACT trial was successful in increasing cardiorespiratory fitness among women, studies that require such costly technology and large investments of time and effort from physicians are not very feasible.

A more realistic method of increasing exercise behavior might involve mailed, self instructional print materials. The value of such an intervention lies in its cost

effectiveness and increased ability to reach more people, particularly underserved populations who would be less likely to have access to newer forms of communication such as the Internet. Owen, Lee, Naccarella, and Haag (1987) was one of the first studies to utilize low cost mailed self help physical activity programs. There were four groups of participants in this study: two comparison groups (fitness class condition and course refusers) and two intervention groups (multiple package group and single package group). The fitness class participants were enrolled in a 12 week fitness program that met twice weekly with an instructor and focused on the methods and techniques outlined in packages of self help printed materials. The other comparison group consisted of individuals who originally expressed interest in the study, but withdrew before it began. Participants in the multiple mailing group received seven letters over a twelve week period. The first letter contained an assessment and then six exercise program lessons of gradually increasing intensity with feedback forms. The single mailing condition received the same program in one package. Mailing one package was not only half as expensive as mailing the same materials in multiple packages, but also more effective in promoting physical activity. While around 35 % of both groups reported meeting the ACSM (1978) recommendations at baseline, participants in the single package condition were more likely (56 % versus 36 %) to report meeting the criteria at the twelve week follow up than the multiple package group. Receiving all the physical activity information in one package may be beneficial because it gives the participant more flexibility and allows for planning in advance. Mailed self instructional programs have the potential to inspire health behavior change among large numbers of people at low cost and effort on the part of the investigators.

While Owen et al. (1987) utilized a low cost mailed physical activity promotion intervention based on the social cognitive theory, similar interventions based on the transtheoretical model have also been successful at increasing exercise behavior. Cardinal and Sachs (1996) examined the efficacy of mailed, stage matched physical activity promotion materials at a worksite. The participants were female clerical staff at a major university (67% African American) who were randomly assigned to three groups: control packet, lifestyle exercise packet, and structured exercise packet. The control packet contained information on the participant's health status without any exercise recommendations. The lifestyle packet encouraged daily routine physical activity (i.e. walking, housework, gardening, etc.). The structured exercise packet promoted the stricter ACSM (1995) exercise guidelines. Both the lifestyle and the structured exercise packet included information tailored to the participant's stage of change; however, the lifestyle packet was perhaps most in agreement with TTM because of its greater appeal to individuals at lower levels of motivational readiness to exercise. The group receiving the lifestyle exercise packet reported more leisure time physical activity than the structured and control group (M METs, or mean multiples of the resting rate of oxygen consumption during physical activity, of 30.7, 22, and 17.6, respectively) at the 1 month follow up. This study argues for the efficacy of stage-matched, mailed self help materials in increasing the adoption of physical activity.

While the previously discussed studies utilized low cost, mailed, stage-targeted self instructional exercise promotion materials on worksite populations, Marshall et al. (2003) evaluated the efficacy of a similar intervention within a randomly selected community sample. This study is important because self-selected participants are less

likely to be in Precontemplation and are often more motivated to achieve behavior change than those recruited from the general population. Nonvolunteer participants are more likely to be in the earlier exercise stages of change and, thus, in greater need of intervention. The intervention consisted of personally addressed letters and stage targeted "Active Living" booklets. Participants in the intervention group were significantly more likely than the control group (adjusted odds ratio [OR] = 2.4; 95 % confidence interval [CI] = 1.44-3.99) to report meeting the ACSM/CDC recommendations for sufficient physical activity at the two month follow up. Therefore, Marshall et al. demonstrated that mailed stage-targeted print materials were not only effective in promoting short term increases in physical activity among self-selected participants, but also within a random sample of Australian adults.

Marcus, Bock, et al. (1998) also utilized low cost, mailed physical activity interventions. In this study, the comparison group received standard self help booklets, while the intervention group received stage-targeted, printed self help materials and computer generated, individually tailored feedback reports on the participant's level of motivational readiness, self efficacy, decisional balance, use of cognitive/behavioral processes of exercise change, and progress. At six month follow up, the participants in the motivationally matched, individually tailored intervention group were significantly more likely to report increases in minutes of physical activity per week, meeting the CDC/ACSM exercise recommendations, and reaching the Action stage. Therefore, individually tailored, motivationally matched interventions are a more effective low cost approach to promoting exercise in the community than standard self-help interventions.

Exercise Promotion Among Low Income African Americans

Mailed self instructional physical activity materials are not only successful in promoting exercise, but are well-suited for reaching underserved populations, such as low income African Americans. Self instructional, mailed physical activity interventions can be mass-distributed at little cost or effort to the researchers. Such exercise programs can be completed by participants at home at any hour. The convenience of an intervention could be an important determinant of its success among lower income African Americans who may have transportation problems, inflexible job hours, or care-taking responsibilities. Also, mailed interventions allow for the inclusion of participants who cannot afford computers or access to newer forms of communication, like the Internet.

While such interventions may have positive outcomes among low income African Americans, who are at increased risk for inactivity and chronic disease, little research has been conducted in this area. Baranowski et al. (1990) is an example of an unsuccessful effort to increase physical activity among 94 African American families. The intervention consisted of individual counseling, small group education, aerobic activity, incentives, telephone prompts, and assessment while the control group received only the assessment. Results suggest no differences in energy expenditure among the two groups and low rates (20 %) of participation. The authors concluded that center-based programs have limited utility in promoting physical activity among healthy, low income African Americans families with young children.

The Fitness Through the Churches Project attempted to promote exercise among African Americans in North Carolina by encouraging local African American churches to hold exercise classes. Hatch, Cunningham, Woods, and Snipes (1986) recruited

participants from local African American churches, held pastorial workshops, conducted a pilot study, and then trained church members to be fitness instructors. While exploratory in nature, the authors suggested that physical activity programs offered at church were acceptable and appealing to African American clergy and congregations.

Unlike previously discussed efforts to increase exercise adoption among African Americans that failed or were of an exploratory nature, a study among African Americans in the Bootheel area of Missouri achieved a small degree of success in promoting physical activity. The five year intervention involved forming six coalitions in rural communities in the Bootheel area of Missouri. Each coalition received $5,000 from the state health department to use for newspaper articles, sermons, exercise classes, walking clubs, new walking trails, and community physical activity events. While results indicated that there was no difference in physical activity levels in the Bootheel and the rest of Missouri at follow up, coalition communities experienced a 3 % decrease in physical inactivity and the physical inactivity rates of communities without coalitions increased 3.8 % (Brownson et al., 1996).

The Physical Activity for Risk Reduction (PARR) project, a constituency-based physical activity promotion program, was also able to produce a limited positive impact on physical activity levels among African American residents of public housing communities in Birmingham, Alabama. The constituency model allowed the community to determine its needs, distinguish the necessary strategies, and then carry the plan out with training and assistance (i.e., financial and technical support) from the project staff. Phase I consisted of collecting data from focus groups and surveys on the residents' exercise patterns, knowledge, beliefs, barriers, determinants, social support, and self

efficacy. Phase II and Phase III involved analyzing the data and then designing and conducting the intervention programs based on health education and social cognitive theories. Three communities comprised the basic intervention groups, in which community leaders provided physical activity programs and informational pamphlets on exercise. Three other communities participated in the enhanced intervention, which included all aspects of the basic intervention and also some behavioral techniques. These behavioral techniques included overcoming barriers by offering child care, setting goals through exercise program attendance competitions, and increasing social support by encouraging community and church leaders to stress the benefits of physical activity. Two control communities received no intervention until after the conclusion of the project, at which time they received similar exercise programs and funding. Overall, the intervention communities did not report significant increases in physical activity at the one year follow up (Lewis et al., 1993). However, the authors suggest that such results could be due to variability among the intervention communities. The organized communities with regular, well-attended meetings and involved leaders and residents reported significant increases in exercise at follow up, unlike unorganized communities with poor attendance at meetings and less involved residents.

A literature review revealed several deficits in the physical activity promotion research. Several studies successfully implemented individually tailored interventions based on TTM. While intervention cost may be a barrier to replication of these studies, mailed self instructional printed materials have been found to be a low cost solution for promoting physical activity. Similar effective interventions have been conducted in many populations; however, neither individually tailored stage-matched interventions or low

cost mailed self help materials have been utilized in an attempt to increase exercise adoption in a low income African American medical population.

Rationale and Hypotheses

Summary and Rationale

This study proposed that individually tailored, stage-matched, mailed physical activity promotion materials will be an appropriate and effective intervention among lower socioeconomic status African Americans in Louisiana for three primary reasons. First, lower socioeconomic status African Americans are in great need of intervention, but remain a difficult group to reach. The advantages of mailed materials are that they do not require significant effort or expense to send to large numbers of participants. Mailed interventions can also reach individuals who do not have access to expensive, new technology, such as computers and the Internet, or visit the doctor regularly.

Second, mailed self-instructional materials are convenient. Participants do not have to take time off from work or care-giving duties to participate in the intervention, but may do so in their spare time. Mailed, self-instructional materials also avoid the issue of transportation. Lower socioeconomic families often rely on one vehicle or public transportation, so the ability to complete the intervention from home is an important component to the success of the intervention.

Third, past research suggests that mailed self instructional materials could be a particularly appealing and less intimidating intervention to lower socioeconomic African Americans. The tailored materials often appear more engaging and personally relevant. The information is stage-matched, so it will be less likely to suggest levels of behavior change that the participant is hesitant and unready to adopt. The materials eliminate the

necessity for participants to deal with a health center or staff, so the participants should experience less fear of social evaluation during this approach. Thus, we proposed that mailed, self-instructional, stage-matched, individually tailored physical activity promotion materials will be a successful intervention in a lower socioeconomic African American medical population in Louisiana. Specific hypotheses tested in this study are:

Hypotheses

H1: The participants that receive the mailed stage-targeted physical activity intervention will report significantly larger increases in physical activity from baseline to follow up than the participants in the control group.

H2: The participants that receive the mailed stage-targeted physical activity intervention will be more likely to report increased progression through the exercise stages of change at follow up than the participants in the control group.

Methods

Participants

Two hundred and seven participants were randomly recruited from the waiting rooms of two outpatient clinics (Family Practice Clinic and General Medicine Clinic) at Earl K. Long Medical Center (EKL). EKL is a teaching hospital affiliated with the Louisiana State University Health Sciences Center. This medical center provides medical care to a predominantly low income African American population. The participants were randomly assigned to either the intervention (n=105) or control group (n=102).

The inclusion criteria required that participants be EKL patients, at least 18 years old, able to walk unassisted, and have access to a telephone (for follow up data). Patients were excluded from this study if they are not able to provide an address where they will be residing for one month or if their reading ability is below an 9th grade level as determined by the Passage Comprehension subtest of the Woodcock Johnson Tests of Achievement (Woodcock, McGrew, & Mather, 2001).

Nine participants were excluded from participation. Two African American females and one African American male were excluded from participation as they did not have access to a telephone. Two Caucasian males, two African American females, and one Caucasian female were excluded as their reading level was determined to be below a 9th grade level by the reading screener. One African American male participant was excluded because he was unable to provide an address where he would be residing for one month.

Ten participants refused to participate in the study. Specifically, two African American males, four African American females, one Caucasian male, and three

Caucasian females refused to participate for a variety of reasons. The most common reason given for non-participation was feeling physically ill (i.e. fatigue or headache).

Measures

Demographic Questionnaire

This questionnaire assessed various demographic variables, including age, gender, race, height, weight, marital status, educational level, income level, and chronic disease status (see Appendix B).

Stages of Exercise Scale (SOES)

Stage of exercise was assessed with Cardinal's five item ordered categorical scale (Cardinal,1995a; Cardinal 1995b). The SOES (see Appendix C) is based on the Transtheoretical Model and its five items correspond to the five stages of change. The precontemplation item states, "I presently do not exercise and do not plan to start exercising in the next 6 months." The contemplation item states, "I presently do not exercise, but I have been thinking about starting to exercise in the next six months." The preparation stage item states, "I presently get some exercise, but not regularly." The action item states, "I presently exercise on a regular basis, but I have only begun doing so within the past six months. The maintenance item states, "I presently exercise on a regular basis and have been doing so for longer than six months."

The construct validity of the SOES was supported by studies that demonstrated variation on a number of physical activity-related variables among participants in different stages of exercise. Cardinal (1995a, 1995b) reported significant differences in exercise energy expenditure ($p < 0.0001$, $w^2 = 0.18$), physical activity energy expenditure ($p < 0.0001$, $w^2 = 0.15$), and VO_{2peak} ml/kg/min ($p < 0.0001$, $w^2 = 0.19$) between stages of

exercise. Cardinal (1995a) also found significant differences between stages for body mass index, cardiorespiratory fitness, exercise behavior, relapse, barriers, and self efficacy overall and for each variable separately. The proportion of variance accounted for by these variables ranged from .06 to .53.

There is also empirical support for the concurrent validity and test-rest reliability of the SOES. Statistically significant Pearson correlation coefficients between the SOES and two other physical activity indexes, Blair's self-report seven-day physical activity recall instrument and Godin and Shephard's "Leisure Time Exercise Questionnaire" argue for the concurrent validity of the SOES. The range of the correlation coefficients, 0.36 to 0.40, was also in the predicted direction (Blair, 1984; Godin & Shephard, 1985). Cardinal (1995a and 1995) reported perfect three-day test-retest reliability values for the SOES in two different samples ($r_s = 1.0$).

Seven-day Physical Activity Recall (PAR)

The PAR (Sallis et al., 1985) is a self report physical activity measure that has been widely used in exercise science and epidemiological research (see Appendix D). In fact, many important behavioral interventions, such as the Stanford five-city project, the Activity Counseling Trial, Project Active, and Project PACE, have used the PAR. It consists of eight items concerning the duration, intensity, and volume of physical activity over the past week.

The PAR is administered by an interviewer in person or by phone and can be completed in less than twenty minutes. The PAR asks the participants to report the amount of moderate, hard, and very hard physical activity they performed (for more than 10 minutes) in the morning, afternoon, and evening. It breaks the day down into segments

to facilitate recall. They are also asked to report the number of hours spent sleeping and then the remaining time in the day is categorized as light activity. It estimates total energy expenditure by multiplying each category by an established MET (or metabolic equivalent) value (sleep=1 MET, light activity=1.5 MET, moderate= 4 METs, hard=6 METs, and very hard= 10 METs).

The construct validity of the PAR has been supported by its relationship with changes in objective measures of physical fitness. Blair et al. (1998) reported a positive association between energy expenditure estimates from the PAR and miles run during training ($p<0.05$), changes in maximal oxygen uptake at six months (VO_{2max} ($r = 0.33$, $p < 0.05$), and in high density lipoprotein-cholesterol ($r = 0.31$, $p < 0.05$) at one year. Energy expenditure estimates from the PAR were negatively associated with body fatness at six months ($r = -0.50$, $p < 0.01$) and triglyceride at one year ($r = -.41$, $p < 0.01$). Dishman and Steinhardt (1988) also reported finding a significant correlation between the PAR and VO_{2max} ($r = 0.61$) and between increases in recall of total and vigorous physical activity on the PAR and increases in time and distant records for supervised running. Rauh, Hovell, Hofstetter, Sallis, & Gleghorns (1992) reported high correlations ($r = 0.67$-0.82) between Caltrac activity monitors and the PAR reports for the same days. Another study reported Pearson correlations between the PAR and TriTrac-R3D of $r = 0.41$ for total minutes per week of physical activity, $r = 0.33$ for moderate, $r = 0.43$ for hard, and $r = 0.74$ for very hard intensity activities (Hayden-Wade, Coleman, Sallis, & Armstrong, 2003).

The concurrent validity and test-retest of the PAR are also satisfactory. There are significant correlations between the PAR and other measures, such as a seven day diary

(r's = 0.82 to 0.87), a psychometric predictor of physical activity (self motivation), and a concurrent physical activity questionnaire (r's = 0.83 to 0.94) (Dishman and Steinhardt, 1988). Rauh et al. (1992) reported high two week test-test reliability for the PAR (r = 0.69).

Another benefit of using the PAR is that it has previously been validated by phone. Hayden-Wade et al. (2003) administered the PAR interview by phone and in person and reported the following correlation coefficients: r = 0.96 for total minutes per week, r = 0.94 for moderate, r = 0.97 for hard, and r = 0.97 for very hard intensity activities. The study also reported reliability coefficients between the phone PAR and TriTracd-R3D for total minutes per week (r = 0.43), for moderate (r = 0.31), for hard (r = 0.39), and very hard intensity activities (r = .78).

Materials

The intervention materials for the current study included mailed, stage-matched exercise promotion written materials. The intervention materials are modeled after those utilized in Marshall et al. (2003). Revisions, such as changing certain phrases to make the language more appropriate for this population and using an individually tailored letter rather than a pamphlet format, were necessary for the current study.

The control materials for the current study included a handout on eating less sodium titled *Eat Less Salt and Sodium--Spice Up Your Life*. This publication is available on the NIH website (Publication No. 55-832) and is part of a set of booklets, Improving Cardiovascular Health in African Americans--Package of Seven Easy-To-Read Booklets. It was mailed to control participants as a control for attention from the hospital.

Procedure

After signing an informed consent (see Appendix A), all participants were asked to complete a demographic questionnaire, SOES and PAR. Research assistants randomly assigned the participants to control and intervention group and mailed individually tailored, stage-matched physical activity information to the intervention participants and handouts on eating less sodium to the control participants during the following week. All participants were then contacted by the researcher four weeks later and re-administered the SOES and PAR by phone. To avoid potentially harassing participants who were not interested in completing follow up measures by phone, the researcher attempted to contact the participants no more than four times if the participants did not return the phone calls.

Results

Sample Characteristics and Descriptive Statistics

Baseline data was gathered on 207 participants. The sample was predominantly female (82.6%), African American (69.1%), and overweight (81.3%). The majority of the sample (64.3%) had a monthly household income of less than $1,000 and 78.5% of the population had one or more chronic diseases. The average age of the participants was 50 years. The average level of education was a high school diploma.

Medical charts were reviewed for height, weight, and presence of chronic disease, specifically hypertension, hyperlipidemia, and diabetes mellitus. The research team was able to review the medical charts of 201 participants (97% of the sample). The research team was unable to locate the medical charts for six participants, even after meeting with the medical records staff. Of the 201 participants that were chart reviewed, 66.2% were diagnosed with hypertension, 29.9% were diagnosed with diabetes mellitus, and 40.8% were diagnosed with hyperlipidemia. Three of the medical charts did not include any reference to height, so it was not possible to calculate a body mass index for those three participants. Of the 198 participants that were chart reviewed and had height data on file, the average BMI was 32.9. 22.2% were overweight (BMI between 25 and 29.9) and 58.6% were obese (BMI of 30 and higher). Sample characteristics are summarized in Tables 1 and 2.

Table 1

Demographic Characteristics of Participants (N=207)

Characteristic	M	SD
Age	49.89	11.69
Years of Education	12.13	1.95
Number of Chronic Illnesses	1.64	1.31
BMI	32.9	8.66

Table 2

Demographic Characteristics Continued

Characteristic	N	%
Group		
Intervention	106	51.2%
Control	101	48.8%
Gender		
Female	171	82.6%
Male	36	17.4%
Race		
African American	143	69.1%
White	63	30.4%
Other	1	.5%
Marital Status		
Single	77	37.2%
Divorced	36	17.4%
Married	61	29.5%
Widowed	14	6.8%
Seperated	19	9.2%

Table 2 Continued

Demographic Characteristics Continued

Characteristic	N	%
Monthly Household Income		
$0-500	68	32.9%
$500-1000	65	31.4%
$1000-1500	41	19.8%
$1500-2000	23	11.1%
$2000+	10	4.8%
BMI Category		
Underweight	3	1.5%
Normal	35	17.7%
Overweight	44	22.2%
Obese	116	58.6%
Medical Diagnoses		
Hypertension	133	66.2%
Hyperlipidemia	82	40.8%
Diabetes Mellitus	60	29.9%

Differences at Baseline between Control and Intervention Group

T-tests and chi square tests were conducted to determine if the control and experimental groups differed on demographic indices or on baseline scores of the SOES or PAR. Independent samples t-tests indicated no significant differences between groups regarding age, body mass index, years of education, and baseline scores on the self-report measure of physical activity (all ps>.05). The control group (M=1.88, SD=1.37) differed from experimental group (M=1.43, SD=1.21) in that control group participants reported significantly higher numbers of chronic diseases than experimental group participants ($t(205)=-2.488$, $p<.014$). Chi square analyses indicated no significant differences between groups regarding gender, weight category (underweight, normal, overweight, obese), race, marital status, income level, and baseline exercise stage of change.

Differences at Baseline between Completers and Non-completers

As mentioned previously, 207 participants completed baseline data. These participants were randomly assigned to either the control (N=106) or intervention (N= 101) group. The researcher was able to contact 143 participants (69%) for follow up data. Among the control group participants, 69 were contacted, and 74 in the experimental group. The researcher was unable to contact 64 participants (31%) for follow up data, which included 32 participants each from the control and intervention groups (see Figure1). There were many reasons given for not completing follow up measures. A participant refused to participate in follow up when contacted, one left town for a month (according to her mother), another was hospitalized, and one could no longer be contacted at the number she provided as “she does not live there anymore”. One phone number provided was a fax machine number, seven were “wrong numbers”, and twelve

were disconnected. The remaining forty non-completers were called four times without establishing contact.

Independent sample t-tests and chi square tests were used to determine if the participants who completed follow up compared to those who did not differed on demographic indices, group assignment, or on baseline scores of the SOES and PAR. Independent samples t-tests indicated no significant differences between groups regarding years of education, body mass index, number of chronic diseases, and baseline scores on the self report measure of physical activity (all ps> .05). There were some significant differences between participants who completed the follow up data (M=51.46, SD=11.91) and those who were not able to be contacted (M=46.42, SD=10.46). Completers were significantly older than non-completers ($t(205)=-2.917$, $p<.004$). Also, completers (M=2502.59, SD=11.38) received significantly lower baseline scores than non-completers (M=2518.64, SD=42.37) on the self report measure of physical activity ($t(205)=-4.212$, $p<.001$). Chi square analyses were conducted and indicated no significant differences between completers and non-completers regarding group assignment (control or intervention), race, weight category, marital status, income level, and baseline exercise stage of change. However, males were less likely than females to be completers ($X^2(1, N=207)=7.429$, $p<.006$).

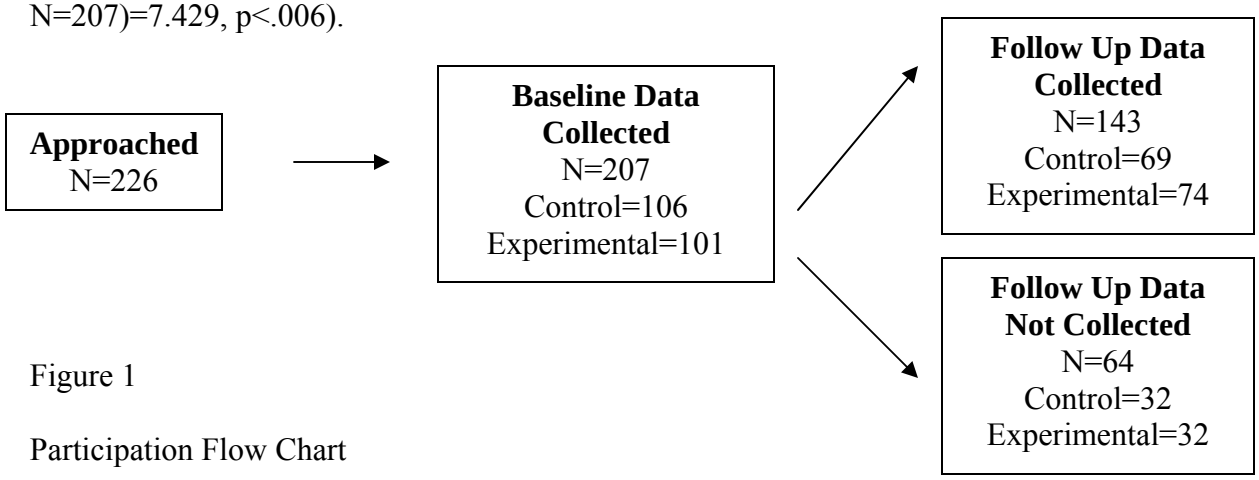

Figure 1

Participation Flow Chart

Hypothesis One

To test hypothesis one that the intervention group will report larger increases in physical activity on the PAR from baseline to follow-up than the control group, a t-test was used to compare difference scores (follow up PAR scores minus baseline PAR scores) between the groups (Jurs, Hinkle, & Wiersma, 1998). An independent samples t-test revealed that the intervention group participants (M=6.39, SD=12.09) reported significantly larger increases in physical activity on the PAR than the participants in the control group (M=-1.66, SD=9.63) from baseline to follow-up (t(142)=4.383, p<.001) (see Table 3).

Table 3

T-test for Hypothesis One

Group	N	Mean	Std. Deviation
Intervention	74	6.3885	12.08936
Control	69	-1.6594	9.63115

t(142)=4.383, p<.001

As there were differences between the control and intervention groups on number of chronic illnesses reported, an analysis of covariance was conducted. After controlling for any group differences in number of chronic diseases, the intervention group (adjusted M=6.677, SE=1.277) reported significantly larger increases in physical activity than the

participants in the control group (adjusted M=-1.969, SE=1.324) on the PAR from baseline to follow-up ($F(1, 140)=21.711$, $p<.001$) (see Table 4).

Table 4

ANCOVA for Hypothesis One

Source	df	Mean Square	F	Sig.
Disease	1	358.181	3.017	.085
Group	1	2577.240	21.711	.000
Error	140	118.704		

$F(1, 140)=21.711$, $p<.001$

Hypothesis Two

To test the second hypothesis, a chi square analysis was run to determine if intervention participants would be more likely to report progression through the exercise stages of change from baseline to follow up than the control group participants (Jurs, Hinkle, & Wiersma, 1998) (see Table 5). Participants that reported stage progression from baseline to follow up on the SOES were coded as improved. Participants that reported stage maintenance or regression from baseline to follow up on the SOES were coded as not improved. The chi square analysis indicated that intervention participants were more likely to report stage progression through the exercise stages of change from baseline to follow up than the control group participants ($X^2(1, N=207)=17.7$, $p<.001$).

Table 5

Chi Square Analysis for Hypothesis Two

	Stage Progression		Total
	No	Yes	
Intervention			
Count	30	44	74
% within group	40.5%	59.5%	100%
Control			
Count	52	17	69
% within group	75.4%	24.6%	100%
Total			
Count	82	61	143
% within group	57.3%	42.7%	100%

$X^2(1, N=207)=17.7, p<.001$.

Discussion

Summary

This study investigated the efficacy of an individually tailored, stage-matched, mail-delivered physical activity intervention among a predominantly low income African American medical population. The intervention was designed to promote increases in self-reported physical activity levels and movement through the exercise stages of change.

Past research has demonstrated the efficacy of mailed, stage-matched physical activity promotion materials within several different samples. The intervention has been implemented with success among a worksite population at a major university (Cardinal & Sachs, 1996), a randomly selected community sample from Australia (Marshall et al., 2003), and a middle class Caucasian American community sample (Marcus, Bock, et al., 1998). This study adds to the literature by testing the efficacy of the intervention among low income African Americans in a medical setting.

The results of the current study support the use of the intervention among a predominantly low income African American medical population. Analyses indicate that the intervention group reported significantly greater increases in physical activity on the 7 day PAR than the control group. Also, responses on the PAR support that a higher percentage of the intervention group perceived themselves as increasing their level of physical activity than the control group. Twenty-one percent of the intervention group and 15.9% of the control group rated their physical activity for the week prior to the follow up interview as “more” in comparison to their physical activity over the past 3 months. (see Table 6).

Table 6

Frequencies of Responses on Item 9 of the 7-Day PAR

Compared to past 3 months, was last week's activity more, less, or about the same?

	Baseline		Follow up	
	Frequency	Percent	Frequency	Percent
Intervention Group				
More	10	13.5%	16	21.6%
Less	23	16.2%	9	12.2%
Same	52	70.3%	49	66.2%
Total	74	100%	74	100%
Control Group				
More	6	8.7%	11	15.9%
Less	8	11.6%	7	10.1%
Same	55	79.7%	51	73.9%
Total	69	100%	69	100%

Another interesting finding is that receiving exercise promotion materials appropriate for the individuals' exercise stage of change not only increased self reported physical activity, but also improved motivational readiness to exercise. The intervention group was more likely to report progression through the exercise stages of change than the control group participants. Similar significant short-term improvements in physical activity have been reported in past studies utilizing self-instructional interventions (Marcus, Bock, et al, 1998; Marcus, Emmons, et al., 1998; Marcus et al., 1997; Marcus et al., 1992; Cardinal & Sachs, 1996; Marshall et al., 2003). Thus, these results support and extend the findings of past research in this area.

Two particularly appealing aspects to this intervention are that it required minimal effort from the research team and was low in cost. Large staffs and budgets are often not available, so the low cost, low effort nature of the intervention increases its generalizability. This study was relatively inexpensive compared to other exercise promotion programs. For example, the ACT trial involved a staff of 51 physicians, two physician assistants, and one nurse practitioner from eleven primary care clinics. Compared with the advice group, the incremental cost alone of the assistance group was around $500 a participant and the incremental cost of the counseling group was $1100 a participant. In this study, participants were willing to participate without financial incentive as they were recruited while waiting for doctor appointments and were able to complete the measures before being called back for the appointment. The main expenses consisted of photocopies of measures, various office supplies (e.g., file folders and staples for making participant files, color ink cartridges for printing the intervention and

control materials), numerous long distance phone calls to collect follow up data, and the envelopes and postage necessary to mail the packets. The intervention also was affordable for participants as it did not require access to new technology, like the internet.

The intervention was low effort since mailing the materials was an easy way to reach a large number of people. Tailoring and stage-matching the materials was a simple task. The researcher created a template for materials suited for each exercise stage of change. After baseline exercise stage of change was determined, the research assistants selected the appropriate materials and quickly personalized the template for the individual participant, addressed the envelope, and placed it in the mail. The interviews were not excessively time consuming either. Both the baseline and follow up interviews were brief, each lasting approximately half an hour

Further research is needed and considerations should include assessing costs per participant for the intervention and assessing the long term effects of these interventions. While cost analyses have been performed on larger studies utilizing expensive technology, such as the ACT trial, the researcher was unable to find a study utilizing mailed exercise promotion materials that examined the costs per participant. The inexpensive nature of the intervention increases its generalizability, so cost data to substantiate this claim would be informative. Past research suggests that the gains are short lived after the intervention is discontinued. Results from six and seven month follow-up in past studies (Marshall et al., 2003; Cardinal & Sachs, 1996) support this trend. More frequent follow-ups beginning shortly after intervention ceases may allow researchers to pinpoint when therapeutic effects begin to wane.

Implications

Past studies have indicated that it is crucial to identify physical activity promotion interventions that work for at risk groups. Lower income, minority women are a prime example of an at risk group, as they report a higher prevalence of physical inactivity and chronic disease than higher income Caucasian participants (Nies, Chruscial, & Hepworth, 2003). Given that the current study was conducted among a lower income African American population that was 82% female, our results suggest that this type of intervention may have some utility among lower income, minority women. Thus, the current study identifies this particular intervention as an effective method of increasing physical activity among a high risk group.

Given the epidemic of chronic disease and physical inactivity in the U.S., there is national need for physical activity promotion programs that can effectively and inexpensively reach a large audience. If future research corroborates this conclusion, practitioners would have a potentially powerful and relatively inexpensive intervention tool for reaching large numbers of high risk patients. Researchers are encouraged to consider these findings in the design of future physical activity interventions.

Another important implication of this study is that the willingness of the patients to participate in this study bodes well for future outcome research among this population. Exercise interventions requiring extended phone follow up among low income ethnic minority populations can be complicated by low retention rates. It is interesting to note that participants in this study that completed follow up were older and reported lower levels of physical activity at baseline than non-completers. Age probably played a role in retention because the older participants were more likely to be retired and at home when

the researcher was conducting follow up phone calls. The participants that reported lower levels of physical activity at baseline may have been more likely to complete follow up measures because they felt in greater need of intervention and more invested in the program. Initial concerns about not being able to reach participants by phone for follow data due to lack of telephone service (temporarily disconnected or unable to afford service at all) or refusal to answer (participant concerns over bill collectors) were unfounded. While not as high as the rate of retention (92%) among a randomly selected Australian community sample (Marshall et al., 2003), this study still achieved a relatively high rate of retention of participants via telephone (69%).

Not only were the participants willing to participate in phone follow up, they also appeared to be willing to read the mailed materials. All participants contacted for follow up interviews (N=143) were asked if they received the mailed materials. If participants reported receiving the mailed materials, the interviewer then asked if they read the materials. One hundred and twenty participants (84%) from the completer group reported receiving the mailed materials. It is regrettable that 23 participants (16%) from the completer group reported not receiving the mailed materials. However, only one packet (citing insufficient address) was returned to the hospital. Ninety-nine (or 83%) of the participants who reported receiving the materials also reported reading the materials. Lack of time was a common reason volunteered by participants for not reading the materials. Similar findings were reported by Marshall et al. (2003). The high rates of participants reporting that they read the materials may reflect positively on participant interest in the study.

Limitations

The generalizability of these findings were affected by limitations of the study design, particularly self report physical activity measures and the small homogenous sample. Physical activity was measured with a self report questionnaire, the 7 day PAR. While this measure correlates well with objective measures of physical activity, the use of self report exclusively in this study requires that the current findings be considered with caution. Also, follow up data was only gathered on 143 out of 207 participants. The sample was homogenous as it consisted of predominantly low income African American patients at a charity hospital in the Southeast. In addition, recruitment was restricted to only two outpatient clinics, general medicine and family practice, of EKL hospital. Results may have differed if participants were recruited from other clinics, such as the OB/GYN or HIV clinics.

Another limitation that should be noted is that participants could have possibly overestimated the frequency and intensity of their physical activity at both interviews, particularly in the category of household activities under moderate and hard activities. Most of the participants were females and not employed outside the home ("housewives" or "stay at home moms"). Many of these individuals considered a clean home a point of pride and may have been prone to exaggerating how often and how long they spent "sweeping and mopping" and "cleaning windows". Also, many participants reported being in poor health and "having to take their time" when participating in activities such as "scrubbing floors". While such individuals may have reported two hours of hard activity (e.g., scrubbing floors), they may have been participating in this "hard activity" at a lower intensity due to poor health. Future research in similar populations may wish to

consider adding follow up questions to help increase accuracy of responding for intensity and duration of physical activity, such as “Did that amount of time you spent in moderate activity include breaks?” or “Was that walking at a moderate activity level?” Also, it is possible that participants who perceived an increase in their physical activity due to the program overestimated their activity at follow up. Many participants were quite excited and proud of their increased activity levels and this may have translated into inflated self reports of physical activity. There is also the possibility that the 55 intervention group participants who reported that they read and received the intervention materials (74% of the 74 intervention group completers) recognized that they were being asked to increase their physical activity and responded accordingly at follow up. Social desirability, a pattern of response in which the participants answers items in a way that presents themselves in a positive light, could have played a role in the reporting of higher levels of physical activity at follow up interviews among this group. As Marshall et al. (2003) described similar concerns about social desirability responding, future researchers may wish to control for social desirability responding by including a measure such as the Marlowe-Crowne Social Desirability scale and instructing participants on the importance of honesty.

Another limitation was the inability for the researcher conducting the baseline and follow up interviews to remain completely blind to group status of participants. While one researcher completed both the baseline and follow up interviews, group assignment and mailing of materials was completed by two research assistants. However, several participants spontaneously volunteered their group status during follow up interviews (i.e., thanking the interviewer for the materials on exercise). In the future,

interviewers are encouraged to begin the follow up interview by politely asking the participants not to disclose any information about the materials that they received in the mail.

Despite these limitations, the results obtained in the current study indicate that the intervention increased self-report levels of physical activity and progression through the exercise stages of change. This suggests that individually tailored, stage-matched, mail-delivered interventions may be an efficacious approach to promoting physical activity among a predominantly low income African American medical population.

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Appendix A: Informed Consent

EKL#_____ Full approval by IRB received_____

LOUISIANA STATE UNIVERSITY HEALTH SCIENCES CENTER IN NEW ORLEANS
INFORMED CONSENT FORM

1. STUDY TITLE:
A Stage Targeted Physical Activity Intervention Among a Predominantly African American Low Income Medical Population

2. PERFORMANCE SITES:
Earl K. Long Medical Center, Baton Rouge, LA

3. NAMES AND TELEPHONE NUMBERS OF INVESTIGATORS:
Phillip J. Brantley, PhD (225) 763-3046
Dori Whitehead (225) 358-1105

4. PURPOSE OF THE STUDY:
The purpose of this study is to find out if mailing physical activity information will be associated with increases in physical activity among African American adults.

5. DESCRIPTION OF THE STUDY:
Dr. Brantley will be directing this study. This study will take place over approximately three months. There will be 128 participants and they will be randomly assigned to either the control or intervention group. It will take around 30 minutes for each participant to participate in this study. Height and weight will be gathered from the participants' medical charts. All participants will complete four questionnaires on site. Next, the intervention group participants will receive the physical activity materials and the control group participants will receive a handout about eating less sodium. Then, all participants will be asked to complete the questionnaires again by phone a month later.

6. BENEFITS TO SUBJECT:
All participants will learn more about their own attitudes and behavior regarding physical activity. Control group participants will learn about the benefits of eating less sodium and may experience improvement in their diet.

7. RISKS TO SUBJECT:
While there are no known risks to participating in this study, participants are advised that they should consult with their physician before making changes to their dietary habits or physical activity routines.

8. ALTERNATIVES TO PARTICIPATION IN THE STUDY:
If you choose not to participate in this study at this time, there will be no alternatives offered to you. If you decide to participate in this study, you can stop at any time without consequence.

9. SUBJECT REMOVAL
There are no circumstances under which the subjects would be removed

10. SUBJECT'S RIGHT TO REFUSE TO PARTICIPATE OR WITHDRAW:

Participation is voluntary. Refusal to participate will involve no penalty or loss of benefits to which the subject is otherwise entitled, and the subject may discontinue participation at any time without penalty or loss of benefits to which the subject is otherwise entitled. Should significant new findings develop during the course of the research which may relate to the subjects' willingness to continue participation, that information will be provided to the subject.

11. SUBJECT'S RIGHT TO PRIVACY/ HEALTH INSURANCE PORTABILITY AND ACCOUNTABILITY ACT (HIPAA)

Records that you give us permission to keep, and that identify you, will be kept confidential as required by law. Federal Privacy Regulations provide safeguards for privacy, security, and authorized access. The results of the study may be published. The privacy of subjects will be protected and subjects will not be identified in any way in published results. The research team will make every effort to keep your information confidential. For example, your identity will be kept confidential by not writing your name on any of the materials, destroying all references to participants' names after publishing the study or within three years of completing the study, and not allowing access to data by any persons other than those running the study.

12. RELEASE OF INFORMATION:

The medical records related to the study are available to the Food and Drug Administration and the LSUHSC IRB. While every effort will be made to maintain your privacy, absolute confidentiality cannot be guaranteed. Records will be kept private to the extent allowed by law.

13. FINANCIAL INFORMATION:

Participation in this study will not result in any extra charges above and beyond those routinely incurred by patients with similar conditions.

A) There will be no payment for participating in this study.
B) There will be no costs for participating in this study.

14. SIGNATURES

The study has been discussed with me and all my questions have been answered. I understand that additional questions regarding the study should be directed to investigators listed on page 1 of this consent form. I understand that if I have questions about subjects' rights, or other concerns, I can contact the Chancellor of LSU Health Sciences Center at (504) 568-4801. I agree with the terms above, acknowledge I have been given a copy of the consent form, and agree to participate in this study. I understand that I have not waived any of my legal rights by signing this form.

_____

Signature of Subject Date

_____

Signature of Witness Date

Appendix B: Demographic Questionnaire

Participant ID# _____

1) Age _____

2) Gender M / F

3) Race W / B / O

4) Height _____

5) Weight _____

6) Marital Status _____

7) Educational Level _____ years

8) Income Level 0-500 per month

500-1000 per month

1000-1500 per month

1500-2000 per month

2000+ per month

9) Chronic Diseases _____

_____

_____

Appendix C: Stages of Exercise Scale

Participant ID# _____

Directions: Please CIRCLE the number that best describes your present exercise behavior. “Regular exercise” equals three or more days per week for 20 minutes or more each day (e.g., swim, walk).

4	I presently exercise on a regular basis and have been doing so for longer than 6 months.
3	I presently exercise on a regular basis, but I have only begun doing so within the past 6 months.
2	I presently get some exercise, but not regularly.
1	I presently do not exercise, but I have been thinking about starting to exercise within the next 6 months.
0	I presently do not exercise and do not plan to start exercising in the next 6 months.

Appendix D: 7-Day Physical Activity Recall Questionnaire

Participant ID# _____

Now we would like to know about your physical activity during the past 7 days. But first, let me ask you about your sleep habits.

1. On the average, how many hours did you sleep each night during the last five weekday nights (Sunday-Thursday)? _____ hours
2. On the average, how many hours did you sleep each night last Friday and Saturday nights? _____ hours

Now I am going to ask you about your physical activity during the past 7 days, that is, the last 5 weekdays, and last weekend, Saturday and Sunday. We are not going to talk about light activities such as slow walking, light housework, or unstrenuous sports such as bowling, archery, or softball. Please look at this list which shows some examples of what we consider moderate, hard, and very hard activities. (hand list of activities) People engage in many other types of activities, and if you are not sure where one of your activities fits, please ask me about it.

3. First, let's consider moderate activities.

   What activities did you do and how many total hours did you spend during the last 5 weekdays doing these moderate activities or others like them? Please tell me to the nearest half hour. _____ hours
4. Last Saturday and Sunday, how many hours did you spend on moderate activities and what did you do? _____ hours
5. Now, let's look at hard activities.

What activities did you do and how many total hours did you spend during the last 5 weekdays doing these hard activities or others like them? Please tell me to the nearest half hour. _____ hours

6. Last Saturday and Sunday, how many hours did you spend on hard activities and what did you do? _____ hours

7. Now, let's look at very hard activities.

   What activities did you do and how many total hours did you spend during the last 5 weekdays doing these very hard activities or others like them? Please tell me to the nearest half hour. _____ hours

8. Last Saturday and Sunday, how many hours did you spend on very hard activities and what did you do? _____ hours

9. Compared with your physical activity over the past 3 months, was last week's physical activity more, less, or about the same?

   1. more _____
   2. less _____
   3. same _____

Examples Of Activities In Each Category

Moderate Activity

Occupational tasks

- delivering mail or patrolling on foot
- house painting
- truck driving (making deliveries, lifting and carrying light objects)

Household tasks

- raking the lawn
- sweeping and mopping
- mowing the lawn with a power mower
- cleaning windows

Sports activities (actual playing time)

- volleyball
- Ping-Pong
- Brisk walking for pleasure or to work (3 miles/hour)
- Golf, walking and pulling or carrying clubs
- Calisthenic exercise

Hard Activity

Occupational tasks

- Heavy carpentry
- Construction work, doing physical labor

Household tasks

- Scrubbing floors

Sports activities (actual playing time)

- Tennis doubles
- Dancing

Very Hard Activity

Occupational tasks

- Very hard physical labor, digging or chopping with heavy tools
- Carrying heavy loads such as bricks or lumber

Sports activities (actual playing time)

- Jogging and swimming
- Singles tennis
- Racquetball
- Soccer

Vita

Dori Whitehead graduated from the University of Alabama in 2002 with a Bachelor of Science in psychology. She is currently a third year student in the clinical psychology doctoral program at Louisiana State University & Agricultural and Mechanical College.