

COMMUNITY-BASED EXERCISE PROGRAM ATTENDANCE AND EXERCISE SELF-EFFICACY
IN AFRICAN AMERICAN WOMEN

Kisha Marie Virgil

Submitted to the faculty of the University Graduate School
in partial fulfillment of the requirements
for the degree
Doctor of Philosophy
in the Department of Health and Rehabilitation Sciences,
Indiana University

May 2013

Accepted by the Faculty of Indiana University, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Alan E. Mikesky, Ph.D., Chair

NiCole R. Keith, Ph.D., Co-Chair

Doctoral Committee

Mary K. de Groot, Ph.D.

April 10, 2013

Lisa M. Hess, Ph.D.

Christina R. Mushi-Brunt, Ph.D.

ACKNOWLEDGEMENTS

I would like to thank my dissertation co-chair, Dr. NiCole Keith, for helping me achieve this professional milestone. Dr. Keith has not only guided me as a researcher, but also mentored me both personally and professionally; for that, I am eternally grateful. I would also like to thank my other co-chair, Dr. Alan Mikesky, and my entire dissertation committee: Dr. Mary de Groot, Dr. Christina Mushi-Brunt, and Dr. Lisa Hess for their expertise and guidance in developing me as a researcher. I would like to express special recognition to Dr. Mary de Groot for her generous assistance and leadership throughout this entire research study. Lastly, I would like to thank my family for their never-ending encouragement, support, and patience during this journey.

ABSTRACT

Kisha Marie Virgil

COMMUNITY-BASED EXERCISE PROGRAM ATTENDANCE AND EXERCISE SELF-EFFICACY IN AFRICAN AMERICAN WOMEN

Rates of chronic disease and physical inactivity are disproportionately high among African American women. Despite the known benefits of physical activity and an increasing number of programs designed to increase activity, attendance rates to many exercise programs remain low. There is much to learn about program types, such as healthy lifestyle programs (HLP); individual factors, such as self-efficacy; and mediating variables that may influence exercise program attendance.

An observational study design was used to compare exercise self-efficacy and attendance in a community-based exercise program in African American women who were enrolled in a HLP (N = 53) to women who were not (N = 27). Exercise program attendance was gathered across six months; demographics, self-efficacy and physical activity behaviors were assessed through surveys; and physiological variables (resting heart rate and blood pressure, height, and weight) and physical fitness (muscular strength and endurance and cardiovascular endurance) were measured at baseline. Descriptive statistics were used to describe participants and groups were compared using T-tests, chi-square and non-parametric statistics. Finally, mediation analyses were conducted using multiple regression models to assess self-efficacy as a potential mediator to exercise program attendance.

Women who enrolled in this study were of low income (61% having an annual income less than \$20,000), obese with a mean (standard deviation) body mass index (BMI) of 37.7 (7.6),

pre-hypertensive with a mean (standard deviation) systolic blood pressure of 125.9 (14.4), and scored poorly and marginally on two fitness tests. On average, women reported being *Moderately Confident* in their ability to exercise regularly, yet had low attendance in the exercise program with a median number .5 days over six months and there were no significant differences in exercise self-efficacy ($p = .23$) or attendance in the exercise program between groups ($p = .79$). Additionally, exercise self-efficacy was not a mediating variable to program attendance.

Women in this study had little discretionary income and several chronic disease risk factors, yet exercise program attendance was low even in those enrolled in a HLP. Identifying factors that increase exercise self-efficacy and factors that influence attendance beyond self-efficacy may help future program design and attendance.

Alan E. Mikesky, Ph.D., Chair

NiCole R. Keith, Ph.D., Co-Chair

TABLE OF CONTENTS

Chapter One

Introduction	1
Statement of Purpose	7
Scope of Study.....	8
Definition of Terms	8

Chapter Two

Review of Literature.....	11
Physical Activity and Health	13
Physical Activity and Disease Prevention	17
Cardiovascular disease.....	18
Type 2 diabetes.....	21
Obesity	23
Cancer	24
Depression	27
Economic Consequences of Physical Inactivity.....	28
Exercise Behavior Studies in African American Women.....	32
Correlates of Physical Activity.....	36
Physical Activity and Exercise Interventions.....	39
Physical Activity Interventions.....	40
Exercise Behavior Interventions.....	45
Interventions and Theory.....	52
Interventions and Mediation Analyses	59
Summary.....	63

Study Aims and Hypotheses	65
Chapter Three	
Methods.....	66
Study Design.....	66
Setting	67
Study Participants	68
Participant characteristics.....	68
Participant recruitment.....	68
Measures.....	68
Exercise program attendance	69
Exercise self-efficacy	69
Demographics and health history	70
Physical activity	70
Anthropometric measures	71
Resting heart rate and blood pressure	71
Muscular strength and endurance.....	71
Cardiovascular endurance	72
Procedures	73
Data Analyses.....	74
Summary	77
Chapter Four	
Results.....	78
Dependent Variable Analyses	80
Mediation Analyses.....	81

Post Hoc Analyses	81
Chapter Five	
Discussion	83
Study Limitations	91
Conclusion.....	92
Chapter Six	
Tables	
Table 1. Physical Inactivity and Relative Risk of Diseases, Prospective Studies.....	94
Table 2. Estimated Economic Costs of Physical Inactivity.....	97
Table 3. Correlates to Physical Activity in African American Women.....	98
Table 4. Physical Activity Interventions Targeting African American Women.....	99
Table 5. Exercise Behavior Interventions Targeting African American Women ..	110
Table 6. Intervention Studies Examining Self-Efficacy as Mediator of Physical Activity Behavior Change	119
Table 7. Study Group Descriptions.....	123
Table 8. Study Sample and Group Statistics.....	124
Table 9. Comparison of Attendance between Groups.....	125
Table 10. Attendance of Attenders	125
Table 11. Comparison of Exercise Self-Efficacy between Groups.....	126
Table 12. Self-Efficacy as a Mediator Using Multiple Regression	126
Figures	
Figure 1. Social Cognitive Theory	127
Figure 2. Mediation Analyses	127

Appendices

Appendix A. Exercise Self-Efficacy Survey..... 128

Appendix B. Demographics and Health History Questionnaire..... 129

Appendix C. Yale Physical Activity Survey..... 132

References 135

Curriculum Vitae

Chapter One

Introduction

Chronic diseases related to physical inactivity continue to be the leading causes of preventable death in the United States and are particularly prevalent among African American women. Approximately 47.3% of African American women have cardiovascular disease (CVD), 45.7% have hypertension, 14.7% have diabetes, and 51% are obese. This compares to 33.8% of White women who have CVD, 31.3% have hypertension, 6.5% have diabetes, and 32.8% are obese (Roger et al., 2012). In addition to chronic diseases being more prevalent, the relative risk for developing many of these diseases is strikingly higher in African American women than in White women. For example, the NHANES I Epidemiological Follow-up Study found African American women aged 25 to 54 years were at 1.76 times greater risk for developing coronary heart disease than White women (Gillum, Mussolino, & Madans, 1997). One study examining the relative risk of developing hypertension found that African American women were more than two times at risk compared to White women (Cornoni-Huntley, LaCroix, & Havlik, 1989). In another large, prospective study, African American women were 2.63 times more likely to develop diabetes than White women (Brancati, Kao, Folsom, Watson, & Szklo, 2000).

The development of chronic disease, which is largely associated with physical inactivity, unfavorably impacts the mortality rate of African American women. In 2008, heart disease was the leading cause of death in African American women, accounting for 24.9% of deaths. African American women are 34% more likely to die of heart disease and 40% more likely to die of a stroke than White women (National Heart, n.d.). In 2008, the overall death rate from diabetes was 16% for White women and 38% for African American women (Minino, Murphy, Xu, & Kochanek, 2011). Although the disparity gap in life expectancy is narrowing, a significant difference between African American women and White women persists. In 2012, the overall

life expectancy of African American women was reported to be 77.5 years compared to 81.2 years for White women (Harper, Rushani, & Kaufman, 2012).

Physical inactivity is one of the most prevalent and modifiable chronic disease risk factors in the United States. Participation in regular physical activity reduces the risk of CVD, stroke, type 2 diabetes, osteoporosis, depression, obesity, breast cancer, and colon cancer (Berlin & Colditz, 1990; Breslow, Ballard-Barbash, Munoz, & Graubard, 2001; Brosse, Sheets, Lett, & Blumenthal, 2002; Helmrich, Ragland, & Paffenbarger, 1994; R. Marcus et al., 1992; Slattery & Potter, 2002; Wing & Hill, 2001). One study reported that over 58% of the CVD cases were found in those who were physically inactive (Wang, Pratt, Macera, Zheng, & Heath, 2004). Physical activity has also shown to reduce the risk of all-cause mortality (Blair et al., 1995). In fact, physical inactivity and poor nutrition together were considered the second leading modifiable risk factors that contributed to death in the U.S. attributing to approximately 15% of the deaths in 2000 or a total of 365,000 deaths (Mokdad, Marks, Stroup, & Gerberding, 2004).

Along with health consequences, physical inactivity imposes a significant economic burden. In 2001, approximately \$24 billion in medical costs were associated with physical inactivity in CVD cases alone (Wang et al., 2004). It has been estimated that health outcomes resulting from physical inactivity costs the U.S. over \$251 billion per year (Chenoweth & Leutzinger, 2006). Physical inactivity is costly and increases in physical activity could be cost-saving. For example, one study estimated that if all inactive Americans became active, it would result in a \$76.6 billion cost-savings (Pratt, Macera, & Wang, 2000).

Over the years, there has been convincing scientific evidence that physical activity is important for good health, while sedentary behaviors are associated with increased risk of several chronic diseases (Pate et al., 1995; U.S. Department of Health and Human Services, 1996). The importance of physical activity has been reinforced through the evolution of

recommendations that were once more clinically-focused and an athletic-related paradigm to a more inclusive population-based approach (Blair, LaMonte, & Nichaman, 2004). Researchers recommend that all Americans engage in moderate or vigorous activity on a regular basis to prevent several health problems (Blair et al., 2004). Because of the strong evidence supporting the health benefits of regular physical activity, the United States Government issued its first-ever *2008 Physical Activity Guidelines for Americans*. These guidelines recommend adults achieve at least 150 minutes of moderate-intensity aerobic physical activity; 75 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of both intensities each week (U.S. Department of Health and Human Services, 2008). Similarly, the American College of Sports Medicine (ACSM) recommends that adults accumulate at least 30 minutes of moderate-intensity aerobic physical activity five days per week or at least 20 minutes of vigorous-intensity aerobic physical activity three days per week. The ACSM also recommends engaging in muscle-strengthening and flexibility activities two to three days per week (American College of Sports Medicine, 2010). By engaging in minimum amounts of physical activity, adults could prevent or delay the onset of chronic diseases and better manage existing conditions (U.S. Department of Health and Human Services, 1996).

Despite the health benefits of regular physical activity and the established national guidelines, nearly 80% of American adults report not meeting federal guidelines, and African American women are the least active subgroup with only 11% meeting both muscle-strengthening and aerobic guidelines and 20% meeting aerobic guidelines only (Schiller, Lucas, Ward, & Perogy, 2012). Physical activity is also inversely associated with low socioeconomic status where adults with less education and lower income are least likely to engage in regular physical activity (Schiller et al., 2012). Health disparity is a serious public health concern and is a major focus of *Healthy People 2020* along with specific objectives is to reduce the proportion of

adults who engage in no leisure-time physical activity and increase the proportion of adults who meet the physical activity recommendations (United States Department of Health and Human Services, 2010). Thus, physical activity interventions that focus on African American women are an important public health initiative because these programs address disparities in physical activity and health outcomes in this population.

There are three different types of interventions involving physical activity: physical activity interventions, exercise training interventions, and exercise behavior interventions. First, physical activity interventions typically differ from exercise training interventions in that physical activity interventions intend to change physical activity behaviors; whereas exercise training interventions aim to examine the physiological effects of physical activity or exercise in a highly structured or supervised setting. Physical activity interventions are less controlled and take place in real-world settings, and are often based on theoretical models that attempt to explain physical activity behavior and factors influencing it (B. H. Marcus & Forsythe, 2009). A third area of research is exercise behavior interventions where the primary goals are to “get sedentary and irregularly active individuals to adopt regular exercise and to keep physically active individuals exercising on a regular basis” (Buckworth & Dishman, 2002, p. 229). Exercise behavior interventions are similar to physical activity interventions in identifying effective strategies to promote long-term change, which often include using theoretical models and taking place in less controlled environments such as churches, community centers, work sites, health care facilities, and homes; however, these involve activities that are planned, structured, and intend to improve physical fitness (Buckworth & Dishman, 2002).

Several behavioral or psychological theories have been successful in predicting and explaining physical activity behaviors and exercise adoption. Research has shown that cognitive factors, such as attitudes, thoughts, perceptions, and feelings play a role in exercise adoption

and maintenance (Buckworth & Dishman, 2002). This suggests that simply changing the environment such as making facilities accessible and convenient may not be enough to change behavior. The social cognitive theory (SCT) is a psychological theory that uses strategies to form positive cognitions through social learning or social interaction (Bandura, 1986). This theory suggests that personal, environmental, and behavioral factors have a reciprocal interaction in determining behavior and behavior change. The Surgeon General recommends this framework to better understand and predict physical activity (U.S. Department of Health and Human Services, 1996). Self-efficacy – one’s confidence in his or her ability to perform a behavior – is a construct within the SCT that is considered a key to success in regular exercise (Bandura, 1997). Numerous studies have found self-efficacy to be associated with physical activity (McAuley & Blissmer, 2000), and several have identified self-efficacy as a mediating variable between programs and physical activity (Y. D. Miller, Trost, & Brown, 2002). Understanding the potential mediating role of psychological variables is useful to determine what program strategies work best (B. H. Marcus & Forsythe, 2009).

In recent years, there has been an increase in physical activity interventions targeting underserved populations, especially African American women, to gain a better understanding of the specific psychological, cultural, social, and economic challenges this subgroup faces and to determine best practices for improving behaviors. Taylor, Baranowski, and Young (1998) identified physical activity intervention studies designed for low-income, ethnic minorities, and populations with disability from 1983 to 1997 and found 10 studies that placed a specific emphasis on the recruitment of ethnic minorities, six of which focused on African Americans only. This review concluded that results were limited: two studies reported no significant change in physical activity, two reported mixed results, two found changes only among subgroups, and only two reported significantly significant positive changes.

Banks-Wallace and Conn (2002) identified 18 interventions promoting physical activity in African American women from 1985 to 1999 and seven included African American women exclusively in their study sample. Four studies were focused on changing physical activity behaviors alone, while 14 targeted both physical activity and dietary behaviors. Overall, these studies experienced high attrition and low participation rates and mixed physical activity outcomes. Eleven studies used direct measures of physical activity as the primary outcome variable and six found statistically significant increases in physical activity while five did not find statistically significant increases.

Whitt-Glover and Kumanyika (2009) identified 29 studies from 1985 to 2006 that focused on increasing physical activity and physical fitness in African American populations and 16 recruited women only. Seven of these studies reported using structured exercise programs as part of their intervention, and physical activity participation was a secondary outcome to other health behaviors or health outcomes in six studies. Similar to findings from Banks-Wallace and Conn (2002), there appears to be an increased research interest in multiple behavior programs, but little is known about how this approach compares to programs focusing on physical activity alone. There are still inconsistent research findings on what strategies are effective at changing long-term physical activity and exercise behaviors in African American women and each of these reviews lists attrition as a significant challenge in this population (Banks-Wallace & Conn, 2002; Taylor et al., 1998; Whitt-Glover & Kumanyika, 2009).

Conducting long-term, structured exercise behavior studies in order to gain a better understanding of the phenomenon of exercise adherence in this population is not always feasible as they can require a lot of time, money, and support (Opdenacker, Boen, Coorevits, & Delecluse, 2008). Therefore, questions still remain on which strategies are effective at

increasing physical activity behaviors in an at-risk population when given an affordable, accessible, community-based exercise program.

In summary, physical inactivity is a serious public health problem with outcomes that result in heavy economic burden. Low-income, African American women are the most at-risk for physical inactivity and chronic disease, and there has been increased focus on this subgroup in recent years. However, there are major gaps in the literature suggesting future programs include: 1) ethnically diverse populations; 2) strategies to minimize attrition; 3) designs that examine social and cultural differences; 4) specific theoretical frameworks; and 6) a measure of overall physical activity behavior and not just health outcomes (Banks-Wallace & Conn, 2002; Whitt-Glover & Kumanyika, 2009). There is also a need for more studies to document their progress to determine if the program or intervention is effective at changing long-term physical activity behaviors in African American women (Banks-Wallace & Conn, 2002; R. K. Lewis, Redmond, Paschal, & Gree, 2005). Filling these gaps could influence the development of exercise opportunities to address the problems of physical inactivity and disproportionate burden of chronic disease among African American women.

Statement of Purpose

The purpose of this study was to compare exercise self-efficacy and attendance in a community-based exercise program in African American women who were enrolled in a healthy lifestyle program versus women who were not enrolled in the same healthy lifestyle program. A secondary purpose was to determine whether exercise self-efficacy played a mediating role between enrollment in a healthy lifestyle program and exercise program attendance. Study aims and hypotheses were based on a review of the literature that is presented in Chapter two.

Scope of the Study

This research intended to provide novel information about African American women's attendance in a community-based exercise program and their self-efficacy beliefs, which may be used to influence the development of program strategies that are effective at increasing long-term physical activity and exercise behaviors in this at-risk population. This research provides insight on the role enrollment in healthy lifestyle programs plays on exercise self-efficacy and on exercise program attendance, both directly and indirectly through self-efficacy. There is a high priority to determine best practices to increase exercise adherence because rates of chronic disease association with physical inactivity are on the rise and rates of drop out from exercise programs remain high (Buckworth & Dishman, 2002; B. H. Marcus et al., 2006). Gaining a better understanding of the influence enrollment in healthy lifestyle programs has on self-efficacy and exercise behaviors will set the stage for effective program strategies targeting a specific subgroup that has disproportionately higher rates of chronic disease, mortality, and physical inactivity.

Definition of Terms

There are some terms used in this paper that are often used interchangeably in research (i.e. physical activity and exercise) or have various meanings. Therefore, these terms should be clearly defined for their use in this research. Below are definitions of terms used throughout this paper.

Physical activity: Any bodily movement produced by contraction of skeletal muscles that result in a substantial increase in energy expenditure (Caspersen & Christenson, 1985).

Exercise: A type of physical activity consisting of planned, structured, and repetitive bodily movement done to improve or maintain one more components of physical fitness (Caspersen & Christenson, 1985).

Physical Fitness: A set of attributes that people have or achieve through exercise and physical activity (Caspersen & Christenson, 1985).

Leisure-time physical activity: Physical activities performed during exercise, recreation, or any other time outside of occupational activity, housework, or transportation (Macera et al., 2003).

Insufficiently active: Engaging in some physical activity, but not meeting physical activity recommendations of ≥ 30 minutes of moderate physical activity, ≥ 5 days per week or ≥ 20 minutes of vigorous physical activity, ≥ 3 days per week (Schiller et al., 2012).

Physically inactive: No participation in light, moderate, or vigorous physical leisure-time physical activity of at least 10 minutes a day (Schiller et al., 2012).

Self-Efficacy: The belief in one's ability to perform a behavior to produce desired outcomes (Bandura, 1997).

Physical activity interventions: Programs that intend to change physical activity behaviors in less controlled settings by incorporating more physical activity into individuals' daily lives and often use behavior change approaches (B. H. Marcus & Forsythe, 2009).

Exercise training interventions: Programs that aim to examine the physiological effects of physical activity or exercise in more controlled settings usually supervised by health professionals (B. H. Marcus & Forsythe, 2009).

Exercise behavior interventions: Programs that intend to increase regular exercise participation often focusing on behavior change approaches (Buckworth & Dishman, 2002).

Healthy lifestyle interventions: Programs that focus on multiple behavior changes and use behavioral strategies such as goal setting, increasing autonomy, discussing barriers, increasing self-efficacy, and motivational interviewing (B. H. Marcus & Forsythe, 2009).

Chapter Two

Review of Literature

Physical inactivity is a problem for African American women in the United States. Researchers and healthcare professionals are particularly concerned with the disproportionate rates of disease in this population when compared to others. Although there has been an increase in the number of published reports, public health initiatives, and community-based programs promoting physical activity in the last two decades, nearly 89% of African American women continue to report less than the recommended amounts of physical activity (Roger et al., 2012).

Researchers have noted the health impacts of physical activity as well as racial differences in behaviors and correlates to participation. Additionally, self-efficacy as a cognitive factor influencing exercise adoption and adherence has been deeply explored in the general population. Information obtained from this study with regard to exercise program attendance, enrollment in a healthy lifestyle program, and exercise self-efficacy will facilitate more effective development of culturally-tailored program designed to promote routine engagement in exercise.

In this chapter, the literature relevant to physical activity and health as well as observational studies and interventions involving minority populations, specifically African American women, is reviewed. The review of literature is divided into four sections. Section one includes research on the health benefits of physical activity and the economic consequences of inactivity. Literature supporting federal agencies stance on health promoting benefits and reduced risk for mortality associated with physical activity were reviewed. Computerized searches of large, prospective studies analyzing relationships between the risk of developing ten different chronic diseases (CVD, stroke, hypertension, type 2 diabetes, obesity, colon cancer,

breast cancer, osteoporosis, osteoarthritis, and depression) and physical inactivity were conducted in PubMed and EBSCO databases. A review of literature identifying costs related to physical inactivity resulting in the development and treatment of chronic conditions was also performed in computerized searches.

Section two addresses exercise behaviors and correlates of physical activity in African American women. Observational studies describing exercise behaviors and participation in African American women were identified through computerized searches in PubMed and EBSCO using a combination of keywords such as *exercise, exercise behaviors, exercise participation, African American, Black, and women*. Similar searches were conducted to find intervention studies from 1996 describing correlates associated with physical activity and exercise in African American women. Additional keywords used in these searches include *physical activity, intervention, and correlates*.

Section three reviews interventions focusing on improved physical activity and exercise behaviors in this population. A comprehensive review of literature was conducted to identify physical activity and exercise interventions that focused on improving physical activity or exercise behaviors in primarily African American women. Computerized searches were performed in databases including PubMed, MEDLINE, EBSCO, and ProQuest using a combination of keywords such as *African American, Black, minority, women, physical activity, exercise, physical fitness, fitness, intervention, program, and weight loss*. Studies from 1996 to 2012 that focused on improving physical activity or exercise behaviors, provided physical activity outcomes, and comprised of at least 40% African American women were included.

Finally, section four discusses theoretical frameworks and the self-efficacy construct used to predict and explain physical activity behaviors in research. A review of literature was performed on physical activity intervention studies that analyzed mediation effects of self-

efficacy on behavior. A combination of keywords including *physical activity, exercise, interventions, mediation, social cognitive theory, and self-efficacy* were used in PubMed and EBSCO electronic databases. All literature found in these database searches from 1994 to 2012 were reviewed for purposes of this paper.

Physical Activity and Health

One of the primary duties of the Office of the U.S. Surgeon General is to protect and advance the health of Americans through education and health promotion (U.S. Department of Health and Human Services, n.d.). Health concerns warranting attention from the Surgeon General are considered significant and deserving of immediate public health attention. The first-ever report of the Surgeon General was released in 1964 and addressed health consequences associated with smoking. After publication of the this report , 40 additional reports have been released on this topic, many public policies and initiatives have been implemented to reduce smoking, and rates have declined significantly from over 42% in 1965 to 19.3% in 2010 (Malarcher, Dube, Shaw, Babb, & Kauffman, 2011).

In 1996, the Surgeon General released a report proclaiming the importance of physical activity on health. This Surgeon General Report (SGR) created a similar turning point for raising awareness of the public health concerns related to physical inactivity among Americans. Audrey F. Manely, the Acting Surgeon General in 1996, prefaced the report by saying there is strong scientific evidence showing relationships between physical activity and health promotion and disease prevention and it served as a “national call to action” (U.S. Department of Health and Human Services, 1996). She continued by stating, “we must get serious about improving the health of the nation by affirming our commitment to healthy people on all levels: personal, family, community, organizational, and national.” The SGR focused entirely on the role physical activity plays in disease prevention as proven by years of scientific research. This report

supported findings that Americans can experience improved health and quality of life by participating in modest amounts of physical activity. Additional health benefits can be gained by participating in greater amounts and intensities of activity. These health benefits include improvements in cardiovascular, respiratory, and endocrine systems as well as reduced risk of premature mortality (U.S. Department of Health and Human Services, 1996).

After publication of the 1996 SGR, Americans appeared to have heightened awareness of health benefits associated with physical activity. Just one year after the release of this report, one study found that approximately one-third of adults heard about the report; however, respondents with greater awareness tended to be older, White, and had attained higher levels of education. Women had greater knowledge of the relationships between physical activity and chronic diseases than men, yet reported less physical activity (Morrow, Jackson, Bazzarre, Milne, & Blair, 1999). This implies that the SGR alone is not sufficient to influence physical activity behaviors in groups that are at highest risk of the adverse effects of inactivity.

Building on the 1996 SGR, several federal and national organizations implemented initiatives to continue to raise awareness and increase physical activity participation among Americans. For example, the President's Council on Fitness, Sports, and Nutrition, the American College of Sports Medicine, and even First Lady, Michelle Obama, have implemented initiatives to increase physical activity. As mentioned previously, the U.S. Government released the *2008 Physical Activity Guidelines for Americans* giving specific direction and motivation to Americans to engage in amounts of physical activity beneficial to promote good health (U.S. Department of Health and Human Services, 2008). The Centers for Disease Control and Prevention (CDC) played a leading role in writing the 1996 SGR, and formally institutionalized physical activity into the Center by creating the Physical Activity and Health Branch that same year (Pratt, Epping, & Dietz, 2009).

Healthy People is a national initiative led by the U.S. Department of Health and Human Services to improve the overall health of Americans by establishing benchmarks and 10-year objectives for the nation to strive to achieve. Over the years, the initiative has evolved considerably to address specific populations that are most at risk in an attempt to close the gap of health disparities (Green & Fielding, 2011). In *Healthy People 2000*, two chapters were devoted to age groups and high-risk populations. *Healthy People 2010* became more assertive with addressing health disparities as one of the two overarching goals was to eliminate disparities, and a similar goal has been established for *Healthy People 2020*, which is to “achieve health equity, eliminate disparities, and improve the health of all groups” (U.S. Department of Health and Human Services, 2010).

Physical activity was one of the 10 Leading Health Indicators of *Healthy People 2010* with the goal to “improve health, fitness, and quality of life through daily physical activity” (U.S. Department of Health and Human Services, 2000). The Leading Health Indicators reflect the most prominent health concerns and are supported by specific objectives to help track progress. Three of the physical activity and fitness objectives were to reduce the proportion of adults who engage in no leisure-time physical activity (Objective 22-1); to increase the proportion of adults who engage in moderate physical activity for at least 30 minutes, five or more days per week (Objective 22-2); and to increase the proportion of adults who engage in vigorous physical activity for at least 20 minutes, three or more days per week (Objective 22-3) (U.S. Department of Health and Human Services, 2000). A final report of *Healthy People 2010* found that there were no significant improvements made in the three objectives. Objective 22-1 improved by 4%, there was no change in Objective 22-2, and there was no significant improvement in Objective 22-3 (U.S. Department of Health and Human Services, 2011). In addition to having made modest or null improvements in these areas of physical activity behaviors, significant

disparities in the African American population were found in the same three objectives. African Americans reported higher rates of no leisure-time physical activity than Whites (47% vs. 32%, respectively); lower rates of regular, moderate physical activity (25% vs. 36%, respectively); and lower rates of regular, vigorous physical activity (19% vs. 27%, respectively) (Centers for Disease Control and Prevention, 2011a). Although these and several other *Healthy People* objectives made little improvements and elimination of disparities was far from being accomplished, many professionals agree that *Healthy People* is a positive initiative to set goals for the Nation to work to achieve (Anonymous, 2012).

Over the past several decades, advancing science has played a significant role in influencing policy to increase physical activity in Americans with the intention to improve health and quality of life. In spite of the well-communicated, health-promoting benefits of physical activity, only small improvements have been made in physical activity behaviors, especially in African Americans. According to Brownson et al. (2008), there are two principles that should guide efforts to increase physical activity: policy and science. Policy may provide direct cues to develop healthy behaviors (e.g. easy access to an exercise facility) or indirect cues such as social norms (e.g. seeing peers exercise may foster greater acceptance of physical activity).

The science principle is two-fold by combining evidence-based practice with practice-based evidence. Evidence-based practice in public health is defined as the development, implementation, and elevation of effective programs and policies through application of principles of scientific reasoning (Brownson, Baker, Leet, & Gillespie, 2003). In evidence-based practice, programs are developed and implemented based on scientifically proven strategies and evaluated contributing to the science. On the other hand, practice-based evidence is developed in the real world rather than in highly controlled settings (Green, 2006). This approach to science helps identify phenomena that may guide evidence-based practice and

policy. Therefore, policy and science are interrelated and important in changing physical activity behaviors.

What national and federal initiatives such as the SGR, *Healthy People*, and the federally established physical activity guidelines do not address are the effective strategies that result in achieving health-benefiting physical activity recommendations. Consequently, more practice-based evidence is needed to help evolve the scientific world since African American women are the least active subgroup and sustainable increases in physical activity have been difficult to achieve. Conducting real-world studies will help researchers and health professionals learn and understand psychological, social, and environmental factors that facilitate or hinder adequate physical activity. This level of understanding will help develop and build upon best practices that can be applied to future programs aiming to increase activity in African American women.

Physical Activity and Disease Prevention

Physical activity is a public health priority not only for its health-promoting benefits, but also for its protection against developing several chronic conditions. A majority of large prospective studies investigating the association of physical activity and disease risk and mortality have been conducted in men. The 1996 SGR, *Physical Activity and Health*, included just three follow-up studies examining the association of physical activity and mortality that were specific to women. More recently, there has been an increase in women's health studies to gain a better understanding of these relationships within this group. However, few of prospective women's health studies have targeted the African American population despite its disproportionately higher rates of disease. The Black Women's Health Study is the largest prospective study on this subgroup to date. It began in 1995 recruiting over 64,000 women ages 21-69 years from all over the United States who researchers continue to follow.

Prospective analyses from women in the Black Women's Health Study as well as other women's health studies researching women of all races and ethnicities have found that physical activity has a dose-response effect in disease prevention similar to findings from studies targeting men and the general U.S. adult population. The dose-response effect suggests that greater amounts of physical activity women engage in and at increasing levels of intensity result in greater protection against the onset of diseases such as CVD, type 2 diabetes, obesity, breast and colon cancer, and depression. A review of studies examining the relative risks of developing and dying from these chronic diseases in women when participating in incremental levels of physical activity is summarized below and in Table 1.

Cardiovascular disease. Heart disease remains the leading cause of death in the United States accounting for 25% of all deaths across all age groups (Minino et al., 2011). The 1996 SGR declared physical activity as a single lifestyle factor directly associated with reducing risks for developing coronary heart disease and protecting against CVD mortality (U.S. Department of Health and Human Services, 1996). African American women have greater prevalence of CVD, hypertension, and stroke than White women, and they have a greater risk of dying from these diseases (Roger et al., 2012).

Currently, no research has been conducted in participants of the Black Women's Health Study associating physical activity and risk of cardiovascular disease. However, the Iowa Women's Health Study examined over 40,000 postmenopausal women over seven years (Kushi et al., 1997). This study found that there was a significant inverse association between CVD mortality and those with medium and high physical activity index scores with relative risks (RRs) of .86, and .55, respectively ($p_{\text{trend}} = .002$) compared to those in the low category. This suggests that women of the highest physical activity category had about half the risk of dying from CVD than those in the lowest category, while women in the medium category had an intermediate

level of risk. The physical activity index scores were based on frequency and intensity of moderate and vigorous activities. Physical activity behaviors were self-reported and were only measured at baseline, which may have led to misclassification and changes in behavior during the follow-up period could not be assessed.

Coronary heart disease (CHD) is a type of CVD, and there is strong scientific evidence that physical activity is inversely related to CHD risk (U.S. Department of Health and Human Services, 1996). From the Women's Health Study described previously, past (early adulthood) and current (middle-age) physical activity behaviors were assessed in 39,876 healthy women who were followed for nine years (Conroy, Cook, Manson, Buring, & Lee, 2005). This study found that women who were more physically active during middle-age had lower risk of developing CHD. Greater energy expenditure was associated with lower risk of CHD with RRs of .62, .61, and .61, respectively ($p < .001$). In other words, the most physically active women had a 39% lower risk of CHD than the least active women. Unlike other studies showing a graded relationship between amounts and intensities of physical activity and disease risk, this study found a threshold effect where women expending 200-599 kilocalories per week had a 38% lower risk, but there was no additional decrease in risk with higher levels of physical activity (600-1499 or ≥ 1500 kilocalories per week). Behaviors were self-reported and a recall of past behaviors may have led to misclassifications. However, the large sample size and strength of associations of current behaviors show physical activity being significant predictor of CHD events.

On the other hand, the 1976 Nurses' Health Study examined the association between walking and incidence of coronary heart events of 72,488 women in an eight-year follow-up and did find a graded dose-response effect between physical activity and risk of coronary events (Manson et al., 1999). Participants reported the amount of time spent engaging in various

recreational activities (i.e. jogging, running, bicycling, swimming, playing tennis, etc.), and participants categorized walking pace as easy or casual, average, or very brisk. Women who reported engaging in recreational exercise from low to high duration and intensities had RRs of 1.0, .88, .81, .74, and .66 for coronary events with a trending p -value of .002. Therefore, women engaging in the highest levels of exercise had a 35% lower risk of experiencing a coronary heart event compared to women in the lowest exercise category. For women who did not engage in any vigorous recreational activities, but reported leisurely walking, there was a significant reduction in risk of coronary events only in the two highest groups of walking time and pace as compared to lowest group with RRs of .70 and .65. This suggests that an increase in casual walking may not provide as much protection against the onset of CHD as brisk walking and vigorous activities. Repeated measures were used in this study, but physical activity was self-reported.

Stroke is a cerebrovascular disease and possible sign of CVD. In 2008, stroke was the fourth leading cause of death (Minino et al., 2011). Recently published studies show a more consistent relationship between physical activity and reduced risk of stroke. Physical activity data were collected repeatedly for 12 years from over 39,000 women in the Women's Health Study described previously (Sattelmair, Kurth, Buring, & Lee, 2010). Participants reported the amount of time spent in specific recreational activities, their normal walking pace (casual, normal, brisk or very brisk), and the number of flights of stairs climbed each day. This study found that there was no significant association between amount of total leisure-time physical activity or amount of vigorous activity and stroke. However, there was a significant inverse association between time spent walking and risk of stroke. Compared to those who did not walk regularly, increased time spent walking had RRs of .91, .96, and .78 ($p = .01$). Walking pace also had a significant association with risk of stroke when 12 of the 16 confounding factors were

controlled for with RRs of .82, .72, and .63 ($p = .007$), but the relationship was no longer statistically significant when the other four factors (BMI, history of diabetes, history of high cholesterol, and history of hypertension) were added. Although the association with vigorous activity was not statistically significant, there was an inverse trend seen toward reduced risk suggesting a need for more research in this population examining various types and intensities of physical activity, and stratifying by race may provide better insight on associations among African American women specifically. This study used repeated measures and a large sample size, but measures were self-reported and only included leisure-time physical activities not including occupational activity, housework, or activity used for transportation. Including additional categories of leisure-time physical activity, such as that used during transportation or work, has shown to influence classification in women (Brownson et al., 2000).

Type 2 diabetes. Diabetes is the seventh leading cause of death (Minino et al., 2011), and 90%-95% of diabetes cases are non-insulin dependent or type 2 (Dall et al., 2010). Prevalence and incidence rates of type 2 diabetes has increased rapidly in the last 20 years with racial and ethnic minorities and those of lower socioeconomic strata experiencing the greatest increases (Centers for Disease Control and Prevention, 2011b). One study found that African American women were twice as likely to develop diabetes as White women and 47.8% of the excess risk was accounted for in potentially modifiable risk factors such as physical activity and excess weight (Brancati et al., 2000).

Research shows that physical activity plays a notable role in preventing type 2 diabetes (Lipton, Liao, Cao, Cooper, & McGee, 1993). For example, authors from the Black Women's Health Study analyzed data from over 45,000 women from 1995 to 2005 to estimate risk of type 2 diabetes comparing levels of physical activity and television watching (Krishnan, Rosenberg, & Palmer, 2009). Women self-reported the number of weekly hours spent on vigorous activity,

walking for exercise, and walking to and from work along with their walking pace. Women also reported the number of hours per day spent watching television. This study found that vigorous activity was inversely associated with type 2 diabetes risk ($P_{trend} < .0001$). Women who engaged in brisk walking five or more hours per week had an incidence rate ratio of .67 and those engaging in seven or more hours of vigorous activity had an incidence rate ratio of .43. Sedentary behavior was also found to increase risk of type 2 diabetes where those watching five or more hours of television per day were nearly twice as likely to develop type 2 diabetes compared to those watching less than one hour per day ($P_{trend} < .0001$). Women reporting no vigorous physical activity and five or more hours of television watching per day were 3.6 times more likely to develop type 2 diabetes compared to women engaging in three or more hours of vigorous activity each week and less than an hour of television watching per day. Therefore, moving more and sitting less can greatly reduce the risk of developing types 2 diabetes in a population whose incidence rates are rising exponentially. Physical activity behaviors were self-reported, but the prospective study design many have reduced the potential of recall bias. Repeated measures were also used, which showed physical activity behaviors over time.

Similarly, greater amounts of physical activity was associated with greater protection against developing type 2 diabetes in women from the Nurses' Health Study (Hu et al., 1999). In this study, over 70,000 healthy women were surveyed throughout an 8-year follow-up period. Women reported time spent in various physical activities as well as walking pace. This dose-response relationship was seen in RRs across low to high levels of physical activity of .77, .75, .62, and .54 ($p < .001$). Women in the highest physical activity level had 46% lower risk of developing type 2 diabetes than women in of the lowest level. Similar results were found in women who did not participate in any vigorous activities and only reported walking. RRs across low to high levels of walking were .91, .73, .69, and .58 ($p < .001$). This suggests that increased

levels of physical activity (even moderate walking) significantly reduce risk of the onset of type 2 diabetes in women. Although this study did not perform subgroup analyses by race, it used a large sample size that may be generalizable across racial groups. Another strength is that repeated measures were used, but behaviors were self-reported and only included leisure-time activities.

Obesity. Obesity is a risk factor for many chronic diseases so much so that medical professionals have now considered it a chronic medical condition of its own (Rippe, Crossley, & Ringer, 1998). Obesity is associated with increased risk of CHD, hypertension, type 2 diabetes, arthritis, and certain types of cancer. The prevalence of obesity has increased significantly over the years, and in 2007-2008 approximately 34% of adults were considered obese. Rates are particularly high among African American women where 50% are obese and 14% are considered extremely obese (BMI \geq 40.0) (Flegal, Carroll, Ogden, & Curtin, 2010). Ogden et al. (2006) found that African American women are twice as likely to become obese than their White counterparts. There is strong evidence associating higher levels of physical activity with lower risk of obesity (U.S. Department of Health and Human Services, 1996).

To date, there is no published research investigating the association between physical activity and obesity from the Black Women's Health Study. However, the Women's Health Study examined weight changes from a large sample of 34,079 women of various races and ethnicities (Lee, Djouse, Sesso, Wang, & Buring, 2010). Women reported their weight and amount of physical activity behaviors throughout the 14-year follow-up period. The study found a significant inverse, dose-response relationship between weight gain and increasing levels physical activity. The 2008 federal guidelines recommend adults engage in 150 minutes of physical activity per week (7.5 MET hours per week). In this study, women who did not meet this guidelines (< 7.5 MET per week) had an odds ratio (confidence interval) of 1.11 (1.08-1.15)

and women expending 7.5 to 20 MET per week had an odds ratio of 1.07 (CI = 1.04-1.11, $p_{\text{trend}} < .001$) compared to women in the highest physical activity category. However, when grouping by BMI, only women with a BMI less than 25 were significantly less likely to gain 2.3 kg of weight with higher levels of physical activity. There was no relationship between weight gain and physical activity among women who were overweight or obese. This suggests that preventing further weight gain after reaching overweight or obesity is difficult even with greater amounts of physical activity. Therefore, physical activity to prevent obesity is critical. Physical activity and weight were self-reported in this study and other factors that may have contributed to weight gain, such as medication and diet over time, were not considered.

Cancer. The role physical activity plays in reducing the risk of cancer has gained research attention in the past 20 years and the evidence continues to grow. The strongest and most consistent evidence shows that physical activity has a protective effect on the development of colon and breast cancers (Friedenreich, Neilson, & Lynch, 2010). Colon cancer is the third most common type of cancer in men and women, and breast cancer is the leading cancer in women (U.S. Cancer Statistics Working Group, 2012). Of particular interest are the greater incidence rates of colorectal cancer and breast cancer among African American women compared to White women as well as death rates of colorectal cancer (U.S. Cancer Statistics Working Group, 2012).

Over 45,000 women from the Black Women's Health Study were followed for six years and data were collected to examine the association between physical activity and the development of colorectal polyps, which are precursors of colon cancer (Rosenberg et al., 2006). Nearly 1,390 women reported having been diagnosed with colorectal polyps, and they self-reported the number of hours per week they participated in vigorous activity, walking for exercise, and walking for transportation along with the intensity. After converting activity to

metabolic equivalent (MET) hours per week, this study found that women who engaged in greater amounts of exercise had a significantly lower risk of developing colorectal polyps. Women had a statistically significant, 20% lower risk with 20 to 30 MET hours per week and a 30% lower risk with 40 or more MET hours per week. Although this does not prove a direct association with colon cancer, it does suggest a protective effect against colorectal polyps. This study did not stratify the analyses by the types of polyps, which was a limitation because some are not considered risk factors for colon cancer.

The Nurses' Health Study examined the relationship between physical activity and incidence of colon cancer. Over 79,000 women were followed in this study for 16 years. Participants reported the amount of time spent participating in specific activities and walking pace at baseline. The study found a trend of increases in physical activity reducing women's risk for colon cancer (Wolin et al., 2007). There was a significant dose-response relationship found between greater amounts of moderate and vigorous physical activities and reduction of risk. Women who expended more than 21.5 MET per week had 49% lower risk of developing distal colon cancer than women who expended less than 2 MET per week (RR = 1.0, .90, .94, .82, .51, $p_{trend} = .004$). There was no association found for more time spent only walking. Results suggest that engaging in moderate and vigorous activities may afford the greatest protection against the development of colon cancer. Although the study sample was large, the small number of colon cancer cases may have impacted the power.

Physical activity has been shown to have a protective effect against the development of breast cancer. In the NHANES I Epidemiological Follow-up Study, women were asked to report their physical activity behaviors from the past 10 years (Breslow et al., 2001). The study found that women 50 years and older who reported consistently high levels of leisure-time physical activity had a 67% reduction in breast cancer risk (RR = 1.0, .87, .33, $p_{trend} = .026$) compared to

women reporting consistently low amounts of activity. There was no significant difference in women younger than 50 years. There were only 138 cases of breast cancer and repeated measures were not used, which may have limited study outcomes.

Physical activity also has been shown to reduce the risk of death after diagnosis of breast cancer in observational studies. A cohort of women from the Nurses' Health Study measured the amount of time spent engaging in various physical activities and walking pace, which were repeated every two years (Holmes, Chen, Feskanich, Kroenke, & Colditz, 2005). This study found that increased amounts of physical activity resulted in RRs of death from breast cancer of .80, .50, .56, and .60 ($p_{trend} = .004$). Women engaging in 24 MET hours per week or more had a 40% lower risk of dying from breast cancer compared to women engaging in less than 3 MET hours per week. Results suggest that even after breast cancer diagnosis, increasing levels of physical activity may have a protective effect against death.

The Black Women's Health Study conducted a case-control study to assess the relationship between vigorous physical activity and the prevalence of breast cancer (L. L. Adams-Campbell, Rosenberg, Rao, & Palmer, 2001). Women self-reported breast cancer diagnosis and physical activity behaviors. Two controls for each breast cancer case of similar age were randomly selected, and this study found that women who engaged in strenuous activity during young adulthood (ages 21 and 30 years) had lower odds of developing breast cancer. More specifically, participating in seven or more hours per week resulted in an odds ratio of .60 ($p_{trend} < .01$) compared to those engaging in less than one hour per week. Physical activity was self-reported and test-retest reliability may have been a factor between groups as well as selection bias in the case group.

These studies examining relationships and associations between physical activity and cancer risk and death found benefits of moderate-intensity activity and greater benefits with

increases in intensity, duration, and frequency. Vigorous activity is the type of activity that African American women report engaging in the least, which supports the need of community-based exercise programs that offer the resources and opportunities for women to routinely participate and to learn factors contributing to sustained attendance.

Depression. In addition to physical health benefits, physical activity and exercise have many psychological benefits such as reducing depression and anxiety symptoms and improving self-esteem (Penedo & Dahn, 2005). Depression is one of the most common illnesses in the U.S. affecting an estimated 9% of adults. The prevalence of depression is higher in women than in men, and greater among African Americans than other ethnic groups (Centers for Disease Control and Prevention, 2010). The Black Women's Health Study was the first large prospective study to examine the relationship between physical activity and depressive symptoms in African American women (Wise, Adams-Campbell, Palmer, & Rosenberg, 2006). In this study, over 35,000 women reported physical activity behaviors and depressive symptoms via mail-based survey in 1997 and again in 1999. Results found a dose-response relationship between vigorous activity and depressive symptoms (OR = 1.0, .89, .85, .74, .72, .81, .75, $p_{trend} < .001$). Women who engaged in vigorous activity seven or more hours per week had 25% lower risk of having depressive symptoms than women engaging in less than 1 hour per week. Walking for exercise was not associated with depressive symptoms, suggesting vigorous activity provides the greatest protection. In this study, it was not possible to determine if physical activity levels influenced depression or if depression influenced physical activity levels, which was a limitation.

In addition to being an overall health promoting behavior, physical activity has become a public health focus because of its protection against the nation's most common diseases. African American women experience similar disparities in rates of physical inactivity as they do in the incidence of many chronic diseases of which science has proven physical activity to

protect against. This body of evidence reinforces that with greater amounts of physical activity and at higher intensities, African American women can reduce their risk of developing or dying from many conditions that plague this population by up to 50%. Although leisurely walking and activities of daily living have health-promoting benefits, more vigorous activities offer even greater protection against diseases (U.S. Department of Health and Human Services, 1996). Studies have shown that African Americans report significantly higher amounts of physical activity when activity for occupational work or transportation is considered (Brownson et al., 2000; Young, Miller, Wilder, Yanek, & Becker, 1998). However, the literature suggests they may benefit even more when strenuous activity is incorporated. This supports the need to implement exercise programs that are accessible, affordable, and effective at promoting long-term increases in physical activity and exercise behaviors in order to close the gap on health disparities.

Economic Consequences of Physical Inactivity

Along with disease burden is the economic burden of physical inactivity. Direct costs include the diagnosis and treatment of health conditions associated with physical inactivity. These costs include hospital stays, doctor visits, medications, rehabilitation, and nursing home stays. Indirect costs, such as those associated with short-term disability and lost productivity are also incurred. Productivity costs include lost wages due to inability to work and wages lost due to premature mortality (Colditz, 1999), and lost wages due to being on the job but not being fully functional, which is known as presenteeism (Chenoweth & Leutzinger, 2006). A review of direct and indirect costs associated with physical inactivity are summarized below and presented in Table 2.

Colditz (1999) conducted a review of the economic costs of inactivity where economic costs of a subset of health conditions were estimated. The proportion of disease that could be

prevented by eliminating inactivity was estimated by calculating the population-attributable risk percent. Population-attributable risk percent is based on the incidence of disease in the inactive group compared to the active group while controlling for confounders. The prevalence of self-reported physical inactivity (28.8%) in U.S. adults from the 1995 Behavioral Risk Factor Surveillance System (BRFSS) was used to estimate the population-attributable risk percent. This study found physical inactivity costs the U.S. \$24.3 billion per year in 1995 dollars, which was approximately 2.4% of all direct health care costs and approximately \$130 per person each year. When considering individual health conditions, physical inactivity was associated with an estimated cost of \$8.9 billion for CHD, \$2.3 billion for hypertension, \$6.4 billion for type 2 diabetes, \$2.38 billion for colon and breast cancers, and \$2.4 billion for osteoporotic fractures. This estimate is based on a subset of health conditions and uses a hypothetical cohort retrieving estimated economic costs from previous literature. Actual medical expenditures from all medical conditions may have influenced these associations. This approach also did not allow for a connection of medical expenditures and physical activity behaviors to each individual, and other potential confounders were not measured.

A similar study used actual medical expenditures of a large health plan of 1.5 million adult members. These data were used to estimate medical expenditures associated with physical inactivity in 2000 (Garrett, Brasure, Schmitz, Schultz, & Huber, 2004). Medical expenditures for inpatient and outpatient care and pharmaceutical costs of conditions including heart disease, stroke, hypertension, type 2 diabetes, colon cancer, breast cancer, osteoporosis, depression, and anxiety were included and physical activity behaviors were derived from the 2000 BRFSS telephonic survey for that state. Expenditures attributable to physical inactivity were estimated using the population-attributable risk percent. Thirty-one percent of costs related to heart disease, stroke, osteoporosis, and colon cancer were associated with physical

inactivity, and the study estimated that physical inactivity cost \$83.6 million for all conditions in this population in 2000. This translates to \$56 per member attributed to physical inactivity each year, which is less than the estimated \$130 per person estimated by Colditz (1999). These differences may be due to this study using actual paid amounts rather than estimated expenditures or use of a selective (single-state and insured) population rather than a random sample or due to differences in the samples used to base their estimates. Similar to Colditz (1999), this study used aggregate physical activity data from the state-wide BRFSS survey, therefore physical activity and health care data were not connected to each individual. As discovered in the previous section, most long-term longitudinal studies show historical physical activity behaviors influencing disease, but only current behaviors were measured in this study. This study sample may not have been representative of all adults as only those medically insured were included.

Pratt et al. (2000) conducted an economic study examining all direct medical expenditures of active and inactive adults and did not limit their analyses to disease-related expenditures. This study used a nationally representative sample using the 1987 National Medical Expenditures Survey (NMES) and included a weighted sample of over 20,000 individuals 15 years or older with no physical limitations. Participants provided demographic information, use and expense of medical care, and health-risk behaviors such as regular physical activity during a series of four interviews. Those who did not report spending at least 30 minutes of strenuous activity three days a week were classified as inactive. Analyses were conducted controlling for age, gender, and smoking status. In this study, 43.2% reported not engaging in regular physical activity and experienced higher annual direct medical costs of \$330 per person compared to those who engaged in regular physical activity. If this cost difference were applied to 43.2% of the U.S. population age 15 and older who are physically inactive, there would be an

estimated cost savings of \$29.2 billion (1987 dollars), which is comparable to Colditz's (1999) estimation of \$24 billion (1995 dollars) of direct medical costs associated with physical inactivity. The largest differences in medical costs were found in women older than 55 years who were physically inactive compared to those who were physically active, which suggests the potential economic gains of increasing physical activity in this population (Pratt et al., 2000).

Unlike the previous studies, Chenoweth and Leutzinger (2006) examined both direct and indirect costs associated with physical inactivity using cost data from several health plans across seven states. Costs were evaluated in this study including medical care, workers' compensation, and lost productivity from health conditions associated with physical inactivity, such as osteoarthritis, cardiovascular disease, diabetes, and some cancers. Lost productivity costs were derived from three outcome measures: absences, short-term disability, and presenteeism. This study estimated \$3 billion in direct medical care costs and \$7.5 billion per year in lost productivity being associated with physical inactivity. Lost productivity is of particular concern because approximately 55% of African American women in the U.S. are employed and nearly the same proportion (53%) of married women are the primary breadwinners in their families (Glynn, 2010; U.S. Department of Labor, 2011).

The importance of physical activity to prevent disease and disease-related death is well documented as described in the previous section. However, understanding the associations of physical activity and disease risk and mortality does not necessarily account for the impact these conditions have on health-related quality of life. Economic analyses provide additional insight on health effects related to these chronic conditions through direct and indirect medical expenditures. Colditz (1999) estimated direct costs of physical inactivity being responsible for approximately 2.4% of all health care expenditures. Moreover, there could be substantial cost savings if inactive Americans became physically active. Jones and Eaton (1994) estimated an

annual cost savings of \$5.6 billion in preventing CHD alone if 25% of physically inactive Americans started a walking program. Furthermore, Pratt et al. (2000) calculated a direct medical cost savings of \$330 per person, which equates to \$76.6 billion if all physically inactive Americans (43% of Americans 15 years and older) became active. Applying this to 48% of the estimated 20 million African American women in the U.S. who are physically inactive (Schiller et al., 2012; U.S. Census Bureau, 2012), a \$3.2 billion annual cost savings could be realized in this subgroup alone if all other factors were held constant (.48 x 20,000,000 x \$330).

Determining the economic burden of physical activity is challenging because it includes both direct and indirect health care costs, and it must be calculated in relation to the treatment and diagnosis of conditions associated with physical inactivity. This approach makes analyses and the control of all confounders difficult. Despite these challenges, it is clear that physical inactivity has a significant economic burden on Americans and on the nation. Even those who are healthy and physically active may encounter the trickle-down effect of higher insurance premiums and rising health care costs to accommodate the expenses of those who are physically inactive. Increasing physical activity behaviors in Americans, particularly African American women who are most at risk, can help improve health, prevent or prolong the onset of diseases, and reduce today's economic burden.

Exercise Behavior Studies in African American Women

In order to achieve the *Healthy People 2010* and *Healthy People 2020* goals of eliminating or reducing health disparities and achieve health equity, differences in behaviors such as physical activity and exercise must be addressed. While incorporating more moderate physical activity into the daily lives of African American women is an important public health approach, the planned, structured, and habitual type of physical activity – exercise – that tends to be more vigorous is equally as important to improve levels of fitness, prevent and reduce

obesity, provide further protection against chronic diseases, and increase longevity and quality of life (U.S. Department of Health and Human Services, 1996). The 1996 Surgeon General's *Report on Physical Activity and Health* addresses the health benefits of moderate-intensity exercise, but encourages adults to engage in vigorous activity to gain additional health benefits (U.S. Department of Health and Human Services, 1996). This section provides a review of exercise behaviors and correlates of exercise in African American women. Through electronic database searches, four studies from 2003 to 2005 were found measuring exercise behaviors and physical fitness of African American women and included in the review.

Descriptive studies are showing that African American women are not only falling short of physical activity guidelines, but a very small proportion of women engage in exercise activities despite the proven health and fitness benefits. For example, L. Adams-Campbell et al. (2000) collected self-reported physical activity behaviors from 33,732 African American women nationwide. In 1995, women aged 21 to 69 years completed a mail-based survey, which included questions regarding the average amount of time spent walking and engaging in moderate and strenuous activities each week in the past year. Examples of strenuous activities included basketball, swimming, running, and aerobics. Overall, women had low levels of physical activity with 61% reporting an hour or less of strenuous activity each week and 34% reported no participation in strenuous activity. Women reported spending an average 1 to 2.3 hours per week engaging in strenuous activities compared to 3.8 to 4.4 hours spent in moderate activity.

Another study surveyed 204 African American women from the Midwest to determine current health behaviors. Results suggest that only 10% of women exercise five or more days per week for 20 minutes or more (R. K. Lewis et al., 2005), which is significantly lower than the *Healthy People 2010* goal of 30% (U.S. Department of Health and Human Services, 2000).

Although this study used the term “exercise” as the type of activity measured, it did not provide definitions for the intensity or type of exercise performed. Asking participants to recall exercise behaviors over a more recent time period (in the past seven days) may have reduced recall bias by increasing the respondent’s ability to remember behaviors within a recent time period, but it may not have been an accurate reflection of typical behaviors over a longer period of time. Despite these limitations, the proportion of those engaging in regular exercise is similar to the 10% of African American men and women who reported engaging in moderate physical activity for at least 30 minutes five or more days per week in the 1997 National Health Interview Survey (NHIS) (U.S. Department of Health and Human Services, 2000).

Paschal, Lewis, Martin, Dennis-Shipp, and Simpson (2004) assessed the health behaviors of 134 African Americans (70% women) from a low-income, urban Midwest city. This study found that only 21% of men and women exercised more than three days a week for at least 20 minutes. Participants took part in a health screening, which revealed females in this population also had high rates of overweight and obesity (96%), hypertension (57%), elevated blood sugar (17%), and high cholesterol (45%). Specific rates of engagement in exercise behaviors were not reported separately for female study participants. However, since women accounted for a majority of the population, a similarly low rate of exercise among women is likely. The frequency and duration of measured exercise was lower than the previous study and the *Healthy People 2010* objective of five days a week for 30 minutes. If higher amounts of frequency and duration were measured, the proportion of women meeting these goals may have been lower. Regardless, the high proportion of chronic disease risk factors and low rate of exercise participation in this study provides additional support of the need for effective exercise programs in this population.

Unlike the previous three studies, Whitt, Kumanyika, and Bellamy (2003) conducted an observational study where they objectively measured moderate and vigorous physical activity of African American women. Fifty-five women were instructed to wear an accelerometer and a pedometer for four consecutive days. This assessment was repeated approximately six months later to account for potential seasonal affects. Accelerometer data from the eight days were used to determine if participants met or exceeded the physical activity guidelines of accumulating at least 30 minutes of moderate or vigorous physical activity five days per week in at least 8-10 minute bouts. Results found that only two of the 55 participants met these recommendations. Women accumulated an average of 32 minutes of moderate to vigorous physical activity per day, but on too few days per week (three days) and in too short of bouts (1-4 minutes) (Whitt et al., 2003). Participants also kept physical activity diaries, and most frequently reported activities included jogging or running, gym classes or exercise machines, aerobics, shopping, dancing, and leisurely walking. This study had a small sample size, but the objective measure of physical activity and addition of intermittent (accumulation of bouts) activity strengthens these findings and may contribute to differences found in other studies using self-reported measures.

Exercise is activity intended to maintain or improve physical fitness, and physical fitness is a major protective factor against cardiovascular disease and premature mortality (Blair et al., 1995; Willis, Gao, Leonard, DeFina, & Berry, 2012). Because African American women are less physically active and few women participate in exercise activities, it may be hypothesized that African American women have lower levels of physical fitness than their White counterparts. However, only one study was found comparing physical fitness between these two groups that did not find convincing evidence. This study assessed the exercise capacity of African American adults (N = 641) compared to Whites (N = 4,428) who were being screened for coronary artery

disease (Lavie, Kuruvanka, Milani, Prasad, & Ventura, 2004). All participants referred for clinical exercise stress testing followed a ramp treadmill protocol and METs were calculated to estimate exercise capacity. In a multivariate analysis, higher exercise capacity was predicted by being younger in age, of male gender, having lower BMI, and of White race ($p < .0001$). Of the female population, 20% were African American (N = 308) and 70% were White (N = 1,211) with mean ages (standard deviations) of 57.6 (12.1) and 61.9 (12.1) years, respectively. Despite being younger in age, African American women had slightly lower exercise capacity than White women with mean (standard deviation) METs of 8.5 (2.9) and 8.7 (3.0), respectively. The unequal group sizes may have affected these outcomes; therefore, further research is warranted.

Increasing the levels of exercise and physical fitness among African American women is part of the solution to reduce health disparities and to improve the health of African American women. Findings from these studies demonstrate that African American women participate in little leisure-time exercise and experience low levels of physical fitness, which may contribute to the disproportionate rates of chronic disease and mortality. There is a clear need for exercise programs targeting this population, and a need to learn more about factors influencing regular exercise participation.

Correlates of Physical Activity

According to Buckworth and Dishman (2002), 50% of people who begin an exercise program will drop out within the first six months. This is consistent with physical activity programs involving mostly African American women, who experience attrition rates as high as 47% (Banks-Wallace & Conn, 2002). Identifying factors associated with physical activity is important to “generate hypotheses about possible causal relationships and about potential mediators that can be targeted in interventions” (Bauman, Sallis, Dzewaltowski, & Owen, 2002,

p. 10). Factors that show associations or predictive relationships are known as correlates and are not considered causal factors. Many cross-sectional and longitudinal studies have found multiple variables within various categories that influence physical activity, such as personal, social, environmental, cultural, and psychological factors. The complexity of factors demonstrates that physical activity is a complex behavior to change (Bauman et al., 2002). Due to an interchangeable use of terms, cross-sectional studies that examined correlates of physical activity and exercise behaviors in African American women were reviewed. Nine studies from 1996 to 2012 were identified and three recruited African American women only. Table 3 provides a summary of the statistically significant correlates identified in these studies.

The review of literature supported behavior change theories, such as the social cognitive theory, that suggest physical activity is a behavior influenced by multiple factors. Several studies identified various personal factors correlated with physical activity participation. For example, women who achieved higher levels of education (Affuso, Cox, Durant, & Allison, 2011; Ainsworth, 2003; Bopp et al., 2006; Bopp, Wilcox, Oberrecht, Kammermann, & McElmurray, 2004; Sternfeld, Cauley, Harlow, Liu, & Lee, 2000; Wilbur, Chandler, Dancy, & Lee, 2003; Wilcox, Bopp, Oberrecht, Kammermann, & McElmurray, 2003), were of younger age (Bopp et al., 2006; Eyler et al., 2003; Sternfeld et al., 2000; Wilcox et al., 2003), and of better health (Ainsworth, 2003; Bopp et al., 2006; Eyler et al., 2003; Wilbur et al., 2003) were more likely to be physically active.

Psychological or emotional factors show that African American women are more likely to be physically active if they perceive the behavior to be of personal importance, if they perceive it as being important for good health, and if they feel the pros in participating outweigh the cons (Affuso et al., 2011; Bopp et al., 2004; Wilcox et al., 2003). Self-efficacy was a factor assessed in five of the nine reviewed studies and four found significant correlation (Ainsworth,

2003; Bopp et al., 2006; Eyler et al., 2003; Wilcox et al., 2003). In fact, Ainsworth and colleagues found that women who were very confident were twice as likely to be physically active as women who were somewhat or not at all confident in a telephonic survey of 917 African American women. Bopp and colleagues (2004) also found greater self-efficacy to be independently associated with meeting walking and moderate and vigorous physical activity in multivariate analyses after surveying a random sample of African American men (N = 165) and women (N = 407) from 20 churches. Similarly, Eyler and colleagues (2003) surveyed ethnically diverse women across the U.S. as part of the Women's Cardiovascular Health Network Project. They found self-efficacy to be one of the most consistent correlates associated with physical activity.

On the other hand, authors of a study that conducted in-person interviews with 399 African American women from an urban Midwestern city did not find self-efficacy to have a statistically significant association with physical activity (Wilbur et al., 2003). Women who were very confident had a non-significant odds ratio (confidence interval) of 1.46 (.46-4.56) in meeting physical activity recommendations compared with those who not confident.

Self-efficacy was the most commonly studied psychological factor and the most consistent in terms of direction of effect. However, none of the reviewed studies assessed this as a potential correlate to exercise program attendance, but rather its association with overall self-reported physical activity behaviors.

Social factors associated with physical activity in African American women include knowing others who are active (Eyler et al., 2003; Wilbur et al., 2003), seeing others similar to them engage in physical activity (Ainsworth, 2003; King et al., 2000), and having more social support or less social strain (i.e. caregiving responsibilities) (Ainsworth, 2003; Bopp et al., 2004; King et al., 2000; Wilcox et al., 2003). Studies also report that physical environments safe and

free from crime are correlated with being more active (Eyler et al., 2003; Wilbur et al., 2003; Wilcox et al., 2003). Having access to facilities was also a significant correlate in one study and identified as a common suggestion in qualitative analyses in another (Affuso et al., 2011; Eyler et al., 2003). These findings support the concept of community-based exercise programs that provide a socially preferable environment that encourages physical activity through a vicarious experience and a physical environment that is safe and accessible.

These cross-sectional studies provide useful information about the personal, psychological, social, and environmental factors correlated with physical activity, which is a complex behavior to change. Community-based exercise programs tend to target specific populations and offer a unique opportunity to engage in exercise by being conveniently located within neighborhoods and attracting peers for a vicarious learning experience. Research should now focus on examining correlates associated with exercise program attendance in African American women, which may differ from those associated with overall physical activity behaviors.

Physical Activity and Exercise Behavior Interventions

There has been a notable increase in the number of programs and interventions designed to promote physical activity among adults since the 1996 SGR on *Physical Activity and Health*, especially those targeting African American women. A 2002 review identified 18 studies from 1984 to 2000 that focused on increasing physical activity in populations comprised of at least 35% African American women (Banks-Wallace & Conn, 2002). Seven of these studies included African American women exclusively. A later review of physical activity and physical fitness interventions targeting African Americans from 1985 to 2006 identified 16 studies that recruited only women and another 10 studies that included men and women, but consisted mostly of women (Whitt-Glover & Kumanyika, 2009). Although there has been an increase in

physical activity research on this subgroup, interventions have seen modest effects on long-term behavior change.

A comprehensive review of the literature was conducted to identify physical activity and exercise behavior interventions that focused on improving physical activity or exercise behaviors in primarily African American women. Studies after 1996 were chosen because of the substantial increase in the number of physical activity interventions targeting minority populations following the SGR on *Physical Activity and Health*. After removing studies that did not focus on improving behaviors, provide physical activity outcomes, or comprise of at least 40% African American women, 50 studies were identified. Of these studies, 29 aimed to increase daily physical activity, 12 of which incorporated strategies to improve multiple behaviors such as diet, physical activity and weight loss (Table 4). Twenty-one of the studies focused on exercise participation, half of which targeted multiple behaviors (Table 5). The sample sizes of these 50 studies ranged from 18 to 1,322 with a mean (standard deviation) of 169.04 (249.1). Twenty-six of the studies (52%) included African American women exclusively, and 27 (54%) of the interventions were derived from at least one behavior change theory. For the 41 studies that provided drop out data, the mean (standard deviation) attrition rate was 24.5% (14.3). Most of the studies used a randomized controlled trial study design (N = 27). The remaining were uncontrolled (N = 18) and non-randomized (N = 5) study designs.

Physical Activity Interventions. The 29 physical activity interventions reviewed found modest improvements in physical activity behaviors in their study populations. Eleven (38%) of the studies found significant improvements in physical activity (Antikainen, 2011; Duru, Sarkisian, Leng, & Mangione, 2010; Keyserling et al., 2002; Migneault et al., 2012; Montgomery, 2007; Nies, Chruscial, & Hepworth, 2003; Pekmezi et al., 2010; Resnicow et al., 2005; Whitt-Glover, Hogan, Lang, & Heil, 2008; Wilson, Porter, Parker, & Kilpatrick, 2005; Zoellner et al.,

2010). The length of these studies ranged from four weeks to 12 months, but only one included post-intervention data to determine if behaviors were maintained after conclusion of the intervention. Most of these studies that saw statistically significant improvements in physical activity behaviors were interventions focused on a single behavior (N = 8) rather than multiple behaviors (N = 3). For example, Wilson et al. (2005) conducted an eight-week intervention to determine the impact of a community-based walking intervention that aimed to increase the number of daily steps in 24 African American cancer survivors. Participants attended weekly group educational sessions and were asked to wear a pedometer and log daily steps. The mean number of steps increased from 4,791 to 8,297 at the end of the eight-week intervention, and this improvement was sustained three months after conclusion of the intervention with a mean of 8,223 steps per day.

Pekmezi et al. (2010) also found a maintained increase in physical activity in a study to determine the feasibility of print- and computer-based interventions. Thirty-eight African Americans (92.6% female) were randomly assigned to one of three groups: (1) tailored print materials based on readiness to change, (2) tailored internet program based on readiness to change, (3) standard internet where participants were directed to general health and fitness websites. Post-intervention data were not collected, but repeated measures were conducted at six and 12 months of the intervention. Results showed that the mean (standard deviation) number of weekly physical activity minutes had significantly increased in all three study groups from baseline [17.24 (20.72)] to six months [139.44 (99.20)], and these increases were maintained at 12 months [104.26 (129.14)]. This suggests that most of the improvements in physical activity behaviors were made early in the adoption phase.

Another faith-based study included 87 African Americans (89% female) who participated in eight group sessions where they discussed physical activity topics, participated in a physical

activity session, and received weekly incentives for three months (Whitt-Glover et al., 2008). Participants were instructed to wear a pedometer each day and self-report weekly minutes of moderate- and vigorous-intensity physical activity. Results found an increase in mean (standard deviation) number of steps per day of 1,373 (728) and an increase in moderate- and vigorous-intensity physical activity of 66.9 (77.6) and 43.8 (66.4) minutes per week, respectively, after twelve weeks. This study did not conduct a post-intervention follow-up.

Six physical activity interventions found improvements in some measured outcomes, but not others (Banks-Wallace & Conn, 2005; Baskin et al., 2011; Campbell et al., 2004; Parra-Medina et al., 2011; Peterson, 2011; Rimmer, Hsieh, Graham, Gerber, & Gray-Stanley, 2010). For example, Rimmer et al. (2010) studied 33 African American women with mobility disabilities. Participants received weekly telephonic coaching calls using motivational techniques to help problem solve and set physical activity goals. Participants were encouraged to engage in 30 minutes of physical activity per day. Prior to the intervention, the women expressed several environmental barriers such as cost, lack of transportation, lack of access; as well as two primary personal barriers that included pain and not knowing how to exercise. After the six-month intervention, two barriers were significantly lowered (lack of access and not knowing how to exercise), and there was a significant increase in time spent in structured exercise and indoor household activity. However, there was no significant change in self-reported leisure-time physical activity or outdoor household activity.

Similarly, Parra-Medina et al. (2011) aimed to increase physical activity and improve nutrition of 266 African American women through an intervention where participants received primary care counseling, nurse-assisted goal setting, and monthly tailored educational materials and telephonic counseling for 12 months. This study found that women increased their amount of leisure-time physical activity, but saw a decrease in overall physical activity compared to the

control group. These studies suggest there may be a more concentrated effort to increase some types of physical activity or exercise, while participating in other areas decreases. These studies did not conduct long-term follow-up to determine if these behaviors remained consistent over time.

Campbell et al. (2004) conducted an individually-tailored intervention and a culturally-tailored intervention on 587 members of African American churches that focused on physical activity, nutrition, and colorectal screening behaviors. Participants of the individually-tailored intervention received tailored messages and feedback based on their current behaviors, readiness to change, beliefs, barriers, and social support while the culturally-tailored intervention extended this strategy by including social networks through the church. This study found significant increases in the individually-tailored group compared to the control, but not in the culturally-tailored intervention. This suggests that interventions tailored to the individual may be a more effective strategy for this population.

Two physical activity studies found short-term increases in physical activity, but these behaviors attenuated over time (Whitehead, Bodenlos, Cowles, Jones, & Brantley, 2007; Wilbur et al., 2008). Interventions that saw short-term increases ranged from four weeks to six months in length and long-term measures that saw attenuation in behavior change ranged from three months to six months. Neither of these studies reported explanations for decrease in physical activity, which supports the need to learn more about reasons for high dropout rates from exercise programs within six months of adoption. For instance, Whitehead et al. (2007) recruited 207 adults who were a majority African American and women to receive mail-based educational material on physical activity that was culturally appropriate and tailored to their individual stage of change. The intervention group saw modest, yet statistically significant increases in physical activity after one month compared to the control group who received

nutrition materials (Whitehead, et al., 2007). However, the self-reported 6-month results showed no significant group differences when compared to baseline physical activity. In the second study, Wilbur et al. (2008) assigned 281 African American women to an enhanced treatment group or a minimal treatment group. Both groups were instructed to walk at least three days per week and the enhanced treatment group also received four motivational workshops and tailored telephone calls over 24 weeks. Women from the enhanced treatment group had significantly higher walking adherence at 24 weeks (adoption phase) and at 48 weeks (maintenance phase) than the comparison group. However, there was a significant decrease in adherence for both groups from 24 weeks to 48 weeks. These two studies suggest that maintenance of physical activity changes beyond six months may be a challenge within this population.

Ten (34%) of the physical activity interventions found no statistically significant behavior changes within or between study groups (Table 4). Eight (28%) controlled trials saw some increases in physical activity, but these changes were not statistically significant when compared to control groups, and five of these were focused on multiple behaviors (Chen, Sallis, Castro, Lee, & Hickman, 1998; Faridi et al., 2010; Kennedy et al., 2005; McNabb, Quinn, Kerver, Cook, & Karrison, 1997; Sharpe et al., 2010; Smith, Heckemeyer, Kratt, & Mason, 1997; Yanek, Becker, Moy, Gittelsohn, & Koffman, 2001; Young & Stewart, 2006). One multiple behavior intervention saw no change in physical activity (Williams, Wold, Dunkin, Idleman, & Jackson, 2004), and one single-behavior study that focused on increasing physical activity in 53 African American women by forming support system, receiving educational material, and attending group meetings saw a statistically significant decrease in physical activity after 10 weeks (Hogue, 2007).

Overall, physical activity interventions targeting African American women have shown modest improvements in physical activity. A majority of the studies reviewed (62%, N = 18)

used self-reported measures to assess changes in behavior, six studies used objective measures, and five studies used a combination of both. Of the 23 studies that used self-reported measures, 11 different tools were identified and five studies did not specify the tools that were used. More consistent measures that are reliable and valid in this subgroup are needed to accurately compare effectiveness of physical activity interventions. Additionally, few studies that found significant improvements in physical activity measured long-term maintenance of physical activity levels making it difficult to know if the interventions were successful at sustaining these changes, and those studies that did measure maintenance did not find sustained behaviors.

Exercise Behavior Interventions. In addition to 29 physical activity interventions, 21 exercise behavior interventions aiming to increase physical activity behaviors that are planned, structured, and intend to improve health were reviewed (Table 5). Exercise training interventions that were held in controlled environments and had primary objectives to improve physiological outcomes were eliminated from this review. The exercise training interventions has a similar impact on behavior as the physical activity interventions described above. Only three (14%) of the exercise behavior intervention studies found significant improvements in exercise behaviors; two of which focused on changing multiple behaviors (Karanja, Stevens, Hollis, & Kumanyika, 2002; Nothwehr, Guare, Marrero, & Hoon, 2001; Staffileno, Minnick, Coke, & Hollenberg, 2007). The length of these studies ranged from eight weeks to six months and one included a 12-month follow-up. Staffileno et al. (2007) aimed to increase exercise and reduce blood pressure levels of 24 hypertensive African American women by instructing them to engage in 150 minutes of exercise at home, such as walking and stair climbing, each week at a prescribed intensity. The exercise group had a significant decrease in systolic blood pressure compared to the control group (-6.4 mmHg vs. -5.0 mmHg, respectively) and the exercise group

reported a significant increase in energy expenditure compared to the control group supporting an increase in activity level. There was no long-term follow-up in this study. Karanja et al. (2002) conducted a 26-week culturally-tailored intervention to increase exercise and weight loss in 66 African American women. Participants attended weekly group meetings and supervised exercise sessions and were encouraged to increase their exercise outside of the sessions and engage in at least 90 minutes of exercise each week. The mean hours of exercise increased significantly throughout the intervention. During weeks 19-26, there was a slight decrease in time spent engaging in exercise, but it remained statistically significant compared to baseline. Finally, Nothwehr et al. (2001) randomly assigned 23 African American women who were diagnosed with type 2 diabetes to attend either 10 weekly sessions of healthy eating followed by 6 weekly sessions about exercise (group 1) or the reverse sequence (group 2). At baseline, the mean (standard deviation) for weekly minutes of physical activity was 38.6 (16.2) for group 1 and 57.9 (21.5) for group 2. At 16 weeks, group 1 and group 2 saw increases in the mean (standard deviation) number of weekly minutes of physical activity [347.7 (97.2) vs. 230.8 (49.2), respectively, $p = .0002$]. At 12 months, the mean (standard deviation) number of weekly minutes of physical activity for group 1 and group 2 was 159.3 (60.0) and 212.3 (47.1), respectively ($p = .0001$). The amount of activity decreased in both groups from 16 weeks to 12 months, but remained significantly higher than baseline. Minutes of physical activity at 12 months was also higher than the 150 minutes per week recommendation, suggesting the focus on multiple behaviors, regardless of the sequence, may increase exercise behaviors.

Nine exercise behavior interventions found inconsistent findings related to exercise interventions (Clark, Stump, & Damush, 2003; D'Alonzo, Stevenson, & Davis, 2004; Dornelas, Stepnowski, Fischer, & Thompson, 2007; Fitzgibbon, Stolley, Schiffer, et al., 2005; Hornbuckle et al., 2012; Resnick, Luisi, & Vogel, 2008; Stolley, Fitzgibbon, Shiffer, et al., 2009; Sullivan-Marx et

al., 2011; Swearingin, 2008). Six of these studies focused on exercise behaviors alone, while three targeted multiple behaviors. Two studies saw improvements in outcome measures in the high attendance groups, but not in low attendance groups (Clark et al., 2003; D'Alonzo et al., 2004). Clark et al. (2003) encouraged 123 female patients of a primary care center who were 50 years of age or older to attend free community-based exercise classes, which were held five days a week. Women were encouraged to attend at least three classes per week and were monitored for 12 months. Exercise data were available for 72 of the women, and those of the moderate-adherence group (N = 18, 50% or greater adherence) saw significant improvements in BMI, hip and waist circumference, triceps skinfold, and exercise self-esteem compared to women of the little-adherence group (N = 17, 30% to 49% adherence) and women of the no-adherence group (N = 36, 0% to 29% adherence). D'Alonzo et al. (2004) invited 44 women ages 18 to 35 years to attend structured exercise classes three days per week for 16 weeks. The high attenders (N = 26) participated in 16% to 60% of the exercise sessions and low attenders (N = 18) participated in 15% or less of the sessions. The high attenders had significantly higher exercise self-efficacy and fewer perceived barriers to exercise (i.e. time constraints, accessibility, fear), and significantly greater improvements in aerobic fitness, flexibility, and muscle strength and body composition than in the low attenders. High attenders saw significant increases in daily physical activity at the end of the 16-week intervention as well as at the 8-week follow-up, which was measured objectively using a digital pedometer. These two studies suggest that consistency in an exercise program may produce optimal health outcomes in both older- and younger-aged women, but adoption and adherence remain a challenge.

Sullivan-Marx et al. (2011) measured recruitment and retention of African American women attending a nursing home care program to a 16-week exercise program. This study employed specific recruitment and retention strategies that focused on partnerships between

researchers, participants, and clinicians. This study reached 61% of their recruitment goal and 71% of the recruited participants completed the exercise program. This program targeted a very specific group of women and was located at sites participants regularly attended as part of their participation in the nursing home care program. Therefore, it may not be generalizable to all populations. Authors attribute these successes to the integration of the intervention with the site activities and hiring an advanced practice nurse to improve retention.

Swearingin (2008) saw improvements in some outcome measures, but not others. In this three group study, forty-five African American women were assigned to a lifestyle activity (LA) intervention where they were encouraged to incorporate physical activity into their daily lives, to a traditional exercise (cardio) intervention where they participated in four low- to moderate-intensity exercise sessions each week, or to a control group. This study found significant improvements in cardiorespiratory fitness in both intervention groups where there were decreases in the control group. The number of daily steps from baseline to 12 weeks increased for all groups, but there were no statistically significant differences between any of the groups. Physical activity logs were used to calculate METs and convert into weekly kilocalories expended during exercise. The cardio group expended more kilocalories per week than the LA group with a mean (standard deviation) of 1,557 (338.4) and 1,029 (347.5) kilocalories, respectively, but there were no physical activity logs from the control group to determine if the intervention groups expended significantly more kilocalories than those receiving no intervention.

Resnick et al. (2008) conducted a multiple behavior intervention with 166 seniors from a senior housing center. Participants attended group sessions twice per week for 12 weeks, where nutrition education was provided and exercise sessions were led by a trained lay leader. There was a significant difference in the amount of exercise between groups where the

intervention group saw an increase of 64.5 minutes of exercise per week compared to a decrease of 18 minutes of exercise in the control group ($p = .04$). However, there was no significant difference in the amount of time spent in overall activity. The intervention group had an increase of 303 minutes per week and the control group had an increase of 110 minutes per week ($p = .63$). In another study, Stolley, Fitzgibbon, Shiffer, et al. (2009) conducted a six-month weight-loss intervention where 198 African American women ages 30 to 65 years met twice weekly to discuss physical activity and diet topics. Women in the intervention group reported significantly higher amounts of vigorous activity and moderate to vigorous activity, including walking compared to the control group. However, there were no significant differences between groups in time spent walking or in moderate activities alone at six months. These studies suggest that participation in some activities may shift once an exercise program is introduced.

Two studies found improvements in exercise behaviors early in the intervention, but these changes were not statistically significant over time (Agurs-Collins, Kumanyika, Ten Have, & Adams-Campbell, 1997; Walcott-McQuigg et al., 2002). Agurs-Collins et al. (1997) conducted a culturally-tailored intervention with 64 African Americans age 55 to 79 years, which had a primary aim to improve glycemic control through changes in weight, physical activity, and diet. Participants attended weekly and bi-weekly group sessions that included nutrition education and exercise classes along with one individual session over 24 weeks. The intervention group showed a significant increase in physical activity at three months compared to baseline, but there was no significant change at six months compared to baseline. In another study, Walcott-McQuigg et al. (2002) recruited 23 African American women who met weekly to discuss strategies for weight loss (weeks 1-16) and weight loss maintenance (weeks 17-32). They were given culturally-tailored educational material for 32 weeks and were encouraged to engage in

exercise three days per week for at least 20 minutes. Post-intervention data were not collected, but repeated measures were conducted at 16 weeks and 32 weeks during the intervention. Results showed an increase in physical activity from moderate (sporadically engaged in recreational activities) to heavy (recreational/fitness activities at least three times a week for 30 to 60 minutes) at 16 weeks. There was no significant difference in activity level at 32 weeks compared to baseline.

Seven (35%) of the exercise behavior interventions found no significant behavior changes within or between groups. Five controlled trials saw some increases in exercise, but these changes were not significant when compared to the control groups (Bopp et al., 2009; Dutton, Martin, Welsch, & Brantley, 2007; Fitzgibbon, Stolley, Ganschow, et al., 2005; Keller, Robinson, & Pickens, 2004; Newton & Perri, 2004). For example, Fitzgibbon, Stolley, Ganschow, et al. (2005) randomly assigned 59 African American women to a culturally-tailored or a faith-based weight-loss intervention. Both groups received weight loss education and exercise sessions twice per week, but the culturally-tailored intervention had no faith component. Physical activity increased in the culturally-tailored group, but not the faith-based group and there was no significant difference between groups. In another study, Bopp et al. (2009) assigned 146 African American church members to a faith-based behavior change intervention where they received educational materials and exercise sessions led by lay church leaders. The control group did not receive group sessions. The intervention group saw greater increases in physical activity and the number of steps per week compared to the control group during the six month intervention, but these differences did not reach statistical significance. However, physical activity outcomes at three and six months demonstrated medium effect sizes suggesting some strength in the possible relationship with the intervention.

Two uncontrolled studies found no changes in the study group following the intervention (Hays, Pressler, Damush, Rawl, & Clark, 2010; Resnick et al., 2009). Hays et al. (2010) measured adoption to an exercise program in low-income women. Women recruited from a primary care center were referred to a free community-based exercise program and encouraged to attend at least three classes per week. Only 44% of the participants attended at least one class and the mean number of sessions completed over eight weeks was 5.7 out of the 24 recommended. The second was a feasibility study to examine effects of exercise, diet, and medication adherence on improving blood pressure in older, hypertensive African Americans. This intervention used strategies to improve self-efficacy and outcome expectations and was held for one hour three times per week for 12 weeks. In this multiple behavior intervention, there were no significant changes in time spent engaging in moderate-intensity physical activity.

Exercise behavior interventions appear to have similar effects in changing behaviors in African American women where 65% (n = 14) of the studies reviewed saw improvements as either the primary outcome measure or secondary outcome measure or there were only short-term improvements (Table 5) compared to 66% (n = 19) of the less structured physical activity interventions (Table 4). These exercise behavior interventions also used a variety of tools to measure physical activity or exercise behaviors: 11 used self-reported measures, four used objective measures, and five used a combination of both. Of the 16 studies that used self-reported measures, six different tools were identified, and four studies did not specify the self-reported tool that was used. Three studies included follow-up measures where one study found higher proportions of continued exercise in older women after three months (Dornelas et al., 2007); and one saw maintained increases in exercise after eight weeks (D'Alonzo et al., 2004) and another study detected maintained activity after 12 months (Nothwehr et al., 2001). More studies are needed to determine the long-term effectiveness of exercise behavior interventions.

In summary, physical activity and exercise behavior interventions including a majority of African American women in their population are increasing in the published literature; however, they have only shown to make modest improvements on physical activity behaviors and effective strategies for successful and sustainable behavior change have yet to be found. Some free, on-going community-based programs exist and have been studied, but both adoption and attendance rates remain low (Clark et al., 2003; Hays et al., 2010). Furthermore, there was an over-abundance of cross-sectional intervention studies and very few observational studies examining exercise behaviors without specific intervention strategies to increase participation. For example, in many of these studies women were instructed to attend a specific number of classes during a given period of time or the classes were designed specifically for the research study and ended upon completion of the study. This may limit the understanding of exercise behaviors in a true real-world experience where women attend an exercise facility without specific attendance expectations established by researchers and warrants the need of this observational study. Additionally, some researchers suggest that programs aiming to change multiple behaviors may have greater success in improving physical activity behaviors than single-behavior programs (Whitt-Glover & Kumanyika, 2009). However, this review found that nearly twice as many single-behavior interventions (N = 9) found statistically significant improvements in physical activity compared to multiple behavior interventions (N = 5).

Interventions and Theory. In general, physical activity programs have shown to increase the success of adopting physical activity participation by 50% to 67% (Dishman & Buckworth, 1996). The design of these programs ranges from simple exercise prescription where a professional assigns frequency, duration, and types of physical activity to more complex, theory-driven strategies to promote behavior change. Dishman and Buckworth (1996) found those using behavior modification or theory-driven strategies, employing mediated

delivery approaches, and targeting specific populations were the most effective programs. The social cognitive theory (SCT) is one of the most supported theories in promoting physical activity and is a framework recommended by the Surgeon General (U.S. Department of Health and Human Services, 1996). The SCT was derived from the social learning theory (SLT) and posits that behavior, the environment, a person's psychological processes have a reciprocal interaction affecting behavior performance (Figure 1) (Bandura, 1986). Through years of research, it has been suggested that several constructs affect these three factors – personal, behavioral, and environmental – resulting in a dynamic theoretical framework. These constructs include observational learning, expectations, expectancies, emotional arousal, behavioral capability, locus of control, reinforcement, and self-efficacy (Hayden, 2009).

Observational learning is learning by watching others perform a particular behavior. The strength of observational learning is most powerful when the person modeling the behavior is well respected or someone to whom the observer can relate. This not only useful in explaining healthy behaviors, but it can also result in unhealthy behaviors. For instance, in several of the studies examining correlates to physical activity reviewed in the previous section, seeing others engage in physical activity was associated with African American women being more active (Ainsworth, 2003; King et al., 2000). However, if these women are more frequently exposed to peers who they see being sedentary, it may result in them being less active.

Expectations and expectancies are two constructs within the SCT that suggests that the outcomes a person expects and the values placed on these outcomes influence behavior. For example, if women expect physical activity or exercise to result in a reduced risk of developing CVD, and they place a high level of value on preventing CVD, they are more likely to be active. On the other hand, if women had a past experience with exercise that resulted in injury, this may have formed a negative expectation that they feel is more detrimental to their well-being.

Three studies reviewed suggest this may true for African American women as they felt exercise was important for good health and that the pros of being physically active outweighed the cons. Expectations can be learned through past experiences in performing the behavior, through a vicarious experience, through social persuasion, or by the emotional or physical response that occurs as a result of the behavior.

Emotional arousal suggests that in certain situations fearful emotions can either encourage healthy or unhealthy behaviors. For instance, the fear of developing or dying from a chronic disease, may promote on to be more physically activity. On the other hand, someone who has physical limitations or health problems may fear that exercise will provoke more serious health problems hindering participation.

Behavioral capability and locus of control suggest that in order to perform a particular behavior, the person must have the skills and knowledge to perform it, and they must believe in their ability to control the behavior. Behavioral capability or the skills and knowledge, can be developed through observational learning; whereas, locus of control is a cognitive process influenced by internal or external beliefs. For instance, those with a sense of internal control feel that what happens to them is a result of their own behaviors. In contrast, those with a sense of external control may feel external forces such as fate or God's will control the outcome and is beyond their control. When it comes to changing unhealthy behaviors (i.e. moving from being sedentary to more active), people may feel more internal control (McLean & Pietroni, 1990). Yet these same people may believe that developing a chronic disease is "in God's hands" and there is little or nothing they can do to prevent it. Research has found that having an internal locus of control is important for healthy behaviors, but is insufficient in predicting much of the variability (Wallston, 1992). Ultimately, few people will begin an exercise program if they don't feel capable of exercising, but it is not necessarily the single determinant.

The SCT suggests that positive and negative reinforcements influence behavior. Positive reinforcements are extrinsic rewards given for performing a particular behavior and negative reinforcements come in the form of punishments in response to not engaging in the behavior. People may be motivated to engage in a particular behavior to receive a reward or to avoid a punishment. These reinforcements may come vicariously through praise and recognition of others, as a direct result of performing the behavior (i.e. weight loss as a reward of exercise), or through reinforcements people place for themselves.

The final construct of the SCT – self-efficacy – is considered the core component of the theory and has shown to be affected by or influence other constructs (Bandura, 1997). Self-efficacy is defined as a person's level of confidence in his or her ability to perform a specific behavior. For example, the SCT proposes that a person must expect positive outcomes from performing the behavior (outcome expectations) and place meaningful value on the outcomes (outcome expectancies). These derived outcomes are believed to be influenced by a person's belief in their ability to perform the behavior or self-efficacy. Meanwhile, other constructs of the SCT such as positive reinforcement and observational learning are thought to influence self-efficacy by increasing a person's confidence. Authors also suggest that self-efficacy adds a more useful understanding to behavior given other theory constructs (O'Donnell, 2002). For instance, a person may have a strong internal locus of control and believe that his or her behaviors are responsible for one's health. However, having little confidence in one's abilities to perform the behavior may reduce the likelihood of performing the behavior mitigating the influence of internal locus.

Self-efficacy is considered to be its own theory and has been added to several other behavior change theories. The theory of self-efficacy states that the stronger a person's self-efficacy and outcome expectations, the more likely he will be to start and maintain that activity

(Bandura, 1997). Self-efficacy is considered the strongest predictor of all stages of exercise with adoption being the most affected stage (DuCharme & Brawley, 1995; McAuley, 1992, 1993; Sallis, Hovell, & Hofstetter, 1992). Self-efficacy is also one of the most commonly studied theoretical constructs to explain and predict physical activity behavior (B.A. Lewis, Marcus, Pate, & Dunn, 2002). Dunn explains that “physical activity self-efficacy involves having a concept of self that fits with being active, successful experience, positive evaluation of the social environment, and a pleasant emotional response” (Dunn, 2008, p. 44). In addition to predicting physical activity behaviors, numerous studies have shown self-efficacy to be a correlate of physical activity in African American women as explained in the previous section. Despite the increase in studies examining the relationship between self-efficacy in African American women, little is known about factors that influence self-efficacy in this population (Martin et al., 2008).

Understanding the role theory plays in physical activity and exercise behavior interventions helps guide the development of long-standing programs. In the review of 50 physical activity and exercise behavior interventions targeting African American women, 27 interventions used at least one behavioral theory to guide the development of the intervention or to measure the impact of the intervention. Twenty of these interventions used the SCT, SLT, or self-efficacy theory and nine measured self-efficacy as a way to help predict or explain behaviors. Unlike the strong relationship between self-efficacy and physical activity in the general population, outcomes do not seem to be as consistent in physical activity and exercise behavior interventions targeting African American women.

Three of the nine studies assessed self-efficacy as a predictor of physical activity or exercise adoption. First, D'Alonzo et al. (2004) conducted a 16-week exercise intervention including 44 African American and Hispanic college-aged women. They found that higher self-efficacy at baseline was associated with the higher attendance group (attended 16% to 60% of

exercise sessions) compared to the low attendance group (attended less than 16% of sessions) ($p < .001$). However, the high attendance group only attended a mean of 1.3 sessions (35%) per week. Second, In a population of slightly older women (Mean age = 48 years, N = 196), Young and Stewart (2006) offered aerobic exercise classes or low-intensity stretching classes and health lectures once a week for six months. The women completed a self-efficacy survey and two physical activity surveys: the Standard 7-Day Physical Activity Recall (PAR) and the Yale Physical Activity Survey (YPAS). The PAR estimates the total daily energy expenditure based on the number of hours spent in activities of various intensities. The YPAS estimates the amount of time spent in various activities and an activity summary index is calculated based on frequency and duration of vigorous activity, leisurely walking, moving, standing, and sitting. In this study, there were mixed findings where higher levels of baseline self-efficacy were predictive of an increase in the activity summary index score ($p < .008$), but not predictive of daily energy expenditure ($p = .3$). This suggests that self-efficacy may predict overall participation in physical activities, but not the level or intensity of physical activity. Third, Hays et al. (2010) found that self-efficacy did not independently predict exercise adoption in 190 older (Mean age = 64 years), low-income women who were referred to a free community-based exercise program. And, although not based on the self-efficacy theory, Dornelas et al. (2007) measured this construct in a clinic- and church-based exercise program targeting Hispanic and African American women and found self-efficacy to be unrelated to attendance.

Six studies measured change in self-efficacy as an outcome measure to determine if intervention strategies were effective in changing self-efficacy (Bopp et al., 2009; Clark et al., 2003; Pekmezi et al., 2010; Resnick et al., 2008; Resnick et al., 2009; Sharpe et al., 2010). Resnick et al. (2009) provided exercise classes and education sessions three times a week to African American and low-income seniors for 12 weeks and found no significant change in

exercise self-efficacy. Bopp et al. (2009) implemented a faith-based intervention, which included education sessions and exercise classes for six months, and found no change in self-efficacy for physical activity at three months or at six months. In fact, a small effect size was observed at six months, but in the opposite direction than predicted. Pekmezi et al. (2010) delivered a print- and internet-based intervention to 38 African Americans for 12 months and found no significant changes in exercise self-efficacy. In two randomized controlled trials, Resnick et al. (2008) found that those randomized to the intervention group where they attended nutrition education and exercise sessions twice a week did not have significant differences in self-efficacy or overall physical activity; Clark et al. (2003) found that there was no difference in self-efficacy between those of the no-adherence group (0% to 29% adherence) and the moderate-adherence group (50% or more adherence), but self-efficacy did significantly improve in the little-adherence group (30% to 49% adherence). Sharpe et al. (2010) assigned 430 women to a media campaign or to a full intervention that included the same media campaign plus an intensive 24-week behavioral intervention. Women in the full intervention group had a significant decline in exercise self-efficacy, but had significant increases in weekly physical activity and walking minutes. This decline in self-efficacy may be a result of an initial decrease once the women started participating in the intervention and identifying new barriers that they may not have anticipated during completion of the survey at baseline.

Overall, research suggests that self-efficacy in African American women may be a predictor of activity adoption of physical activity, but research has yet been able to identify effective strategies to improve adherence to physical activity over time. Improving or maintaining high levels of exercise self-efficacy after adoption is important because studies have shown it to be a central determinant to adherence (Desharnais, Bouillon, & Godin, 1986; McAuley, 1993). This study provides novel information in the discovery process in first learning

about exercise self-efficacy of African American women after joining a community-based exercise program without implementing specific improvement strategies. Although there were no specific strategies to improve self-efficacy, there may be components of an exercise program that affect attendance through self-efficacy. Therefore, the next step in the discovery process is to determine if self-efficacy plays a mediating role in attendance.

Interventions and Mediation Analyses. Learning about potential mediating relationships is important because it helps to determine if program structure or strategies are effective at improving self-efficacy in order to promote behavior change. It is not only critical to know what factors influence adoption, but researchers and public health professionals should know what works and what does not once an exercise program has been adopted. Measuring constructs, such as self-efficacy, as mediating variables helps to determine the effectiveness of specific intervention elements (Baranowski, Anderson, & Carmack, 1998). Mediators are defined as causal variables that intervene on exposure to the intervention and the outcome variable (Bauman et al., 2002), and there has been a call for more research evaluating mediating variables (Baranowski et al., 1998).

More research evaluating the mediational relationship is needed particularly in the African American population because physical activity interventions struggle to effectively improve self-efficacy as described in the previous section, and few studies examining mediating factors have been conducted in the population. In a review of physical activity and exercise behavior studies targeting African American women, none of the 50 studies identified measured theoretical constructs as potential mediating variables, which supports the need for more research within this subgroup. Ideally, all intervention studies would conduct some mediation analyses in order to know what worked well and what did not to further develop the practice-

based literature and evolve the scientific world leading to the implementation of evidence-based practices.

Because none of the originally reviewed physical activity studies evaluated mediational relationships, a more broad computerized literature search including all genders and ethnicities was conducted to find physical activity interventions measuring mediational relationships of self-efficacy on behavior. This search resulted in identifying 15 studies from 1994-2010 (Table 6). Five of these studies employed the mediation analyses methods recommended by Baron and Kenny (1988) using multiple regression models (B. A. Lewis et al., 2006; Y. D. Miller et al., 2002; Napolitano et al., 2008; Pinto, Lynn, Marcus, DePue, & Goldstein, 2001; Plotnikoff, Pickering, Flaman, & Spence, 2010; Plotnikoff, Pickering, Rhodes, Courneya, & Spence, 2010); and three others used similar frameworks to Baron and Kenny (Baruth, Wilcox, Blair, et al., 2010; Baruth, Wilcox, Dunn, et al., 2010; Rabin, Pinto, & Frierson, 2006). Most studies were conducted on the general population, while four focused on women (Castro, Sallis, Hickman, Lee, & Chen, 1999; Y. D. Miller et al., 2002; Plotnikoff, Pickering, Rhodes, et al., 2010; Rabin et al., 2006), one evaluated ethnic minorities (Castro et al., 1999), one recruited African Americans only (Baruth, Wilcox, Blair, et al., 2010), and one included college students only (Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999).

Of the eight studies that employed recommended mediation frameworks, mixed results were found regarding self-efficacy as a mediating variable (Baruth, Wilcox, Blair, et al., 2010; Baruth, Wilcox, Dunn, et al., 2010; B. A. Lewis et al., 2006; Y. D. Miller et al., 2002; Napolitano et al., 2008; Pinto et al., 2001; Plotnikoff, Pickering, Rhodes, et al., 2010; Rabin et al., 2006). One study conducted on 554 mothers of preschool-aged children randomized women to a control group receiving three surveys, or two intervention groups receiving print-based material to increase motivation and reduce barriers to physical activity or print material plus an invitation to

attend weekly group meetings to develop local physical activity programs for mothers (Y. D. Miller et al., 2002). This study found that self-efficacy was a significant mediator to physical activity, but changes in physical activity were only short-term and were not maintained at five months. This was also specific to young mothers, and may not generalize to men, older adults, minorities, or women without children.

Four studies have found only partial support for a mediational relationship. For example, one study conducted an individually-tailored intervention where participants received reports and manuals based on their readiness to change as defined by the transtheoretical model (TTM) at one month, three months, and six months (B. A. Lewis et al., 2006). This study found that the intervention had a moderately significant effect on self-efficacy at three months ($p = .61$) and that self-efficacy had a direct effect on physical activity at six months ($p = .002$), but when self-efficacy was controlled, there was no significant relationship between the intervention and physical activity suggesting no mediation effect. Napolitano et al. (2008) conducted a similar study where 239 adults (82% female) were assigned to a telephonic or print-based intervention group or a control group over six months. This study found moderately significant increases in self-efficacy in both intervention groups compared to the control group, but changes in self-efficacy did not result in changes in physical activity. Therefore, mediation criteria were not met. This suggests that the intervention may have been effective at improving self-efficacy, but not sufficient enough to change behavior.

A second study provided physical activity counseling by primary care providers as well as an educational manual to intervention participants (Pinto et al., 2001). This intervention also had a short-term effect showing a significant increase in self-efficacy at six weeks compare to the control group, but not at eight months. Self-efficacy had no mediation effect at six months or eight months. This attenuation in self-efficacy is similar to many physical activity and exercise

behavior interventions that see attenuation in behavior over time. A third study of 86 breast cancer survivors received weekly counseling phone calls, pedometers, and exercise logs over 12 weeks (Rabin et al., 2006). Women in the intervention group saw a significant increase in self-efficacy when compared to the control, but there was not a mediating effect on this home-based intervention.

Finally, Pinto et al. (2001) examined mediating effects of self-efficacy on a theory-based intervention that included 350 patients in a primary care facility. Participants were adults 50 years and older and received physician exercise counseling and an educational manual. Physical activity behaviors were measured in a telephone interview at baseline, six weeks, and eight months. The intervention group saw significant increases in physical activity behaviors at six weeks, but behavior change was no longer significant at eight months. Not all of the Baron and Kenny criteria were met; therefore self-efficacy had no mediation effect on the intervention and physical activity.

Three studies showed interventions to have no direct effect on self-efficacy. Therefore, self-efficacy did not mediate the effect of the intervention on physical activity (Baruth, Wilcox, Blair, et al., 2010; Baruth, Wilcox, Dunn, et al., 2010; Plotnikoff, Pickering, Rhodes, et al., 2010). These studies were longer term interventions of 12 or 24 months, therefore attrition may have affected the statistical power of these outcomes. Mixed results suggest more research is needed to determine the effectiveness of interventions and the role self-efficacy may play in mediating physical activity behaviors especially among minority women. Also, the lack of mediation analyses in physical activity and exercise behavior interventions of primarily African American women populations suggests a greater need for this research in underserved populations.

Summary

Physical activity is essential for good health and disease prevention, yet a large proportion of African American women do not meet physical activity recommendations or are physically inactive. Physical inactivity is not only costly to individuals health, but it is also has an economic burden costing the nation billions of dollars each year. Recognizing the physical and financial consequences of physical inactivity, the U.S. government and other national organizations have established physical activity recommendations as well as goals and objectives for Americans to achieve to promote better health and quality of life.

In addition to the benefits of physical activity gaining national attention over the past two decades, there has been an increase in the number of programs encouraging physical activity and an increase in the number of programs targeting minorities who are at greatest risk. Despite what is already known about the benefits of physical activity and program strategies designed to increase activity, there is much to learn about the importance of individual factors, such as self-efficacy, particularly among African American women. Studies that have examined exercise program attendance have shown a variety of results: poor attendance in women who received a physician screen and referred to a free, community-based exercise program (Hays et al., 2010); increased attendance was associated with SCT variables, such as self-efficacy and perceived benefits and barriers (D'Alonzo et al., 2004); and higher attendance was associated with recruitment and retention strategies focusing on a partnership between researchers, clinicians, and participants (Sullivan-Marx et al., 2011).

Researchers understand that poor health and chronic disease are not always attributable to one specific behavior. Therefore, more interventions and programs are taking the approach to change multiple behaviors at a time, but little is known about the effectiveness of this strategy in increasing exercise behaviors compared to programs targeting physical activity

alone. Some authors feel that programs attempting to change only one behavior produce better outcomes because attention and efforts are not divided (Whitt-Glover & Kumanyika, 2009). No research was identified that compared voluntary exercise program attendance in African American women enrolled in a multiple behavior, healthy lifestyle program to those who are not.

Self-efficacy has shown to be a correlate in physical activity behaviors in African American women (Ainsworth, 2003). However, the effectiveness of multiple behavior programs compared to single behavior programs on improving self-efficacy is unclear. In fact, the effectiveness of physical activity interventions on improving self-efficacy and self-efficacy as a predictor of behavior in African American women does not seem to be as clear as that seen in the general population. Research has not compared exercise self-efficacy differences in women enrolled in a healthy lifestyle program to women who are not enrolled. Therefore, more research is needed to determine the relationship between self-efficacy and exercise adoption and adherence in African American women.

Furthermore, exploring self-efficacy as a potential mediator may help researchers determine if it is a variable critical for increasing exercise program attendance, which may lead to the development of more targeted programs. Although identifying self-efficacy as a potential mediator is important to understand how behavior interventions work, studies examining self-efficacy as a potential mediator in multiple behavior, healthy lifestyle program enrollment and exercise program attendance were not found. Additional research will provide insight into how healthy lifestyle programs exert their effects on attendance in a community-based exercise program.

There has been an increase in physical activity interventions involving a majority of African American women in recent years, but the racial gaps in physical activity behaviors,

prevalence of chronic conditions, and mortality rates may not be closing as quickly warranting the current study to examine the relationship between self-efficacy and` behavior and what strategies are effective at promoting long-term behavior change in this minority population.

Study Aims and Hypotheses

Study Aim 1

Examine exercise program attendance in the healthy lifestyle program (HLP) group compared to the non-HLP group over 6 months.

Hypothesis 1

The HLP group will have higher attendance rates to the community-based exercise program compared to the non-HLP group.

Study Aim 2

Compare exercise self-efficacy in the HLP group and the non-HLP group at baseline.

Hypothesis 2

The HLP group will have higher exercise self-efficacy compared to the non-HLP group.

Study Aim 3

Determine if exercise self-efficacy plays a mediating role in program attendance.

Hypothesis 3

Exercise self-efficacy will mediate enrollment in a HLP and exercise program attendance.

Chapter Three

Methods

The primary purpose of this study was to compare group attendance in an accessible and affordable community-based exercise program. Group 1 included African American women who were enrolled in a healthy lifestyle program (HLP) as well as a community-based exercise program. Group 2 included African American women who were not enrolled in the same healthy lifestyle program (non-HLP), but were members of the same community-based exercise program. This study also examined differences in exercise self-efficacy between these two groups. A secondary purpose was to determine if exercise self-efficacy played a mediating role in exercise program attendance.

Study Design

This was a retrospective analysis of data collected from a larger prospective observational study that aimed to describe the characteristics and perceptions of members of a community-based exercise program located in urban communities of a Midwestern metropolitan city. A retrospective analysis of this observational study was used to determine behaviors in a real-world setting when African American women have access to an affordable exercise program without additional strategies to increase physical activity or self-efficacy similar to other commercially franchised fitness centers and gyms. This approach allowed us to provide a description of this population that may drive future research or theory. Data gathered from the exercise program records showed that a large proportion of members are African American women (39%). Therefore, for program sustainability, it is important to understand factors influencing physical activity in this subgroup. The initial study was approved by the Indiana University Institutional Review Board, and all participants read and signed an informed consent prior to being enrolled in the study.

Setting

Study participants were members of a community-based exercise program that was located in three local community high schools. These locations were convenient and familiar to the members. This exercise program was in existence for five years prior to the study; therefore, study participants may have been in various stages of their membership. Members of Group 2 (non-HLP members) paid a nominal fee of \$20 per year while members of Group 1 (HLP members) had a fully subsidized membership to the exercise program as a benefit of their free, healthy lifestyle program enrollment. The program was available Monday through Friday from 4:00 p.m. to 7:00 p.m. (one site is open to members at 2:30 p.m.) where they had access to a variety of exercise equipment, personal trainers, and group fitness classes.

Women in Group 1 were enrolled in a HLP which was located in six safety net community health centers, which provide health care to those who are uninsured or underinsured. Women were enrolled in this program through physician referral if they had a BMI \geq 35 or two or more cardiovascular disease risk factors. This program focused on improving multiple behaviors such as diet, physical activity, and weight loss and behavior changes were specific to the individual and identified through the use of Motivational Interviewing techniques (W. R. Miller & Rollnick, 2009) and the 5 A's of Behavior Change (Glasgow, Emont, & Miller, 2006) by trained wellness coaches. If exercise was a behavior change goal identified during sessions with their wellness coach, they were provided a list of local fitness resources with this community-based exercise program being one. Enrollees of the HLP also had the opportunity to participate in regular meetings with a personal wellness coach and attend regularly scheduled support groups, cooking demonstrations, low-impact fitness classes, and weigh-ins.

Study Participants

Participant characteristics. The study included a convenience sample of 80 African American women who were recruited from the three community-based exercise program sites. Members of the community-based exercise program could enroll in the study if they volunteered to participate and met the inclusion criteria of: (1) 18 years of age or older, (2) self-identified as African American women, (3) English-speaking, and (4) past or current members of the exercise program. Fifty-three of these women were also participants of a HLP, and the remaining 27 women were not. Women were assigned to Group 1 if they participated in the HLP program, and were assigned to Group 2 if they were not members of the same HLP. A description of these study groups are presented in Table 7.

Participant recruitment. Participants were recruited from the three exercise program sites via advertisements, letters, phone calls, and word-of-mouth. Flyers were posted at each of the sites and letters were sent to all past and current members' home address inviting them to participate in the study. Those who were interested in the study were asked to call a study assigned phone number. Outbound phone calls were also made to past and current members inviting them to participate in the study. Those who met the inclusion criteria were scheduled for a day and time to participate in the study within two weeks of the intake phone call. Women were enrolled to the study after providing written informed consent.

Measures

Graduate and undergraduate research assistants were trained by the principal investigator to collect survey, physiological, and fitness data. To insure inter-rater reliability, the researchers practiced data collection with the principal investigators and each other and had quarterly booster trainings. Research assistants also met with the principal investigators weekly

to discuss study progress and address any concerns regarding study processes and procedures that came up.

Exercise program attendance. Attendance in the exercise program was collected from program records. When members attended the exercise program, they signed in with the staff upon arrival. The number of times a person attended any of the exercise program sites six months from the date they participated in baseline data collection was calculated.

Exercise self-efficacy. Exercise self-efficacy was measured using an 18-item survey to assess each person's level of confidence that she would engage in exercise despite specific barriers (Appendix A). This survey was adapted from the Exercise Self-efficacy Survey developed by Benisovich, Rossi, Norman, and Nigg (1998). The original measure asks participants to rank their confidence in overcoming six common barriers (negative affect, excuse making, exercising alone, lack of access, resistance from others, and bad weather) on a 5-point likert scale (1 = Not at all confident; 2 = Somewhat confident; 3 = Moderately confident; 4 = Very confident; 5 = Completely confident), and it has an adequate internal consistency ($\alpha = .76$ to $.82$) and good construct validity (Benisovich et al., 1998; B. H. Marcus & Owen, 1992; J. O. Prochaska & Marcus, 1994). A recent study confirmed good internal validity and adequate external validity of the original tool in the African American population (Blaney et al., 2012). Previously, this tool was used and validated in primarily White populations. In the African American sample, the coefficient α was $.80$ and factor loadings from each of the six categories ranged from $.49$ to $.70$. Several other studies using this measure as well as slightly modified versions have found this survey to have good reliability (Baruth, Wilcox, Blair, et al., 2010; Blaney et al., 2012; Napolitano et al., 2008; Pinto et al., 2001; Plotnikoff, Hotz, Birkett, & Courneya, 2001). The adapted 18-item survey lists three additional items within each of the six categories. Each subscale (negative affect, excuse making, exercising alone, lack of access, resistance from others, and bad weather)

has shown to have an internal consistency of .85, .83, .87, .77, and .85, respectively (Cancer Prevention Research Center, n.d.).

Demographics and Health History. Participants were given the choice to complete the demographics and health history questionnaires on their own or with the lead of a research assistant (Appendix B). The demographic questionnaire asked participants to provide information such as date of birth, highest level of completed education, and annual household income given in ranges of \$10,000. Age was calculated from the day of survey completion and the provided date of birth. The health history questionnaire asked participants to answer yes or no to having specific cardiovascular risk factors such as family history of heart disease; history of high blood pressure, high cholesterol, and pre-diabetes or diabetes; physically inactive; and currently smoke. The number of risk factors was summed for data analysis with a range of zero to six.

Physical activity. Physical activity behaviors were measured using the Yale Physical Activity Survey (YPAS), which was originally designed to measure current physical activity among older adults (Appendix C). This survey was chosen because African American women are known to lead less active, more sedentary lives, and it was thought that this survey would differentiate the levels of physical activity in this population. The YPAS is a comprehensive survey that measures physical activity behaviors performed in the past month across various intensity levels and in multiple domains including leisure and vigorous walking; heavy housework and yard work; jogging and playing basketball; climbing stairs; standing and moving around; standing without moving around; and sitting. This survey was used to capture all levels of physical activity participants engaged in by measuring the frequency and duration they performed activities each week through calculated indices for vigorous activity, leisure walking, moving, standing, and sitting. The Activity Dimensions Summary Score (ADSS) was calculated by

multiplying the frequency score (number of times per week) by the duration (number of minutes) for each of the activities and multiplied again by a weighting factor based on relative intensity of the activity. The five measured indices and their assigned weights were: vigorous activity = 5, leisurely walking = 4, moving = 3, standing = 2, sitting = 1. Other studies have used this tool in a variety of racial and age groups and have found good validity and reliability (Resnick et al., 2009; Staffileno et al., 2007; Yanek et al., 2001; Young & Stewart, 2006).

Anthropometric measures. Standing height and weight were measured by a trained research assistant. Height was measured using a mobile stadiometer. Participants were instructed to remove their shoes prior to measurement, and results were recorded in centimeters. Weight was measured using a calibrated digital scale (EatSmart Precision Plus Bathroom Scale). Participants were instructed to remove their shoes before measurement and results were recorded in kilograms. This equipment remained at each of the sites and did not require transportation. Calibration of the scales was performed quarterly or as needed. BMI was calculated post-hoc using a formula [weight (kg)/height (m)²].

Resting heart rate and blood pressure. Resting heart rate was taken manually from the participant's radial artery. The number of beats were counted for 15 seconds and then multiplied by four. The number of beats per minute was recorded. Resting blood pressure was taken using a manual sphygmomanometer and stethoscope and the measurement was taken on the left arm unless otherwise instructed by the participant. The appropriate adult or large, adult size cuff was used for each study participant as indicated by the circumference line on the cuff. The systolic and diastolic blood pressures were measured at the respective first and last audible beats and were recorded.

Muscular strength and endurance. Muscular strength and endurance were measured through modified push-up and partial curl-up tests based on the American College of Sports

Medicine protocol (American College of Sports Medicine, 2010). For the modified push-up test, women were instructed to start on the mat in the prone position, and then fully extend their arms onto their hands and knees while keeping their neck and back aligned in a flat, inclined position, and then return to the starting position until their arms broke the 90° plane without resting on the floor at any time. The test was stopped if two consecutive push-ups were not acceptable form. The total number of repetitions completed without breaking form was recorded. For the partial curl-up test, women started in the supine position with their knees bent at a 90° angle and arms extended to their sides with fingers touching a piece of tape. A second piece of tape was placed 10 centimeters lower, and a metronome was set at 50 beats per minute. At the first beat, participants lifted their shoulder blades reaching for the bottom tape and returned to the starting position at the second beat. One repetition was counted each time the participants' shoulder blades touched the mat. Participants performed repetitions to the cadence until exhaustion or until they reached the one minute time limit. The test was terminated if the cadence was broken and only full repetitions where fingertips touched the tape were counted. The total number of repetitions was recorded.

Cardiovascular endurance. A motorized commercial-grade treadmill was used to measure cardiovascular endurance using the ACSM ramp treadmill protocol that was extended to two-minute stages to account for time spent measuring rate of perceived exertion, heart rate, and blood pressure after each completed stage (American College of Sports Medicine, 2010). Participants were familiarized with the treadmill and asked to start by straddling the belt and placing hands on the handlebars. Participants started walking at a pace of 1.5 MPH and a 0% grade. Every two minutes the pace was increased by .5 MPH until they reached a maximum pace of 3.0 MPH. Once the maximum pace was reached, the grade was elevated 1% every two minutes. The test was completed when participants reached 70% of their heart rate reserve,

rated themselves as a reaching maximal exertion on the RPE scale, reached the maximum number of eight stages (16 minutes), or asked to terminate the test. Women did not engage in the treadmill test if they had contraindications, such as extremely elevated blood pressure, they had physical limitations interfering with walking, or they refused. The total number of completed stages was used to evaluate cardiovascular fitness in this study.

Procedures

Testing occurred during regular exercise program hours (between 2:30 p.m. and 7:00 p.m. at one location and 4:00 p.m. to 7:00 p.m. at two locations, Monday through Friday) at a time determined by the participants. The testing site was dependent upon the location of which participants were members. Appointment reminder and confirmation phone calls were made 6-24 hours prior to their scheduled testing time. At this time, participants were also given pre-test instructions including suggested attire and a brief explanation of study measures and procedures. Participants were instructed to wear gym shoes and comfortable exercise clothing.

The order of evaluation was participant consent, demographic and health history survey, exercise self-efficacy survey, Yale Physical Activity Survey (YPAS), resting heart rate and blood pressure, height, weight, partial curl-ups, modified push-ups, and the treadmill test. To account for varying levels of literacy, participants were given the option to complete the demographic and health history surveys alone or with the help of the research assistant. The exercise self-efficacy and YPAS surveys were administered by the research assistant based on recommendations from other research (Baruth, Wilcox, Dunn, et al., 2010; Dipietro, Caspersen, Ostfeld, & Nadel, 1993; Resnick et al., 2008). Participant consent was completed in approximately 10 minutes and the series of questionnaires was completed in approximately 30 minutes. After being seated for at least five minutes, the research assistant collected resting heart rate and resting blood pressure. Next, participants were asked to remove their shoes and

height and weight were measured. These measures were later used to calculate body mass index (BMI). Finally, participants were taken through a series of fitness tests in the order of partial curl-ups, modified push-ups, and sub-maximal treadmill test. Fitness tests were completed in approximately 45 minutes. Participants received \$20 cash upon completion of their testing.

Data Analyses

All data were collected on paper and carefully entered in an Excel spreadsheet for data analysis. Data were checked by a separate research assistant to guarantee accuracy. Formulas were added to the Excel spreadsheet to calculate BMI using height (m) and weight (kg) ($\text{weight}/\text{height}^2$) and to calculate age using self-reported date of birth and the date of which they completed the study. Data analyses were performed using IBM Statistical Package for the Social Sciences (SPSS, version 21.0.0) and statistical significance was set at an alpha level of .05. With the exception of exercise program attendance, the variables were normally distributed meeting the assumption of normality. Descriptive statistics were determined for Group 1 and Group 2 using means and standard deviations for continuous variables (age, BMI, number of risk factors, resting blood pressure, heart rate, physical activity indices, and number of push-ups, curl ups, and treadmill stages completed); and percentages for categorical variables (annual income and education). Independent t-tests were done to compare differences of continuous variables between groups, and chi-square tests were done to compare differences of categorical variables between groups. Medians and interquartile ranges for the number of days participants attended the exercise program were calculated for each group.

Hypothesis 1. To test the first hypothesis that exercise program attendance is expected to be higher in Group 1 compared to Group 2, exercise program attendance was calculated by summing all days participants were reported as being in attendance to any of the three exercise

program sites six months from the date they completed the study. Prior to testing for the median number of days attended, the data were tested for normality and was skewed to the left. Therefore, the nonparametric measures were used and the Mann-Whitney U test was performed to compare the median of the two groups.

Hypothesis 2. The exercise self-efficacy summary score was calculated by using the mean and standard deviation of all 18 items and participants who had two or more missing values were omitted from the calculation. Means and standard deviations were calculated for each of the six domains using one of the three questions from each of the six subcategories (*I am under a lot of stress, I feel I don't have the time, I have to exercise alone, I don't have access to exercise equipment, I am spending time with friends or family who do not exercise, it's raining or snowing*) to determine if some barriers potentially had greater effect on self-efficacy than others. These six questions were identified based on the validated tool used in other research and were used to compare to other studies findings (Blaney et al., 2012). Scores ranged from one to five and higher scores indicated a higher level of exercise self-efficacy.

To test the second hypothesis that exercise self-efficacy is higher in Group 1 compared to Group 2, the mean exercise self-efficacy summary scores were compared between groups using independent t-tests, which were normally distributed meeting the assumption of normality. Those who did not answer two or more of the 18 survey items were omitted from these data analyses. To compare self-efficacy in each of the six domains between groups, independent t-tests were conducted and women who did not provide responses to these questions were omitted from these analyses.

Hypothesis 3. To test the third hypothesis that exercise self-efficacy plays a mediating role between enrollment in a healthy lifestyle program (Group 1 vs. Group 2) and exercise program attendance, we used a four step regression process based on four regression equations

as suggested by Baron and Kenny (1986). They suggest that analysis of variance (ANOVA) provides limited information on a mediational relationship and a series of regression analyses is preferred (Baron & Kenny, 1986). Potential mediating variables are considered mediators when the following conditions are met (Figure 2): (1) the independent variable must effect the mediator variable (path a); (2) the mediating variable must effect the outcome variable (path b); (3) the independent variable must have a direct effect on the outcome variable (path c); and (4) the independent variable has no effect when the mediating variable is controlled (path c') (Baron & Kenny, 1986). Many studies evaluate the direct effect an intervention has on self-efficacy or the direct effect self-efficacy has on physical activity behavior, but few measure both (Baranowski et al., 1998; B.A. Lewis et al., 2002). Applying Baron and Kenny's criteria for mediation, four equations were tested using a series of regression equations. First, a simple regression was conducted with healthy lifestyle program attendance predicting exercise self-efficacy (path a, Table 12). Second, a simple regression analysis was conducted with exercise self-efficacy predicting exercise program attendance (path b). In the third equation, a simple regression analysis was conducted with healthy lifestyle program enrollment predicting exercise program attendance (path c). In the final step, a multiple regression analysis was conducted with HLP enrollment predicting exercise program attendance while controlling for self-efficacy to test for full mediation (path c'). Unstandardized regression coefficients were used as suggested by Baron and Kenny (1986) (Table 12). To demonstrate that self-efficacy functions as a mediator in this model, the strength of the relation between enrollment in the healthy lifestyle program and exercise program attendance should be eliminated or significantly decreased (Baron & Kenny, 1986). Each of these steps controlled for covariates identified as descriptive variables that had strongly significant differences between groups (income, BMI, RHR, and completed TM stages).

Summary

The primary purpose of this study was to determine if there was a difference in African American women's exercise self-efficacy and their attendance in an accessible and affordable community-based exercise program in relation to their enrollment in the healthy lifestyle program. This study also intended to determine if exercise self-efficacy played a mediating role in exercise program attendance between these two groups. By assessing factors that potentially influence attendance in a well-established community-based exercise program, a true and meaningful relationship may be estimated that could be used to influence the design of future strategies to retain exercise program members of similar at-risk populations.

Chapter Four

Results

In response to announcements promoting voluntary participation in the research study for community-based exercise program members, 128 women expressed interest either onsite at the exercise program locations or by telephone. One hundred twenty-two women participated in baseline measurements and 80 were self-identified as being African American and were included in this study. Of these 80 women, 53 were members of the healthy lifestyle program (Group 1) and the remaining 27 were not (Group 2). Demographic statistics and group means and standard deviations for participant characteristics can be found in Table 8. The mean age (standard deviation) of the women was 48.4 (11.9) years, 61% had an annual household income less than \$20,000, and 30% were college graduates. This compares to the 2009 national averages of 31.5% of African Americans with a household income less than \$20,000 and 21% of African American women with a college degree or more (U.S. Census Bureau, 2012). T-test and chi-square analyses show that there was no difference in age or education between study groups; however, income was significantly different where women of Group 1 reported lower levels of annual income than women of Group 2. In fact, 75.5% of women in Group 1 reported an annual household income less than \$20,000 compared to 33.3% of women in Group 2 ($p < .001$).

Health measures found that the study population had a mean (standard deviation) of 2.34 (1.74) CVD risk factors out of 6; a mean (standard deviation) BMI of 37.7 (7.6), which is considered class II obesity; systolic blood pressure (SBP) of 125.9 (14.4) and diastolic blood pressure (DBP) of 77.2 (12.6), which is considered pre-hypertension; and a resting heart rate (RHR) of 77.8 (12.6), which falls within the normal category. T-test analyses found differences in blood pressure and BMI between groups. Group 1 had higher mean (standard deviation)

systolic blood pressure [128.4 (14.9) vs. 121.0 (12.2), $p = .03$]; higher resting heart rate [80.3 (12.8) vs. 72.8 (10.8), $p = .01$]; and higher BMI [39.1 (7.5) vs. 34.6 (7.1), $p = .018$] compared to Group 2. There was no difference between groups in the number of CVD risk factors reported or diastolic blood pressure.

In the three fitness tests, women completed six out of eight stages of the submaximal treadmill test; and according to ACSM standards, the women performed poorly on the push-up test completing a mean (standard deviation) of 4.55 (6.51) modified push-ups. According to the ACSM, the “average” standard for women age 40-49 years is 8-19 modified push-ups. Women completed a mean (standard deviation) of 10.9 (10.0) crunches in the partial curl-up test. According to ACSM, completing 15 curl-ups is classified as “good” for women 45 years and older (ACSM, 2010). T-test analyses found a difference between groups in the cardiovascular test and the push-up test where out of eight 2-minute stages, Group 1 completed fewer treadmill stages than Group 2 with a mean (standard deviation) of 5.77 (2.39) and 7.33 (1.0), respectively ($p = .00$) and fewer push-ups 3.25 (5.27) and 7.15 (7.97), respectively ($p = .03$). There was no difference between groups in the partial curl-up test.

In the YPAS, women reported the frequency and duration they spent in five physical activity dimensions (vigorous activity, leisurely walking, moving, standing, and sitting). Overall, women were considered physically active with the total time spent in activity, the summary index, slightly higher than what was reported by DiPietro et al. (1993) in the original YPAS sample and 2.6 times higher than what was reported by Rohm-Young et al. (2000) in an older African American women population. The amount of time spent in vigorous activities in this population was also much higher than that reported by both DiPietro et al. (1993) and Rohm-Young et al. (2000). In contrast, the leisurely walking, moving, standing, and sitting indices were similar to those of original YPAS sample (DiPietro et al., 1993). There were no differences

between groups in total time spent in physical activity or in any of the individual component indices.

Dependent Variable Analyses

This study population attended a median number of .5 days over six months with an interquartile range (*IQR*) of 6.75 (Table 9). Group 1 had a median (interquartile range) attendance of 0 (6.0) days compared to 1.0 (10.0) days over six months for Group 2. The first hypothesis that members of Group 1 would have greater attendance in the community-based exercise program than Group 2 was not supported as there was no statistically significant difference between groups ($p = .79$). Approximately 50% of participants from each group never attended any sessions within the six months. Of those who attended at least once, 45% attended fewer than six times during the six-month period (Table 10) and the median (interquartile range) number of days attended was 6.5 (13.0) for this group (Table 9). Although attenders of Group 2 had a higher median number days they attended than Group 1, there was not statistically significant difference (8.5 vs. 6.0, respectively, $p = .91$) (Table 9).

The entire study sample reported being *Moderately Confident* in their ability to exercise given specific barriers with a mean (standard deviation) exercise self-efficacy score of 3.13 (.86). Those of Group 1 had a mean (standard deviation) score of 3.23 (.74) compared to 2.94 (1.06) for Group 2 (Table 11). Our second hypothesis that Group 1 would have higher exercise self-efficacy than Group 2 was not supported as there was no statistically significant difference between groups ($p = .23$). The effect size was considered small (Cohen's $d = .34$) also suggesting little relationship between enrollment in the healthy lifestyle program and self-efficacy especially when coupled with a small sample size, which resulted in a rejection of the null hypothesis (Table 11). When looking at one self-efficacy question from each of the six categories, women reported having the least amount of confidence in their ability to exercise

when they *felt they didn't have the time* with and mean (standard deviation) of 2.91 (1.19) and the most confidence if they had to *exercise alone* [3.46 (1.39)] (Table 11). This is comparable to other studies of a similar population (Blaney et al., 2012).

Mediation Analyses

In step one (path a), the simple regression analysis found no significant relationship between healthy lifestyle program enrollment and exercise self-efficacy ($p = .07$) while controlling for income, BMI, RHR and completed TM stages. Step two of the mediation analysis determined if exercise self-efficacy was related to exercise program attendance (path b). After controlling for covariates, this simple regression found no significant correlation between exercise self-efficacy and attendance in the exercise program ($p = .24$). Step three determined if enrollment in the healthy lifestyle program predicted exercise program attendance (path c) by regressing attendance on enrollment in the healthy lifestyle program while also controlling for covariates. This step did not find a significant association between exercise self-efficacy and attendance ($p = .89$). If one or more of these relationships in steps 1-3 are found to be non-significant, researchers usually conclude that mediation is not likely and omit step 4. However, for this study step four was conducted and found that there was not significant relationship between enrollment in the healthy lifestyle program and attendance in the exercise program while controlling for exercise self-efficacy as well as the aforementioned covariates ($p = .18$). Therefore, hypothesis three was not supported. Although there was no mediation effect, the Beta coefficient increased from .001 to 1.393 once exercise self-efficacy was added to the regression equation and the p-values were trending towards statistical significance suggesting enrollment in the healthy lifestyle program may be related to exercise program attendance when controlling for self-efficacy.

Post Hoc Analyses

Because this was a retrospective data analysis, post hoc analyses were conducted to determine desirable sample sizes to show significant relationships. The effect size (Cohen's d) was first calculated using means and standard deviations for self-efficacy and attendance between the two groups. These effect sizes were then used to calculate sample size for the desired power of 80%. For two-tailed t-tests to compare exercise-self efficacy, a total sample size of 274 participants would be needed, and a sample of 3,880 participants would be needed to show significance in attendance between the two groups. The observed R^2 was used to calculate the effect size (f^2), which was used along with the number of predictor variables to test for desired power of the simple regression analyses. For paths a, b, and c of the mediation analysis, a total sample size of 151, 221, and 37 participants, respectively, would be needed for 80% power.

Chapter Five

Discussion

Physical inactivity and insufficient physical activity are major risk factors for chronic diseases among adults and rates are disproportionately high in African Americans, particularly African American women (U.S. Department of Health and Human Services, 2010). In the past two decades, there has been an increase in physical activity interventions and programs targeting minority populations using different approaches, yet little is known about the efficacy of long-term, urban exercise programs and the impact multiple behavior programs may have on program attendance and self-efficacy. Researchers have also expressed a need for more real-world behavior change research focused on underserved populations (Carroll et al., 2011). Thus, the purpose of this study was to examine the efficacy of an urban, community-based exercise program among African American women by examining exercise self-efficacy and attendance rates; to compare the exercise self-efficacy and attendance rates in women who are enrolled in a healthy lifestyle program to those who do not; and to examine exercise self-efficacy as a possible mediator to attendance.

Although the hypotheses were not supported, novel information was gathered helping to guide future research and exercise program design. Study participants enrolled in the healthy lifestyle program had less discretionary income, were of poorer health status, and were less fit than women not enrolled in the same healthy lifestyle program. This shows a strong need for healthy lifestyle programs where individuals learn to incorporate healthy behaviors into their daily lives (Opdenacker et al., 2008). Despite the demographic, health, and fitness differences between the two groups, exercise self-efficacy and exercise program attendance were similar. Enrollment in the healthy lifestyle program did not seem to have a significant impact on exercise self-efficacy or attendance in the exercise program. Additionally, women of both groups were

moderately confident in their abilities to exercise, yet had extremely poor attendance rates to an exercise program that was both affordable and accessible to them. The low attendance rates would presume extremely low self-efficacy. Because this was not found, there appear to be additional factors outside of self-efficacy that may influence exercise behaviors in this population.

Randomized controlled trials are considered the gold standard of intervention efficacy as a result of their high internal validity (Concato, Shah, & Horwitz, 2000; Koretz, 2007). However, an observational design is more appropriate for measurement of the real-world effectiveness of programs. Therefore, a retrospective analysis of data collected in an observational, prospective study was used to compare differences in exercise program attendance and psychological factors in women exposed to a healthy lifestyle program to women who were not exposed. Although this study design would only be possible to show association rather than causation, observational trials can help to inform future programs (Concato et al., 2000). This study design was chosen to help describe the effectiveness of a long-standing community-based exercise program and the role a healthy lifestyle program might play in the efforts of increasing physical activity and exercise behaviors as well as exercise self-efficacy in African American women.

The results of this study indicate that this population has little discretionary income to spend on costly exercise facilities, but despite the accessibility and affordability of the program, women were moderately confident in their ability to exercise, yet had a median attendance of less than one visit over six months. Also, 40 of the women (50%) attended zero times over the six-month period. This low attendance rate is comparable to another study of women who were predominately low-income, African American, and slightly older in age (Mean age = 64 years). This population had a mean (standard deviation) number of 5.7 (8.8) visits to a community-

based exercise program over two months, which can be averaged to 2.85 visits per month, and 56% completed zero of the exercise sessions (Hays et al., 2010). Of those who attended at least once (n = 84), there was a median of 6.5 days that women attended the exercise program over six months and 70% attended fewer than 12 times during that six month period. This consistently low rate of attendance suggests that exercise adherence is a challenge in this population, which is consistent with findings from Dornelas et al. (2007) revealing 70% of Hispanic and African American women did not continue exercise three months after a 10-week, culturally-tailored exercise intervention.

Despite low attendance rates to the exercise program, women reported high levels of vigorous physical activity as well as overall physical activity, which also included time spent in leisure walking, moving, sitting, and standing compared to other studies (Dipietro et al., 1993). This suggests women may be physically active outside of the exercise program meeting physical activity recommendations. A majority of the physical activity and exercise behavior interventions reviewed also used self-reported measures of physical activity, which appear to be a better measure of differences in levels of physical activity between gender and age groups; however, it may not be an accurate measure of actual amounts of physical activity (Troiano et al., 2008). In other words, self-reported measures may be able to detect differences in activity between males and females, but the amount of activity reported by both groups may not be as reliable as using objective measures. For example, Troiano et al. (2008) found only 3.5% of adults age 20 to 59 years met physical activity guidelines as defined by *Healthy People 2010* objective 22-2 through accelerometer measures compared to an estimated 25-33% of the population through self-report. Based on these findings, it is possible that women of this study population overestimated their physical activity, misclassified their intensity, provided socially desirable responses, or a combination. There is also wide variability in self-reported results

across national datasets, which reinforces the need for objective measures (Ham & Ainsworth, 2010; Whitt-Glover, Taylor, Heath, & Macera, 2007). Therefore, self-reported physical activity behaviors should be interpreted carefully and future research should consider using objective measures of physical activity to reduce bias and conduct a more truthful assessment of the population to drive program strategies.

This research was guided by the SCT because it is a theory often used to predict and explain physical activity behaviors. It is a framework that suggests a triadic reciprocal relationship between personal, behavioral, and environmental factors that involves cognitive processes (Bandura, 1986). The community-based exercise program offered an opportunity for observational learning and on-site trainers and fitness instructors were there to provide education and guidance that might enhance participants' behavioral capabilities. Observational learning and behavioral capability are constructs within the SCT that might influence self-efficacy. Furthermore, those enrolled in the healthy lifestyle program had the opportunity to receive additional guidance from health coaches who used behavior change techniques such as motivational interviewing and the 5 A's of behavior change to increase one's confidence. One method of entry into the healthy lifestyle program is through physician referral. Therefore, women may have established health-promoting expectations of participating in the exercise program after conversations with their physician and health coach. Enrollees of the healthy lifestyle program also received a fully-subsidized membership to the exercise program where they were awarded positive reinforcement for attending through a stamped passport for each visit. Because the healthy lifestyle program design appeared to incorporate more constructs of the SCT, it was hypothesized that women enrolled in a healthy lifestyle program would have greater exercise self-efficacy and better attendance in the exercise program than women not enrolled. However, this study found no differences between the two groups. Both groups had

similar exercise self-efficacy and had similarly low attendance in the community-based exercise program. Future research should compare the self-efficacy between attenders and non-attenders to determine if differences exist.

There is inconsistent research on the benefits of attempting to change two or more behaviors at a time. Some researchers suggest that there is little change in the intended behaviors when targeting multiple health behaviors (J. J. Prochaska, Spring, & Nigg, 2008), while others suggest this approach is effective and may be preferable given the economic benefits and the disease burden resulting from multiple lifestyle risks (J. O. Prochaska, 2008). More research is needed to better understand the effectiveness of multiple behavior programs in increasing physical activity and the best strategies, particularly in minority populations.

The prediction that exercise self-efficacy would mediate enrollment in a healthy lifestyle program and exercise program attendance was also unsupported in this study's findings. One of the challenges with conducting mediation analyses as recommended by Baron and Kenny (1986) is that it is not always possible to do a full test of mediation because of the lack of a control group, having a cross-sectional rather than a prospective design, or both. As an observational study, we faced both of these challenges. Also, the effect of the community-based exercise program and the healthy lifestyle program on self-efficacy had not been established suggesting mediation analyses may have been premature to conduct a full analysis of exercise self-efficacy as a mediator (B.A. Lewis et al., 2002). Several other physical activity intervention studies reviewed saw no effect on self-efficacy, resulting in no mediation effect on the measured outcome (Baruth, Wilcox, Blair, et al., 2010; Baruth, Wilcox, Dunn, et al., 2010; Calfas, Sallis, Oldenburg, & French, 1997; A. L. Dunn et al., 1997; Hallam, 1998; McAuley, Courneya, Rudolph, & Lox, 1994; Nichols, Wellman, Caparosa, Sallis, & Calfas, 2000; Plotnikoff, Pickering, Rhodes, et al., 2010). Other research has found self-efficacy to have differing effects across the course of

exercise; self-efficacy was a significant predictor of exercise adoption and played a lesser role in exercise maintenance. Therefore, mediation through cognitive control may be better served earlier on during the adoption phase, which has been seen in a more general populations (Oman & King, 1998). Future research of community-based exercise programs should measure self-efficacy of new members upon joining the program and repeat this measure at different time points throughout their membership or use a control group to compare different stages. This will help gain a better understanding of the role self-efficacy plays and when. This stage model of activity will help determine when exercise-related self-efficacy plays its most important role as a determinant of activity (McAuley & Blissmer, 2000).

Regardless of the self-reported amounts of physical activity, women were not attending the exercise program. Based on identified correlates of physical activity in African American women, programs should incorporate social, environmental, and personal factors that address barriers to maximize effectiveness and behavior change sustainability. For example, having a higher self-rating of health, having higher physical activity self-efficacy, attending religious services, knowing people who exercise or seeing others exercise, and having a safe place to exercise are all correlates that have been identified within this population (Bopp et al., 2006; Eyler et al., 2003; King et al., 2000; Wilbur et al., 2003). A majority of women in this study had an annual income of less than \$40,000 per year suggesting little discretionary income. Therefore, factors related to limited household income, such as caregiving responsibilities, stress, or depression might be more significant than self-efficacy in this population, and future studies should consider addressing this factors. Other personal factors, such as health status may also influence attendance. These women had an average of more than two chronic disease risk factors, which may have affected their outcome expectations or their level of comfort in

exercising in the presence of others. Therefore, strategies to educate women of the benefits of exercise on preventing and managing conditions should be considered.

Although the exercise program of which study participants were members provided a safe, accessible, and affordable facility, components that encourage regular attendance may have been missing. For instance, studies have identified social strain and lack of social support as barriers to regular physical activity. Researchers should incorporate positive reinforcement and accountability measures as family responsibilities may become a higher priority and interfere with good intentions. Future intervention and program studies guided by the SCT should assess other constructs and conduct mediation analyses to gain a clearer understanding of other psychological factors as well as personal, social, and environmental factors that may influence exercise program attendance.

Some studies have attempted to address these factors, but continue to find difficulty in maintaining adherence to physical activity (Banks-Wallace & Conn, 2005; Clark et al., 2003; Fitzgibbon, Stolley, Ganschow, et al., 2005; Resnick et al., 2008; Swearingin, 2008; Young & Stewart, 2006). Despite incorporating cultural- or faith-based components, being conveniently located within the community where participants could see peers exercise, and incorporating strategies to increase self-efficacy, these studies saw attrition rates of 38% to 49%. These rates are similar to our study where 50% of the study population did not attend the exercise program during the six-month study period. Therefore, it is important to continue to conduct observational and experimental research studies to learn about this at-risk population and learn about what is working, what is not working, and why.

The women of this study represent a population that normally has low participation in leisure-time physical activity. Generally, there are fewer exercise facilities in low-income, minority communities (Richter, Wilcox, Greaney, Henderson, & Ainsworth, 2002). Therefore,

having three sites centrally located in urban neighborhoods for a nominal membership fee removes two common barriers: cost and accessibility. It also offers a social and physical environment that is safe and supportive of exercise behaviors. These strategies may have been effective at bringing women to voluntarily join the exercise program, but we must better understand factors related to why they discontinued attendance. These factors are likely complex, and we do not have follow-up information on why they stopped attending. It cannot be assumed that stopping attendance also meant an end to participation in other physical activity. In fact, the women's self-reported physical activity indicated a high level of physical activity participation. Objective measures may help determine the accuracy of these reports. Further research is needed to learn how to best tailor an exercise intervention to fit the needs and characteristics of this population resulting in long-term adherence to such programs. Qualitative research, including focus groups may help to clarify this issue.

This study intended to describe exercise program attendance behaviors and exercise self-efficacy of a low-income, African American population. Findings support other research that after initiating or joining an exercise program, long-lasting change is difficult to achieve. Despite the community-based exercise program being affordable and accessible; having vicarious learning opportunities; and being associated with a clinic-based, multiple behavior program, attendance to the exercise program remained low. Future research is needed to identify factors that influence self-efficacy in this population and additional psychological, social, and environmental factors that may affect exercise program attendance to drive program design. Furthermore, studies should consider using an objective measure of overall physical activity outside of exercise program attendance, such as accelerometers or pedometers, as a more accurate form of measurement. On the surface, the collaboration of a clinic-based healthy lifestyle program and a community-based exercise program appears to be a logical solution to

improve the health and fitness of at-risk populations. However, continued research is needed to determine the role multiple behavior programs play on exercise behaviors and psychological factors to determine if this is an effective strategy to long-term behavior change. Future studies should determine if healthy lifestyle program participation rather than enrollment influences attendance in exercise programs. For example, women who are more active in the healthy lifestyle program may attend the exercise program more regularly than those who are less active.

Study Limitations

There were several limitations to the study despite the novel findings in that women enrolled in the healthy lifestyle program were of poorer health and fitness; had lower income; and had similar self-efficacy and attendance to the exercise program than women not enrolled. First, these were retrospective analyses and these were not a priori hypotheses when the original study was designed. Additionally, the sample for this study was limited to 80 African American women, and a small proportion of women were of the non-HLP group. This small sample size and unequal groups limited the research findings and could have affected the observed self-efficacy scores and may have made detection of a relationship impossible. Although exercise self-efficacy was measured, mediation outcomes may have been limited because there were no intentional strategies to increase participant's confidence in their ability to participate in these behaviors. Additionally, participants of this study were at different points in their exercise program membership (new member; current, active member; current, non-active member; or past member). Furthermore, this study assessed physical activity over six months making it difficult to determine behaviors across a longer period of time. Another limitation is that overall physical activity behaviors were assessed using self-reported measures. This may have led to over-reporting or misclassification of behaviors. Finally, the amount of

participation women had in the healthy lifestyle program was not assessed and possible enrollment in other healthy lifestyle programs was not determined. Enrollment in only one clinic-based healthy lifestyle program was assessed. It is possible that women were involved in other programs that may have affected our findings.

Conclusion

Exercise programs offer equipment and resources to engage in more vigorous types of physical activity as well as instruction and guidance to help individuals improve their health and fitness. In spite of the aforementioned study limitations, this research suggests that making exercise facilities accessible, being enrolled in a healthy lifestyle program, and having greater levels of self-efficacy may not be enough to improve attendance in this population. Therefore, researchers should begin looking at other potentially influential factors. For example, future research should evaluate perceived outcome expectations and expectancies of this population. It is possible women have limited knowledge or misperceptions about the benefits of exercise or that they place little value on it. Secondly, researchers should consider objectively measuring physical activity outside of program attendance. If physical activity outside of the exercise program is adequate, women may feel little need to attend an exercise program regularly. Third, study participants should have delineated groups with similar characteristics. For example, the amount of participation in the healthy lifestyle program may influence attendance in the exercise program; and one's course of exercise adoption or maintenance may also influence attendance. Therefore, future research should include women who actively participate in the healthy lifestyle program and include only early adopters of the exercise program. Additionally, prospectively studying a cohort of women from the first day of joining the exercise program through a longer follow-up period should be considered. Lastly, future research should evaluate other social and cultural factors that may account for some of the

variance in exercise program attendance. For instance, women may be confident that they can exercise regularly, but they may place higher value on caregiving or job responsibilities. More qualitative research may be useful to better understand the phenomenon, which would lead to implementing specific program strategies and evaluating their effectiveness.

Chapter Six

Tables

Table 1. *Physical Inactivity and Relative Risk of Diseases, Prospective Studies*

Author	Condition	Follow-Up Period	Population	Dependent Variable	Independent Variables	Covariates	Relative Risks	P-Value
Kushi et al. (1997)	CVD	7 years	40,417 women	CVD Mortality	Self-reported physical activity	Age, parity, alcohol intake, energy intake, smoking, estrogen use, BMI, WHR, education level, marital status	1.0, .86, .55	.002
Conroy et al. (2005)	CHD	9 years	39,876 women	Incidence of CHD	Self-reported physical activity	Age, smoking, alcohol use, diet, use of hormone therapy, menopausal status, family history of CHD	1.0, .62, .61, .61	<.001
Manson et al. (1999)	CHD	8 years	72,488 women	Incidence of CHD	Vigorous activities; leisure walking	Age, follow-up period, smoking, BMI, menopause status, hormone therapy, family history of CHD, vitamin use, alcohol use, aspirin use, and history of hypertension, diabetes, and hypercholesterolemia	1.0, .88, .81, .74, .66; 1.0, .78, .88, .70, .65	.002; .02
Sattelmair et al. (2010)	Stroke	12 years	39,315 women	Incidence of stroke	Walking time; Walking pace	Age, random assignment, smoking, alcohol, saturated fat, fruit and vegetable, fiber, hormone therapy, menopausal status, family history of MI, migraine aura, BMI, history of diabetes, history of high cholesterol, history of hypertension	1.0, .91, .96, .78; 1.0, .82, .72, .63 (12 of 16 covariates)	.01; .007

Author	Condition	Follow-up Period	Population	Dependent Variable	Independent Variables	Covariates	Relative Risks	P-Value
Krishnan et al. (2009)	Diabetes, type 2	10 years	45,669 African American women	Incidence of type 2 diabetes	Brisk walking; Vigorous activity	Age, time period, family history of diabetes, education, income, marital status, cigarette use, alcohol use, energy intake, coffee consumption, vigorous activity, walking, television watching	1.0, .91, .78, .69; 1.0, .90, .77, .53, .49, .43	< .0001
Hu et al. (1999)	Diabetes, type 2	8 years	70,102 women	Incidence of type 2 diabetes	Leisure-time physical activity; Walking	Age, time period, smoking, menopausal status, hormone therapy, parental history of diabetes, alcohol, history of hypertension, history of high cholesterol	1.0, .77, .75, .62, .54; 1.0, .91, .73, .69, .58	<.001; <.001
Lee et al. (2010)	Obesity	14 years	34,079 women	Weight gain (2.3kg)	Physical activity	Age, baseline weight, height, exam period, race, education, smoking, menopausal status, hormone therapy, hypertension, diabetes, alcohol, energy intake, fruits and vegetables	1.11, 1.07 (OR)	<.001
Rosenberg et al. (2006)	Colon Cancer	6 years	45,400 African American women	Incidence of colorectal polyps	MET hours per week	Age, BMI, smoking, family history of colorectal cancer, education	1.0, .94, .91, .91, .83, .72	.01
Wolin et al. (2007)	Colon Cancer	16 years	79,295 women	Incidence of colon cancer	MET hours per week	Age, BMI, smoking, multivitamin, aspirin, alcohol, red meat, Vit D, calcium, family history of colon cancer, history of endoscopy, history of polyps	1.0, .90, .94, .82, .51;	.004

Author	Condition	Follow-up Period	Population	Dependent Variable	Independent Variables	Covariates	Relative Risks	P-Value
Breslow et al. (2001)	Breast Cancer	10 years	6,160 women	Incidence of breast cancer	Physical activity	Height, BMI, weight change, sample design variables	1.0, .87, .33	.026
Holmes et al. (2005)	Breast Cancer	10 years	2,987 women	Breast cancer mortality	Physical activity	Age, time between diagnosis and assessment, smoking, BMI, menopausal status, hormone therapy, age at first birth and parity, contraceptive use, energy intake, protein intake, disease stage, radiation treatment, and tamoxifen treatment	1.0, .80, .50, .56, .60	.004
Wise et al. (2006)	Depression	2 years	35,224 African American women	Depressive symptoms	Physical activity	BMI, preexisting health conditions, energy intake, smoking, alcohol use, child care responsibilities	1.0, .89, .85, .74, .72, .81, .75	< .001

CVD = cardiovascular disease; CHD = coronary heart disease; BMI = body mass index; BMD = bone mineral density; OR = odds ratio; CI = confidence interval

Table 2. *Estimated Economic Costs of Physical Inactivity*

Author	Population	Expenditures	Data Collection Methods	Physical Inactivity Defined	Linking of Variables to Individuals	Condition(s)	PAR%	Estimated Cost
Colditz (1999)	Hypothetical cohort	Direct costs and indirect costs	Physical activity = 1995 BRFSS (self-reported) Costs = Review of literature reporting economic costs of inactivity or cost of illness	No leisure-time physical activity	No	CHD	22%	\$8.9 (billions)
						Hypertension	12%	\$2.3
						Type 2 diabetes	12%	\$6.4
						Breast cancer	5%	\$0.38
						Colon cancer	22%	\$2.0
						Osteoporotic fractures	18%	\$2.4
						Gall bladder disease	22%	\$1.9
						Total		\$24.3
Garrett et al. (2004)	1.5 million health plan members of Minnesota	Direct costs	Physical activity = 2000 state-specific BRFSS (self-reported) Costs= Medical claims	No leisure-time physical activity	No	Heart disease	31%	\$35.3 (millions)
						Stroke	18%	\$10.8
						Hypertension	31%	\$9.2
						Type 2 diabetes	18%	\$9.1
						Breast cancer	19%	\$7.2
						Colon cancer	31%	\$4.6
						Osteoporosis	31%	\$4.5
						Depression & anxiety	12%	\$2.9
Total		\$83.6						
Pratt et al. (2000)	National sample (N=20,041, ≥15 years)	Direct costs	Physical activity & Costs = 1987 National Medical Expenditure Survey (self-reported)	<30 minutes of strenuous activity 3 days per week	Yes	All	n/a	\$29.2 billion
Chenoweth and Leutzinger (2006)	Health plan members across 7 states	Direct costs and indirect costs (productivity)	Physical activity = State-specific prevalence rates Costs = Claims data	<30 minutes of moderate physical activity most, if not all, days of the week	Physical fitness	33 selected conditions	No	\$92.3 billion \$251 billion (nationally)

PAR% = Population-attributable risk percent; CVD = cardiovascular disease; CHD = coronary heart disease

Table 3. *Correlates to Physical Activity in African American Women*

Variable	Theory associated with each variable	Association with physical activity	Frequency (N = 9)
Personal			
Education	---	+	7
Weight/BMI	--	-	3
Age	--	-	3
Health status (perceived or actual)	--	+	4
Employment	--	+	2
Trying to change eating behaviors	--	-	2
Trying to lose weight	--	+	1
Income	--	+	1
Having physical impairment	--	-	1
Having sleeping problems	--	-	1
Psychological and emotional			
Self-efficacy	SCT, TTM, TPB	+	4
Enjoyment	--	+	2
Pros/cons (decisional balance)	TTM, SCT	+	2
Exercise is very or somewhat important	HBM	+	1
Necessary to be healthy	--	+	1
Barriers	HBM, TPB, TTM	-	1
Higher levels of stress or depressive symptoms	--	+	1
Social and cultural			
See people exercise	SCT	+	2
Social strain/caregiving responsibilities	SCT	-	2
Social support	SCT	+	2
Knowing others who exercise	--	+	2
Attending religious services	--	+	1
Environmental			
Safe from crime	Ecological	+	3
Presence of sidewalks	Ecological	+	2
Access to facilities (actual)	Ecological	+	2

SCT = social cognitive theory; TTM = transtheoretical model; TPB = theory of planned behavior; HBM = health belief model

Table 4. Physical Activity Interventions Targeting African American Women (N=29)

Author	Population	Setting	Study design, Intervention, Length of study	Theory	Outcome measures	PA objective	PA measure	PA outcomes	Attrition rate
Physical Activity Interventions (N=18)									
Chen et al. (1998)	125 minority women (41% AA), mean age 37 y, sedentary	Home-based	RCT. Telephonic- and mail-based behavioral intervention to increase walking. 8 wks, 3-mo and 27-mo follow-ups	SCT	PA	Increase walking	Walking questions from NHIS, accelerometer	There were significant increases in minutes walked in both groups at each of the 3 time points compared to baseline. No difference between groups. Walking decreased over time.	18%
Nies et al. (2003)	197 women (45% AA), 30-60 y, sedentary or mostly inactive	Home-based	RCT. The intervention group received 16 counseling calls. The attention control group received the same number of calls, but only activity was reported and there was no counseling. Control group received no calls, but completed assessments. 6 mos.	N/A (but SCT appeared to be used)	PA (primary), health outcomes (secondary)	>90 min of PA per week	Self-reported minutes walked per day	The intervention group saw significant increases in the number of minutes walked per day compared to the control group.	19%
Banks-Wallace and Conn (2005)	21 AA women Mean age 25-68 y, sedentary,	Home-based	UCT. A 3-hour monthly group with storytelling and interactive group learning, group walks,	N/A	Daily steps	Encouraged to walk at home at least 2 days per week	Pedometer	Total group had a slight increase (5%) in mean steps/day at 12 mos, while a	43%

	treated for hypertension		and home-based walking. 12-mo intervention, 3, 6, 9, 12, and 18-mo follow-up			with partner		subgroup of regular attenders experienced a 13% decrease. Mean steps/day increased from baseline to 18-mo follow-up for both groups.	
Wilson et al. (2005)	24 AA women, 47-66 y, breast cancer survivors	Community and church-based	UCT. Women attended weekly group sessions that were didactic and interactive to help problem-solve and increase PA participation. 8 wks, 3-mo follow-up	HBM	Daily steps, BMI	Increase PA participation (target not specified)	Pedometer	There was a statistically significant increase in the number of steps walked per day from baseline to 8 wks (4791 vs. 8297). No significant difference from 8 wks to 3-mo follow-up.	8%
Young and Stewart (2006)	196 AA women, mean age 48.2 y, sedentary	Church	RCT. Aerobic Exercise group was offered a weekly culturally-tailored exercise class for 6 months. Participants were encouraged to increase PA to 30 min five times per week. The comparison group received alternating weekly low-intensity stretch classes and health lectures. 6 mos	SCT	PA (primary), cardiorespiratory fitness, CVD risk factors, psychosocial factors, quality of life (secondary)	Increase PA to 30 min five days per week	7-day PAR, YPAS	There was no difference in PA level between groups at the end of the intervention period. Physical inactivity rates decreased from 39% to 32% for Aerobic group and from 42% to 31% in Stretch group from baseline to end of intervention.	40%
Hogue (2007)	53 AA women	Home-based	NCT. Intervention group (I) was instructed to contract	Components of the HBM	PA, physical endurance, BMI, BP	Increase PA participation (target not	Rapid Assessment of Physical	Minutes of PA decreased in both groups. There was	0% (I), 28% (C)

			with a family member or friend to provide buddy support. Both groups were given education, incentives, for attending meetings, pedometers, and log sheets. 10 wks			specified)	Activity, Pedometer, log sheets (minutes & intensity of PA & steps taken)	no significant difference in PA between groups.	
Montgomery (2007)	31 AA women, 18-40 y, 6 wks - 6 mos postpartum	Home-based	UCT. Women were asked to wear a pedometer for 12 weeks to see if it would increase PA. Women were instructed to increase the average number of steps by at least 500 per week. Participants received motivational and educational material throughout. 12 wks	N/A	PA/steps	Encouraged to increase number of steps by at least 500 per week and a target of 5000 steps 3-5 days per week.	Pedometer	Women had a significant increase in the number of steps per day after the intervention	0%
Whitehead et al. (2007)	207 adults (69.1% AA, 82.6% female)	Home-based	RCT. Intervention participants received 4 mail-based educational pieces on PA that were specific to their stage of change and culturally appropriate. Control participants received low-sodium diet brochures. 4 wks, 6 month follow-up	TTM	PA	Increase PA participation (target not specified)	7-Day PAR and Weekly Leisure Time Exercise questionnaire (WLTEQ)	Participants had modest, yet significant increases in PA at month 1 compared to the control group, but this had attenuated by month 6.	31% (1 mo), 54.3% (6 mos)
Whitt-Glover et al. (2008)	87 AAs (89% female), mean age	Church	UCT. A culturally-tailored, faith-based PA intervention included 8 weekly	SCT	PA	Increase PA participation . No specific target, but	Modified version of the IPAQ, Pedometer	Participants had significant increases in steps per day and self-	N/A

	52 y		group sessions focusing on behavioral strategies to increase moderate and vigorous PA. 3 mos			were advised of 10,000 steps per day		reported minutes per week in moderate and vigorous PA after 12 weeks.	
Wilbur et al. (2008)	281 AA women, 40-65 y, sedentary	Home-based	UCT. Women were randomly assigned to one of two groups: enhanced treatment (ET) or minimal treatment (MT). Both groups were instructed to walk a least of 3 days a week within their target heart rate range. The ET group had 4 weekly motivational workshops that were culturally-sensitive followed by 3 weekly and 7 biweekly calls. 24 wks (adoption), 48 wks (maintenance)	SCT, TTM	PA, adherence to walking	Increase PA participation and walking adherence	Self-reported (BRFSS), Walking adherence (HR monitor & log book)	Women from the ET group had significantly higher walking adherence at both time points than the MT group. For women with walking data at both time points, there was a significant decrease in adherence for both groups from 24 weeks to 48 weeks.	7% (adoption phase), 33% (maintenance phase)
Duru et al. (2010)	62 AA Women >60 y, sedentary, church members	Church	RCT. Culturally-tailored, multicomponent curriculum including scripture readings, prayer, goal-setting, a community resource guide, and PA session. Included 8 weeks of weekly meetings & 6 months of monthly meetings. Control group participated in meetings to discuss topics unrelated to PA.	None specified (components of SCT appear to be used)	PA	Increase walking	CHAMPS, pedometer	Intervention group significantly increased the number of weekly steps by 7,457 more than the control group.	15%

8 mos									
Pekmezi et al. (2010)	38 AAs (92.6% female), mean age 43 y	Home-based	RCT. Participants were randomly assigned to one of three groups: Tailored print, tailored internet, and standard internet. Tailored interventions provided feedback based on individuals' readiness to change. The standard internet group was directed to 6 health and fitness websites. 12 mos	SCT, TTM	PA	Increase PA participation	7-day PAR	PA increased significantly in all groups from baseline to 6 months, but not from 6 months to 12 months.	N/A
Rimmer et al. (2010)	33 AA women, mean age 60.1 y, obese, mobility disabilities	Home-based	UCT. Participants received weekly telephonic coaching calls using motivational interviewing to help to problem solve and set goals in order to increase daily physical activities. 6 mos	N/A	PA, exercise	30 min of PA per day	PADS	There was a significant increase in structured exercise and total PA, but no significant change in leisure-time PA	42%
Sharpe et al. (2010)	430 women (61% AA), 35-54 y	Community-based	NCT. Intervention participants were assigned to one of two groups: exposure to a year-long media campaign (media) to promote moderate-intensity exercise or media campaign plus an intensive 24-week behavioral intervention (full). The control group received no	SCT	PA	Increase PA participation	Self-reported (BRFSS questions)	Participants in the full intervention group saw significant increases in weekly PA and walking minutes as did the control group. There were not significant changes in the media group.	48%

intervention. 24 wks									
Zoellner et al. (2010)	83 adults (98% AA, 95% women), mean age 44 y	Home-based	UCT. Participants wore a pedometer and maintained a diary for 6 months and attended monthly nutrition and PA education sessions. Participants were instructed to set realistic weekly goals and no defined amount of walking was required. 6 mos	N/A	PA/steps	Increase PA participation . No specific target, but were advised of 10,000 steps per day recommendation.	Pedometer	There was a significant increase in the average step per day beginning with 6665 during month 1 and increasing to 9232 steps per day during month 6 (P < .0001).	20%
Baskin et al. (2011)	1,322 AA women, mean age 48.4 y	Communitybased	UCT. A walking intervention encouraged participants to increase walking by joining a team of at least 2 members. Trained team leaders motivated and encouraged the team. 6 mos	N/A	Retention	Walk \geq 30 min 5 or more days per week	Submission of pedometer data	Women 50 years and older and those who lived in urban counties were more likely to be retained. Women reporting membership in the walking group was the greatest predictor of retention.	22%
Antikainen (2011)	54 adults (91% AA, 72.7% female), 54-96 y	Home-based	RCT. Intervention group received mail-based motivational PA packages based on stage of change and weekly phone calls. 4 wks	TTM; TPB	PA	Increase PA participation (target not specified)	Physical Activity Scale for the Elderly (PASE)	The treatment group increased PASE physical activity score by 13 points, while the control group declined 40.8 points from baseline to follow-up	
Peterson (2011)	18 AA women,	Church	UCT. Participants used a motivational booklet	Social compariso	PA	Increase PA participation	7-day activity recall (7-DAR)	Total minutes of PA improved	N/A

	41-63 y		and attended weekly group meetings that provided appraisal, social support, and culturally-tailored activities. 6 wks	n theory				significantly from baseline to 6 weeks. Intensity of PA did not show significance.	
Multiple Behavior Interventions Including Physical Activity (N=11)									
McNabb et al. (1997)	39 AA women, mean age 56 y, BMI 30-45	Church	RCT. Trained lay church members conducted a culturally-tailored weight-loss program, which consisted of weekly sessions where nutrition goals were set and participants were instructed to engage in an at-home exercise program. Control group was placed on a wait list. 14 wks	N/A	Weight (primary), diet, PA (secondary)	Increase PA participation (not specified)	Self-reported frequency, duration, and type in past 7 days	Both intervention and control groups saw increases in weekly minutes of PA, but differences between groups were not statistically significant.	15%
Smith et al. (1997)	22 women (41% AA), mean age 62 y	Clinic	RCT. Standard treatment group received weekly weight-loss sessions where low-calorie and low-fat diet and increased PA were encouraged. The MI group received the same sessions along with 3 individual MI sessions. 16 wks	N/A	BMI, glycated hemoglobin (primary), behavior adherence (secondary)	Increase PA participation (not specified)	Self-reported (number of days exercised)	MI group had greater number of days exercised, but not significantly different from control group.	27%
Yanek et al. (2001)	529 AA women, >40 y	Church	RCT. Standard intervention group (SI) received weekly group sessions including discussions, nutrition	Social learning theory	CVD risk factors (primary), PA, diet, weight	≥30 min of exercise 5-7 days per week	YPAS	Energy expenditure increased in intervention group, but was not	N/A

			education, and 30 min of moderate exercise. The spiritual group received the same sessions along with faith-based components. The control group received self-help information. 12 mos		(secondary)			significant. There was no difference between groups.	
Keyserling et al. (2002)	200 AA women, >40 y, diagnosed type 2 diabetes	Clinic and community based	RCT. Groups A and B consisted of four counseling sessions to enhance PA and dietary intake that was culturally-tailored. Group A had three additional group sessions and monthly phone calls from a peer counselor. Group C consisted of mail-based educational pamphlets. 12 mo, 6 mo and 1 y follow-up	Behavior change theory	PA, diet	Increase PA participation	accelerometer	All groups experienced significant increases in PA after 12 months. Group A saw significant differences in increased PA at 12 mos compared to Group C and Group B compared to Group C at 6 mos.	15%
Campbell et al. (2004)	587 members of 13 AA churches (74% women, 99% AA)	Church and home-based	RCT. Individually- and culturally-tailored intervention. Intervention delivered theory-based materials at home, within the church, or a combination of both. Control churches held education sessions unrelated to study objectives. 12 mos	SCT, TTM, HBM, Social support models	PA, diet, colorectal cancer screening	Encouraged moderate to vigorous activity most days of the week.	Self-reported, not specified.	The individually-tailored intervention group saw significant increases in recreational exercise compared to the control. The culturally-tailored group did not see significant differences compared to the	N/A

									control group.
Williams et al. (2004)	294 AA women, mean age 36 y	Worksite	UCT. The intervention was tailored to individual CVD risk and focused on diet and PA change. Participants received an on-site health risk appraisal followed by a one-on-one worksite interview, a written report discussing CVD risk factors and suggested behavior changes, and a follow-up letter focusing on dietary fat intake and PA. Self-reported health risk appraisal, 2 wk onsite biometric data collection, 12 month follow-up	N/A	Blood pressure, cholesterol, BMI (primary), PA, diet (secondary)	Not specified.	Self-reported (Healthier People Health Risk Appraisal)	There was no significant change in PA from pretest to posttest.	10%
Kennedy et al. (2005)	40 AAs (37 women, 3 men), 26-71 y, BMI >27	Church and home-based	RCT. The group intervention included monthly group sessions of nutrition education and discussion. The individual intervention included 15 individual meetings, record keeping, and nutrition assessment. Both groups were encouraged to increase PA, but there was no structured exercise and were led by trained church	N/A	Weight loss (primary), physical activity (secondary)	Increase PA participation (not specified)	PA Questionnaire (type & frequency of leisure time & sport activity, physical inactivity, and TV viewing)	Participants from both groups saw a significant increase in leisure-time PA. There were no significant differences between groups.	10%

			members. 6 mos						
Resnicow et al. (2005)	1,056 adults (majority AA, but percentage not specified, 74.2% female)	Church	RCT. Group 1 received standard educational materials, Group 2 received culturally-tailored nutrition and PA materials, and Group 3 received the same intervention as Group 2 plus 4 telephonic calls using motivational interviewing. 12 mos	N/A	PA, diet	Increase PA participation (target not specified)	CHAMPS	Groups 2 and 3 saw significant increases in PA compared to Group 1.	14%
Faridi et al. (2010)	246 African-Americans (81.1% female), church members	Church	NCT. Trained community health advisors led culturally-tailored diabetes intervention including topics on diet, PA, weight loss, and social support. Control group received delayed treatment. 12 mos	N/A	PA, diet	Increase PA participation (target not specified)	7-day PAR	There were no significant differences in increased PA between intervention and control groups.	34%
Parra-Medina et al. (2011)	266 AA women, ≥35 y, patients of a community health center	Primary care	RCT. Participants were randomized to two groups. All participants received standard care of primary care counseling, nurse-assisted goal setting, guide to local resources, and ethnically-tailored educational material. The intervention group received an additional monthly	TTM, SCT	PA, diet (primary)	Increase moderate-to-vigorous PA	CHAMPS	Participants in the intervention group had a significant decrease in overall PA, but a significant increase in leisure-time PA when compared to the standard care group.	43%

			tailored educational material and telephonic counseling. 12 mos						
Migneault et al. (2012)	337 AAs (70% female), mean age 56 y, hypertensive	Home-based	RCT. Weekly telephonic counseling intervention that educated and counseled individuals on behaviors to manage hypertension and was individually tailored using motivational interviewing. Content was culturally tailored. The control group received standard primary care. 8 mos	SCT, TTM	PA, diet, medication adherence	Increase PA participation	7-day PAR	There was a significant increase in PA in the intervention group compared to the control group after 8 months.	18%
<p>RCT = randomized controlled trial; UCT = uncontrolled trial; NCT = non-controlled trial; PA = physical activity; MI = motivational interviewing; SCT = social cognitive theory; TTM = transtheoretical model; TPB = theory of planned behavior; HBM = health belief model; NHIS = National Health Institute Survey; BRFSS = Behavioral Risk Factor Surveillance System; YPAS = Yale Physical Activity Survey; PAR = physical activity recall; CHAMPS = community health activities model program for seniors; PADS = Physical Activity and Disability Survey</p>									

Table 5. *Exercise behavior interventions targeting African American women (N=21)*

Author	Population	Setting	Study design, Intervention, Length of study	Theory	Outcome measures	PA objective	PA measure	PA outcomes	Attrition rate
Exercise Interventions (N=10)									
Clark et al. (2003)	123 female patients (67% AA), ≥50 y	Community center	UCT. Patients completed an exercise test using the cycle ergometer and physicians encouraged them to attend free exercise classes at a local community building. Classes were held once a day, 5 days a week and included chair-based or standing exercises and up to 30 minutes of indoor walking. Participants were encouraged to attend at least 3 classes per week. 12 mos.	SCT	PA adherence, health outcomes	≥150 min PA per week	Self-reported (not specified), attendance	Minutes of PA increased for the moderate-adherence group, but there was no change in the no- and little-adherence groups. The moderate-adherence group saw significant improvements in health outcomes compared to the no-adherence group.	38%
Newton and Perri (2004)	60 AAs (81% female), 30-69 y, sedentary	Hospital	RCT. Standard behavioral counseling group (SB) received 10 mixed race group sessions. Culturally sensitive counseling group (CS) received 10 group sessions of AA attendees and leaders only with culturally-tailored material. Both groups were prescribed specific walking frequencies, durations,	N/A	PA, cardiorespiratory fitness	Participate in 30 min of PA 3-7 days per week at 45-75% HRR	PAR	There were significant differences between the SB and CS groups had significantly greater increases in fitness compared to the PA group. There were no significant differences in PA between groups, but the SB and CS	23% (SB), 15% (CS), 0% (PA)

			and intensities. Physician advice comparison group (PA) received typical exercise recommendations. 6 mos					groups saw significant increases in PA within groups after 6 months.	
D'Alonzo et al. (2004)	44 women (36 AA), 18-35 y	University	UCT. Participants attended exercises 3 times per week and were classified as either high attendees or low attendees. Self-efficacy enhancing feedback was provided to the women after each session and they were given weekly educational and motivational material. 16 wks, 8-wk follow-up	SCT	Attendance, PA/steps, self-efficacy, perceived benefits and barriers, aerobic fitness, muscle strength, body fat	Increase program attendance	Attendance, pedometer	26 women were considered high attendees and 18 were considered low attendees. High attendees had significantly higher exercise self-efficacy, perceived benefits and barriers. Significantly greater improvements in aerobic fitness, flexibility, muscle strength, and percentage of body fat were found in the high attendees than in the low attendees. High attendees had significant increases in daily activity levels immediately after the program and at the 8 week follow-up.	25%

Keller et al. (2004)	29 AA women, 45-70 y, BMI >25, sedentary	Community-based	RCT. Group 1 walking 3 days/wk and Group 2 walked 5 days/wk both at 65% of the target heart rate. 36 wks.	N/A	Body fat, blood lipids, W-H ratio (primary), exercise adherence (secondary)	Walk 3 or 5 days/wk for 60 min	7-day PAR and Baecke Questionnaire of Habitual Physical Activity	There were was a significant improvement in health measures within groups. There was no significant difference between groups. Women of the lower frequency group had greater adherence than the higher frequency group.	41%
Staffileno et al. (2007)	24 AA women, 18-45 y, elevated blood pressure	Home	RCT. The exercise group was instructed to engage in lifestyle PA at home for 10 minutes 3 times a day, 5 days a week at a prescribed moderate intensity. The control group continued their normal daily activities. 8 wks.	N/A	Blood Pressure (primary), PA (secondary)	Accumulated 150 min of PA per week	YPAS, daily activity logs, HR monitors (on 2 separate occasions)	Women in the exercise group had a significant decrease in systolic blood pressure. The exercise group a significant increase in PA compared to the control group (P=.047). PA adherence ranged from 65-98% and was correlated with change in blood pressure.	4%
Swearingin (2008)	45 AA women, 22-55 y, BMI >23, sedentary	Home & fitness center	RCT. The lifestyle activity modification (LA) group was encouraged to get 150 of PA per week and attended weekly meetings to learn how to incorporate PA into	N/A	PA, cardiorespiratory fitness, BMI, body composition, cholesterol	≥150 min PA per week	PAR, pedometer, PA logs, YMCA submaximal cycle ergometer	Overall, there was a significant improvement in cardiorespiratory fitness, but not a significant difference between any of	49%

			their daily lives. The traditional exercise group (cardio) participated in 4 low to moderate intensity exercise sessions each week. The control group received no intervention, but met every other week to receive educational information. 12 wks.					the groups. Both intervention groups had increases and cardiorespiratory fitness compared to decreases in the control group. The cardio group expended more kcals per week from structured exercise than the LA group.	
Hays et al. (2010)	190 low-income women (62% AA), 50-88 y	Community center	UCT. Women received a physician screening and were referred to a free, community-based exercise program that consisted of 20 min of chair-based exercises, 20 min of resistance exercises and 30 min of indoor walking. 8 wks.	SCT	Attendance	Encouraged to attend ≥ 3 classes per week.	Attendance	56% participants completed no exercise classes, 44% completed at least one, and the mean number of classes completed was 5.7 out of 24.	N/A
Sullivan-Marx et al. (2011)	52 AA women, mean age 80 y (noncompleters) 78 y (completers)	Community center	UCT. Recruitment and retention strategies focused on researcher, clinician, and participant partnerships. Participants were instructed to attend exercise classes 2-3 days per week, which included cardio and strength exercises. 16 wks.	N/A	Attendance	Attend exercise classes 2-3 days per week	Attendance	61.2% of the target enrollment was reached. 71.2% completed 16 weeks or 48 sessions. 47.8% of completers attended at least 3 times per week and 70.7% attended at least 2 times per week.	29%

Hornbuckle et al. (2012)	44 AA women, 39-61 y, inactive	Home & university	UCT. Walking group (W) was asked to increase daily steps to >10,000 and strength group (WRT) added 2 days per week of resistance training to the same goal of steps per day. 12 wks.	N/A	CVD risk factors, PA (steps per day), strength	Increase daily steps to $\geq 10,000$ and strength to reduce CVD risk factors	Pedometer, blood pressure, blood lipids	Both groups significantly increased steps, but did not reach goal of $\geq 10,000$ per day. Significant improvements in strength were found in the WRT group and no change in the W group.	27%
Dornelas et al. (2007)	76 Hispanic & AA women (39 AA), 17-70 y	Clinic or church	NCT. Women participated in either a clinic- or church-based exercise program that was held 2 days per week and was culturally-tailored. 10 wks, 3-mo follow-up.	N/A	Attendance (primary), PA, nutrition, self-efficacy, social support, well-being	Not specified	Baecke Questionnaire for Habitual Physical Activity	Age was a predictor of attendance independent of site. Site was not a significant predictor of attendance	N/A
Multiple Behavior Interventions Including Exercise Component (N=11)									
Agurs-Collins et al. (1997)	64 AAs (77% women), 55-79 y, overweight diagnosed with type 2 diabetes	Clinic	RCT. Culturally-tailored weekly and bi-weekly group sessions of nutrition education and exercise and 1 individual session. Participants encouraged to engage in additional exercise at least 2 days per week at home. Control group received standard care. 24 wks	Social Action Theory	Glycemic control (primary), weight, PA, diet (secondary)	Engage in moderate PA at least 3 days a week	PASE	Women showed a significant increase in activity with a net increase in PA Scale for Elderly Questionnaire (PASE) score of 54.0 points (P=0.001) at 3 months compared to controls. The entire intervention group had a net increase in PASE score of 49.4 points (P<0.001) at 3 months, but scores were no	14%

								longer significant after 6 mos.	
Nothwehr et al. (2001)	23 AA women, 40-65 y, diagnosed type 2 diabetes, BMI >27	Fitness center (YMCA)	RCT. Participants were randomly assigned to either 10 weekly sessions about healthy eating followed by 6 weekly sessions about exercise or to the reverse sequence. PA sessions consisted of group discussions and structured exercise. 16 wks, 12 mo follow-up	N/A	Attendance (primary), PA, diet (secondary)	Encouraged to engage in ≥ 150 min of PA per week	Not specified (self-reported number of minutes walked and in other activities in the past week)	At 4 months and 1 year, there were no significant differences between groups in PA. Both groups had significant increases in PA from baseline to the 4 month and 1 year follow-ups and exceeded the 150 minutes per week recommendation.	17%
Walcott-McQuigg et al. (2002)	23 AA women, 22-51 y	Home-based	UCT. Women met as a group weekly and strategies for weight loss and weight loss maintenance were discussed. Participants were given culturally-sensitive educational material throughout. 32 wks (16 wks weight loss, 16 wks weight loss maintenance)	SCT	Weight, body composition, blood lipids, blood pressure, PA	Exercise 3 days per week for ≥ 20 min	Self-reported exercise/activity scale.	Average PA level increased from moderate at baseline to heavy at 16 wks. There was no significant increase in PA at 32 wks.	29%
Karanja et al. (2002)	66 AA women, mean age 44 y	Community center	UCT. Women participated in culturally-tailored weekly group meetings and supervised exercise sessions and were encouraged to increase PA outside of sessions. 26 wks	N/A	Weight loss, PA, diet	Engage in structured PA for ≥ 90 min per week.	Self-reported (not specified)	The number of hours of exercise per week significantly increased. Those attending at least 75% of the group meetings lost a mean of 6.2 kg at six months	N/A

								compared to 0.9 kg in those who attended fewer.	
Fitzgibbon, Stolley, Ganschow, et al. (2005)	59 AA women, >21 y, BMI >25	Hospital	RCT. Participants randomly assigned to culturally-tailored or faith-based weight-loss intervention included weight loss education and PA sessions twice per week. Control group received culturally-tailored intervention with no faith component. 12 wks	SCT	Weight loss, diet, PA	Increase PA participation (not specified)	7-day PAR	PA increased significantly in the culturally-tailored group, but not in the faith-based group. There was no significant difference between groups.	49%
Fitzgibbon, Stolley, Schiffer, et al. (2005)	64 AA women, 35-65 y, overweight or obese	Fitness center (YMCA) and university	RCT. Culturally-tailored breast health and weight loss intervention group received twice weekly education and PA sessions. Sessions for cohort 1 focused 50% on breast health and 50% on weight loss. Cohort 2 spent 80% of the time on weight loss. The control group received mailed educational material. 20 wks	SCT	PA, diet, weight loss, breast self-exam proficiency	Increase PA participation	Self-reported, not specified.	PA frequency, duration, and intensity were significantly greater in cohort 2 than the control group. There were no significant differences between cohort 1 and the control group.	17% (I)
Resnick et al. (2008)	166 adults (72% AA, 81% female), mean age 73 y	Senior housing center	RCT. Participants were randomized to an intervention or control group. The intervention group attended twice weekly nutrition education and exercise sessions led by	Self-efficacy theory	PA, exercise, diet	Increase PA participation (target not specified)	YPAS	The intervention had significantly greater increases in exercise than the control group, but there were not significant differences in	38%

			trained lay exercise trainers. 12 wks, 14-16 wk follow-up					overall physical activity	
Bopp et al. (2009)	72 (I) (79% female, mean age 52.5 y), 74 (C) (81% female, mean age 52 y), AA church members, inactive or sedentary	Church	NCT. Faith-based behavior change intervention including educational activities and exercise programs led by church leaders. Control group did not receive group sessions. 6 mos	SCT, TTM	Health (resting BP, BMI W-H ratio, FBS), psychosocial, PA, diet	Increase PA participation (target not specified)	BRFSS, pedometer	There were greater increases in PA behavior and the number of steps per week compared to the comparison group, but did not show statistical significance.	17% at 3 mos, 36% at 6 mos
Resnick et al. (2009)	22 adults (86% AA, 64% female), mean age 76.4 y,	Senior housing center	UCT. Participants attended weekly group sessions three times a week that delivered culturally-tailored education messages on behaviors to prevent CVD and led exercise classes. 12 wks, 14 wk follow-up	Social ecologi cal model, self- efficacy	PA, diet, medication adherence, blood pressure	Increase PA participation	YPAS	There was no significant change in time spent in moderate PA after the 12 week intervention.	9%
Stolley, Fitzgibbon, Schiffer, et al. (2009)	198 AA women, 30-65 y, BMI 30-50	University	RCT. Intervention was a culturally-adapted weight loss program that targeted changes in diet and PA patterns that met twice weekly. The control group received weekly educational newsletters and monthly telephone calls during the 6 months. 6 mo intervention, 1 y	SCT	BMI, PA, diet	Exercise at moderate to vigorous intensity a minimum of 3-4 days per week for at least 30 minutes.	International Physical Activity Questionnaire-Long Format (IPAQ)	Women in the intervention group reported significantly higher amounts of vigorous activity and moderate-to- vigorous PA after 6 months compared to the control group. 1 year maintenance outcomes were	7%

			maintenance program					not reported.	
Dutton et al. (2007)	139 women (92% AA), 18-65 y, BMI \geq 25, low-income, clinic attendees	Primary care	RCT. Participants received monthly 15-min physician visits that included healthy lifestyle counseling. Individually-tailored diet and PA programs were provided. Control group received standard care. 6 mos	Incorporated components from SCT and TTM	PA, physical fitness	\geq 150 min PA per week	7-Day PAR, YMCA 3-min step test	PA levels increased in the intervention group, but were not statistically significant compared to the control group. There was no significant change in physical fitness.	N/A

RCT = randomized controlled trial; UCT = uncontrolled trial; NCT = non-controlled trial; PA = physical activity; SCT = social cognitive theory; TTM = transtheoretical model; TPB = theory of planned behavior; HBM = health belief model; NHIS = National Health Institute Survey; BRFSS = Behavioral Risk Factor Surveillance System; YPAS = Yale Physical Activity Survey; PAR = physical activity recall

Table 6. *Intervention Studies Examining Self-Efficacy as Mediator of Physical Activity Behavior Change*

Author	Population	Setting	Study design, Intervention, Length of study	Theory	Effect of intervention on SE	Effect of SE on PA outcome	Mediation Analyses
Used Mediation Framework							
Pinto et al. (2001)	355 adults, mean age 65.6 y	Primary care	RCT. Intervention group received counseling from primary care provider, physical activity prescription and educational manual. 6-wk & 8-mo follow-up.	TTM, SCT	Intervention group saw significant increases at 6 weeks, but not 8 months.	No mediation effect at 6 weeks or 8 months.	Baron and Kenny (1986)
Y. D. Miller et al. (2002)	554 women, mean age 33 y, mothers of children 2-5 y	Home-based	RCT. Intervention groups received either print-based educational material to increase motivation for PA or print material and an invitation to attend a group meeting to strategize programs to be implemented locally. 8 wks, 5-mo follow-up.	None specified	Significant differences between groups.	SE had a mediating effect on PA.	Baron and Kenny (1986)
B. A. Lewis et al. (2006) B. H. Marcus et al. (1998)	150 adults, mean age 44.3 y	Home-based	RCT. Individually-tailored group received readiness stage-matched reports and manuals every 3 months. Comparison group received standard print materials. 6 mos; 1-, 3-, 6-month follow-ups.	TTM, SCT	Increases in SE were marginally significant at 3 mos.	SE had a significant effect on PA, but no mediation effect.	Baron and Kenny (1986)
Napolitano et al. (2008)	239 underactive adults, mean age 18-65 y,	Home-based	RCT. Group 1 received telephonic, stage-matched counseling; Group 2 received print-based	TTM, SCT	Intervention groups saw moderately significant	No mediation effect.	Baron and Kenny (1986)

	82% women		material; Group 3 was control. 6 mos, 12-mo follow-up.		increases in SE		
Plotnikoff, Pickering, Rhodes, et al. (2010)	323 women, mean age 42.6 y	Worksite	RCT. Group 1= received readiness stage-matched print material to increase PA. Group 2= received standard print material. Group 3= control. 12 mos; 6- & 12-mo follow-ups	TTM, TPB, SCT, PMT	No significant difference between groups.	No mediation effect.	Baron and Kenny (1986)
Baruth, Wilcox, Dunn, et al. (2010)	878 adults, 35-75 y	Primary care	RCT. Group 1= standard physician advice on PA; Group 2= physician advice plus one counseling session and phone call with health educator; Group 3 = same as Groups 1 & 2 plus bi-weekly telephonic counseling for 6 weeks, in-person counseling, and behavioral classes from health educator. 24 mos.	TTM	No significant difference between groups	No mediation effect.	MacKinnon, Lockwood, Hoffman, West, and Sheets (2002)
Baruth, Wilcox, Blair, et al. (2010)	418 African American adults	Church	RCT. Randomized church groups implemented culturally-tailored PA programs designed to increase self-efficacy and PA behaviors. 12 mos.	TTM	No significant effect on SE.	No mediation effect.	MacKinnon et al. (2002)
Rabin et al. (2006)	86 women, mean age 53.4 y, breast cancer survivors	Home-based	RCT. Received weekly counseling calls, pedometers and exercise logs and were encouraged to increase exercise to 30	TTM	Intervention had significant effect on SE	No mediation effect.	Kraemer, Wilson, Fairburn, and Agras (2002)

min, at least 5 days/wk. 12 wks.							
No Reported Mediation Framework							
McAuley et al. (1994)	114 adults, mean age 54.5 y, sedentary	Fitness center	RCT. One intervention group attended exercise classes 3 days/wk for 20 wks. The other intervention group added 15-min biweekly meetings prior to exercise classes designed to increase self-efficacy. 5 mos.	SE	No direct effect on SE.	Accounted for some variance in exercise frequency at 4 months, but not adherence.	Multiple regression analyses
Calfas et al. (1997)	255 sedentary adults, mean age 40 y	Primary care	NRT. Intervention included behavioral counseling by physicians plus telephone follow-up 2 weeks later. 4-6 wk follow-up.	TTM, SCT	No significant difference between groups	<i>Sticking to it</i> SE was correlated with three of four PA measures. <i>Making time</i> SE was correlated with two of four PA measures.	Bivariate correlations
Hallam (1998)	86 adult employees, mean age 38 y (I) & 36 y (C)	Worksite	NRT. Intervention group attended four 1-hr sessions that used approaches to increase exercise SE. Length not specified, 4 wks?	SCT	No significant changes between groups.	Not measured	ANOVA
A. L. Dunn et al. (1997)	116 men, 119 women, 35-60 y, sedentary	Home- or gym-based	RCT. Participants in the exercise group was prescribed exercise routines of 50-85% of max aerobic power, 20-60 min, 3-5 days per week for 6 mos. Asked to attend exercise classes 3-5 days per week. Participants in	SCT, SOC, DM	No significant difference between groups.	Increase in SE was associated with achieving PA criterion.	Logistic regression models

			the lifestyle group were asked to accumulate 30 min of moderate PA on most days of the week and were invited to small group meetings. 6 mos.				
Nichols et al. (2000)	64 adults, 24-61 y	Worksite	RCT. Intervention group met weekly discussing topics to increase behavioral motivation and were encouraged to participate in a 12-wk exercise program at the YMCA. 12 wks.	SCT, TTM	No significant difference between groups.	Not measured	ANOVA
Sallis et al. (1999)	184 females (f), 154 males (m), university seniors, mean age 24 y	Home-based	RCT. Intervention group attended 50-min lectures and 1-hr and 50 min discussion to increase PA. A 2-hr per week science lecture was comparison. 16 wks.	TTM, SCT	SE increased significantly for women, but not men when compared to controls.	<i>Resisting relapse</i> SE was positively associated with one out of five PA measures for women and two out of five for men.	ANCOVA & regression models
Castro et al. (1999)	125 ethnic minority women, mean age 37 y, sedentary	Home-based	RCT. Intervention group received material to help increase walking and 6 weekly phone calls. Control group received standard print material. 6 wks.	Not specified	Decreased in both groups.	Change in walking was inversely related to SE in both groups.	ANCOVA & regression models

PMT = protection motivation theory; SOC = stages of change (Stages of Motivational Readiness); DM = decision-making theory; SCT = social cognitive theory; TTM = transtheoretical model; TPB = theory of planned behavior; HBM = health belief model; SE = self-efficacy

Table 7. Study Group Descriptions

Group 1 (HLP)	Group 2 (Non-HLP)
Member of community-based exercise program	Member of community-based exercise program
Enrolled in a free, healthy lifestyle program	Not enrolled in the same healthy lifestyle program
Identified exercise as a goal with wellness coach	Did not identify exercise as a goal with a wellness coach
Fully subsidized membership to exercise program	Pay \$20 per year to be a member of exercise program

HLP = healthy lifestyle program

Table 8. Study Sample and Group Statistics

	Total Population	Group 1 (HLP)	Group 2 (Non-HLP)	P-value
Demographic Values				
Age (years), Mean (SD)	48.4 (11.9)	49.6 (11.7)	47.2 (12.3)	.40
Income (%)				.00*
<\$20,000	61.3	75.5	33.3	
\$21,000-\$40,000	25.0	20.8	33.3	
≥\$41,000	13.8	3.8	33.3	
Education (%)				.19
Less than high school	10.0	13.2	3.2	
High school grad, some college	60.0	62.3	55.6	
College grad	30.0	24.5	40.7	
Health & Fitness Values, Mean (SD)				
# of risk factors (0-7)	2.34 (1.74)	2.58 (1.70)	1.85 (1.75)	.08
BMI	37.7 (7.6)	39.1 (7.5)	34.6 (7.1)	.02*
Systolic blood pressure	125.9 (14.4)	128.4 (14.9)	121.0 (12.2)	.03*
Diastolic blood pressure	77.2 (9.5)	78.7 (10.0)	74.4 (7.7)	.05
Resting heart rate	77.8 (12.6)	80.3 (12.8)	72.8 (10.8)	.01*
Push-ups	4.55 (6.51)	3.25 (5.27)	7.15 (7.97)	.03*
Curl-ups	10.9 (10.0)	9.58 (9.96)	13.3 (9.77)	.12
Completed treadmill stages (0-8)	6.30 (2.16)	5.77 (2.39)	7.33 (1.00)	.00*
Physical Activity				
Activity Dimensions Summary Score (ADDS)	56.57 (28.86)	56.75 (30.69)	56.11 (4.90)	.92
Vigorous activity index	30.93 (20.10)	31.10 (21.46)	30.6 (17.46)	.11
Leisure walking index	12.27 (8.83)	11.92 (8.91)	12.96 (8.81)	.63
Moving index	10.14 (4.20)	10.44 (4.39)	9.56 (3.81)	.36
Standing index	3.85 (2.93)	3.89 (2.90)	3.78 (3.06)	.88
Sitting index	2.36 (1.21)	2.27 (1.30)	2.54 (1.03)	.34

* Denotes statistical significance at $p < .05$

HLP = healthy lifestyle program

Table 9. Comparison of Attendance between Groups

Variable	Median (IQR)			P-value
	Total Sample	Group 1 (HLP)	Group 2 (Non-HLP)	
Days attended	.5 (6.75)	0 (6.0)	1.0 (10.0)	.79
		Attendees		
Days attended of attendees (>1 visit) only	6.5 (13.0)	6.0 (13.0)	8.5 (16.0)	.91

HLP = healthy lifestyle program

Table 10. Attendance of Attendees

Variable	N (%)		
	Total Sample	Group 1 (HLP)	Group 2 (Non-HLP)
All attendees (> 1 visit)	40 (50%)	26 (49%)	14 (52%)
Attendees by number of visits			
< 6 visits	18 (45%)	12 (46%)	6 (43%)
6-11 visits	10 (25%)	6 (23%)	4 (29%)
12-17 visits	5 (12.5%)	4 (15%)	1 (7%)
18-23 visits	2 (5%)	2 (7.7%)	0 (0%)
≥ 24 visits	5 (12.5%)	2 (7.7%)	3 (21%)

Table 11. Comparison of Exercise Self-Efficacy between Groups

Variable	Mean (SD)			P-value	Effect Size (Cohen's <i>d</i>)
	Total Sample	Group 1 (HLP)	Group 2 (Non-HLP)		
Exercise self-efficacy Summary Score	3.13 (.86)	3.23 (.74)	2.96 (1.06)	.23	.34
<i>I am under a lot of stress.</i> (SE 1)	3.24 (1.23)	3.26 (1.20)	3.19 (1.30)	.80	.06
<i>I feel I don't have the time.</i> (SE 4)	2.91 (1.19)	3.08 (1.16)	2.59 (1.22)	.09	.41
<i>I have to exercise alone.</i> (SE 7)	3.46 (1.39)	3.50 (1.30)	3.37 (1.60)	.72	.09
<i>I don't have access to exercise equipment.</i> (SE 10)	3.23 (1.40)	3.40 (1.33)	2.89 (1.48)	.14	.36
<i>I am spending time with friends or family who do not exercise.</i> (SE 13)	3.37 (1.17)	3.52 (1.08)	3.07 (1.30)	.13	.38
<i>It's raining or snowing.</i> (SE 16)	3.04 (1.27)	3.15 (1.21)	2.81 (1.36)	.28	.26

HLP = healthy lifestyle program

Table 12. Self-Efficacy as a Mediator Using Multiple Regression*

Steps in testing for mediation	<i>B</i>	<i>SE B</i>	95% CI	<i>P</i> -value
Step 1 (Path a) Predictor: HLP enrollment Outcome: self-efficacy	-.492	.266	-1.02, .038	.07
Step 2 (Path b) Predictor: self-efficacy Outcome: program attendance	1.17	.99	-.81, 3.14	.24
Step 3 (Path c) Predictor: HLP enrollment Outcome: program attendance	.001	.007	-.012, .014	.89
Step 4 (Path c') Predictor: program attendance Outcome: HLP enrollment & self-efficacy	1.39	1.021	-.644, 3.43	.18

*Controlling for income, body mass index, resting heart rate, and completed treadmill stages
B = unstandardized beta; *SE B* = standard error of beta; CI = confidence interval; HLP = healthy lifestyle program

Figures

Figure 1. *Social Cognitive Theory*

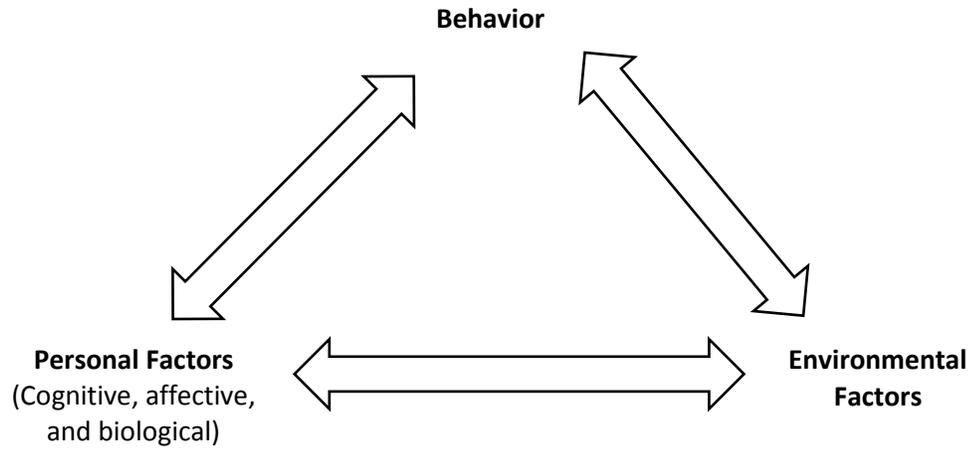
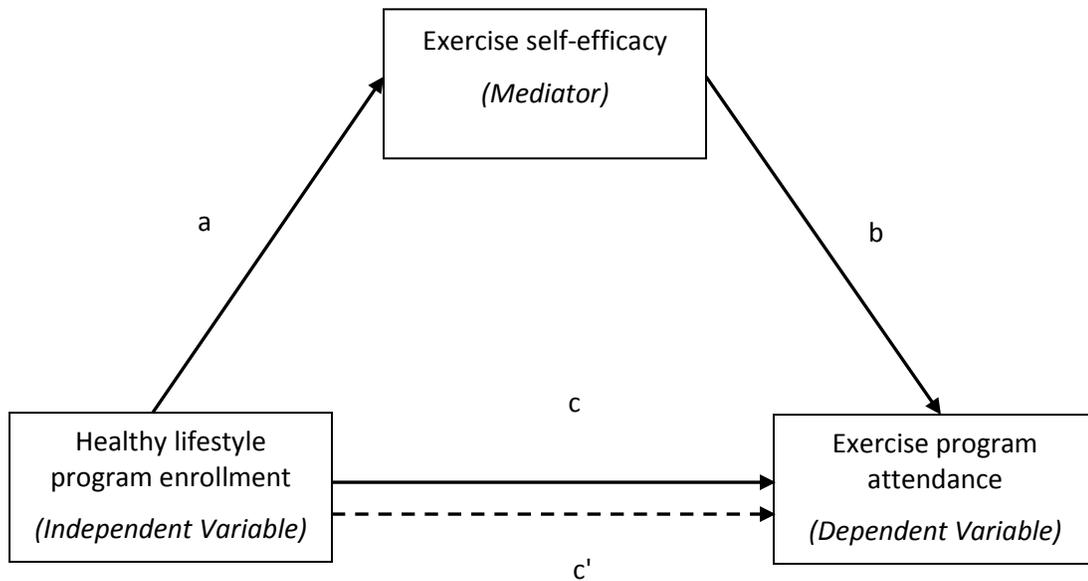


Figure 2. *Mediation Analyses*



Appendices

Appendix A: Exercise Self-Efficacy Questionnaire

The next questions ask you how confident you are to exercise when other things get in the way. Please read the following items and circle the number that best describes you.

	Not at all confident	Somewhat confidence	Moderately confident	Very confident	Completely confident
Negative Affect					
1. I am under a lot of stress.	1	2	3	4	5
2. I am depressed.	1	2	3	4	5
3. I am anxious.	1	2	3	4	5
Excuse Making					
4. I feel I don't have the time.	1	2	3	4	5
5. I don't feel like it.	1	2	3	4	5
6. I am busy.	1	2	3	4	5
Exercising Alone					
7. I have to exercise alone.	1	2	3	4	5
8. I am alone.	1	2	3	4	5
9. My exercise partner decides not to exercise that day.	1	2	3	4	5
Lack of Access					
10. I don't have access to exercise equipment.	1	2	3	4	5
11. I am traveling.	1	2	3	4	5
12. My gym is closed.	1	2	3	4	5
Resistance from Others					
13. I am spending time with friends or family who do not exercise.	1	2	3	4	5
14. My friends don't want me to exercise.	1	2	3	4	5
15. My significant other does not want me to exercise.	1	2	3	4	5
Bad Weather					
16. It's raining or snowing.	1	2	3	4	5
17. It's cold outside.	1	2	3	4	5
18. The roads or sidewalks are snowy.	1	2	3	4	5

Appendix B: Demographics and Health History Questionnaire

Demographic Characteristics

In this section, we'll be asking you some questions about your background. You may find that some of these questions are easy and others are difficult. A few questions will ask you for the same information in a slightly different way. This is so that we can compare the characteristics of program members to national information.

1. What is your age? _____ (years)
2. What is your date of birth? (Month) __XX____/(Day) __XX____/(Year) __XXXX____
3. What is your gender/sex? (circle one)
 1. Male
 2. Female
4. Are you Spanish/Hispanic/Latino?
 1. Yes
 2. No

If yes, are you:

 - a) Mexican, Mexican American or Chicano
 - b) Puerto Rican
 - c) Cuban
 - d) Other Spanish/Hispanic/Latino: Please indicate group: _____
5. What is your race? (Circle one or more races)
 - a) White, Caucasian, European, not Hispanic
 - b) Black or African American
 - c) American Indian
 - d) Asian Indian
 - e) Chinese
 - f) Filipino
 - g) Japanese
 - h) Korean
 - i) Vietnamese
 - j) Native Hawaiian
 - k) Guamanian or Chamorro
 - l) Samoan
 - m) Other Asian (write in): _____
 - n) Other Pacific Islander or Oriental: (write in) _____
 - o) Some other race: (write in): _____

6. What is your marital status (Please circle one)?
- a) Now married
 - b) Widowed
 - c) Divorced
 - d) Separated
 - e) Never married
7. What is your annual **household** income BEFORE taxes? Please CIRCLE the range that best describes your TOTAL yearly income for everyone who lives with you.
- 0 - \$10,000
 - \$10,000-\$20,000
 - \$21,000-\$40,000
 - \$41,000 - \$60,000
 - \$61,000 - \$80,000
 - \$81,000 - \$100,000
 - More than \$100,000
8. How many people are supported by this income: _____ People
9. What is the highest degree or level of school you have completed (circle one)?
- a) No schooling completed
 - b) Nursery school to 4th grade
 - c) 5th grade to 6th grade
 - d) 7th grade or 8th grade
 - e) 9th grade
 - f) 10th grade
 - g) 11th grade
 - h) 12th grade, no diploma
 - i) High school Graduate or GED
 - j) Some college credit, but less than 1 year
 - k) 1 or more years of college, no degree
 - l) Associate degree (for example, AA, AS)
 - m) Bachelor's degree (for example, BA, AB, BS)
 - n) Master's degree (for example, MA, MS, MEng, Med, MSW, MBA)
 - o) Professional degree (for example, MD, DDS, DVM, LLB, JD)
 - p) Doctorate degree (for example: PhD, EdD)

Risk Factors

	YES	NO
Has your father or brother experience a heart attack, heart surgery or sudden death before age 55?		
Has your mother or sister experienced a heart attack, heart surgery or sudden death before age 65?		
Has your doctor told you that you have high blood pressure?		
Has your doctor told you that you have high cholesterol? Total: _____ HDL: _____ LDL: _____		
Do you have diabetes?		
Are you physically inactive (you get less than 30 minutes of physical activity on less than 3 days a week)?		
Do you currently smoke?		
If YES, how many cigarettes do you smoke per day?		
If NO, have you quit in the past 6 months?		
Is your BMI greater than or equal to 30 kg/m ² ?		

Appendix C: Yale Physical Activity Survey

1. Now I would like to ask you about your physical exercise. Do you currently exercise regularly?

1 = yes
5 = no
998 = Don't know
999 = Refused

2. I would now like to ask you about types of activities that you might have done during the past 4 weeks. I will ask you how much walking, sitting and other activities you usually do. First, think about the walks you have taken during the past 4 weeks. About how often during that time did you walk for at least 10 minutes or more without stopping which caused your legs to get tired, your heart to beat faster, or your breathing to get heavy.
0 = Not at all [skip to 4]
1 = 1-3 times per month
2 = 1 time per week
3 = 2 times per week
4 = 3 times per week
5 = 4 times per week
6 = 5+ times per week
998 = Don't know
999 = Refused

3. On the average, how many minutes would you say that these walks usually lasted? [IF ASKED: These are the type of walks that last at least 10 minutes where your legs get tired, your heart beats faster, or your breathing gets heavy.] ENTER A FIGURE BETWEEN 10 AND 360.

_____ MINUTES (0 = not applicable, 999 = refused, and 998 = don't know)

4. About how many times during the past 4 weeks did you walk for at least 10 minutes or more without stopping which did not cause your legs to get tired, your heart to beat faster, or your breathing to get heavy?
0 = Not at all [skip to 6]
1 = 1-3 times per month
2 = 1 time per week
3 = 2 times per week
4 = 3 times per week
5 = 4 times per week
6 = 5+ times per week
999 = Refused
998 = Don't know

5. On average how many minutes would you say that these leisurely walks usually lasted?
ENTER A FIGURE BETWEEN 10 AND 360.

_____ MINUTES (0 = not applicable, 999 = refused, and 998 = don't know)

6. During the past 4 weeks, did you do any physical activities other than walking that caused your legs to get tired, your heart to beat faster, or your breathing to get heavy? Examples might be yard work, heavy housework, jogging, or basketball.

1 = yes

5 = no [skip to 9]

7 = don't know [SKIP TO 9]

8 = refused [SKIP TO 9]

7. On the average, how often did you do these activities? (IF MORE THAN 1 ACTIVITY, HELP RESPONDENT SUM THE FREQUENCIES)

0 = Not at all [skip to 9]

1 = 1-3 times per month

2 = 1 time per week

3 = 2 times per week

4 = 3 times per week

5 = 4 times per week

6 = 5+ times per week

998 = Don't know

999 = Refused

8. On the average, how many minutes would you say that (this activity/these activities) usually lasted (FOR EACH ACTIVITY, ENTER A FIGURE BETWEEN 1 AND 30. IF MORE THAN 1 ACTIVITY, SUM THE TIMES)?

_____ MINUTES (0 = not applicable, 999 = refused, and 998 = don't know)

9. Thinking now about how much time you spent standing or moving around on your feet on an average day in the past 4 weeks, on average, about how many hours a day did you spend moving around on your feet while doing things? Please report only the time that you were actually moving.

0 = Not at all

1 = Less than 1 hour per day

2 = 1 to less than 3 hours per day

3 = 3 to less than 5 hours per day

4 = 5 to less than 7 hours per day

5 = 7+ hours per day

998 = Don't know

999 = Refused

10. In the past 4 weeks, on average about how many hours a day did you spend standing on your feet without moving around?

0 = Not at all

1 = Less than 1 hour per day

2 = 1 to less than 3 hours per day

3 = 3 to less than 5 hours per day

4 = 5 to less than 7 hours per day

5 = 7+ hours per day

998 = Don't know

999 = Refused

11. About how many hours did you spend sitting on an average day during the past 4 weeks?

0 = Not at all

1 = Less than 3 hours

2 = 3 hours to less than 6 hours

3 = 6 hours to less than 8 hours

4 = 8+ hours

998 = Don't know

999 = Refused

12. During the past 4 weeks, about how many flights of stairs did you climb during a typical day?

1= None

2= Less than one

3 = 1-2 flights

4 = 3-4 flights

5 = 5 or more flights

References

- Adams-Campbell, L., Rosenberg, L., Washburn, R. A., Rao, R. S., Kim, K. S., & Palmer, J. (2000). Descriptive Epidemiology of Physical Activity in African-American Women. *Prev Med, 30*, 43-50.
- Adams-Campbell, L. L., Rosenberg, L., Rao, R. S., & Palmer, J. R. (2001). Strenuous physical activity and breast cancer risk in African-American women. *J Natl Med Assoc, 93*(7/8), 267-275.
- Affuso, O., Cox, T. L., Durant, N. H., & Allison, D. B. (2011). Attitudes and beliefs associated with leisure-time physical activity among African American adults. *Ethn Dis, 21*(1), 63-67.
- Agurs-Collins, T. D., Kumanyika, S. K., Ten Have, T. R., & Adams-Campbell, L. L. (1997). A randomized controlled trial of weight reduction and exercise for diabetes management in older African-American subjects. *Diabetes Care, 20*(10), 1503-1511.
- Ainsworth, B. (2003). Personal, social, and physical environmental correlates of physical activity in African-American women in South Carolina. *Am J Prev Med, 25*(3), 23-29. doi: 10.1016/s0749-3797(03)00161-2
- American College of Sports Medicine. (2010). *ACSM's guidelines for exercise testing and prescription: 8th edition*. Philadelphia: Lippincott Williams & Wilkins.
- Anonymous. (2012). In light of the failure to reach the healthful goals of Healthy People 2000 and 2010, what is the purpose of continuing the Healthy People 2020 goals? *Journal of Physical Education, Recreation & Dance, 83*(4), 52-53.
- Antikainen, I. E. (2011). *Investigating the effectiveness of physical activity interventions for older adults*. (Doctor of Philosophy Dissertation), Georgia State University. (Paper 9)
- Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1997). *Self-efficacy: the exercise of control*. New York: W.H. Freeman.
- Banks-Wallace, J., & Conn, V. (2002). Interventions to Promote Physical Activity Among African American Women. *Public Health Nurs, 19*(5), 321-335.
- Banks-Wallace, J., & Conn, V. (2005). Changes in steps per day over the course of a pilot walking intervention. *The ABNF Journal, 16*(2), 28-32.
- Baranowski, T., Anderson, C. B., & Carmack, C. (1998). Mediating variable framework in physical activity interventions. How are we doing? How might we do better? *Am J Prev Med, 15*(4), 266-297.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.
- Baruth, M., Wilcox, S., Blair, S., Hooker, S., Hussey, J., & Saunders, R. (2010). Psychosocial mediators of a faith-based physical activity intervention: implications and lessons learned from null findings. *Health Educ Res, 25*(4), 645-655. doi: 10.1093/her/cyq007
- Baruth, M., Wilcox, S., Dunn, A. L., King, A. C., Marcus, B. H., Rejeski, W. J., . . . Blair, S. N. (2010). Psychosocial mediators of physical activity and fitness changes in the activity counseling trial. *Ann Behav Med, 39*(3), 274-289. doi: 10.1007/s12160-010-9178-4
- Baskin, M. L., Gary, L. C., Hardy, C. M., Schoenberger, Y., Scarinci, I., Fouad, M. N., & Partridge, E. E. (2011). Predictors of Retention of African American Women in a Walking Program. *Am J Health Behav, 35*(1), 40-50.
- Bauman, A. E., Sallis, J. F., Dzawaltowski, D. A., & Owen, N. (2002). Toward a better understanding of the influences on physical activity: the role of determinants, correlates, causal variables, mediators, moderators, and confounders. *Am J Prev Med, 23*(2 Suppl), 5-14.

- Benisovich, S. V., Rossi, J. S., Norman, G. J., & Nigg, C. R. (1998). Development of a multidimensional measure of exercise self-efficacy. *Ann Behav Med, 20 Suppl*, S190.
- Berlin, J. A., & Colditz, G. A. (1990). A Meta-Analysis of Physical Activity in the Prevention of Coronary Heart Disease. *American Journal of Epidemiology, 132*(4), 612-628.
- Blair, S. N., Kohl, H. W., Barlow, C. E., Paffenbarger, R. S., Gibbons, L. W., & Macera, C. A. (1995). Changes in Physical Fitness and All-Cause Mortality: A Prospective Study of Healthy and Unhealthy Men *JAMA, 273*(14), 1093-1098.
- Blair, S. N., LaMonte, M. J., & Nichaman, M. Z. (2004). The evolution of physical activity recommendations: how much is enough? *Am J Clin Nutr, 79*(5), 9135-9205.
- Blaney, C. L., Robbins, M. L., Paiva, A. L., Redding, C. A., Rossi, J. S., Blissmer, B., . . . Oatley, K. (2012). Validation of the Measures of the Transtheoretical Model for Exercise in an Adult African-American Sample. *American Journal of Health Promotion, 26*(5), 317-325.
- Bopp, M., Wilcox, S., Laken, M., Butler, K., Carter, R. E., McClorin, L., & Yancey, A. (2006). Factors associated with physical activity among African-American men and women. *Am J Prev Med, 30*(4), 340-346. doi: 10.1016/j.amepre.2005.11.007
- Bopp, M., Wilcox, S., Laken, M., Hooker, S. P., Parra-Medina, D., Saunders, R., . . . McClorin, L. (2009). 8 Steps to Fitness: A Faith-Based, Behavior Change Physical Activity Intervention for African Americans. *Journal of Physical Activity and Health, 6*, 568-577.
- Bopp, M., Wilcox, S., Oberrecht, L., Kammermann, S., & McElmurray, C. T. (2004). Correlates of strength training in older rural African American and Caucasian women. *Women Health, 40*(1), 1-20. doi: 10.1300/J013v40n01_01
- Brancati, F. L., Kao, W. H., Folsom, A. R., Watson, R. L., & Szklo, M. (2000). Incident Type 2 Diabetes Mellitus in African American and White Adults: The Atherosclerosis Risk in Communities Study. *JAMA, 283*, 2253-2259.
- Breslow, R. A., Ballard-Barbash, R., Munoz, K., & Graubard, B. I. (2001). Long-term Recreational Physical Activity and Breast Cancer in the National Health and Nutrition Examination Survey I Epidemiologic Follow-up Study. *Cancer Epidemiology Biomarkers Prev, 10*(7), 805-808.
- Brosse, A. L., Sheets, E. S., Lett, H. S., & Blumenthal, J. A. (2002). Exercise and the Treatment of Clinical Depression in Adults: Recent Findings and Future Directions. *Sports Med, 32*(12), 741-760.
- Brownson, R. C., Baker, E. A., Leet, T. L., & Gillespie, K. N. (2003). *Evidence-based public health*. New York: Oxford University Press.
- Brownson, R. C., Eyler, A. A., King, A. C., Brown, D. R., Shyu, Y. L., & Sallis, J. F. (2000). Patterns and correlates of physical activity among US women 40 years and older. *Am J Public Health, 90*(2), 264-270.
- Brownson, R. C., Kelly, C. M., Eyler, A. A., Carnoske, C., Grost, L., Handy, S. L., . . . Schmid, T. L. (2008). Environmental and policy approaches for promoting physical activity in the United States: A research agenda. *Journal of Physical Activity and Health, 5*, 488-503.
- Buckworth, J., & Dishman, R. K. (2002). *Exercise Psychology*. Champaign, IL: Human Kinetics Publishers, Inc.
- Calfas, K. J., Sallis, J. F., Oldenburg, B., & French, M. (1997). Mediators of change in physical activity following an intervention in primary care: PACE. *Prev Med, 26*, 297-304.
- Campbell, M. K., James, A., Hudson, M. A., Carr, C., Jackson, E., Oakes, V., . . . Tessaro, I. (2004). Improving multiple behaviors for colorectal cancer prevention among african american church members. *Health Psychol, 23*(5), 492-502. doi: 10.1037/0278-6133.23.5.492
- Cancer Prevention Research Center. (n.d.). Measures Exercise: Self-efficacy Retrieved October 28, 2012, from <http://www.uri.edu/research/cprc/Measures/Exercise04.htm>

- Carroll, J. K., Yancey, A. K., Spring, B., Figueroa-Moseley, C., Mohr, D. C., Mustian, K. M., . . . Fiscella, K. (2011). What are successful recruitment and retention strategies for underserved populations? Examining physical activity interventions in primary care and community settings. *Translational Behavioral Medicine, 1*(2), 234-251. doi: 10.1007/s13142-011-0034-2
- Caspersen, C. J., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Reports, 100*(2), 126.
- Castro, C. M., Sallis, J. F., Hickman, S. A., Lee, R. E., & Chen, A. H. (1999). A prospective study of psychosocial correlates of physical activity for ethnic minority women. *Psychology and Health, 14*, 277-293.
- Centers for Disease Control and Prevention. (2010). Current depression among adults - United States, 2006 and 2008. *Morbidity & Mortality Weekly Report, 59*(38), 1229-1235.
- Centers for Disease Control and Prevention. (2011a). DATA2010. The Healthy People 2010 Database Retrieved August 22, 2012, from http://www.cdc.gov/nchs/healthy_people/hp2010/hp2010_final_review.htm
- Centers for Disease Control and Prevention. (2011b). National diabetes fact sheet: National estimates and general information on diabetes and prediabetes in the United States, 2011 Retrieved from http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf
- Chen, A. H., Sallis, J. F., Castro, C., Lee, R. E., & Hickman, S. A. (1998). A telephone and mail-based intervention to promote walking in sedentary ethnic minority women: Project WALK. *Women's Health: Research on Gender, Behavior, and Policy, 4*(1), 19-39.
- Chenoweth, D., & Leutzinger, J. (2006). The Economic Cost of Physical Inactivity and Excess Weight in American Adults. *Journal of Physical Activity and Health, 3*, 148-163.
- Clark, D. O., Stump, T. E., & Damush, T. M. (2003). Outcomes of an Exercise Program for Older Women Recruited through Primary Care. *Journal of Aging and Health, 15*(3), 567-585. doi: 10.1177/0898264303253772
- Colditz, G. A. (1999). Economic Costs of Obesity and Inactivity. *Med Sci Sports Exerc, 31*(11, Suppl 1), S663.
- Concato, J., Shah, N., & Horwitz, R. I. (2000). Randomized, controlled trials, observational studies, and the hierarchy of research designs. *N Engl J Med, 342*(25), 1887-1892.
- Conroy, M. B., Cook, N. R., Manson, J. E., Buring, J. E., & Lee, I. M. (2005). Past Physical Activity, Current Physical Activity, and Risk of Coronary Heart Disease. *Med Sci Sports Exerc, 37*(8), 1251-1256.
- Cornoni-Huntley, J., LaCroix, A. Z., & Havlik, R. J. (1989). Race and Sex Differentials in the Impact of Hypertension in the United States: The National Health and Nutrition Examination Survey I Epidemiologic Follow-up Study. *Arch Intern Med, 149*, 780-788.
- D'Alonzo, K. T., Stevenson, J. S., & Davis, S. E. (2004). Outcomes of a program to enhance exercise self-efficacy and improve fitness in Black and Hispanic college-age women. *Res Nurs Health, 27*(5), 357-369. doi: 10.1002/nur.20029
- Dall, T. M., Zhang, Y., Chen, Y. J., Quick, W. W., Yang, W. G., & Fogli, J. (2010). The economic burden of diabetes. *Health Aff (Milwood), 29*(2), 297-303.
- Desharnais, R., Bouillon, J., & Godin, G. (1986). Self-efficacy and outcome expectations as determinants of exercise adherence. *Psychological Reports, 59*, 1155-1159.
- Dipietro, L., Caspersen, C. J., Ostfeld, A. M., & Nadel, E. R. (1993). A Survey for Assessing Physical Activity Among Older Adults. *Med Sci Sports Exerc, 628-642*.
- Dishman, R. K., & Buckworth, J. (1996). Increasing physical activity: a quantitative synthesis. *Med Sci Sports Exerc, 28*(6), 706-719.

- Dornelas, E. A., Stepnowski, R. R., Fischer, E. H., & Thompson, P. D. (2007). Urban ethnic minority women's attendance at health clinic vs. church based exercise programs. *J Cross Cult Gerontol*, *22*(1), 129-136. doi: 10.1007/s10823-006-9023-1
- DuCharme, K. A., & Brawley, L. R. (1995). Predicting the intentions and behavior of exercise initiates using two forms of self-efficacy. *J Behav Med*, *18*(5), 479-497.
- Dunn, A. L., Marcus, B. H., Kampert, J. B., Garcia, M. E., Kohl, H. W., & Blair, S. N. (1997). Reduction in cardiovascular disease risk factors: 6-month results from projective *active*. *Prev Med*, *26*, 883-892.
- Dunn, M. Z. (2008). Psychosocial mediators of a walking intervention among African American women. *J Transcult Nurs*, *19*(1), 40-46. doi: 10.1177/1043659607309138
- Duru, O. K., Sarkisian, C. A., Leng, M., & Mangione, C. M. (2010). Sisters in motion: a randomized controlled trial of a faith-based physical activity intervention. *J Am Geriatr Soc*, *58*(10), 1863-1869. doi: 10.1111/j.1532-5415.2010.03082.x
- Dutton, G. R., Martin, P., Welsch, M. A., & Brantley, P. J. (2007). Promoting physical activity for low-income minority women in primary care. *Am J Health Behav*, *31*(6), 622-631.
- Eyler, A., Matson-Koffman, D., Young, D. R., Wilcox, S., Wilbur, J., Thompson, J., . . . Evenson, K. R. (2003). Quantitative study of correlates of physical activity in women from diverse racial/ethnic groupsThe Women's Cardiovascular Health Network Project summary and conclusions. *Am J Prev Med*, *25*(3), 93-103. doi: 10.1016/s0749-3797(03)00170-3
- Faridi, Z., Shuval, K., Njike, V. Y., Katz, J. A., Jennings, G., Williams, M., . . . Group, P. P. W. (2010). Partners reducing effects of diabetes (PREDICT): a diabetes prevention physical activity and dietary intervention through African-American churches. [Research Support, U.S. Gov't, P.H.S.]. *Health Educ Res*, *25*(2), 306-315. doi: 10.1093/her/cyp005
- Fitzgibbon, M. L., Stolley, M. R., Ganschow, P., Schiffer, L., Wells, A., Simon, N., & Dyer, A. (2005). Results of a faith-based weight loss intervention for Black women. *J Natl Med Assoc*, *97*(10), 1393-1402.
- Fitzgibbon, M. L., Stolley, M. R., Schiffer, L., Sanchez-Johnsen, L. A., Wells, A. M., & Dyer, A. (2005). A combined breast health/weight loss intervention for Black women. *Prev Med*, *40*(4), 373-383. doi: 10.1016/j.ypmed.2004.06.018
- Flegal, K. M., Carroll, M. D., Ogden, C. L., & Curtin, L. R. (2010). Prevalence and trends in obesity among US Adults, 1999-2008. *JAMA*, *303*(3), 235-241.
- Friedenreich, C. M., Neilson, H. K., & Lynch, B. M. (2010). State of the epidemiological evidence on physical activity and cancer prevention. *Eur J Cancer*, *46*(14), 2593-2604.
- Garrett, N. A., Brasure, M., Schmitz, K. H., Schultz, M. M., & Huber, M. R. (2004). Physical Inactivity: Direct Cost to a Health Plan. *Am J Prev Med*, *27*(4), 304-309.
- Gillum, R. F., Mussolino, M. E., & Madans, J. H. (1997). Coronary Heart Disease Incidence and Survival in African-American Women and Men: The NHANES I Epidemiologic Follow-up Study. *Ann Intern Med*, *127*, 111-118.
- Glasgow, R. E., Emont, S., & Miller, D. C. (2006). Assessing delivery of the five 'As' for patient-centered counseling. *Health Promot Int*, *21*(3), 245-255.
- Glynn, S. J. (2010). The New Breadwinners: 2010 Update. In C. f. A. Progress (Ed.).
- Green, L. W. (2006). Public health asks of systems science: to advance our evidence-based practice, can you help us get more practice-based evidence? *Am J Public Health*, *96*(3), 406-409.
- Green, L. W., & Fielding, J. E. (2011). The U.S. Healthy People Initiative: Its Genesis and Its Sustainability. *Annu Rev Public Health*, *32*, 451-470.
- Hallam, J. (1998). A worksite intervention to enhance social cognitive theory constructs to promote exercise adherence. *Am J Health Promot*, *13*(1), 4-7.

- Ham, S. A., & Ainsworth, B. (2010). Disparities in data on Healthy People 2010 physical activity objectives collected by accelerometry and self-report. *Am J Public Health, 100*(S1), S263-S267.
- Harper, S., Rushani, D., & Kaufman, J. S. (2012). Trends in the Black-White Life Expectancy Gap, 2003-2008. *JAMA, 307*, 2257-2259.
- Hayden, J. (2009). *Introduction to Health Behavior Theory*. Sudbury, MA: Jones and Bartlett Publishers, LLC.
- Hays, L. M., Pressler, S. J., Damush, T. M., Rahl, S. M., & Clark, D. O. (2010). Exercise adoption among older, low-income women at risk for cardiovascular disease. *Public Health Nurs, 27*(1), 79-88. doi: 10.1111/j.1525-1446.2009.00829.x
- Helmrich, S. P., Ragland, D. R., & Paffenbarger, R. S. (1994). Prevention of Non-insulin-dependent Diabetes Mellitus with Physical Activity. *Med Sci Sports Exerc, 824-830*.
- Hogue, P. A. (2007). *The Effects of Buddy Support on Physical Activity in African American Women*. (Doctor of Philosophy), The University of Toledo.
- Holmes, M. D., Chen, W. Y., Feskanich, D., Kroenke, C. H., & Colditz, G. A. (2005). Physical activity and survival after breast cancer diagnosis. *JAMA, 293*(20), 2479-2486.
- Hornbuckle, L. M., Liu, P. Y., Ilich, J. Z., Kim, J. S., Arjmandi, B. H., & Panton, L. B. (2012). Effects of resistance training and walking on cardiovascular disease risk in African-American women. *Med Sci Sports Exerc, 44*(3), 525-533. doi: 10.1249/MSS.0b013e31822e5a12
- Hu, F. B., Sigal, R. J., Rich-Edwards, J. W., Colditz, G. A., Solomon, C. G., Williett, W. C., . . . Manson, J. E. (1999). Walking Compared with Vigorous Physical Activity and Risk of Type 2 Diabetes in Women: A Prospective Study. *JAMA, 282*(15), 1433-1439.
- Jones, T., & Eaton, C. (1994). Cost-benefit analysis of walking to prevent coronary heart disease. *Arch Fam Med, 3*(8), 703-710.
- Karanja, N., Stevens, V. J., Hollis, J. F., & Kumanyika, S. (2002). Steps to soulful living (steps). A weight loss program for African American women. *Ethn Dis, 12*, 363-371.
- Keller, C. S., Robinson, B., & Pickens, L. (2004). Comparison of two walking frequencies in African American postmenopausal women. *The ABNF Journal, 15*(1), 3-9.
- Kennedy, B. M., Paeratakul, S., Champagne, C. M., Ryan, D. H., Harsha, D. W., McGee, B., . . . Bogle, M. L. (2005). A pilot church-based weight loss program for African-American adults using church members as health educators: A comparison of individual and group intervention. *Ethn Dis, 15*, 373-378.
- Keyserling, T. C., Samuel-Hodge, C. D., Ammerman, A. S., Ainsworth, B. E., Henriquez, C. F., Elsay, T. A., . . . Bangdiwala, S. I. (2002). A randomized trial of an intervention to improve self-care behaviors in African-American women with type 2 diabetes. *Diabetes Care, 25*(9), 1576-1583.
- King, A. C., Castro, C., Eyster, A. A., Wilcox, S., Sallis, J. F., & Brownson, R. C. (2000). Personal and Environmental Factors Associated with Physical Inactivity Among Different Racial-Ethnic Groups of U.S. Middle-Aged and Older-Aged Women. *Health Psychology, 19*(4), 354-364. doi: 10.1037/ab78^133.19.4.354
- Koretz, R. L. (2007). Considerations of study design. *Nutr Clin Pract, 22*(6), 593-598.
- Kraemer, H. C., Wilson, G. T., Fairburn, C. G., & Agras, W. S. (2002). Mediators and moderators of treatment effects in randomized clinical trials. *Archives of General Psychiatry, 59*, 877-883.
- Krishnan, S., Rosenberg, L., & Palmer, J. R. (2009). Physical activity and television watching in relation to risk of type 2 diabetes: The black women's health study. *Am J Epidemiol, 169*(4), 428-434.

- Kushi, L. H., Fee, R. M., Folsom, A. R., Mink, P. J., Anderson, K. E., & Sellers, T. A. (1997). Physical Activity and Mortality in Postmenopausal Women *JAMA*, 277(16), 1287-1292.
- Lavie, C. J., Kuruvanka, T., Milani, R. V., Prasad, A., & Ventura, H. O. (2004). Exercise Capacity in Adult African-Americans Referred for Exercise Stress Testing: Is Fitness Affected by Race? *Chest*, 126, 1962-1968.
- Lee, I., Djouse, L., Sesso, H. D., Wang, L., & Buring, J. E. (2010). Physical Activity and Weight Gain Prevention. *JAMA*, 303(12), 1173-1179.
- Lewis, B. A., Forsythe, L. H., Pinto, B. M., Bock, B. C., Roberts, M., & Marcus, B. H. (2006). Psychosocial mediators of physical activity in a randomized controlled intervention trial. *Journal of Sport & Exercise Psychology*, 28, 193-204.
- Lewis, B. A., Marcus, B. H., Pate, R. R., & Dunn, A. L. (2002). Psychosocial mediators of physical activity behavior among adults and children. *Am J Prev Med*, 23(2 (Suppl 1)), 26-35.
- Lewis, R. K., Redmond, M., Paschal, A., & Gree, B. L. (2005). Health Behavior Patterns of African Americans: Are We Making Progress Toward the Healthy People 2010 Goals? *American Journal of Health Studies*, 20(3), 149-155.
- Lipton, R. B., Liao, Y., Cao, G., Cooper, R. S., & McGee, D. (1993). Determinants of incident non-insulin-dependent diabetes mellitus among blacks and whites in a national sample. The NHANES I Epidemiologic Follow-up Study. *Am J Epidemiol*, 138(10), 826-839.
- Macera, C. A., Jones, D. A., Yore, M. M., Ham, S. A., Kohl, H. W., Kimsey, C. D., & Buchner, D. (2003). Prevalence of Physical Activity, Including Lifestyle Activities Among Adults --- United States, 2000--2001. *MMWR*, 52(32), 764-769.
- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychol Methods*, 7(1).
- Malarcher, A., Dube, S., Shaw, L., Babb, S., & Kauffman, R. (2011). Quitting Smoking Among Adults --- United States, 2001--2010. *MMWR*, 60(44), 1513-1519.
- Manson, J. E., Hu, F. B., Rich-Edwards, J. W., Colditz, G. A., Stampfer, M. J., Willett, W. C., . . . Hennekens, C. H. (1999). A prospective study of walking as compared with vigorous exercise in the prevention of coronary heart disease in women. *N Engl J Med*, 341(9), 650-658.
- Marcus, B. H., Bock, B. C., Pinto, B. M., Forsythe, L. H., Roberts, M. B., & Traficante, R. M. (1998). Efficacy of individualized, motivationally tailored physical activity intervention. *Ann Behav Med*, 20, 174-180.
- Marcus, B. H., & Forsythe, L. H. (2009). *Motivating People to Be Physically Active, Second Edition*. Champaign, IL: Human Kinetics.
- Marcus, B. H., & Owen, N. (1992). Motiational readiness, self-efficacy and decision making for exercise. *J Appl Soc Psychol*, 22, 3-16.
- Marcus, B. H., Williams, P. M., Dubbert, P. M., Sallis, J. F., King, A. C., Yancey, A. K., . . . Claytor, R. P. (2006). Physical Activity Intervention Studies. What We Know and What We Need to Know: A Scientific Statement From the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity); Council on Cardiovascular Disease in the Young; and the Interdisciplinary Working Group on Quality of Care and Outcomes Research *Circulation*, 114, 2739-2752.
- Marcus, R., Drinkwater, B., Dalsky, G., Dufek, J., Raab, D., Slemenda, C., & Snow-Harter, C. (1992). Osteoporosis and Exercise in Women. *Med Sci Sports Exerc*, 24(6 Suppl), S201-S207.
- Martin, M. Y., Person, S. D., Kratt, P., Prayor-Patterson, H., Kim, Y., Salas, M., & Pisu, M. (2008). Relationship of health behavior theories with self-efficacy among insufficiently active

- hypertensive African-American women. *Patient Educ Couns*, 72(1), 137-145. doi: 10.1016/j.pec.2008.02.012
- McAuley, E. (1992). The role of efficacy cognitions in the prediction of exercise behavior in middle-aged adults. *J Behav Med*, 15(1), 65-88.
- McAuley, E. (1993). Self-efficacy and the maintenance of exercise participation in older adults. *J Behav Med*, 16(1), 103-113.
- McAuley, E., & Blissmer, B. (2000). Self-Efficacy Determinants and Consequences of Physical Activity. *Exercise and Sport Sciences Review*, 85-88.
- McAuley, E., Courneya, K. S., Rudolph, D. L., & Lox, C. L. (1994). Enhancing Exercise Adherence in Middle-Aged Males and Females. *Preventive Medicine*, 23, 498-506.
- McLean, J., & Pietroni, P. (1990). Self-care - Who does it best? *Social Science and Medicine*, 30, 591-596.
- McNabb, W., Quinn, M., Kerver, J., Cook, S., & Karrison, T. (1997). The PATHWAYS church-based weight loss program for urban African-American women at risk for diabetes. *Diabetes Care*, 20(10), 1518-1523.
- Migneault, J. P., Dedier, J. J., Wright, J. A., Heeren, T., Campbell, M. K., Morisky, D. E., . . . Friedman, R. H. (2012). A culturally adapted telecommunication system to improve physical activity, diet quality, and medication adherence among hypertensive African-Americans: a randomized controlled trial. *Ann Behav Med*, 43(1), 62-73. doi: 10.1007/s12160-011-9319-4
- Miller, W. R., & Rollnick, S. (2009). Ten things that motivational interviewing is not. *Behav Cogn Psychother*, 37(2), 129-140.
- Miller, Y. D., Trost, S. G., & Brown, W. J. (2002). Mediators of physical activity behavior change among women with young children. *Am J Prev Med*, 23(2 Suppl), 98-103.
- Minino, A. M., Murphy, S. L., Xu, J., & Kochanek, K. D. (2011). Deaths: Final Data for 2008. *National Vital Statistics Reports*, 59(10), 1-126.
- Mokdad, A. H., Marks, J. S., Stroup, J. L., & Gerberding, J. L. (2004). Actual Causes of Death in the United States, 2000. *JAMA*, 291, 1238-1245.
- Montgomery, V. H. (2007). *The influence of increased physical activity on weight retention, body composition, psychological profiles, and cardiovascular function in postpartum African American women*. (Doctor of Philosophy Dissertation), Auburn University.
- Morrow, J. R., Jackson, A. W., Bazzarre, T. L., Milne, D., & Blair, S. N. (1999). A One-Year Follow-Up to Physical Activity and Health: A Report of the Surgeon General. *Am J Prev Med*, 17(1), 24-30.
- Napolitano, M. A., Papandonatos, G. D., Lewis, B. A., Whiteley, J. A., Williams, D. M., King, A. C., . . . Marcus, B. H. (2008). Mediators of physical activity behavior change: a multivariate approach. *Health Psychol*, 27(4), 409-418. doi: 10.1037/0278-6133.27.4.409
- National Heart, L., and Blood Institute. (n.d.). Unpublished Tabulations of National Vital Statistics System Mortality Data, 2008 Retrieved August 1, 2012, from http://www.cdc.gov/nchs/nvss/mortality_public_use_data.htm
- Newton, R. L., & Perri, M. G. (2004). A randomized pilot trial of exercise promotion in sedentary African-American adults. *Ethn Dis*, 14, 548-557.
- Nichols, J. F., Wellman, E., Caparosa, S., Sallis, J. F., & Calfas, K. J. (2000). Impact of a worksite behavioral skills intervention. *14*, 4(218-221).
- Nies, M. A., Chruscial, H. L., & Hepworth, J. T. (2003). An intervention to promote walking in sedentary women in the community. *Am J Health Behav*, 27(5), 524-535.

- Nothwehr, F. K., Guare, J., Marrero, D. G., & Hoon, H. (2001). Sequencing Diet and Exercise Programs for African American Women With Diabetes. *The Diabetes Educator*, 27(2), 245-251. doi: 10.1177/014572170102700211
- O'Donnell, M. P. (2002). *Health Promotion in the Workplace: Third Edition*. Albany, NY: Delmar Publications.
- Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence and trends in obesity among US adults, 1999-2008. *JAMA*, 295, 1549-1555.
- Oman, R. F., & King, A. C. (1998). Predicting the adoption and maintenance of exercise participation using self-efficacy and previous exercise participation rates. *Am J Health Promot*, 12(3), 154-161.
- Opdenacker, J., Boen, F., Coorevits, N., & Delecluse, C. (2008). Effectiveness of a lifestyle intervention and structured exercise intervention in older adults. *Prev Med*, 26, 518-524.
- Parra-Medina, D., Wilcox, S., Salinas, J., Addy, C., Fore, E., Poston, M., & Wilson, D. K. (2011). Results of the Heart Healthy and Ethnically Relevant Lifestyle trial: a cardiovascular risk reduction intervention for African American women attending community health centers. *Am J Public Health*, 101(10), 1914-1921. doi: 10.2105/AJPH.2011.300151
- Paschal, A. M., Lewis, R. K., Martin, A., Dennis-Shipp, D., & Simpson, D. S. (2004). Baseline Assessment of the Health Status and Health Behaviors of African Americans Participating in the Activities-for-Life Program: A Community-based Health Intervention Program. *Journal of Community Health*, 29(4), 305-318.
- Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C., . . . Willmore, J. H. (1995). Physical Activity and Public Health: A Recommendation From the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA*, 273, 402-407.
- Pekmezi, D. W., Williams, D. M., Dunsiger, S., Jennings, E. G., Lewis, B. A., Jakicic, J. M., & Marcus, B. H. (2010). Feasibility of using computer-tailored and internet-based interventions to promote physical activity in underserved populations. *Telemedicine and e-Health*, 16(4), 498-503.
- Penedo, F. J., & Dahn, J. R. (2005). Exercise and Well-Being: A Review of Mental and Physical Health Benefits Associated with Physical Activity. *Curr Opin Psychiatry*, 18, 189-193.
- Peterson, J. A. (2011). Evaluation of the heart and soul physical activity program by African American women. *The ABNF Journal*, 22(3), 64-72.
- Pinto, B., Lynn, H., Marcus, B. H., DePue, J., & Goldstein, M. G. (2001). Physician-based activity counseling: Intervention effects on mediators of motivational readiness for physical activity. *Ann Behav Med*, 23(1), 2-10.
- Plotnikoff, R. C., Hotz, S. B., Birkett, N. J., & Courneya, K. S. (2001). Exercise and the transtheoretical model: A longitudinal test of a population sample. *Prev Med*, 33(5), 441-452.
- Plotnikoff, R. C., Pickering, M. A., Flaman, L. M., & Spence, J. C. (2010). The role of self-efficacy on the relationship between the workplace environment and physical activity: a longitudinal mediation analysis. *Health Educ Behav*, 37(2), 170-185. doi: 10.1177/1090198109332599
- Plotnikoff, R. C., Pickering, M. A., Rhodes, R. E., Courneya, K. S., & Spence, J. C. (2010). A test of cognitive mediation in a 12-month physical activity workplace intervention: does it explain behaviour change in women? *Int J Behav Nutr Phys Act*, 7, 32. doi: 10.1186/1479-5868-7-32

- Pratt, M., Epping, J. N., & Dietz, W. H. (2009). Putting Physical activity into Public Health: A Historical Perspective from the CDC. *Preventive Medicine, 49*(4), 301-302.
- Pratt, M., Macera, C. A., & Wang, G. (2000). Higher direct medical costs associated with physical inactivity. *Phys Sportsmed, 28*(10), 63-70.
- Prochaska, J. J., Spring, B., & Nigg, C. R. (2008). Multiple health behavior change research: An introduction and overview. *Prev Med, 46*(3), 181-188.
- Prochaska, J. O. (2008). Multiple health behavior research represents the future of preventive medicine. *Prev Med, 46*, 281-285.
- Prochaska, J. O., & Marcus, B. H. (1994). The Transtheoretical Model: applications to exercise *Advances in Exercise Adherence* (pp. 161-180). Champaign, IL: Human Kinetics.
- Rabin, C., Pinto, B. M., & Frierson, G. M. (2006). Mediators of a randomized controlled physical activity intervention for breast cancer survivors. *Journal of Sport & Exercise Psychology, 28*, 269-284.
- Resnick, B., Luisi, D., & Vogel, A. (2008). Testing the Senior Exercise Self-efficacy Project (SESEP) for use with urban dwelling minority older adults. *Public Health Nurs, 25*(3), 221-234. doi: 10.1111/j.1525-1446.2008.00699.x
- Resnick, B., Shaughnessy, M., Galik, E., Scheve, A., Fitten, R., Morrison, T., . . . Agness, C. (2009). Pilot Testing of the PRAISEDD Intervention among African American and low-income older adults. *Journal of Cardiovascular Nursing, 24*(5), 352-361.
- Resnicow, K., Jackson, A., Blissett, D., Wang, T., McCarty, F., Rahotep, S., & Periasamy, S. (2005). Results of the healthy body healthy spirit trial. *Health Psychol, 24*(4), 339-348. doi: 10.1037/0278-6133.24.4.339
- Richter, D. L., Wilcox, S., Greaney, M. L., Henderson, K. A., & Ainsworth, B. E. (2002). Environmental, policy, and cultural factors related to physical activity in African American women. *Women Health, 36*(2), 91-109.
- Rimmer, J. H., Hsieh, K., Graham, B. C., Gerber, B. S., & Gray-Stanley, J. A. (2010). Barrier removal in increasing physical activity levels in obese African American women with disabilities. *Journal of Women's Health, 19*(10), 1869-1876.
- Rippe, J. M., Crossley, S., & Ringer, R. (1998). Obesity as a chronic disease: modern medical and lifestyle management. *J Am Diet Assoc, 98*(10 Suppl 2), S9-S15.
- Roger, V. L., Go, A. S., Lloyd-Jones, D. M., Benjamin, E. J., Berry, J. D., Borden, W. B., . . . Stroke Statistics, S. (2012). Heart disease and stroke statistics--2012 update: a report from the American Heart Association. [Comparative Study]. *Circulation, 125*(1), e2-e220. doi: 10.1161/CIR.0b013e31823ac046
- Rosenberg, L., Boggs, D., Wise, L. A., Palmer, J. R., Roltsch, M. H., Makambi, K. H., & Adams-Campbell, L. L. (2006). A follow-up study of physical activity and incidence of colorectal polyps in African-American women. *Cancer Epidemiology Biomarkers Prev, 15*, 1438-1442.
- Sallis, J. F., Calfas, K. J., Alcaraz, J. E., Gehrman, C., & Johnson, M. F. (1999). Potential mediators of change in a physical activity promotion course for university students: Project GRAD. *Ann Behav Med, 21*(2), 149-158.
- Sallis, J. F., Hovell, M. F., & Hofstetter, C. R. (1992). Predictors of adoption and maintenance of vigorous physical activity in men and women. *Prev Med, 21*(2), 237-251.
- Sattelmair, J. R., Kurth, T., Buring, J. E., & Lee, I. M. (2010). Physical Activity and Risk of Stroke in Women. *Stroke, 41*, 1243-1250.
- Schiller, J. S., Lucas, J. W., Ward, B. W., & Perogy, J. A. (2012). Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2010. *Vital Health Stat, 10*(252).

- Sharpe, P. A., Burroughs, E. L., Granner, M. L., Wilcox, S., Hutto, B. E., Bryant, C. A., . . . Pekuri, L. (2010). Impact of a community-based prevention marketing intervention to promote physical activity among middle-aged women. *Health Educ Behav, 37*(3), 403-423. doi: 10.1177/1090198109341929
- Slattery, M., & Potter, J. (2002). Physical Activity and Colon Cancer: Confounding or Interaction? *Med Sci Sports Exerc, 34*(6), 913-919.
- Smith, D. E., Heckemeyer, C. M., Kratt, P. P., & Mason, D. A. (1997). Motivational interviewing to improve adherence to a behavioral weight-control program for older obese women with NIDDM. *Diabetes Care, 20*(1), 52-54.
- Staffileno, B. A., Minnick, A., Coke, L. A., & Hollenberg, S. M. (2007). Blood pressure responses to lifestyle physical activity among young, hypertension-prone African-American women. *Journal of Cardiovascular Nursing, 22*(2), 107-117.
- Sternfeld, B., Cauley, J., Harlow, S., Liu, G., & Lee, M. (2000). Assessment of physical activity with a single global question in a large, multiethnic sample of midlife women. *Am J Epidemiol, 152*(7), 678-687.
- Stolley, M. R., Fitzgibbon, M. L., Schiffer, L., Sharp, L. K., Singh, V., Van Horn, L., & Dyer, A. (2009). Obesity reduction black intervention trial (ORBIT): six-month results. [Randomized Controlled Trial Research Support, N.I.H., Extramural]. *Obesity (Silver Spring), 17*(1), 100-106. doi: 10.1038/oby.2008.488
- Stolley, M. R., Fitzgibbon, M. L., Shiffer, L., Sharp, L. K., Singh, V., Van Horn, L., & Dyer, A. (2009). Obesity reduction black intervention trial (ORBIT): Six-month results. *Obesity (Silver Spring), 17*(1), 100-106. doi: 10.1038/oby.2008.488
- Sullivan-Marx, E. M., Mangione, K. K., Ackerson, T., Sidorov, I., Maislin, G., Volpe, S. L., & Craik, R. (2011). Recruitment and retention strategies among older African American women enrolled in an exercise study at a PACE program. *Gerontologist, 51 Suppl 1*, S73-81. doi: 10.1093/geront/gnr001
- Swearingin, B. (2008). *The comparison of the effects of lifestyle activity and structured cardiovascular exercise on obesity-related risk ractors of African American women ages 22-55*. (Doctor of Philosophy Dissertation), University of North Carolina.
- Taylor, W. C., Baranowski, T., & Young, D. R. (1998). Physical Activity Interventions in Low-Income, Ethnic Minority, and Populations with Disability. *Am J Pev Med, 15*(4), 334-343.
- Troiano, R. P., Berrigan, D., Dodd, K. W., Masse, L. C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc, 40*(1), 181-188. doi: 10.1249/mss.0b013e31815a51b3
- U.S. Cancer Statistics Working Group. (2012). United States Cancer Statistics: 1999–2008 Incidence and Mortality Web-based Report Retrieved from <http://apps.nccd.cdc.gov/uscs/>
- U.S. Census Bureau. (2012). The 2012 Statistical Abstract Retrieved February 13, 2013, from <http://www.census.gov/compendia/statab/cats/education.html>
- U.S. Department of Health and Human Services. (1996). *Physical Activity and Health: A Report of the Surgeon General*.
- U.S. Department of Health and Human Services. (2000). *Healthy People 2010: With Understanding and Improving Health and Objectives for Improving Health* (2nd ed.). Washington, DC: US Government Printing Office.
- U.S. Department of Health and Human Services. (2008). *2008 Physical Activity Guidelines for Americans*.

- U.S. Department of Health and Human Services. (2010). Healthy People 2020 Retrieved October 30, 2012, from <http://www.healthypeople.gov/2020/about/DOHAbout.aspx>
- U.S. Department of Health and Human Services. (2011). Final review. Healthy People 2010: Physical Activity and Fitness Retrieved August 22, 2012, from http://www.cdc.gov/nchs/data/hpdata2010/hp2010_final_review_focus_area_22.pdf
- U.S. Department of Health and Human Services. (n.d.). Surgeon General Retrieved August 23, 2012, from <http://www.surgeongeneral.gov/index.html>
- U.S. Department of Labor, B. o. S. (2011). Employment and Earnings. In K. J. Cook (Ed.).
- United States Department of Health and Human Services. (2010). Healthy People 2020: Improving the Health of Americans Retrieved August 12, 2012, from <http://healthypeople.gov/2020/topicsobjectives2020/pdfs/HP2020objectives.pdf>
- Walcott-McQuigg, J. A., Chen, S., Davis, K., Stevenson, E., Choi, A., & Wagsrikhun, S. (2002). Weight loss and weight loss maintenance in African American women. *J Natl Med Assoc*, *94*(686-694).
- Wallston, K. A. (1992). Hocus-pocus, the focus isn't strictly on locus: Rotter's social learning theory modified for health. *Cognitive Therapy and Research*, *16*, 183-199.
- Wang, G., Pratt, M., Macera, C. A., Zheng, Z. J., & Heath, G. (2004). Physical activity, cardiovascular disease, and medical expenditures in U.S. adults. *Ann Behav Med*, *28*, 88-94.
- Whitehead, D., Bodenlos, J. S., Cowles, M. L., Jones, G. N., & Brantley, P. J. (2007). A stage-targeted physical activity Intervention among a predominantly African-American low-income primary care population. *Am J Health Promot*, *21*(3), 160-163.
- Whitt-Glover, M. C., Hogan, P. E., Lang, W., & Heil, D. P. (2008). Pilot study of a faith-based physical activity program among sedentary Blacks. *Prev Chronic Dis*, *5*(2), A51.
- Whitt-Glover, M. C., & Kumanyika, S. K. (2009). Systematic Review of Interventions to Increase Physical Activity and Physical Fitness in African-Americans. *American Journal of Health Promotion*, *23*(6), S33-S56.
- Whitt-Glover, M. C., Taylor, W. C., Heath, G. W., & Macera, C. A. (2007). Self-reported physical activity among blacks: estimates from national surveys. *Am J Prev Med*, *33*(5), 412-417. doi: 10.1016/j.amepre.2007.07.024
- Whitt, M., Kumanyika, S., & Bellamy, S. (2003). Amount and bouts of physical activity in a sample of African-American women. [Research Support, U.S. Gov't, P.H.S.]. *Med Sci Sports Exerc*, *35*(11), 1887-1893. doi: 10.1249/01.MSS.0000093618.60631.C3
- Wilbur, J., Chandler, P. J., Dancy, B. L., & Lee, H. (2003). Correlates of physical activity in urban Midwestern African-American women. *Am J Prev Med*, *25*(3 Suppl 1), 45-52.
- Wilbur, J., McDevitt, J. H., Wang, E., Dancy, B. L., Miller, A. M., Briller, J., . . . Lee, H. (2008). Outcomes of a home-based walking program for African-American women. *Am J Health Promot*, *22*(5), 307-317.
- Wilcox, S., Bopp, M., Oberrecht, L., Kammermann, S., & McElmurray, C. T. (2003). Psychosocial and perceived environmental correlates of physical activity in rural and older African American and White women. *The Journals of Gerontology*, *58B*(6), P329-P337.
- Williams, A., Wold, J., Dunkin, J., Idleman, L., & Jackson, C. (2004). CVD prevention strategies with urban and rural African American women. *Applied Nursing Research*, *17*(3), 187-194. doi: 10.1016/j.apnr.2004.06.003
- Willis, B. L., Gao, A., Leonard, D., DeFina, L. F., & Berry, J. D. (2012). Midlife fitness and the development of chronic conditions later in life. *Arch Intern Med*, *172*(17), 1333-1340.

- Wilson, D. B., Porter, J. S., Parker, G., & Kilpatrick, J. (2005). Antropometric changes using a walking intervention in African American breast cancer survivors: A pilot study. *Prev Chronic Dis*, 2(2), 1-7.
- Wing, R. R., & Hill, J. O. (2001). Successful Weight Loss Maintenance. . *Ann Rev Nutr*, 21(1), 323-341.
- Wise, L. A., Adams-Campbell, L. L., Palmer, J. R., & Rosenberg, L. (2006). Leisure time physical activity in relation to depressive symptoms in the black women's health study. *Ann Behav Med*, 32(1), 68-76.
- Wolin, K. Y., Lee, I. M., Colditz, G. A., Glynn, R. J., Fuchs, C., & Giovannucci, E. (2007). Leisure-time physical activity patterns and risk of colon cancer in women. *Int J Cancer*, 121(12), 2776-2781.
- Yanek, L. R., Becker, D. M., Moy, T. F., Gittelsohn, J., & Koffman, D. (2001). Project joy: Faith based cardiovascular health promotion for African American women. *Public Health Rep*, 116(Suppl 1), 68-81.
- Young, D. R., Miller, K. W., Wilder, L. B., Yanek, L. R., & Becker, D. M. (1998). Physical activity patterns of urban African Americans. *Journal of Community Health*, 23(2), 99-112.
- Young, D. R., & Stewart, K. J. (2006). A Church-based Physical Activity Intervention for African American Women. *Family & Community Health*, 29(2), 103-117.
- Zoellner, J., Connell, C., Powers, A., Avis-Williams, A., Yadrick, K., & Bogle, M. L. (2010). Does a six-month pedometer intervention improve physical activity and health among vulnerable African Americans? A feasibility study. *Journal of Physical Activity and Health*, 7, 224-231.

CURRICULUM VITAE

Kisha Marie Virgil

EDUCATION:

Doctor of Philosophy in Health and Rehabilitation Sciences, Health Services Research – Indiana University, earned at Indiana University-Purdue University Indianapolis ▪ May, 2013

Master of Public Health, Social and Behavioral Health Science – Indiana University, earned at Indiana University-Purdue University Indianapolis ▪ August, 2009

Bachelor of Science in Community Health – University of Illinois, Urbana/Champaign, IL ▪ August, 2005

PROFESSIONAL EXPERIENCE:

Wellness Research Manager – Principal Wellness Company, Indianapolis, IN ▪ February, 2006 – Current

Graduate Assistant – Chase Near Eastside Legacy Center/IUPUI, Indianapolis, IN, ▪ August, 2011 – May, 2012

Health Coach – Principal Wellness Company, Indianapolis, IN ▪ February, 2006 – November, 2007

Health Coach – Summex Health Management (WebMD), Indianapolis, IN ▪ July, 2005 – February, 2006

TEACHING & MENTORSHIP EXPERIENCE:

Graduate Teaching Assistant – Theories of Health Promotion and Disease Prevention ▪ Fall 2009

High School Student Mentor – Mentored three Project SEED students ▪ May – July, 2012

RESEARCH EXPERIENCE:

Research/Project Coordinator – *Evaluating Physical and Emotional Health of Members of an Exercise Program Located in an Urban Setting*, IUPUI, Indianapolis, IN, October, 2010 – May, 2012

Research Assistant – *Assessing Availability, Quality, and Price of Healthy Foods throughout Marion County, Indiana*, IUPUI, Indianapolis, IN, April, 2010 – March, 2011

HONORS & AWARDS:

Selected student intern – 20th Annual Art & Science of Health Promotion Conference – 2010

Recipient of the Level II ACSM Leadership and Diversity Training Program – 2010

Selected student intern – 21st Annual Art & Science of Health Promotion Conference – 2011

FASEB MARC Travel Award Recipient – 2012

SCHOLARLY PRESENTATIONS:

Oral

- 2011 **Virgil, K.** Worksite Wellness: Renovating the Workplace. Indiana SOPHE workshop. Moderated panel presentation. Indianapolis, IN, April 2011.
- 2011 Keith, N., De Groot, M., **Virgil, K.** Campus and Community Physical Activity Partnerships to Promote Health. Midwest ACSM Regional Conference. Indianapolis, IN, October 2011.
- 2013 **Virgil, K.**, Keith, N. Health Monitoring and Social Networking: There's an App for That. Weekend U: IUPUI Department of Psychology. Indianapolis, IN, February 2013.

Poster

- 2011 **Virgil, K.**, Mushi-Brunt, C. Ending Food Disparities: Is It as Simple as Adding Large Grocery Stores? 21st Annual Art & Science of Health Promotion Conference. Colorado Springs, CO, March 2011.
- 2011 **Virgil, K.**, Greer, S. Physically Active Residential Communities and Schools (PARCS): Eliminating Barriers and Getting Active. 7th Annual Civic Engagement Showcase & Symposium. Indianapolis, IN, April 2011.
- 2011 **Virgil, K.**, De Groot, M., Greer, S., Herrera, S., Keith, N. LANDSCAPE: Learning about the Needs and Desires of a School and Community-based Activity Program Evaluation. Midwest ACSM Regional Meeting. Indianapolis, IN, October 2011.
- 2012 Keith, N., De Groot, M., Greer, S., **Virgil, K.** LANDSCAPE: Learning About The Needs And Desires Of A School And Community-based Activity Program Evaluation. 8th Annual Civic Engagement Showcase & Symposium. Indianapolis, IN, April 2012.
- 2012 Dukes, L., Stainbrook, S., **Virgil, K** (presenter). The Cost of Doing Nothing. 22nd Annual Art & Science of Health Promotion Conference. San Diego, CA, April 2012
- 2012 **Virgil, K.**, De Groot, M., Greer, S., Herrera, S., Keith, N. LANDSCAPE: Learning about the Needs and Desires of a School and Community-based Activity Program Evaluation. 2012 ACSM Annual Meeting. San Francisco, CA, May 2012.

CERTIFICATIONS:

Certified Health Education Specialist

Graduate Certificate – Public Health, Indiana University

ACSM Certified Personal Trainer

MEMBERSHIPS:

American College of Sports Medicine

Indiana Society of Public Health Education

National Commission for Health Education Credentialing, Inc.