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Evaluation of the SagePlus Steps Program to Promote Physical Activity and Decrease Cardiovascular Risk in Low-Income Women

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EVALUATION OF THE SAGE*PLUS* STEPS PROGRAM TO PROMOTE PHYSICAL ACTIVITY AND DECREASE CARDIOVASCULAR RISK IN LOW-INCOME WOMEN

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Abstract

EVALUATION OF THE SAGE*PLUS* STEPS PROGRAM TO PROMOTE PHYSICAL ACTIVITY AND DECREASE CARDIOVASCULAR RISK IN LOW-INCOME WOMEN

There is little known about the effectiveness of the Steps Program specifically used in the Sage*Plus* program in Minnesota to promote physical activity and reduce cardiovascular risk. The purpose of this study was to evaluate the effectiveness of the Sage*Plus* Steps Program for low-income middle-aged women ages 40 to 64 to meet a daily physical activity goal of 10,000 steps and reduce their cardiovascular disease risk, measured by their Framingham Risk Score. A nonexperimental, descriptive correlational design was used to guide data collection for this study. Demographic data, step counts after weeks 1, 4, 12, and 24, activity level at baseline and reenrollment, and Framingham Risk Scores at baseline and reenrollment were collected from the MDH database. Data from 174 participants was analyzed using the Statistical Package for the Social Sciences (SPSS) version 12. Analysis of the data revealed that there was poor participation and high drop out rates with step card submissions. There was a statistically significant increase in step counts from week 1 to week 4. There were also clinically significant changes in the increase in reported vigorous, moderate, and walking minutes from initial enrollment to reenrollment as well as in the net decrease in Framingham Risk Score from initial enrollment to reenrollment. While the small sample of participants who recorded steps had a higher than average number of daily steps compared to the average American, the sample's reported vigorous, moderate, and walking minutes were well below recommended levels.

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CHAPTER I

INTRODUCTION

Heart disease is the leading cause of death for American women (Centers for Disease Control [CDC], 2010b). After the age of 65, mortality from cardiovascular disease (CVD) in women is equal to that of men (Minnesota Department of Health [MDH], 2010). In Minnesota, heart disease caused 20% of all deaths and follows cancer as the second leading cause of mortality. In 2008, hospitalizations due to heart disease cost Minnesota $1.85 billion (MDH, 2010).

Physical activity has been shown to decrease risks for mortality associated with CVD (Kahn et al., 2002). Exercise has also been shown to decrease risks for stroke, type 2 diabetes, colon and breast cancers, falls, osteoporosis, and mental illness (CDC, 2008; Kahn et al., 2002). To achieve health benefits from physical activity, the CDC (2008) recommends 150 minutes each week of moderate intensity aerobic activity or 75 minutes of vigorous aerobic activity with each session lasting for at least 10 minutes at a time. However, the CDC reports that only 25% of adults in the United States (U.S.) report moderate to vigorous activity at the recommended level (Kahn et al., 2002). According to the new 2010 State Indicator Report on Physical Activity, 62.9% of Minnesotans reported that they were physically active while 17.9% reported no leisure time physical activity (CDC, 2010a). Healthy People 2020 ranked physical activity as a priority category. The first physical activity objective is to “reduce the proportion of adults who engage in no leisure-time physical activity” (U.S Department of Health and Human Services [USDHHS], 2010, p. 263).

Health promotion aims to prevent disease by focusing on three levels of prevention: primary, secondary, and tertiary (Dunphy, Winland-Brown, Porter, & Thomas, 2007). Primary prevention focuses on preventing disease and illness while secondary prevention focuses on screening to detect early disease and illness. Tertiary prevention is aimed at interventions after a disease has been established. Current efforts in policy and programming are reprioritizing the healthcare system efforts from tertiary prevention to primary prevention (USDHHS, 2010). All 10 health indicators in Healthy People 2020 focus on primary prevention. Frequently, the earlier a disease or illness is detected, the more likely the sequalae of the disease or illness is reduced. This paper focuses on a program that utilizes all three levels of prevention.

WISEWOMAN (Well-Integrated Screening and Evaluation for Women Across the Nation) is a health promotion program funded by the Centers for Disease Control and Prevention (CDC). This program is designed to improve the health status of American women. The mission of WISEWOMAN is "to provide low-income, under- or uninsured 40- to 64-year-old women with the knowledge, skills, and opportunities to improve diet, physical activity, and other lifestyle behaviors to prevent, delay and control cardiovascular and other chronic diseases" (CDC, 2011). This program provides women with heart disease risk-factor testing, lifestyle interventions, and referral to health providers at no or low cost. Currently, the program is available in 19 states and 2 tribal organizations. Sage*Plus* is the Minnesota version of the national WISEWOMAN program.

Sage and Sage*Plus* are state-funded, clinic-based health-promotion programs run by the MDH. Sage offers cervical and breast cancer screening for uninsured or underinsured women 40 to 64 years of age with subsequent diagnostics and treatment (MDH, 2011a). This program was developed in 1991 as part of the CDC's National Breast and Cervical Cancer Early Detection Program (NBCCEDP). Since 1991, the Sage Program has detected 1,610 breast and cervical cancers in Minnesota women (MDH, 2011a). Presently, Sage screening, diagnostic, and treatment services are performed at over 150 clinics throughout Minnesota.

In collaboration with Sage, the Sage*Plus* program, which was developed in 2004 as part of the CDC's WISEWOMAN program, screens, diagnoses, and treats women who have increased risks for CVD. To be eligible to participate in Sage*Plus,* women must be 40 to 64 years old, have no insurance or be underinsured, and have an income within MDH guidelines. Underinsured women are women who have insurance that does not cover screening for cardiovascular risks or who have insurance with unmet deductibles or copayments. Sage*Plus* does not cover women who have Minnesota Care or Medical Assistance because screening costs are covered under those programs. Income guidelines, which change yearly, are based on the Federal Poverty Level (FPL) for the current year. Sage*Plus* provides free blood pressure, cholesterol, blood glucose, and body mass index (BMI) screening with a free rescreening at 12 months. Women who have abnormal screenings are referred for a medical visit for further diagnosis and treatment.

Participants are offered lifestyle-counseling interventions where they set health promoting goals. The healthcare professionals who provide the lifestyle counseling interventions are encouraged by the MDH to utilize Motivational Interviewing (MI) techniques. MI is an interview-based intervention that promotes internal motivation and self-efficacy for behavior change. Discussions regarding behavior change are based on a person's stage of readiness, developed from the transtheoretical model, and are discussed within a collaborative relationship between patient and provider.

Women are also offered incentive programs to help motivate them to increase health-promoting behaviors and decrease their risks for CVD. *Smart Choices!* is a fruit and vegetable incentive program in which women are provided self-addressed stamped postcards on which they record their daily number of fruit and vegetable servings. They return the provided pre-addressed, postage paid postcards to MDH for one calendar year. According to the Sage*Plus* website, women ages 40 to 64 should eat about 1½ cups of fruit and 2 to 2½ cups of vegetables daily (MDH, 2011b). Women are rewarded with a $20 gift card for every thousand servings of fruits and vegetables they consume.

The Steps Program is another incentive program aimed at increasing daily exercise with a goal to reach 10,000 steps a day. Participants submit weekly reports with the provided pre-addressed, postage paid post-cards detailing their number of daily steps measured by a pedometer. A $20 gift card is provided to the participant once they reach one million steps. The hope is that women will increase daily fruit and vegetable intake and daily physical activity as well as gain an increased awareness of their consumption of fruits and vegetables and physical activity level.

Healthcare providers follow-up twice with the participants, within a 4-to 6-month time frame, in order to determine the progress that women have made toward their self-identified diet and activity goals, provide positive reinforcement, and help problem solve. Time spent in the program depends on the goals a woman sets at the initial counseling intervention. A monthly newsletter is also sent to participants for 1 year to promote positive health behaviors. Women are eligible to reenroll in the program when they return to the clinic for their next Sage screening appointment.

Problem Statement

Sage*Plus* is run and operated by the MDH where staff members monitor and track the program's success. While there is research on the effectiveness of MI and physical activity interventions to increase positive health behaviors, little is known about the effectiveness of the Steps Program specifically used in the Sage*Plus* program in Minnesota.

Purpose of the Study

The purpose of this study is to evaluate the effectiveness of the Sage*Plus* Steps Program for low-income middle-aged women ages 40 to 64 to meet a daily physical activity goal of 10,000 steps and reduce their CVD risk as measured by their Framingham Risk Score. Knowledge gained in this study will inform future lifestyle modification interventions for the population described.

Research Questions

1. Do women who participate in the Sage*Plus* Steps Program increase their daily step count from week 1 to week 4 to week 12 to week 24?
2. After one year, do women enrolled in the Sage*Plus* Steps Program report a change in baseline activity level?
3. Is there a change in Framingham Risk Score from initial enrollment to reenrollment in the Sage*Plus* Steps Program?
4. Is there a correlation between the change in activity level and the change in Framingham Risk Score from baseline to the one year mark?

Definition of Terms

Cardiovascular Disease Risk (CVD): The Framingham Risk Score predicts the 10-year CVD risk, which is the probability of having a CVD event in the next 10 years. The factors utilized are gender, age, smoking status, diabetes, total cholesterol, HDL, left ventricular hypertrophy, and systolic blood pressure. A CVD event includes myocardial infarction, coronary heart disease (CHD), death from CHD, stroke, CVD, and death from CVD (Anderson, Odell, Wilson, & Kannel, 1991).

Daily Step Count: The Sage*Plus* program recommends women take 10,000 steps a day. Steps are recorded on a pedometer that women wear daily. The number of steps is recorded and submitted weekly to the MDH.

Low-Income: Women are considered low income if their monthly income is equal to or less than $2,269 with an additional $796 per person living in the house. Self-employed women or farmers use household net income after business expenses.

Steps Program: The Steps Program is an incentive program aimed to increase daily exercise with a goal to reach 10,000 steps a day. Participants submit weekly reports detailing their number of daily steps measured by a pedometer worn every day. A $20 gift card is provided to the participant once they reach 1 million steps.

Assumptions

1. Pedometers worn by the participants work correctly and accurately record steps taken.
2. All participants truthfully and accurately record their number of daily steps.
3. All participants are at risk for CVD.
4. Cardiovascular risk testing is measured accurately at each recording.

Limitations

Women may have been influenced by motivating factors other than the Steps Program to increase their daily steps. Extraneous variables such as diet, stress reduction, smoking cessation, and/or medication may have played a role in reducing cardiovascular risks. BMI may not accurately represent the amount of body fat a person has. A low or high muscle mass may skew the interpretation of the BMI. Conclusions from the study are limited to low-income, un- or underinsured women between 40 and 64 years of age and are not applicable to the general population.

Summary

While the aim of the Sage*Plus* program is to increase activity level and decrease cardiovascular risk in women ages 40 to 64, little is known about the effectiveness of this program. Thus, the purpose of this study is to evaluate the effectiveness of the Sage*Plus* Steps Program in motivating low-income middle-aged women 40 to 64 to meet a daily physical activity goal of 10,000 steps, and reduce their CVD risk as measured by their Framingham Risk Score. Conceptual and operational definitions for the variables of the steps program, daily activity level, CVD risk, and low income are provided.

CHAPTER II

REVIEW OF RELEVANT LITERATURE AND THEORETICAL FRAMEWORK

The purpose of this study is to evaluate the effectiveness of the Sage*Plus* Steps Program for low-income middle-aged women to meet a daily physical activity goal of 10,000 steps, and to reduce their CVD risk. Literature from 2000 to 2011 was reviewed for this study. The following databases were utilized: Cumulative Index for Nursing and Allied Health Literature (CINAHL), Medline (PubMed), Centers for Disease Control (CDC), as well as general internet searches. Search terms employed included physical activity, exercise, pedometer, incentive programs, and women. This literature review presents the current evidence regarding physical activity, factors influencing physical activity, pedometer programs, incentivized programs, and the theoretical framework for the study.

Physical Activity

The CDC recommends that adults engage in 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous-intensity aerobic activity each week (CDC, 2008). The phrase "10,000 steps" has become a universal promotion tool to motivate people to increase their activity level. Dr. Yoshiro Hatano, the Japanese creator of 10,000 steps, posits that walking 10,000 steps is equal to walking approximately 5 miles and consumes 350-400 kcal. This level is greater than the U.S. Surgeon General's Report on Physical Activity and Health recommendation of 150 kcal per day. It is also higher than the American College of Sports Medicine (ACSM) and the CDC, which recommend 200 kcal per day (Masurier, Sidman, & Corbin, 2003; Tudor-Locke et al., 2001).

Pedometers do not measure intensity of activity so Masurier et al. (2003) wanted to determine whether 10,000 steps actually met current physical activity guidelines. For 4 weeks, 121 sedentary women recorded their steps. In addition to wearing a pedometer, 59 women were randomly selected to wear an accelerometer for one day during the study's 4th week. The accelerometer measures vertical acceleration, which according to Masurier et al. (2003), "infers the intensity of physical activity" (p. 390). Women were categorized by those who reached 10,000 steps and women who did not.

Participants who walked 10,000+ steps had more minutes of total moderate physical activity (MPA) and more continuous bouts of activity (> 5 and > 10 minutes) than the women who did not reach the 10,000 steps goal. In considering continuous activity, significantly more participants in the 10,000+ steps group achieved more than 30 minutes of MPA than the proportion of those participants in the < 10,000 steps group. However, there was no statistically significant difference between the groups in meeting current physical activity guidelines of 30 minutes of MPA on most days of the week when total MPA was considered (Masurier et al., 2003). The researchers concluded that 10,000 steps a day most likely meets current guidelines but does not guarantee that individuals accumulating 10,000 steps will attain the benefits of physical activity.

Physical Activity in U.S. Adults

Regardless of these physical activity recommendations, research illustrates that Americans are not achieving adequate levels of physical activity. Wyatt, Peters, Reed, Barry, and Hill (2005) conducted a survey to assess the number of steps adults who reside in Colorado were taking on a daily basis. For four consecutive days, 742 adults with a mean age of 44 $\pm$ .42 years and mean BMIs of 25.3 $\pm$ .18 wore a pedometer. Pedometer readings indicated that the average adult took 6,804 daily steps, 33% took fewer than 5,000 steps a day, and only16% took 10,000 daily steps. Research by Bassett, Wyatt, Thompson, Peters, and Hill (2010), which built on the research done in Colorado, was done to describe the physical activity level of U.S. adults. For two days, 1,136 people ages 13 and above wore pedometers. The mean number of steps taken was 5,117.

While Wyatt et al. (2005) examined the adult activity levels in one of the leanest states in the U.S., Sanderson et al. (2003) studied the activity levels in one of the most inactive populations. These researchers contacted 567 African American women living in rural Alabama regarding the number of minutes of moderate or vigorous exercise that they achieved in a week. Women who met recommendations engaged in “moderate activity 5 times per week for at least 30 minutes or vigorous activity 3 times per week for at least 20 minutes” (Sanderson et al., 2003, p. 30). Women were categorized as inactive if they reported no activity and insufficient if they did not meet recommendations. Thirty-nine percent of women met exercise recommendations, 46% were insufficiently active, and 15% were inactive (Sanderson et al., 2003).

All three of these studies examined specific demographic variables in relation to physical activity. While the Wyatt et al. (2005) study found that steps did not differ between men and women living in Colorado, Bassett et al.’s (2010) results were statistically significant for U.S. men taking more daily steps than U.S. women (5,340 vs. 4,912). Single people were found to be more likely to be active than partnered people (Bassett et al., 2010; Sanderson et al., 2003; Wyatt et al., 2005).

In several studies, the number of steps taken was correlated with various demographic variables. There was an inverse relationship between steps and age, but both Wyatt et al. (2005) and Bassett et al. (2010) found that participants age 40 to 49 took more steps than the 30 to 39 age group. Sanderson et al. (2003), however, found that rural African American women ages 30 to 39 were more likely to meet physical activity recommendations. As adults aged in Croteau and Richeson's (2005) study, there was a decrease in steps. The 85 and higher age group had the lowest number of steps. Income level also correlates with physical activity; the higher the income level the more likely people are to be active (Bassett et al., 2010; Wyatt et al., 2005). There were, however, conflicting findings with education level. While Bassett et al. (2010) saw a positive correlation with education, Sanderson et al. (2003) found a negative correlation, and Wyatt et al. (2005) determined that education did not affect the number of steps taken.

Wilcox, Castro, King, Houseman, and Brownson (2000) examined the differences in physical activity level between rural and urban women. These researchers surveyed 1,242 rural and 1,096 urban U.S. women ages 40 and older. They found that, in general, rural women were more sedentary than urban women. In particular, rural women who were southern, African American, and less educated, as well as older women living in both regions, were more sedentary. However, rural women from the west were more likely to be regularly active than western women living in urban areas.

Benefits of Physical Activity

It is well known that there is an inverse relationship between physical activity and CVD (Herman et al., 2006; Manson et al., 2002). Physical activity lifestyle modifications have been shown to decrease cardiovascular mortality risk factors such as hypertension and insulin resistance (Moreau et al., 2001; Swartz et al., 2003). Conversely, sedentary adults are more likely to have increased risk factors, such as obesity (Hornbuckle, Bassett, & Thompson, 2005; Tudor-Locke et al., 2001).

Hornbuckle et al. (2005) evaluated the relationship between physical activity and body composition in African American women. For 7 days, 69 nonsmoking African American women ages 40 to 65 wore a pedometer. These women were divided into physical activity levels of less than 5,000; 5,000 to 7,499; and 7,500 or more steps per day. There was a significant negative correlation between mean BMI values and physical activity levels (33.9 $\pm$ 1.5 kg x m for least active, 30.0 $\pm$ 1.0 kg x m, and 26.4 $\pm$ 1.3 kg x m or most active). BMI, percent body fat, and hip circumference variables were significantly different between the least active and most active groups. There were no significant differences among the three groups in daily calories consumed.

Tudor-Locke et al. (2001) found a negative correlation between physical activity and the body composition of a more ethnically and gender diverse group of subjects. For 21 consecutive days, 109 participants (8 African American men, 23 African American females, 33 Caucasian males, and 45 Caucasian females) wore a pedometer to measure their baseline physical activity. The results showed that steps-per-day were negatively correlated with BMI and percent body fat. Forty-one percent of participants in the lowest physical activity level ($<$ 5,267 steps/day) were considered to be obese compared to 11% of participants in the highest physical activity level ($\geq$ 9,357 steps/day). Fifty-seven participants in the highest activity level had normal BMIs while only 30% of participants had normal BMIs in the lowest activity level.

Miles and Panton (2006) conducted a 12-month study to motivate women to increase their number of daily steps to 10,000. They found that an increase of 2,000 steps per day resulted in "health benefits" (Miles & Panton, 2006, p. 383). Ten low-income obese women ages 30 to 65, who increased their steps by at least 2,000 steps per day (baseline of 6,306 to 10,870), had improvements in body weight and BMI from baseline and 3 months to 6, 9 and 12 months. The 19 women who did not achieve the 2,000-step increase (4,929 to 4,742 steps/day) did not have a change in BMI (Miles & Panton, 2006).

Walking, a common form of physical activity for women, has been shown to decrease multiple modifiable cardiovascular risks (Manson et al., 2002). In a prospective study in 2002, Manson et al. examined the preventative effects of walking compared to vigorous activity on cardiovascular risk reduction. These researchers examined the relationship between total physical activity, walking, and vigorous exercise and hours spent sitting and the incidence of cardiovascular events. This prospective study examined 73,743 postmenopausal women ages 50 to 75 with no known CVD or cancers. In 5 years and 9 months of follow-up there were 345 newly diagnosed cases of coronary heart disease (nonfatal myocardial infarction or death from coronary causes) and 1,551 total cardiovascular events (myocardial infarction, death from coronary causes, coronary revascularization, angina, congestive heart failure, stroke, or carotid revascularization). Manson et al. found that increasing physical activity had a strong inverse association with coronary events and total cardiovascular events. Walking and vigorous exercise were found to have similar reductions in CVD risk (Manson et al., 2002).

The JNC-7 is the latest guideline from the Joint National Committee on the prevention, detection, evaluation, and treatment of high blood pressure. This committee recommends lifestyle change, such as an increase in physical activity level, to reduce borderline hypertension. Moreau et al. (2001) examined the effects exercise had on blood pressure in 24 postmenopausal women with borderline to stage 1 hypertension. Fifteen women were assigned to an exercise group and 9 to a nonexercise control group. The women wore a pedometer for 26 weeks; 2 baseline weeks and 24 exercise weeks. Women in the exercise group were provided a target amount of steps that would equate to 3km in daily walking, which is the amount of walking the ACSM and CDC recommend (Moreau et al., 2001).

The researchers studied a variety of cardiovascular variables at 12 and 24 weeks. While there were no significant differences in percent body fat, abdominal and waist circumference, or sagittal diameter in the exercise group, fasting insulin was elevated by 23% at 12 weeks in the control group and remained elevated throughout the duration of the study (Moreau et al., 2001). There were significant reductions in body mass (0.9 $\pm$ 0.3 kg) at 12 weeks with an additional 0.3 kg reduction at 24 weeks in the exercise group. Systolic BP (SBP) and arterial BP were also lowered after 12 weeks in the exercise group. SBP reduced from 142 $\pm$ 3 to 136 $\pm$ 2 mm Hg and mean arterial BP was 103 $\pm$ 1 at baseline and 98 $\pm$ 2 mm Hg at 12 weeks (Moreau et al., 2001). At 24 weeks, SBP was reduced further by 5 mm Hg. There was, however, no significant change in diastolic BP. By the end of the 26 weeks, six women in the exercise group normalized their blood pressure. Four of these women were previously classified as having stage 1 hypertension. Three women also reduced their blood pressure from stage 1 hypertension into the borderline category. In all of the women who had a reduction in SBP, there were no significant differences in the women who were on antihypertensive medication and those who were not.

Positive changes in blood pressure from increased physical activity were echoed in a study by Staffileno, Minnick, Coke, and Hollenberg (2007) who examined the effects of increasing lifestyle physical activity such as walking or stair climbing had on blood pressure in 24 African American women. These sedentary women ages 18 to 45 either had normal blood pressure or were untreated for stage 1 hypertension. The women in the exercise group were to increase physical activity for 10 minutes, 3 times a day for 5 days a week at a prescribed heart rate that was 50% to 60% of their heart rate reserve. The goal of the intervention was to accumulate 150 minutes per week of physical activity for 8 weeks . These women were also given a one-hour private education session about safety, goal setting, self-monitoring, barriers, creating ways to incorporate activity into their lives, etc. The exercise group had a significant reduction in SBP (-6.4 mm HG) and also a reduction in diastolic blood pressure (-3.3 mm HG). This change was not statistically significant. However, it was clinically significant in that it moved the women from stage 1 hypertension to pre-hypertension.

Insulin resistance and glucose intolerance can cause vascular changes that can result in high blood sugar, which increases one's cardiovascular risk. Swartz et al. (2003) examined the effects of a walking program on glucose intolerance in 18 overweight inactive women aged 40 to 65 with a family history of type 2 diabetes. During a 4-week control period, participants walked 4,972 steps a day. Women then increased their steps to 9,213 in an 8-week intervention period. There were no changes in diet during this time. This increase in steps resulted in an 11% reduction in the 2-hour post load glucose tolerance test. All but two women lowered their 2-hour glucose levels and four of the women were able to normalize their 2-h glucose level.

Physical activity has also been shown to reduce relapse associated with smoking cessation, which can reduce one's risk for CVD risk. In a randomized controlled trial conducted between 2003-2006 in San Francisco by Prochaska et al. (2008), 407 adults who smoked cigarettes were given a pedometer and counseled to increase their steps by 10% biweekly toward the goal of 10,000 steps. These participants had gone through a 12-week group-based smoking cessation program with a quit date at day 3. They were then randomized into a no further treatment group or 40 weeks of buproprion or placebo with or without an 11-session relapse prevention intervention of 2 sessions at 16 and 20 weeks. The increase in moderate to vigorous physical activity (MVPA) was associated with sustained smoking abstinence at week 24 and relapse to smoking was associated with decline in activity. Among participants with sustained abstinence, increased MVPA was also associated with increased vigor and decreased perceived difficulty with abstaining from smoking.

Factors Influencing Physical Activity

There is a complexity of factors that determines an individual's engagement and commitment in health-promoting behaviors. Research identifies many determinants related to physical activity level. Barriers to physical activity may be real or perceived and be influenced by personal, social, or environmental factors. Changing an individual's perception of these barriers may reduce their influence and increase physical activity level.

The physical environment influences physical activity level. Rural women identify limited local facilities, lack of sidewalks, and uneven pavement as environmental barriers to physical activity (Eyler, 2003; Eyler & Vest, 2002). Safety in rural areas also presents barriers such as poor lighting and living on busy roads (Eyler & Vest, 2002). Deshpande, Baker, Lovegreen, and Brownson (2005) surveyed 274 adults with diabetes regarding activity levels and physical activity characteristics. Individuals who reported regular physical activity, defined as greater than or equal to 30 minutes for at least 5 days/week, were more likely to report facility use such as health clubs, parks, walking trails, recreation centers, and schools. Women who identified “many places to walk nearby”, “often walk to nearby places, “and “shoulders on streets” were more likely to engage in regular physical activity compared to their inactive counterparts.

Physical activity levels are also strongly influenced by social environment. In research performed by Eyler and Vest (2002), 33 rural women ages 20 to 50 who were not currently physically active took part in focus groups about barriers to physical activity. Care taking and family responsibilities were the most often mentioned reason for not taking time to exercise. This sample of women reported that they already had too much to do; exercising was seen as “one more thing” (Eyler & Vest, 2002, p. 117). Women also reported “feeling guilty taking time to do something just for themselves” (Eyler & Vest, 2002, p. 115). Wilcox et al. (2000) compared determinants of leisure time physical activity between 2,338 ethnically diverse rural and urban women ages 40 to 64 and women over 65 years. While rural women reported similar social barriers as the Eyler and Vest study such as care giving duties, urban women reported that a lack of time, lack of energy, and being too tired were their top three barriers to leisure time physical activity.

The literature illustrates that social support is positively related to physical activity. Eyler (2003) surveyed 1,000 women ages 20 to 50 years who lived in rural areas regarding activity level and personal, social, and environmental correlates of physical activity. Women who attended religious services or who were members of community groups were much more likely to meet activity recommendations outlined by the CDC and the ACSM.

These findings echo the findings in the Sanderson et al. (2003) study. Women considered more active in this study were twice as likely to report that they knew people who exercised and were more likely to report seeing other people exercise in their neighborhoods. They were also twice as likely to attend religious services. Women in the Eyler and Vest study (2002) reported that exercising with a friend would be a major motivating factor to increasing their physical activity level. Friends would "hold them accountable" and exercising with a friend would be more fun and make the time go by faster (Eyler & Vest, 2002, p.117).

It is important to tailor interventions that address barriers. However, the myriad of barriers makes it difficult to create standardized programs, such as the Steps Program, that reach a large percentage of women across a variety of demographics. Research illustrates that altering intrapersonal correlates may help change perceptions about barriers. Bandura (2004) postulates that increasing self-efficacy influences health behaviors "directly and through its impact on goals, outcome expectations, and perception of sociostructural facilities and impediments to health promoting-behavior" (p. 146).

Ayotte, Margrett, and Hicks-Patrick (2010) examined the relationship between "self-efficacy, outcome expectations, perceived barriers, self-regulatory behaviors, and social support with physical activity" (p. 173). Surveys focused on these variables were completed by 116 couples ages 50 to 75. The results showed that people who identified more social support had increased self-efficacy and self-regulation. Also, individuals with higher self-efficacy scores had a more positive outlook on exercise outcomes, identified fewer perceived barriers, and engaged in more self-regulatory behavior and more physical activity than people with lower self-efficacy (Ayotte et al., 2010, p. 182).

Pedometer Programs

Many of the studies discussed thus far utilized pedometers to monitor and track steps. However, pedometers have also been utilized as a motivator to increase physical activity levels. Numerous studies have shown an increase in steps with a pedometer intervention. Gubler, Gaskill, Fehrer, and Laskin (2007) found no difference in the number of steps taken between a 10,000-steps group compared to an Active, Living, Everyday program (ALED). Fourteen participants ages 31 to 66 participated in a 10-week intervention to increase physical activity. One group, consisting of seven participants, was told to gradually increase steps to 10,000 using their pedometers to track their steps. The ALED group of seven subjects went to 10 one-hour meetings, which used social cognitive theory and the transtheoretical model to promote 30 minutes of moderate intensity walking a day. At the end of 10 weeks the mean step count in the 10,000 steps group was 9,892 $\pm$ 3,690 and 9,056 $\pm$ 2,348 in the ALED program.

Pedometers were also shown to motivate older adults to increase their physical activity levels in a study by Croteau and Richeson (2005). Seventy-six subjects ages 60 to 99 living in Maine completed a 4-month walking program tailored to older adults. Subjects and facilitators designed a “Personal Action Plan” that established daily goals and ways to meet those goals. Subjects were encouraged to increase their daily steps to at least 5% over their baseline. Throughout the day participants tracked step counts with the pedometer and adjusted their daily physical activity to meet their goals. By the end of the fourth month, participants had a significant increase in steps from baseline (4,041 $\pm$ 2,824) to the end of the program (5,559 $\pm$ 3,866).

Incentivized Programs

There has been an increasing use of financial incentives to promote positive behavior change. Women, who participate in the Steps Program, receive a $20 gift card for every one million steps they report. Incentives have been shown to increase participation in health-promoting programs. In 1999, the IBM Corporation offered their employees a $150 cash rebate to participate in an online physical activity program (Herman et al., 2006). This program incorporated goal-setting, activity logging, team-based exercise activities, progress reports, and free consultations with fitness professionals. To earn the monetary incentive, participants were required to engage in at least 20 minutes of activity 3 days per week for 10-12 weeks (Herman et al., 2006). At the end of the 12 weeks, 49,568 (73.6%) of the 67,324 who participated reached the goal of 20 minutes activity 3 times per week for 10-12 weeks and received the incentive. The researchers also determined that over 53% of employees eligible to participate in this program enrolled and participated in this program. This participation rate surpassed the participation rate of most on-site physical activity programs, which they deduced to be around 20%.

Incentives have also shown the ability to motivate individuals to increase positive health behaviors. Volpp et al. (2008) specifically showed that incentives motivated people to lose weight. Fifty-seven obese subject ages 30 to 70 were randomized to a monthly weight group, a “lottery incentive program”, or a “deposit contract” to lose 1 lb. a week for 16 weeks (Volpp et al., 2008, p. 2631). Participants in the deposit group contributed $0.01-$3.00 each day for a month. Researchers matched participants’ contributions and added $3 a day. If they met the weight loss goal at the end of the month, they were refunded their daily deposits. Those in the incentive group were able to win a daily lottery of $3 per day if they had met their weight loss goal. There were also large awards of $100 and other smaller awards $10. The control group participated in a weight loss program with monthly weigh-ins. At the end of the 16 weeks, participants in both incentive groups lost significantly more pounds than the control group. About half of the participants in the incentive groups lost the 16-pound weight loss goal while only 10.5% reached the goal in the control group.

Theoretical Framework

Nola J. Pender developed the Health Promotion Model in reaction to her disenchantment with a health-care model that was more reactive than proactive; namely, health interventions occurred only during time of illness or after chronic disease had already compromised a person’s quality of life. Pender deduced that health was “positive, comprehensive, unifying and humanistic” and believed in the health of the whole person (Peterson & Bredow, 2009, p. 292). She defined health as the “actualization of inherent and acquired human potential through goal-directed behavior, competent self-care, and satisfying relationships with others, while adjustments are made as needed to maintain structural integrity and harmony with relevant environments” (Peterson & Bredow, 2009, p. 292).

This conceptual model is based on social cognitive theory and expectancy value theory. Social cognitive theory proposes that there is a positive correlation with self-efficacy and behavior change; the greater a person believes that he/she can practice positive health behaviors the more likely that the person will incorporate them into his/her daily life. Expectancy value theory posits that an individual is more likely to work toward a goal that they value and in which he/she thinks is achievable (Peterson & Bredow, 2009).

Her model is a framework that offers providers, specifically nurses, a method to assess health-promoting behaviors and identify patient characteristics that influence these behaviors. Health-promoting behaviors may be diet, exercise, smoking cessation, and stress management. Interventions based on Pender's Health Promotion Model are designed to alter patient perceptions of these concepts resulting in an increase in health promotion behaviors (Peterson & Bredow, 2009).

Summary

This literature review examined the current state of research regarding physical activity recommendations, the physical activity level of U.S. adults, cardiovascular benefits of physical activity, factors influencing physical activity, and pedometer and incentive program utilization to motivate adults to increase positive health-promotion behaviors. The literature illustrates that American adults are not achieving the recommended levels of physical activity, and this sedentary lifestyle is contributing to an increase in risk factors associated with mortality from CVD. Physical activity level is influenced by environmental, interpersonal, and intrapersonal correlates. Motivating individuals to increase positive health-promoting behaviors has proved difficult, but the research illustrates that utilizing pedometers and incentives may directly and indirectly influence the myriad of factors, such as perceived self-efficacy and expected value, that change perceptions of barriers and increase motivation toward positive behavior change.

CHAPTER III

METHODOLOGY

The purpose of this study is to evaluate the effectiveness of the Sage*Plus* Steps Program for low-income middle-aged women ages 40 to 64 to meet a daily physical activity goal of 10,000 steps and to reduce their CVD risk as measured by their Framingham Risk Score. Knowledge gained in this study will inform future lifestyle modification interventions for the population described. This chapter will review the methodology surrounding the research and will discuss the research design, population, ethical considerations, measurement, data collection, data analysis, and limitations.

Design

A nonexperimental, descriptive correlational design will be used to guide data collection for this study. A descriptive design is used to gain further insight into a particular phenomena and to provide the researcher with a clear picture of what is occurring. Descriptive designs do not suggest causality. A correlational design examines relationships between the variables in a single group to determine a positive or negative relationship (Burns & Grove, 2009). This design was chosen because a descriptive correlational design provides the researcher with insights on the relationships between variables and determines the degree and direction of correlations between variables of interest. However, this design does not establish a definitive cause and effect relationship between variables.

Population

The sample population for this study includes women who have participated in the Sage*Plus* Steps Program and who have reenrolled in the Sage*Plus* program between 12 and 13 months of their initial enrollment. Eligibility criteria for participation in the Sage*Plus* program include women ages 40 to 64 years old, no insurance or being underinsured, and a monthly income less than $2,269 for one person with an additional $796 per person living in the house. The desired sample size for this study is a minimum of 100 women. Dates of reenrollment are one year between April 2008 and April 2011.

Ethical Considerations

IRB approvals were obtained from Minnesota State University, Mankato (see Appendix A) and the MDH (see Appendix B) prior to data collection. When women enrolled in the Sage and Sage*Plus* program, they gave permission for release of information to the MDH's Sage and Sage*Plus* screening program. Informed consent was not necessary as there was no contact with participants. A numeric code to de-identify data and protect participant confidentiality was assigned to every Sage*Plus* screening form. For this study, a key was utilized that will assign a numeric code to the numbers designated by MDH; this researcher did not have access to identifying information. Data inclusion did not affect an individual's participation in the Sage*Plus* Program. There was no way to identify individual participants or their data in any reports generated by this study. The researcher only shared group data and analysis information with the MDH. Data collected was saved on the researcher's password protected computer. The key will be stored in the MSU office of the principal investigator, Diane Witt, until 2 years after the completion of the study upon which it will be destroyed. This office will be locked when not occupied.

Measurement

Participants complete a screening form at the initial Sage*Plus* appointment with the provider. Completed forms are submitted to the participating clinic that same day which are then submitted to the MDH. Demographic variables, including age, race, language spoken, health insurance status, highest level of education, and monthly income, are documented on this screening form. Baseline activity level is also documented on this form. Participants are asked the following questions: (a) During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?; (b) How much time did you usually spend doing vigorous activities on one of those days?; (c) During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles at tennis?; (d) How much time did you usually spend doing moderate physical activities on one of those days?; (e) During the last 7 days, on how many days did you walk for at least 10 minutes at a time?; and (f) How much time did you usually spend walking on one of those days? These questions are asked again at the time of reenrollment. After the baseline visit and upon reenrollment, the woman's CVD risk is calculated using the Framingham Risk Score. Gender, age, smoking status, diabetes, total cholesterol, HDL, left ventricular hypertrophy, and systolic blood pressure are utilized to calculate this score. This method has been previously described by Anderson et al. (1991). Daily steps are assessed from the weekly postcards women send in with daily step counts from the previous week.

Data Collection

Data was collected from the MDH database with the assistance of an MDH employee, Mike Malone. Demographic data collected included race, health insurance status, age, percentage of FPL, smoking status, and educational level. Activity level at baseline and reenrollment, steps after weeks 1, 4, 12, and 24, and Framingham Risk Scores at baseline and reenrollment after one year were also gathered from the database and copied to an excel spreadsheet.

Data Analysis

Descriptive and correlational statistics were calculated using the Statistical Package for the Social Sciences (SPSS) version 12 to analyze the data. Race, smoking status, and health insurance status were at the nominal level of measurement and were analyzed utilizing nonparametric statistics such as frequency counts. Age and FPL were at the interval level of measurement and were analyzed utilizing means, standard deviations, and range. Educational level was at an ordinal level of measurement and nonparametric statistic such as frequency counts were used to analyze this data.

The number of steps taken and Framingham Risk Score were at the interval level of measurement. A *t*-test was utilized to assess the mean daily step counts at the end of week 1, week 4, week 12, and week 24. Activity level was measured by the number of days of moderate and vigorous activity in a week multiplied by the number of minutes of total moderate and vigorous activity. Walking minutes was measured by multiplying the number of days spent walking by the minutes spent walking at one time. Mean differences were calculated by subtracting reenrollment data from baseline data. A *t*-test was also used to determine if there was change in the Framingham Risk Score from baseline to reenrollment at one year. A Pearson's Product Moment Correlation Coefficient was used to determine if a relationship exists between the change in vigorous and moderate physical activity level and walking and the change in Framingham Risk Scores.

Limitations

Women may have been influenced by motivating factors other than the Steps Program to increase their daily steps. Extraneous variables such as diet, stress reduction, smoking cessation, and/or medication may have played a role in reducing cardiovascular risks. BMI may not accurately represent the amount of body fat a person has. A low or high muscle mass may skew the interpretation of the BMI. Conclusions from the study are limited to low-income, un- or underinsured women between 40 and 64 years of age and are not applicable to the general population.

Summary

A nonexperimental, descriptive correlational design was used to guide data collection for this study. The sample population for this study included a minimum of 100 women who have participated in the Sage*Plus* Steps Program and who have reenrolled in the Sage*Plus* program between 12 and 13 months of their initial enrollment. After obtaining IRB approval, a numeric code was used to de-identify information to protect participants' confidentiality and data will be locked in the principal investigator's office for a period of 2 years after completion of the study upon which it will be destroyed. Demographic data collected included race, health insurance status, age, smoking status, percentage of the FPL, and educational level. Activity level at baseline and reenrollment, steps after weeks 1, 4, 12, and 24, and Framingham Risk Scores at baseline and reenrollment were also gathered. This data was analyzed using descriptive and inferential statistics. Limitations include the influence of extraneous variables and misleading BMI scores. Conclusions from the study are limited to low-income, un- or underinsured women between 40 and 64 years of age and are not applicable to the general population.

CHAPTER IV

RESULTS OF THE ANALYSIS

The purpose of this study is to evaluate the effectiveness of the Sage*Plus* Steps Program for low-income middle-aged women ages 40 to 64 to meet a daily physical activity goal of 10,000 steps and reduce their CVD risk as measured by their Framingham Risk Score. Knowledge gained in this study will inform future lifestyle modification interventions for the population described. This chapter describes the sample population, data analysis, results, and summary of the findings.

Sample

The sample population for this study included women who participated in the Sage*Plus* Steps Program and who reenrolled in the Sage*Plus* program between 12 and 13 months of their initial enrollment from April 2008 to April 2011. Eligibility criteria for participation in the Sage*Plus* program include women ages 40 to 64 years old, no insurance or being underinsured, and a monthly income less than $2,269 for one person and an additional $796 per person living in the house. This created a pool of 174 participants for this study.

The mean age of participants was 50.86 with a range from 40 to 64 years old. Of the 172 participants who recorded insurance status, 144 (83.7%) did not have insurance and 28 (16.3%) had insurance. The income level of the women ranged from 0 to 230% of the FPL. Out of the 174 Sage*Plus* participants, 107 participants were less than 100% of the FPL.

The participants were racially diverse but not representative of the general population of Minnesota. There were 80 (47.3%) Hispanic participants, while 61 (36.1%) were Caucasian, 14 (8.3%) were Asian, 13 (7.7%) were Black, and 1 (0.6%) was Native American. Of these 174 participants, five did not record their race. This sample was not representative of Minnesota's demographics. According to the U.S. Census Bureau (2010), Minnesota's population is 85.3% Caucasian, 5.2% Black, 4.7% Hispanic or Latino, 4% Asian, and 1.1% American Indian or Alaskan Native. Minorities represented a greater percent in the sample population compared to Minnesota's population; Caucasians were represented much less in the sample. There were 10 times more Hispanic and 2 times as many Asians in the study than in the general Minnesota population.

There were 42 participants (24.1%) who had an education level less than 9th grade and 23 participants (13.2%) who reported some high school education, grade 9 to 11. There is a large disparity between high school graduates within this sample and the data related to average graduation rates reported to the U.S. Census Bureau from 2005-2009. In this sample, there were 107 (62.6%) high school graduates, while 91.1% of all Minnesotans 25+ years or older received high school diplomas (U.S Census Bureau, 2010). There were 63 (36.2%) of the 174 participants who had some college level education or technical school training but did not have a degree. Seven participants (4%) recorded that they either had an associate's degree (2-yr), bachelor's degree (4-yr.) or post graduate degree. This percentage of participants with college level degrees is much lower than the 31.2% of Minnesotans who reported a bachelor's degree or higher (U.S. Census Bureau, 2010).

Data Analysis

Research Question One

The first research question was the following: Do women who participate in the Sage*Plus* Steps Program increase their daily step count from week 1 to week 4 to week 12 to week 24?

When examining the data, it was evident that there was a decline in the submission of step counts via postcards as the weeks in the program progressed. There were 72 Sage*Plus* participants who recorded steps for both week 1 and week 4, 57 Sage*Plus* participants who recorded for weeks 1, 4, and 12, and 40 Sage*Plus* participants who recorded for weeks 1, 4, 12, and 24. Data was also analyzed to include the change in step counts after week 1 and week 24 in the group of 40 women in order to illustrate the change in steps throughout a 24-week period.

Between weeks 1 and 4, participants increased their mean number of steps taken from 7,950 to 8,609 for a mean increase of 659 steps. Between weeks 4 and 12, participants increased steps taken from 8,562 to 9,495, for a mean increase of 933 steps. Between weeks 12 and 24, there was a decrease number of steps taken from 9,156 to 8,125 steps for a mean decrease of 1030 steps. For the group of 40 women who returned step cards after weeks 1, 4, 12, and 24, there was a mean increase of 765 steps. Tables 1-4 display these results.

Table 1 shows that only the increase in the average number of steps from week 1 to week 4 was statistically significant at $p < .05$. There was no statistical significance for the change in step counts from week 4 to week 12 or from week 12 to week 24. There was also no statistical significance for the change in step counts of the 40 women from week 1 to week 24.

Table 1

Paired t-test for Average Number of Steps for Weeks 1 and 4

Week	N	Mean	Std. Dev.	*t*	df	Sig. (2-tail)
1	72	7950	4866.39	-2.161	71	.034
4	72	8609	5541.06			

Table 2

Paired t-test for Average Number of Steps for Weeks 4 and 12

Week	N	Mean	Std. Dev.	*t*	df	Sig. (2-tail)
4	57	8562	5524.11	-1.855	56	.069
12	57	9495	8050.60			

Table 3

Paired t-test for Average Number of Steps for Weeks 12 and 24

Week	N	Mean	Std. Dev.	*t*	df	Sig. (2-tail)
12	40	9156	9422.60	1.039	39	.305
24	40	8125	4486.05			

Table 4

Paired t-test for Average Number of Steps for Weeks 1 and 24

Week	N	Mean	Std. Dev.	*t*	df	Sig. (2-tail)
1	40	7361	4983.05	-1.517	39	.137
12	40	8125	4486.05			

Research Question Two

The second research question was: After one year, do women enrolled in the Sage*Plus* Steps Program report a change in baseline activity level? Tables 5-7 represent the results of the analysis. The results showed that there was a change in the number of reported minutes of vigorous, moderate, and walking activity. The sample of 174 women reported a mean of 20.52 minutes of vigorous activity per week during the initial enrollment in the Sage*Plus* Program, with a range of 0 to 480 minutes, and a mean of 28.77 minutes per week at reenrollment, with a range of 0-600 minutes. On average, these participants increased vigorous activity by a mean of 8.25 minutes with a range of -435 to 600 minutes. This change was not statistically significant.

Table 5

Paired t-test for Change in Minutes of Vigorous Activity After 1 Year

Score	N	Mean	Std. Dev.	*t*	df	Sig. (2-tail)
Initial	174	20.52	70.21	-1.241	173	.216
Second	174	28.77	79.04			

Moderate activity was performed at a mean of 25.52 minutes per week at initial enrollment, with a range of 0 to 480 minutes, and a mean of 36.05 minutes at reenrollment, with a range of 0 to 480 minutes. These participants increased minutes of moderate activity by a mean of 10.5 minutes, with a range of -420 to 480 minutes. This change was not statistically significant.

Table 6

Paired t-test for Change in Minutes of Moderate Activity After 1 Year

Score	N	Mean	Std. Dev.	*t*	df	Sig. (2-tail)
Initial	174	25.52	63.58	-1.530	173	.128
Second	174	36.05	86.59			

Participants walked a mean of 50.78 minutes per week at initial enrollment, with a range of 0 to 900 minutes, and a mean of 58.63 minutes at reenrollment, with a range 0 to 600 minutes. This sample increased walking minutes by a mean of 7.85, with a range of -900 to 540 minutes. This change was not statistically significant.

Table 7

Paired t-test for Change in Minutes of Walking After 1 Year

Score	N	Mean	Std. Dev.	*t*	df	Sig. (2-tail)
Initial	174	50.78	100.72	-.826	173	.410
Second	174	58.63	97.44			

Research Question Three

Research question three was: Is there a change in Framingham Risk Score from initial enrollment to reenrollment in the Sage*Plus* Program? Scores were recorded for 163 participants at enrollment and reenrollment. Table 8 represents the results of the analysis. Results showed a Framingham Risk Score mean of .081 (8.1%) at enrollment with a range of .00 (0.0%) to .65 (65%) and .077 (7.7%) at reenrollment with a range of .0053 (0.53%) to .43 (43%). Although there was a decrease in the Framingham Risk Score, the change was not statistically significant (0.381).

Table 8

Paired t-test of Framingham Risk Score After 1 Year

Score	N	Mean	Std. Dev.	*t*	df	Sig. (2-tail)
Initial	163	.08126	.08004	.879	162	.381
Second	163	.07651	.06790			

Research Question Four

The last research question was asked was: Is there a correlation between the change in activity level and the change in Framingham Risk Score from baseline to the one year mark? Framingham Risk Scores were recorded for 163 of 174 women participating in the study. Using Pearson's Product Moment Correlation, results showed that there were no statistically significant correlations between the change in the Framingham Risk Score and the change in the number of vigorous minutes of activity (-.037), the number of moderate minutes of activity (-.004), or the change in minutes of walking minutes (-.002). See Table 9 for these results.

Table 9

Correlations Between Change in Framingham Risk Score and Change in Activity Level and After One Year

		Difference in Number of Vigorous Minutes of Activity	Difference in Number of Moderate Minutes of Activity	Difference in Number of Walking Minutes of Activity
Difference in Framingham Risk Score	Pearson Correlation Sig. (2 tailed)	-0.37 .635	-.004 .961	-.002 .976
	N	163	163	163

Additional Findings

Data analysis showed that out of 174 participants who received lifestyle coaching and enrolled in the Steps Program, only 78 participants (44.8%) of the sample recorded their steps and sent them to the MDH on the pre-addressed postcards. Over half of the sample did not report any step counts to MDH. It was shown that many of the 78 participants who sent step counts stopped sending the cards to the MDH as time progressed. This can be seen Tables 1-3. The 78 participants recorded steps for an average of 24.55 weeks with a range of 2-49 weeks.

Summary

This study was performed to evaluate the effectiveness of the Sage*Plus* Steps Program for low-income middle-aged women ages 40 to 64 to meet a daily physical activity goal of 10,000 steps and reduce their CVD risk as measured by their Framingham Risk Score. The sample included 174 women. This sample was primarily Hispanic with a large mix of very educated and undereducated women. The number of steps increased from week 1 to week 4 and from week 4 to week 12. However, steps decreased from week 12 to week 24. The only statistically significant change was the increase in steps from week 1 to week 4. While there was a slight increase in the number of vigorous, moderate, and walking minutes per week from initial enrollment to reenrollment, this change was not statistically significant. Framingham Risk Score at reenrollment decreased but not enough to be statistically significant. There was no significant correlation between the increase in weekly minutes of vigorous, moderate, and walking activity and the decrease in the Framingham Risk Scores. Additional findings showed a poor participation rate and a large drop-out rate. There were no participants who recorded steps for the entire year of the program.

CHAPTER V

DISCUSSIONS AND CONCLUSIONS

The purpose of this study was to evaluate the effectiveness of the Sage*Plus* Steps Program for low-income middle-aged women ages 40 to 64 to meet a daily physical activity goal of 10,000 steps and reduce their CVD risk as measured by their Framingham Risk Score. Knowledge gained in this study will inform future lifestyle modification interventions for the population described. The research questions were: (a) Do women who participate in the Sage*Plus* Steps Program increase their daily step count from week 1 to week 4 to week 12 to week 24? (b) After one year, do women enrolled in the Sage*Plus* Steps Program report a change in baseline activity level? (c) Is there a change in Framingham Risk Score from initial enrollment to reenrollment in the Sage*Plus* Steps Program? and (d) Is there a correlation between the change in activity level and the change in Framingham Risk Score from baseline to the 1-year mark?

This chapter discusses the results of the study. Conclusions are made and the scope and limitations are described. This chapter discusses the implications for practice and research and a summary is provided.

Discussion and Conclusion

Research Question One

The first research question was: Do women who participate in the Sage*Plus* Steps Program increase their daily step count from week 1 to week 4 to week 12 to week 24? Of 174 participants who enrolled in the Steps program, there were only 78 participants (44.8%) who submitted their step counts to the MDH on the provided postage paid postcards at any point during the enrollment year. Of those 78 participants, 72 recorded steps at week 1. To be included in the data analysis, a woman had to provide data for each pair of weeks. The data showed that many of the participants in the sample stopped recording steps as the enrollment year progressed. There were 72 participants who recorded steps for both week 1 and week 4, 57 participants who recorded steps for weeks 1, 4, and 12, and 40 participants who recorded steps for weeks 1, 4, 12, and 24. To better understand the step counts of participants over the course of 6 months, data was analyzed to include those participants who recorded step counts after weeks 1, 4, 12 and 24. There were only 40 participants in this sample group.

Between weeks 1 and 4, participants increased their mean number of steps taken from 7,950 to 8, 609 steps for a mean increase of 659 steps. Between weeks 4 and 12, participants increased steps taken from 8,562 to 9,495 for mean increase of 933 steps. Between weeks 12 and 24, there was a decrease in the mean number of steps taken from 9,156 to 8,125 for a mean decrease of 1030 steps. For the participants who returned step cards after weeks 1, 4, 12, and 24 there was a mean increase of 765 steps from week 1 to week 24.

The only statistically significant finding in the change in step counts was the increase of 659 steps between weeks 1 and 4. This could have resulted because of the larger sample size of 72 participants in weeks 1 and 4.

Participants may have increased their daily steps between weeks 1 and 4 and between weeks 4 and 12 because they were highly motivated at the beginning of the program. The novelty of the program and the pedometer, as well as the monetary incentive, may have played a direct and indirect role in increasing motivation to increase steps. As postulated in the conceptual framework, there is a complexity of factors that determine an individual's engagement and commitment in health promoting behaviors. As the program progressed, there may have been environmental, interpersonal, and/or intrapersonal factors that altered participants' perceptions about barriers that prevented them from increasing step counts or continuing to report their steps to the MDH. While participants who continued to record steps had high step counts and could realistically increase step counts to 10,000, it appears that the pedometer and/or the financial incentive did not motivate participants to increase step counts to this recommended goal. There is no way to know if the 96 participants who did not fill out cards or those who dropped out as the weeks progressed increased their activity or not at any point during the enrollment year.

As part of the program, providers follow up twice with participants within a 4-to 6-month time frame to assess the progress they have made toward their self-identified goals, to provide positive reinforcement, and to help solve problems. While there were 40 highly motivated participants who continued to record their steps at week 12 and week 24, provider follow-up during that time frame was not enough to prevent a decrease in step counts. It would be interesting to learn in what week the decrease in steps began. A follow-up, ideally with motivational interviewing, during the week step counts began to decline may help motivate participants to overcome barriers enough to continue to increase step counts.

While not statistically significant, there may be clinical significance in changes in step counts. Miles and Panton (2006) showed that increasing steps by 2,000 a day had improvements in body weight and BMI. Participants who did not achieve the 2,000-step increase did not have a change in BMI. Regardless of statistical significance an increase of 659 steps may not have provided any significant health benefits for this sample.

Research Question Two

The second research question was: After one year, do women enrolled in the Sage*Plus* Program report a change in baseline activity level? The results showed that there was a change in the reported average minutes of vigorous, moderate, and walking activity. Participants reported an average of 20.52 minutes of vigorous activity per week during initial enrollment and 28.77 minutes per week at reenrollment. Moderate activity was performed at an average of 25.52 minutes per week at enrollment and 36.05 minutes at reenrollment. Participants walked 50.78 minutes per week at enrollment and 58.63 minutes at reenrollment. Participants increased vigorous activity by a mean of 8.25 minutes, moderate activity by 10.5 minutes, and walking minutes by 7.85. These increases in minutes, however, were not statistically significant.

The CDC recommends that adults should engage in 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous-intensity aerobic activity each week (CDC, 2008). While there were participants in the sample who achieved the recommended levels of physical activity, on average, this sample of participants did not achieve the current recommendations. While there are no guidelines regarding what level of activity is considered sedentary, the average amount of time of vigorous and moderate physical activity in this sample is so low that one may consider this sample to be sedentary.

While the sample may not have achieved recommended levels of physical activity and the change in reported activity from initial enrollment and reenrollment was not statistically significant, there is clinical significance. As healthcare providers, we encourage our patients to increase their physical activity levels and after participation in the Sage*Plus* Steps Program, this sample of women did have a net increase in reported physical activity.

The average of number walking minutes per week was almost double that of time spent in vigorous and/or moderate activity. This data may show that this population of participants may be more inclined to walk. Walking is highly publicized by public health campaigns and during provider visits as an easy way to increase physical activity. Facilities to perform more intense forms of exercise like exercise classes or participating in team sports may not be financially accessible to this population (Eyler, 2003; Eyler & Vest, 2002). Older participants may also be more inclined to walk rather than perform more intense forms of exercise due to debilitating health conditions like arthritis. Low-income women may be more inclined to walk due to high transportation costs. However, it would appear women in the sample would have had more minutes of walking if they utilized walking as their mode of transportation; harsh Minnesota winters may have deterred women from walking more.

Research Question Three

The third research question was: Is there a change in Framingham Risk Score from initial enrollment and reenrollment in the Sage*Plus* Steps Program? The Framingham Risk Score utilizes gender, age, smoking status, diabetes, total cholesterol, HDL, left ventricular hypertrophy, and systolic blood pressure. This score reflects the 10-year CVD risk, which is the probability of having a CVD event in the next 10 years.

There were 163 participants whose Framingham Risk Score was calculated and recorded by MDH at both initial enrollment and reenrollment. Results showed a Framingham Risk Score mean of .081 (8.1%) at enrollment with a range of .00 (0.0%) to .65 (65%) and .077 (7.7%) at reenrollment with a range of .0053 (0.53%) to .43 (43%). These results showed that at enrollment participants in this sample had an 8.1% chance of having a cardiovascular event in the next 10 years and at reenrollment cardiovascular risk dropped to 7.7%. Although there was a decrease in Framingham Risk Score, the change was not statistically significant (0.381).

This result shows that the Framingham Risk Score was not significantly affected by participation in the Sage*Plus* Steps Program. These results could be explained by the lack of participation in the program. There were only 78 (44.8%) participants who recorded any step counts and only 40 participants of the 78 who returned postcards at week 24. Neglecting to send in step counts throughout the year does not mean that participants were not engaging in physical activity. There were 174 women who reported vigorous, moderate, and walking minutes of activity at initial enrollment and reenrollment of the Sage*Plus* Program. There was a small net increase in this reported physical activity, which may have resulted in the small net decline in the Framingham Risk Score. It should also be noted that the highest Framingham Risk Score at initial enrollment dropped from 65.1% to 42.6% at reenrollment. This drop in Framingham Risk Score is clinically significant. Increased participation in recording step counts, however, may further reduce the average Framingham Risk Score for this sample.

Variables that cannot be controlled such as age and gender may have a large influence on Framingham Risk Scores. Extraneous variables such as diet, stress, and smoking status may also influence scores. Of 174 participants, there were 15 participants who smoked at enrollment and 11 who reported smoking at reenrollment. While these numbers most likely did not affect the Framingham Risk Scores in this sample, it may be important to look more closely at these variables and whether there is a correlation with Framingham Risk Scores. Lifestyle coaching is provided on diet, physical activity, and smoking cessation for participants found to be at risk for CVD. Dietary changes or smoking cessation could be correlated with the decline in the Framingham score; however, it was beyond the scope of this study to explore those variables. Considering that a large portion of this sample is Hispanic, a language barrier may have also prevented participants from making the suggested activity changes or completing the step count postcards. Overall, there was a small decrease in risk and continued participation in the program may continue to decrease this risk to statistically significant levels.

Research Question Four

The last research question was: Is there a correlation between the change in activity level and the change in Framingham Risk Score from baseline to the one year mark? Using Pearson's Product Moment Correlation, there were no statistically significant correlations between the change in the Framingham Risk Score and the change in the number of vigorous minutes of activity (-.037), the number of moderate minutes of activity (-.004), or the change in minutes of walking (-.002).

The Steps Program is aimed at increasing daily physical activity to decrease risks associated with cardiovascular events such as myocardial infarctions and strokes. While there was an increase in reported activity level and a decrease in Framingham Risk Scores, they were not significant enough to create a strong correlation. The results posit that the change in Framingham Risk Score cannot be attributed to the changes in activity level reported by the participants.

The literature illustrates that physical activity modifications have been shown to decrease cardiovascular mortality risk factors (Moreau et al., 2001; Swartz et al., 2003). Manson et al. (2002) found that increasing physical activity had a strong inverse relationship with coronary events and total cardiovascular events. It is not known, however, how much physical activity influences certain variables that compose the Framingham Risk Score. On average, these participants were not achieving the recommended levels of physical activity. It is possible that a larger increase in physical activity closer to recommended levels was required to affect the variables that compose the Framingham Risk Score thus reducing cardiovascular risk.

Discussion of Other Findings

Poor Participation

Of the 174 participants in the sample, only 78 participants (44.8%) reported their steps. There were 96 participants (55.2%) who enrolled in the Steps Program but never returned a step count postcard. It is important to explore why participants enrolled in the Steps Program and did not follow through with reporting their steps. It is possible that participants felt pressured to enroll in an intervention program but did not have any interest in participating. Clinics may not have been supplied with step cards, pedometers, or program materials. Participants may not have been able to set-up or utilize the pedometers because they were not set-up or shown during the lifestyle coaching visit. Pedometers may have malfunctioned or the participants may have lost them. Almost half of the participants were Hispanic. A language barrier may have existed between patient and provider and/or with the materials provided. A quarter of the sample had an education level below 9th grade so the literacy level of the educational materials may have been too advanced for these participants to understand the program.

High Drop Out Rates

Of 174 participants, there were only 72 participants who reported step counts after week 1 and week 4. There were 57 participants who reported step counts after weeks 1, 4, and 12, and 40 participants who reported steps after weeks 1, 4, 12, and 24. While on average these participants did not significantly increase step counts throughout the 6 months or reach the recommended level of 10,000 steps, the mean step counts were relatively high. The participants who continued to report their steps may have done so because they were achieving high steps counts. Ayotte et al. (2010) found that individuals with higher self-efficacy scores had a more positive outlook on exercise outcomes, identified fewer perceived barriers, and engaged in more self-regulatory behavior and more physical activity than people with lower self-efficacy (p. 182). Results from Ayotte et al. (2010) echo the concepts in the theoretical framework of this study. These participants may have felt high levels of self-efficacy, which motivated them to continue to record steps. It would be interesting to see the baseline step counts recorded at day 1 for the participants who continued to recorded step counts. These participants may have had a high daily step count at baseline and were motivated to continue the behavior they were already doing. Through this analysis, it appears that an individual doing well in an incentivized program may be more inclined to continue to participate in the program. Participants not recording may have stopped participating because they were not achieving high step counts and felt discouraged or embarrassed to send in their step counts to the MDH.

Upon enrolling in the Steps Program, participants receive cards packaged for 52 weeks on which to report their daily steps. The mean weeks of recorded steps was 24.55 with a range of 2-49 weeks. The data shows that less than 25% of the sample population recorded steps at 6 months and of 78 participants, there was no woman who completed the 52 weeks.

Financial incentives have been shown to increase participation in health-promoting programs and motivate individuals to increase positive health behaviors (Herman et al., 2006; Volpp et al., 2008). This researcher was unable to find data in the literature regarding completion rates of incentivized programs. Women, who participated in the Steps Program, received $20 for every one million steps they report. It is possible considering that less than 25% of the women reported steps at the halfway point in the program that the incentive is not meeting its objective. Expectancy value theory, which is the cornerstone of Pender's Health Promotion Model, posits that an individual is more likely to work toward a goal they value and in which they think is achievable (Peterson & Bredow, 2009). One million steps may appear intimidating for participants at sedentary physical activity levels and may prevent them from continuing with the program. It may be beneficial to alter the incentive to achieve higher participation and completion rates. Incentives could be given in 4-week, 12-week, and 24-week increments. Incremental goals may be perceived to be more achievable.

Activity Level

Research illustrates that Americans are not achieving recommended levels of physical activity (Bassett et al., 2010; Wyatt et al., 2005). The goal of 10,000 steps per day was not achieved by most of the participants in this study. These results echoed conclusions in the literature. Wyatt et al. (2005) found residents of Colorado had a mean step count of 6,804. Bassett et al. (2010) concluded that Americans took an average of 5,117 steps per day. Participants in this study were achieving more steps than those in the above studies. However, not all the participants in the sample of 174 were represented in the data analysis for this question. The small sample size should be considered when making conclusions about the level of activity compared to the average level of activity reported in the literature.

Scope and Limitations

There were several limitations in this study. Conclusions from the study are limited to participants in the sample population and are not applicable to the general population.

There was a small sample size of participants who reported their steps through 6 months and conclusions regarding step counts and increases in steps do not reflect the larger sample of participants who enrolled in the Steps Program. Expanding reenrollment either before or beyond 12-13 months may have provided a more accurate reflection of this population's step counts. Participants also may have been influenced by motivating factors other than the Steps Program to increase their daily steps. Knowing whether women achieved their personal goals would have provided a more accurate reflection on the effectiveness of the Steps Program.

It was found during analysis that participants were not reporting data consistently. For example, 124 participants recorded that they had 0 days of vigorous activity but 132 participants from the same sample reported that they 0 minutes of vigorous activity. This discrepancy was also seen in reported days and weekly minutes of moderate activity and walking minutes at enrollment and reenrollment. A language barrier or poor instructions could have caused this. It may be beneficial for either the medical assistant rooming the patient or the provider to review forms either with the patient or after she has completed the forms. There was a participant who reported a step count of 346, 442, which is highly unlikely. This could have been a data entry error to the MDH database.

Extraneous variables such as diet, stress reduction, smoking cessation, and/or medication may have played a role in reducing cardiovascular risk scores. Body mass index (BMI) may not accurately represent the amount of body fat a person has. A low or high muscle mass may skew the interpretation of the BMI and the Framingham Risk Score.

Implications for Practice

This study reveals that individuals may need more incentives to overcome barriers to change behavior. Providers may need to play a larger role in addressing environmental, interpersonal, and intrapersonal barriers associated with physical activity. Continuity of care with a provider who utilizes motivational interviewing and patient-provider mutuality may augment incentivized programs aimed at behavior change. It is important for providers to utilize positive reinforcement to increase an individual's self-efficacy regarding her ability to increase health-promoting behaviors such as healthy diets, increased physical activity, smoking cessation, and stress relief. It is crucial for outreach programs that offer incentives to examine targeted populations and provide realistic and achievable goals.

Implications for Research

This study examined low-income middle-aged women so it would be valuable to examine a variety of ages, genders, and income levels. Small participation, high drop out and completion rates of the program were significant findings. It would be beneficial to learn what motivated the women who continued to report step counts as well as what caused women to stop reporting step counts. Examining the provider follow up process may provide insight into more effective and appropriate ways to address these barriers.

While as a population the women did not achieve 10,000 steps, they may have reached personal goals. Therefore, it would be beneficial to examine whether women achieved the personal goals set at the time of the lifestyle intervention.

It would be interesting to see if relationships exist between BMI, race, educational level, or smoking status and activity level and/or Framingham Risk Score. It also would be interesting to see how the program impacted smoking cessation.

Summary

Heart disease is the leading cause of death for American women (CDC, 2010b). Physical activity has been shown to decrease risks for mortality associated with CVD (Kahn et al., 2002). However, the literature illustrates that American adults are not achieving the recommended levels of physical activity, and this sedentary lifestyle is contributing to an increase in risk factors associated with mortality from CVD. Utilizing pedometers and incentives may directly and indirectly influence the myriad of factors, such as perceived self-efficacy and expected value, that change perceptions of environmental, interpersonal, and intrapersonal barriers and increase motivation toward positive behavior change.

The Sage*Plus* Steps Program run and operated by the MDH is an incentive program for low-income women ages 40 to 64 aimed at increasing daily physical activity. The purpose of this study is to evaluate the effectiveness of the Sage*Plus* Steps Program for low-income middle-aged women ages 40 to 64 to meet a daily physical activity goal of 10,000 steps and reduce their CVD risk, measured by their Framingham Risk Score.

While the small sample of participants who recorded steps had a higher than average number of daily steps compared to the average American, the sample's reported vigorous, moderate, and walking minutes were well below recommended levels. Analysis of the data revealed that there was poor participation and high drop out rates with step card submissions. The incentive process may not be enough in this population of women to return their cards. Individuals may need more than increased motivation to overcome barriers to change behavior. There was a statistically significant increase in step counts from week 1 to week 4. There were also clinically significant changes in the increase in reported vigorous, moderate, and walking minutes from initial enrollment to reenrollment as well as in the net decrease in Framingham Risk Score from initial enrollment to reenrollment.

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APPENDICES

APPENDIX A

MINNESOTA STATE UNIVERSITY IRB APPROVAL LETTER

August 30, 2011

Dear Diane Witt, PhD:

Re: IRB Proposal entitled "[267673-1] EVALUATION OF THE STEPS PROGRAM TO PROMOTE PHYSICAL ACTIVITY"

Review Level: Level *I*

Your IRB Proposal has been approved as of August 30, 2011. On behalf of the Minnesota State University, I wish you success with your study. Remember that you must seek approval for any changes in your study, its design, funding source, consent process, or any part of the study that may affect participants in the study. Should any of the participants in your study suffer a research-related injury or other harmful outcome, you are required to report them to the IRB as soon as possible.

The approval of your study is for one calendar year from the approval date. When you complete your data collection or should you discontinue your study, you must notify the IRB. Please include your log number with any correspondence with the IRB.

This approval is considered final when the full IRB approves the monthly decisions and active log. The IRB reserves the right to review each study as part of its continuing review process. Continuing reviews are usually scheduled. However, under some conditions the IRB may choose not to announce a continuing review. If you have any questions, feel free to contact me at patricia.hargrove@mnsu.edu or 507-389-1415.

Sincerely,

Patricia Hargrove

Patricia Hargrove, Ph.D.
IRB Coordinator

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Minnesota State University's records.

APPENDIX B

MINNESOTA DEPARTMENT OF HEALTH IRB APPROVAL LETTER

From: Rode, Peter (MDH) [peter.rode@state.mn.us]
Sent: Wednesday, August 03, 2011 4:29 PM
To: Witt, Diane E
Cc: Avis, Callie A; Kowski, Ann (MDH)
Subject RE: IRB question

Hi, Diane:

Thank you for contacting the MDH IRB regarding the study titled “Evaluation of the STEPS Program to Promote Physical Activity”. We have reviewed the material, and we think this study is program evaluation of a public health program and does not constitute research as defined by federal regulations. The primary intent is to evaluate some key outcomes for a specific program – the STEPS program within Sage Plus. The intent is not to create “generalizable knowledge” as envisioned by the federal regulations. Further review by the Department of Health’s IRB is not required.

Good luck with the study.

Sincerely,
Pete Rode
IRB Administrator