PHYSICAL ACTIVITY AND PHYSICAL FUNCTION IN OLDER ADULTS IN GEORGIA

by

SARA ELLEN FITZPATRICK

(Under the Direction of Mary Ann Johnson)

ABSTRACT

This study examined the effects of a nutrition and physical activity intervention on improvements in daily physical activity, daily step counts, physical function, and barriers to physical activity of congregate meal participants in senior centers from all 12 Georgia Area Agencies on Aging. Participants were a convenience sample of older adults (N = 592, mean age 75 years, 84% female, 44% Caucasian, 55% African American) from 39 senior centers. The main physical activity interventions were an educator-led program using a modified version of the National Institute on Aging's chair exercises and promotion of walking. Among those who completed the intervention, participants' physical function scores, average minutes of physical activity per day, and average daily step counts significantly increased, while some barriers to physical activity were decreased. Although the intervention was successful, many participants did not complete the post-test and/or had difficulty recording step counts. In summary, although many participants engaged in less physical activity than recommended and had low physical function scores, these measures were all improved by an educator-led nutrition and physical activity intervention.

INDEX WORDS: Older Americans Act Nutrition Program, Congregate Meal Program, Senior Center, Physical Activity, Physical Function, Short Physical Performance Battery (SPPB), Step Counts

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DEDICATION

This work is dedicated to all my family and friends in honor of their love and support. I am so blessed to have you all in my life. I would not be where I am today without you.

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CHAPTER 1

INTRODUCTION

The aging of the United States population, in part due to the aging of the baby boomers, is a topic of much interest throughout the nation. Many areas are working to have policies and procedures in place to accommodate the growth of this aging population. According to 2005 Census data, the United States population of adults over the age of 65 is 36,790,113 people and 870,422 of these people live in the state of Georgia (United States Census Bureau, 2005). By the year 2030, the United States population of those over the age of 65 is expected to be over 70 million, which translates into one in five Americans (Merck Institute, 2004). Current data show that Americans are living longer than ever before, but not necessarily in better health during their senior years (Merck Institute, 2004). The first goal of Healthy People 2010 is to "increase the quality and years of healthy life" by helping individuals of all ages increase their life expectancy and quality of life (United States Department of Health and Human Services, 2000).

The goal of the study, "Physical Activity and Physical Function in Older Adults in Georgia," a community-based, statewide intervention, is to increase physical activity, as well as physical function status, in older adults in senior centers throughout Georgia. A pre-test, a series of 16 lessons, each with a physical activity component, and a post-test were conducted in senior centers covered by all 12 Area Agencies on Aging (AAA) in Georgia. Similar interventions seeking to increase knowledge, exercise frequency, and

physical function in a subset of this population have proven successful, even though the target population may not be fully compliant with all recommended behaviors (McCamey et al., 2003). Approximately 60% of Americans who reach age 65 will need long-term care at some time in their lives. Since the average cost for a private room in a nursing home is $203 per day, or $74,095 annually, any increase in physical function, and subsequent decrease in disability or nursing home admission, can have a large impact on the health and well-being of Americans (American Association of Homes and Services for the Aging, 2006).

Physical activity, which has been identified as a key component in healthy aging, is generally lacking in the overall United States population (United States Department of Health and Human Services and United States Department of Agriculture, 2005). Statistics on physical activity practices in adults over the age of 65 show 24.6% of Americans and 29.4% of Georgians in this age group are currently physically inactive (National Center for Chronic Disease Prevention and Health Promotion, 2005). The relationship of long-term physical activity with postponement of disability, decreased mortality, and increased years of independent living is well studied. It has been shown that any increase in the amount of physical activity, and subsequent physical function, will have a major impact on the health and quality of life of older adults in this growing population (American Dietetic Association, 2005).

Chapter 2 is a review of the literature concerning both older adults and programs targeted towards their physical activity, physical function, and step counts, as well as barriers to physical activity specific to this population, the theory-driven health belief

model that was used as the basis for this intervention, and previous successful interventions in the target population.

Chapter 3 is a manuscript to be submitted to the journal *Preventing Chronic Disease: Public Health Research, Practice, and Policy*. This article includes the methods, results, and discussion of the results from the nutrition, health, and physical activity intervention. All data tables are included in Chapter 3 as well.

Chapter 4 summarizes the major findings of the nutrition, health, and physical activity education intervention and brings together all general conclusions from this study.

Detailed references for this entire document are listed following Chapter 4. Appendix A contains the power analysis for the reported study. Appendix B contains an expanded version of the Short Physical Performance Battery (SPPB) by Guralnik et al. (1994). Appendix C contains the physician's clearance form required for participation in the study. A sample of the pre-test/post-test used in the intervention for those without diabetes is included in Appendix D. Appendix E contains the forms used for reporting step counts.

CHAPTER 2

LITERATURE REVIEW

The Older Adult Population

The aging of the United States population, in part due to the aging of the baby boomers, is a topic of much interest throughout the nation. Many areas, including state and national government, as well as industry, are working to have policies and procedures in place to accommodate the growth of this aging population. According to 2005 Census data, the United States population of adults over the age of 65 is 36,790,113 people and 870,422 of these people live in the state of Georgia (United States Census Bureau, 2005). By the year 2030, the United States population of those over the age of 65 is expected to be over 70 million, which translates into one in five Americans (Merck Institute, 2004). Current data show that Americans are living longer than ever before, but not necessarily in better health during their senior years (Merck Institute, 2004). The first goal of Healthy People 2010 is to "increase the quality and years of healthy life" by helping individuals of all ages increase their life expectancy and quality of life (United States Department of Health and Human Services, 2000).

Programs for Older Americans

One national program, the Older Americans Act Nutrition Program (OAANP), is aimed at providing community-based preventive nutrition and health-related services to older persons in order to increase life expectancy and quality of life. Formally known as the Elderly Nutrition Program, the OAANP was established in 1972 under the Older

Americans Act (Millen et al., 2002). In 2004, 13,511 people were served by the OAANP in senior centers throughout the state of Georgia. In addition to providing meals and nutrition-related services, federal funds for OAANP programs also offer other needed community-based services, including health promotion and physical activity programs. Those eligible for this program include all persons over 60 years of age, a spouse of any age, disabled persons under the age of 60 who reside with or near members of the program, and nutrition service volunteers (Georgia Department of Human Resources, 2004). The OAANP delivers programs that are well-targeted, effective and efficient to the at-risk older population, including those classified as low-income, minority, and frail. The integration of nutrition, health-related, social and other services in the OAANP offers considerable opportunity for use as a model program for delivering preventive disease services to the older population (Millen et al., 2002).

In addition to federally funded programs for older adults, the state of Georgia also provides state funds for home and community-based services targeted for promotion of exercise and physical fitness, as well as health promotion and wellness programs. One example is in northeast Georgia, where The University of Georgia collaborates with the Northeast Georgia Area Agency on Aging to provide monthly nutrition education and physical activity programs in senior centers in 13 surrounding counties. Statewide, these funds are used to deliver similar programs to over 200 senior centers within each of the 12 Area Agencies on Aging in an effort to enable older adults to remain in the community and keep their independence by maintaining or improving their nutritional status, physical activity, physical function, and overall health.

Older Adults and Physical Activity

Physical activity is a key part of healthy aging, as demonstrated by the inclusion of physical activity recommendations in the 2005 Dietary Guidelines for Americans and the Healthy People 2010 objectives. The 2005 Dietary Guidelines urge older adults to participate in regular physical activity in order to reduce functional decline associated with aging and in order to maximize the benefits of physical activity for adults of all ages (United States Department of Health and Human Services and United States Department of Agriculture, 2005). Statistics on the occurrence of physical activity in adults 65 years of age and older show 24.6% of all adults in the United States are physically inactive. An even greater percentage (29.4%) of Georgia older adults are physically inactive (National Center for Chronic Disease Prevention and Health Promotion, 2005). Seventy percent of the decline in physical function that occurs with aging is related to such modifiable risk factors as smoking, poor nutrition, physical inactivity, and failure to use preventative and screening services (Merck Institute, 2004).

Regular physical activity provides numerous benefits to older adults including improvements in blood pressure, diabetes mellitus, lipid profile, osteoarthritis, osteoporosis, weight management, optimal mental health, and management of arthritis. Long-term physical activity is related to postponement of disability, decreased mortality and increased independent living, even in the oldest population (American Dietetic Association, 2005). Research shows that physically active, non-smoking women at age 65 can expect to remain functionally active for 18 more years, on average, compared to less than 13 years for similar inactive women (American Geriatric Society, 2005). Older adults are encouraged to participate in aerobic exercise, strength training, and balance and

flexibility exercises. All exercise intensities are beneficial. Low- to moderate-intensity exercise, such as walking, has been shown to reduce diabetes incidence and lower mortality in those with diabetes mellitus. Research on older adults using focus groups has identified walking as the exercise of choice. Habitual walking has been shown to improve older adults' physical performance, fitness, and prevention of physical disabilities (American Dietetic Association, 2005).

Measures of Physical Activity and Physical Function

Assessment of physical function and disability is a major component in the evaluation of older persons. Physical performance measures may offer advantages over self-report measures in terms of validity, reproducibility, sensitivity to change, applicability to cross-sectional studies, and the ability to characterize high levels of function. Guralnik et al. (1994) studied the association of self-reported function and performance-based measures of lower extremity function, as well as the relative contribution of the self-report and performance measures to the prediction of death and nursing home admittance. The study, using 5,174 older adults from three communities of the Established Populations for Epidemiologic Studies of the Elderly (EPESE), compared elderly performance on the Short Physical Performance Battery (SPPB), also known as the EPESE test, to self-reported physical function as assessed by Activities of Daily Living (ADLs) (Guralnik et al., 1994).

The performance measure used in the present study, and reported later in this thesis, the SPPB, was adapted from previously used measures, including the EPESE. The SPPB assesses balance, gait, and lower extremity strength and endurance. Categories of performance are set for each of three measures, with scores ranging from zero to four. A

summary performance score, ranging from zero to 12, is created by summing the category scores for each of the three measures. Standing balance is tested using tandem, semi-tandem, and side-by-side stands. Those able to hold the semi-tandem position for ten seconds progress on to the tandem stand, while those unable to hold the position for ten seconds move to a side-by-side stand. Participants' scores are based on time holding the stand, with timing stopped when participants either move their feet, grasp an object for support, or ten seconds elapse. Walking speed is measured using an 8-foot walking course, which can be completed with assistive devices if necessary. Participants are timed twice on the amount of time it takes them to complete the walk, with the faster of the two times used in analyses. Strength and endurance are tested using the ability to rise from a chair (chair stands). Participants' scores are based on the amount of time it takes them to rise from the chair, with their arms across their chest, five times (Guralnik et al., 1994). Physical performance scores were compared to self-reported physical functioning, as measured through ADLs. Participants were classified as disabled if the ADLs they needed help with or were unable to perform including walking across a small room, bathing, transferring from the bed to a chair, or using the toilet. Measures of higher mobility included asking participants about their ability to walk up and down stairs to the second floor and walk a half mile without help (Guralnik et al., 1994).

The performance measures reported by Guralnik et al. (1994) were found to be practical and safe for use by well-trained interviewers. No injuries or adverse outcomes were reported. A strong association was found between performance measures of lower extremity function and self-reported disability. The report notes that performance measures contribute other information beyond that obtained from self-reports. The most

important finding of this study, which had never before been demonstrated, was that a comprehensive scale of lower extremity performance can provide information across the entire spectrum of functioning. Those scoring a 12, the maximum, on the performance scale were shown to have lower mortality than those scoring an 11, who have lower mortality than those scoring ten. This finding was quite notable, as no self-reported measures of functioning have been demonstrated to define risk for those who are disabled and for those who rank at the highest end of the functional spectrum (Guralnik et al., 1994).

Through the Guralnik et al. (1994) study, the SPPB has been shown to be a performance measure that provides information not obtainable from self-report. Evidence was also provided on the analyses of predictors of death and nursing home admission, which verified that the summary performance scale is a strong and consistent predictor of these outcomes, even after adjustment for self-reported disability. Sherman and Reuben (1998) have also studied the validity of performance-based measures of functional status, as well as their correlation with self-report measures. By comparing a lower-extremity function test with another test that measures both lower- and upper-extremity function, the researchers were able to find that neither scale has a higher correlation with self-reported measures of functional status, which indicates that both tests are valid measures (Sherman and Reuben, 1998).

To further evaluate the effectiveness of such measures as the SPPB, Perera and colleagues (2006) took several validated physical function measures and sought out criteria for estimating the amount of change that can be considered meaningful in a clinical and research setting. The study population used to evaluate the criteria for

meaningful change in the SPPB included the Predicting Elderly Performance (PEP) data set, a prospective observational cohort of community-dwelling older adults. In this study, participants were assessed in their homes every three months for one year and every six months for the following two years. The cohort included 492 participants, with an average age of 74.1 years, a 43.7% female population, and a baseline total SPPB score of 8.3. The results of their research indicate that an increase in 0.5 points on the SPPB total score, with an estimated standard deviation of 1.48 between stable subjects, is indicative of small meaningful change. This number, however, is only indicative of change over a large population, due to the integer-valued scoring used in individual SPPB results (Perera et al., 2006).

While the SPPB has been proven to be an effective means of evaluating physical function in older adults, how to affect long-term compliance to the physical activities needed to improve physical function has not been determined. Simple dissemination of information about the health benefits of physical activity does not appear sufficient to increase older adults' participation. In order to affect long-term change in behavior, studies have shown that it is necessary to identify, examine, and begin to address barriers that prevent older adults from transitioning from a sedentary to an active lifestyle (Cress et al., 2004).

Step Counts and Older Adults

Regular physical activity is one of the most effective ways for older adults, including those with disease and disability, to help prevent and/or improve chronic disease, promote independence, and increase quality of life in later years (Cress et al., 2004). Focus group based research in older adults from seven different cultural groups

identified walking as the exercise of choice for all groups. Habitual walking has been associated with reduced diabetes incidence, lower mortality in adults with diabetes, and improved physical performance, fitness, and prevention of physical disabilities in older adults (American Dietetic Association, 2005).

Quantifying walking through the use of step counts, calculated using pedometers, has been shown to be both a good assessment and motivational tool in older adults, despite potential inadequacies (Cyarto et al., 2004). In fact, Berlin and colleagues (2004) have found pedometers to be "remarkably accurate" in counting steps, especially in people without functional impairment who walk at least 0.9 meters per second. Pedometers have been shown, however, to underestimate the step counts of those with a gait speed slower than 0.9 meters per second, and those who are obese. Special considerations may be needed in those who are obese, defined as a body mass index (BMI) greater than 30 kg/m^2, due to central obesity. When a pedometer is worn at the waist in someone with central obesity, the pedometer may not be properly vertically oriented and may be inaccurate (Berlin et al., 2004).

Step count requirements in older adults, as well as other special segments of the population, has received much focus in recent studies. The popularity of the 10,000 step per day requirement, which actually originated in Japanese walking clubs over 30 years ago, has appeared as a reasonable recommendation of daily activity for apparently healthy adults. Preliminary evidence suggests, however, that this goal may not be sustainable for some groups, including older adults and those living with chronic disease (Tudor-Locke and Bassett, 2004). Recommendations for healthy older adults, who typically average 3,500 to 5,500 steps per day, are currently set at 6,000 to 8,500 steps

per day. Recommendations for those with chronic illness and/or disability are set at 3,500 to 5,500 steps per day (Berlin et al., 2004). These step count recommendation are based on both epidemiologic data and indices of desired outcomes, such as a healthy BMI and blood pressure. A study of healthy older adults showed an average (± standard deviation) of 6,559 (± 2,956) steps per day, over the course of nine days of monitoring, despite attending a structured exercise class two to three times per week in addition to frequent walking. Another study, looking at the number of steps taken during 30 minutes of walking, showed that healthy adults take between 3,800 and 4,000 steps in 30 minutes, while healthy older adults (aged 59-80) take an average of 3,400 steps (Tudor-Locke and Bassett, 2004).

In some populations, however, setting goals to increase a person's number of steps may be more appropriate than setting an immediate goal of 10,000, or even 6,000 steps per day. Previous research has shown that these goals may be overly ambitious, intimidating, and possibly even unsafe. In these instances, striving to increase steps by five to ten percent per week may be a more attainable goal, as well as one that can be part of a more permanent lifestyle change (Berlin et al., 2004).

Barriers to Physical Activity in Older Adults

The health benefits of physical activity in older adults have been proven repeatedly. Older adults, as well a majority of the population, still seem to have trouble turning their knowledge of the benefits of physical activity into action. In order to determine what keeps older adults from being physically active, barriers to physical activity have also been studied. A study by Schutzer and Graves (2004) looked at various barriers and motivators for exercise in older adults. Their study found the most frequent

barriers to exercise in older adults to be poor health, the environment, physician advice, and knowledge. Eighty-seven percent of the elderly population is stated to have at least one barrier to prohibit regular participation in exercise. This study cites poor health and chronic pain as the leading barrier to exercise and physical activity (Schutzer and Graves, 2004). Barriers to physical activity, which are often unique to this cohort, are relevant and must be acknowledged in order to effectively intervene and change patterns in physical activity in older adults.

Health Belief Model

Use of the health belief model, a psychological model used to explain and predict behaviors, has performed well as a conceptual framework for educational interventions. The key concepts of the health belief model related to the success of an educational intervention include susceptibility and severity, perceived benefits, perceived barriers, cues to action and self-efficacy. The susceptibility and severity concept can be used to emphasize the health conditions that can occur due to a lack of physical activity. Perceived benefits can be shown through education on the potential positive benefits of increased physical activity. By providing information, and correcting misinformation, perceived barriers to physical activity can be diminished or dismantled completely. Cues to action can be provided with "how-to" information on types of physical activity that can be safely performed and how to perform them. Self-efficacy can be achieved in older adults by demonstrating and reinforcing the various ways in which they can include physical activity in their day-to-day activities (Stretcher and Rosenstock, 1997). The concepts outlined in the health belief model to influence older adults' physical activity are similar to the recommendations of Cress et al. (2004) on the behavioral factors

associated with initiating and maintaining physical activity. Their work found that social support, self-efficacy, active choices, health contracts, perceived safety, regular performance feedback, and positive reinforcement can all be employed as behavioral strategies to facilitate adoption of physical activity as a lifetime habit (Cress et al., 2004).

Previous Successful Interventions

Previous research on a statewide intervention to improve the physical activity and physical function of older adults in senior centers has been conducted by the Georgia Division of Aging Services and the Department of Foods and Nutrition at The University of Georgia. An evaluation of a physical activity intervention was reported by McCamey et al. (2003). The intervention had 12 lessons on nutrition and physical activity that were evaluated in 501 participants of congregate meal programs at senior centers in Georgia. The goals of this study included evaluating the effect of a physical activity intervention program on older adults' knowledge about fitness and improving their behavior related to physical activity and overall health and well-being. Topics covered in the curriculum included heart disease and high blood pressure, calcium and osteoporosis, diabetes, and nutrition and cancer prevention. The physical activity intervention consisted of five leg exercises targeting the lower body. The exercise intervention was depicted on a placemat to provide visual cues to complete the exercises at home. Encouragement to perform the exercises at home or in the senior center was also offered at each of the 12 lessons (one to two meetings per month). Questions from the Behavioral Risk Factor Surveillance System (BRFSS) were used to test older adults' knowledge and behavior related to exercise and physical activity. Participants' fitness level was measured using both the

SPPB (also referred to as the EPESE) battery and the Fullerton Functional Fitness Test for Older Americans (McCamey et al., 2003).

Results from the McCamey et al. (2003) study show that many dimensions of physical activity improved significantly following completion of the educational intervention. Participation in any form of physical activity in the past month increased from 82% to 87% from pre-test to post-test. Increases in physical activity were not the only benefit the elders received, as their knowledge about physical activity increased as well. Following the intervention, 68% of participants reported knowing that 30 minutes of physical activity was recommended on most days of the week, compared to only 53% at pre-test. The portion of older adults who were active on most days of the week increased from 80% to 88%. Barriers to physical activity were also assessed; 23% of the sample had a health condition that kept them from being active, two percent thought the cost of activity was too high, five percent did have time to be physically active, nine percent disliked physical activity, three percent thought it was too late to improve their health, and five percent felt it was unsafe to be physically active following the physical activity intervention (McCamey et al., 2003).

Participants' physical performance was also impacted by the intervention, as mean scores on the SPPB battery significantly increased from 8.0 to 8.3 (maximum = 12), accompanied by a movement of more elders toward the higher end of the functional spectrum. Although the number of participants in the lower category of the functional spectrum remained the same, at 17%, the average category decreased from 51% to 41% of the older adults and the high category increased from 32% to 42% of older adults (McCamey et al., 2003). The results of the McCamey et al. (2003) study provide strong

support for the feasibility and benefits of senior center based physical activity programs in senior centers throughout Georgia.

Recent research by Wellman and colleagues (2007) at Florida International University has also shown improvement in physical activity through an intervention targeted at OAANP participants. This study design used the Administration on Aging's "You Can" program, reported in a ten-site intervention. Results (N = 620, average age 74.6 years, 82% women, and 41% minority) show 75% made a significant advance in one or more physical activity stages of change, in addition to a 35% increase in daily steps. This research further supports interventions for OAANP participants, as well as the Administration on Aging's "You Can" program as an efficacious intervention in older adults (Wellman et al., 2007).

Rationale, Specific Aims, and Hypotheses

The proposed study builds on and improves upon previous studies, such as McCamey et al. (2003), with a more comprehensive physical activity program and an evaluation of a larger number of people. By including an expanded battery of chair exercises and promoting walking, it is expected that greater improvements in older adults' physical activity and physical function will be seen in the present study. By improving physical activity practices and physical function in the expanding older adult population, it is possible that increased years of quality living, decreased nursing home admission, and decreased morbidities and mortality can be achieved in the study population. The overall goal of the proposed study is to identify the impact of a physical activity intervention on physical function in older adults in senior centers throughout the state of Georgia. The hypothesis is that pre-intervention levels of physical activity,

physical function and step counts will be low, but that the intervention will increase the average daily amount of physical activity, average daily step counts, and average physical function scores. The specific aims are to conduct a pre-test to determine daily physical activity and physical function, examine the association of physical activity patterns with performance on the physical function test, and determine the effects of the physical activity intervention on changes in physical function.

CHAPTER 3

PHYSICAL ACTIVITY AND PHYSICAL FUNCTION IN OLDER ADULTS IN GEORGIA[1]

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This study is part of a large statewide effort to prevent and manage chronic disease and promote healthy aging in Georgia's older adults. Because of their valuable contributions to the design of the study, recruitment of participants, data collection, and interpretation of the results, the additional authors are Mary Byrd, Jennifer Crosby, Suzanne M. Elbon, Lisa D. Hale, Jami Harper, L. Monique Hillman, Lisa Howard, Noaleen Ingalsbe, Loreatha Jenkins, Brenda Kirkland, Ilona Preattle, and Lisa Whitley.

Abstract

Introduction

The purpose of this study was to examine the effects of a nutrition, health and physical activity intervention on improvements in the daily amount of physical activity, daily step counts, physical function, and barriers to physical activity among congregate meal participants in senior centers throughout Georgia.

Methods

This study recruited a convenience sample from 39 senior centers in 12 Georgia Area Agencies on Aging (AAA) (N = 592, 97.5% aged 60 and older, mean age = 75 ± 8 years).

Pre-test and post-test questionnaires containing questions on overall health, nutrition, physical activity, and physical function were conducted prior to and following a 16-week intervention on nutrition, health, and physical activity. Statistical analyses were performed to examine changes in and predictors of physical activity, physical function, and barriers to physical activity.

Results

Following the intervention there were statistically significant increases in participants' physical function, daily physical activity, and daily step counts, as well as significant decreases in several barriers to physical activity.

Conclusion

A high percentage of older adults, as well as a large portion of the United States population, are currently physically inactive. The goal of this intervention was to increase the physical function and amount of physical activity of older adults in an at-risk population. Participants were recruited from congregate meals sites enrolled in a nutrition, health, and physical activity intervention. Data from the present study suggest that interventions targeted to this population, and delivered at senior centers, are successful in achieving modest increases in physical function and physical activity in the older adult population.

Introduction

Americans are living longer than ever before, but not necessarily in better health (Merck Institute, 2004). According to 2005 United States Census Data, the population of adults over the age of 65 nationwide is over 36 million, and over 870,000 of these people live in the state of Georgia (US Census Bureau, 2004). By the year 2030, the United States population of those over the age of 65 is expected to be over 70 million, which translates into one out of five Americans (Merck Institute, 2004). With the aging of the United States population, and the rising costs of healthcare, major emphasis has been placed on improving quality of life in the later years. In fact, the first goal of Healthy People 2010 is to "increase the quality and years of healthy life" by helping individuals of all ages increase not only their life expectancy, but their quality of life (USDHHS, 2000).

Physical activity, identified as one of the key components in healthy aging, is generally lacking in the overall United States population (USDHHS and USDA, 2005).

National statistics describe 24.6% of Americans over the age of 65 as physically inactive, while estimates for Georgia describe 29.4% of the same age group as physically inactive (National Center for Chronic Disease Prevention and Health Promotion, 2005). Since the relationship of long-term physical activity with postponement of disability, decreased mortality, and increased years of independent living is well documented, any increase in amount of physical activity, and subsequent gains in physical function, will have major impacts on the health and quality of life of older adults in this growing population (American Dietetic Association, 2005).

One subgroup of the older adult population that may benefit form physical activity interventions are those who receive congregate meals through the Older Americans Act Nutrition Program (OAANP). OAANP participants are of low income, minority, and frail, with high rates of chronic disease and disability. Thus, they are an at-risk population (Millen et al., 2002). Given their health status and disease concerns, this population was targeted for a nutrition, health, and physical activity intervention, a collaborative program by the Georgia Division of Aging Services and The University of Georgia.

The overall goal of this study was to increase physical activity and physical function and to reduce barriers to physical activity in older adults at senior centers throughout the state of Georgia. To accomplish this, a theory-based nutrition education and physical activity intervention was developed, implemented and evaluated with a pre-test, a series of 16 lessons, each with a physical activity component, and a post-test in older adults at senior centers in all 12 Georgia Area Agencies on Aging (AAA). Research has previously shown that a series of 12 nutrition and physical activity lessons,

including five educator-led chair exercises, given during a six-month period was successful in modestly increasing physical activity and physical function (McCamey et al., 2003). Compared to a previous intervention, the current intervention was designed to include more chair exercises (16 versus 5), have educator-led chair exercises every week rather than every other week, and promote walking. Thus, it was expected that this intervention would lead to larger gains in physical activity and physical function than the previous intervention.

The overall goal of the proposed study is to identify the impact of a physical activity intervention on physical function in older adults in senior centers throughout the state of Georgia. The hypothesis is that pre-intervention levels of physical activity, physical function and step counts will be low, but that the intervention will increase the average daily amount of physical activity, average daily step counts, and average physical function scores. The specific aims include conducting a pre-test to determine daily physical activity and physical function, examining the association of physical activity patterns with performance on the physical function test, and determining the effects of the physical activity intervention on changes in physical function.

Methods

Note

The methods described below are adapted from Speer et al. (2006) as pursuant to authorization from the faculty members supervising the work as allowed by The University of Georgia.

Community Partners

The success of this intervention depended on the cooperation of many community partners. Therefore, the initiative was presented and discussed on a regular basis with the Georgia Division of Aging Services and Georgia Department of Public Health (beginning in January, 2005), Wellness Coordinators (beginning in June, 2005), Area Agency on Aging Directors (September and October, 2005), and all partners, including state-wide trainings covering the development, implementation, evaluation, and pre- and post-testing of the intervention (October, 2005, 5 hours, 45 attendees). UGA staff provided on-site assistance in each Area Agency on Aging (AAA) for up to five days to assist with: 1) collection of pre-test data (2 days), 2) the intervention (1 day), and 3) collection of post-test data (2 days). Additional assistance was provided by telephone and email on a regular basis.

Sample

A convenience sample of older adults aged 60 (2.5% were under 60) and older was recruited from 39 senior centers, as well as one adult day care center and one housing and urban development center, in rural and urban areas in each of the 12 Area Agencies on Aging (AAAs) in Georgia. Recruitment of participants was accomplished by Wellness Coordinators, senior center directors, and their staff. Most participants were recipients of congregate meals. Homebound elders were excluded. Other exclusion criteria, as determined by interviewer assessment, was the inability of participants to understand the informed consent, answer pre- and post- test questions, or participate in educational activities. A total of 815 participants were recruited into the physical activity intervention (about 70 per AAA). These individuals represented a subset of

approximately 3,000 individuals who participated in the intervention state-wide. The study population was 44% Caucasian, 55% African American, and one percent other minorities, and 84% of the participants' were female.

Physicians' clearance for participation in the physical activity intervention was initiated before informed consent because it is recommended whether or not individuals are enrolled in the study. Written informed consent was obtained from all participants, and all procedures were approved by the Institutional Review Boards of The University of Georgia and the Georgia Department of Human Resources.

Pre-tests

Experts in nutrition, physical activity, and diabetes (three faculty members and three registered dietitians in the Department of Foods and Nutrition, University of Georgia, and the Georgia Division of Aging Services) reviewed and edited the pre- and post-test questionnaires (health, nutrition, physical activity, and physical function) to ensure content validity and cultural appropriateness based on their collective experience working with the target population. Input from other Division of Aging Services staff and the Wellness Coordinators also was solicited and incorporated into the questionnaires. Questionnaires are available at www.livewellagewell.info.

About one hour was required to explain the study, obtain informed consent, and complete the pre-test for each participant. Additional follow-up was needed to continue to obtain the physician clearance forms for physical activity. In each AAA, participants from one to five senior centers were recruited and interviewed by Wellness Coordinators and their staff who read the questions to participants and recorded their responses. Assessments included demographic information, general health including current

illnesses (yes/no, diabetes, high blood pressure, heart disease, arthritis, and joint stiffness), and anthropometrics (measured and self-reported height, measured and self-reported weight). Body mass index (BMI) was later calculated.

Behaviors related to physical activity were assessed as previously described for the target population (13 questions) (McCamey et al., 2003; Toobert et al., 2000). At the first lesson, participants were given a pedometer (Accusplit, San Jose, CA) and instructed on its use and how to record their steps in a daily log. The first and last week of this step log, collected from participants by the educators, was used to determine changes in step counts related to the physical activity interventions.

Participants' physical performance was assessed with the Short Performance Physical Battery test (SPPB) (Guralnik et al., 1994). Poor performance on this test predicts future nursing home placement, disability and death (Guralnik et al., 1994). The SPPB test assesses older adults' mobility by measuring the three categories of balance, strength, and gait speed as an individual performs a standing balance, chair stands, and an 8-foot walk, respectively, with performance in each category scored on a scale of 0 to 4. A summary performance score is calculated by summing each of the three category scores to give a final score ranging from 0 to 12, where higher scores indicate higher performance: poor function (0 to 5), moderate function (6 to 9), and good function (10 to 12).

Intervention

After completing the pre-test questionnaires, the educational and physical activity interventions were initiated at the senior centers. The complete intervention consisted of 16 lessons. Each lesson was given one time and lasted 45 to 60 minutes. The physical

activity intervention was incorporated into every lesson. Nutrition and physical activity experts from The University of Georgia (four faculty, including two registered dietitians), who have experience with the target population, assisted in developing the materials and reviewing the curriculum for the interventions. Based on years of related experience, these experts ensured that the curriculum was culturally appropriate and safe for the participants. The curriculum was developed based on the previously successful educational interventions developed by The University of Georgia for older adults for physical activity (adapted from the National Institute on Aging, 2004; Administration on Aging, 2004; American Association of Retired Persons, 2004). The updated curriculum incorporated recent changes in physical activity recommendations (USDHHS and USDA, 2005).

The conceptual framework for these interventions was based on the health belief model (Strecher and Rosenstock, 1997). The key concepts of this framework that were incorporated were the perceived susceptibility and severity (e.g., emphasizing the health conditions that occur frequently in older adults that are associated with low physical activity participation), perceived benefits (e.g., defining how to take action by increasing physical activity), perceived barriers (e.g., providing information and correcting misinformation about physical activity), cues to action (e.g., provide "how-to" information on practicing physical activity), and self-efficacy (e.g., by demonstrating and reinforcing during the interventions the various ways to include physical activity).

The physical activity part of each lesson lasted up to 30 minutes and included demonstrations by the educator and participation in selected physical activities by the older adults. Each educator had the option to choose physical activities that were

appropriate for their population (such as the Arthritis Foundation Exercise Program), however the primary physical activities were encouragement of walking based on the principles of the Administration on Aging's "You Can" program (2004), American Association of Retired Person's "Step Up to Better Health" (2004), as well as exercises for strength, balance, flexibility, and endurance selected from the Aging Exercise Guide (National Institute on Aging, 2004). These lessons can be found online (http://noahnet.myweb.uga.edu/niaexercises/exercise_booklet.pdf). A series of 16 chair exercises were presented throughout the lessons. During the first 4 lessons, pedometers were introduced and discussed, including checking for proper use and proper recording of daily step counts. Lessons 5 and 6 introduced chair exercises 1 through 4, with an additional 4 exercises introduced at lesson 7 and 8, lesson 9 and 10, and lesson 11 and 12, until all 16 chair exercises have been introduced. The last 4 lessons (13 through 16) concentrated on repeating all 16 chair exercises and encouraging participants to continue these exercises at home.

The nutrition and health education components of this intervention are discussed elsewhere (Speer, 2007; Hendrix, 2007). Briefly, the nutrition and health education component consisted of 8 lessons, given every 2 weeks intermittently, on both fruits and vegetables and diabetes self-management education. These lessons were entitled "Serving Up Fruits, Vegetables, and Physical Activity Everyday" and "Seniors Taking Charge of Diabetes!"

Post-Tests

The post-test was administered within 1 to 2 months following the last lesson of the intervention to allow participants time to make behavior changes (May and June,

2006). The post-test was the same as the pre-test, except that additional questions were added to allow participants to further describe changes in their behaviors related to physical activity, as well as their satisfaction with the lessons and overall program.

Statistical Analyses

The pre- and post-test questionnaires, consent forms, and physician clearance forms were sent to The University of Georgia for analyses. Data were coded and entered into secure files with access restricted to key personnel and were analyzed using the Statistical Analysis System (SAS, Version 8, SAS Institute, Cary, NC). Descriptive statistics, including frequencies, means, and standard deviations were calculated. Categorical data from the pre-test and post-test were compared using chi-square analyses. All comparisons of mean changes from the pre-test and the post-test were evaluated with the Signed Rank Test for non-normally distributed data, unless otherwise indicated (paired t-test for normally distributed data). Multiple regression analyses were used to identify factors associated with physical activity and physical function at pre-test, as well as making changes in physical activity and physical function following the intervention. $P \leq .05$ was considered statistically significant.

During statistical analyses, further exclusion criteria were applied. Thirty-five participants from two senior centers were excluded because the questionnaires were not interviewer-administered. Other exclusions were participants with no response at pre-test for the SPPB total score (n = 21), days of physical activity per week (n = 12) and minutes of physical activity per day (n =2 5) or any combination of these (n = 3). Other exclusions were no response or a time of ≤ 2 seconds on the 8 foot walk timed measure at pre-test (n = 23) and post-test (n = 56). Participants with any combination of the above

criteria (n = 48) were excluded. Taken together, these exclusion criteria yielded 592 participants for pre-test analyses. Pre-test versus post-test comparisons were performed in 418 participants, because 174 participants had incomplete or missing data for the following reasons: death (n = 4), hospitalization/sickness (n = 32), no longer attending the senior center (n = 80), refusal (n = 20), cognitive impairment (n = 1), and no reason given (n = 73). Some analyses may have less than 592 (pre-test) or less than 418 participants (pre-test versus post-test) due to incomplete responses for other variables.

In addition to exclusion criteria for the questionnaire data, exclusions were also applied during analysis of step counts. Participants reporting step counts lower than 1,000 steps per week (n = 6) were excluded from analyses. With 2,000 steps being approximately equivalent to one mile, those reporting less than 1,000 steps per week were believed to have had some difficulty with pedometer accuracy. In addition to excluding those with less than 1,000 steps per week, results from several reporting sites (n = 18) were excluding due to inaccuracies in data reporting. Common problems included missing data, incorrect weekly reporting of data, and inaccurate labeling of data to participant identification numbers. Considering these exclusions, and the exclusions listed above for all data, step counts were analyzed in 78 participants.

Results

Eight hundred-fifteen people enrolled in this study, but for the purposes of these analyses only data from participants that completed the questionnaires concerning physical activity and physical function were used for pre-test analyses (n = 592) and for the pre-test and post-test comparisons (n = 418). Characteristics of these participants are shown in Table 3.1. At the pre-test, those who did not complete the post-test (non-

completers) and those who completed the intervention (completers) differed in several areas. Compared to non-completers, completers were of older age (73 vs. 75 years, $P <$ .001), had lower BMI (31.4 vs. 29.6 kg/m², $P = .007$), and lower education (11.0 vs. 10.5 years, $P = .01$). Completers and non-completers did not significantly differ in race, sex, or self-reported overall health status.

A subset of participants provided additional data on step counts (pre-test: n = 96, pre-test and post-test: n = 78). Characteristics of these participants are also shown in Table 3.1. At the pre-test, non-completers and completers differed in age and gender, but did not differ significantly in BMI, race, education, or overall self-reported health status. Non-completers were younger (70 vs. 74 years, $P = .003$) and were less likely to be female (86% vs. 61%, $P = .02$).

Short Physical Performance Battery (SPPB) and sit-and-reach results of participants at the pre- and post-test are shown in Table 3.2. All of the measures of physical function significantly improved except standing balance following the intervention.

Changes in physical activity practices of the participants are shown in Table 3.3 and changes in step counts in a subset of the sample are shown in Table 3.4. All of these measures of physical activity significantly improved except minutes of physical activity on the days that participants report being physically active ($P = .08$).

Barriers to physical activity in the participants were assessed, and the results are shown in Table 3.5. Of the ten barriers assessed, only feeling that “it’s not safe” was significantly decreased after the intervention, while there was a trend for “I don’t like to”

to decrease (P = .10). "I already am physically active on all or most days of the week" was also significantly increased following the intervention (64% vs. 73%, P = .01).

Multiple linear regression models were used to explore the relationship of participant characteristics with both their amount of daily physical activity (Table 3.6) and total physical performance score (Table 3.7) at pre-test. Lower physical activity was significantly associated with reporting "health condition interfering with activity" and "30 minutes daily is too much." Higher physical activity was positively and significantly associated with reporting that physical activity "costs too much." Table 3.7 shows that higher scores on the SPPB at pre-test were associated with higher education, while lower scores on the SPPB were associated with older age, being black and having a "health condition interfering with activity." There was a trend for physical function scores to be lower in those who report suffering from diabetes (P = .08) and arthritis (P = .06).

Multiple linear regression models were also used to examine the relationship of selected participant characteristics with changes in daily physical activity (Table 3.8) and changes in total physical performance scores (Table 3.9) from pre-test to post-test. Improvement in daily physical activity was significantly higher in those with a greater change in SPPB score from pre-test to post-test, a higher SPPB score at pre-test, and those reporting joint pain at pre-test, and significantly lower in those reporting arthritis at pre-test. The negative association of "change in 30 minutes daily is too much" with change in physical activity means that those who changed from agreeing to not agreeing with this statement had an increase in their daily physical activity. Table 3.9 shows that greater improvements in physical function scores were seen in those reporting greater improvement in overall health, greater improvement in daily physical activity, those

reporting high blood pressure at pre-test, and those with higher rates of physical activity at pre-test. Less improvement in physical function scores were seen in those with older age and those lower physical function scores at pre-test.

Discussion

Regular physical activity provides one of the greatest opportunities for people to extend years of active independent life, improve quality of life, and reduce disability and functional limitations. A multi-dimensional activity program that covers activities to increase balance, flexibility, and strength and endurance is optimal for health and functional benefits (Cress et al., 2004). In the present study, the primary physical activity interventions were educator-led chair exercises (at least once per week) and promotion of walking, while the primary outcome measures were self-reported physical activity, step counts, self-reported barriers to physical activity, and objective measures of physical function in older adults in senior centers throughout Georgia. This 16-week program was associated with statistically significant improvements in physical performance, average daily minutes of physical activity, average daily step counts, and decreases in several barriers to physical activity.

No similar evaluations of educator-led chair exercises in older adults at senior centers could be found in the current literature, in part due to the focus on younger populations (King et al., 1998). Another statewide intervention in Georgia involved a series of 12 lessons on nutrition and physical activity that consisted of 5 chair exercises that focused on the lower body, in addition to promotion of physical activity. Following the intervention, there were significant increases in physical activity, knowledge of physical activity recommendations, and improvements in physical function (McCamey et

al., 2003). Rigorous physical activity programs in senior centers, such as the aerobic conditioning, strength training, flexibility, and balance exercises of the Lifetime Fitness Program (now known as EnhanceFitness), result in marked improvements in heath status and several measures of physical performance (Belza et al., 2006). It is well accepted that these rigorous forms of physical activity offer more benefits. However, the present study documents that these educator-led chair exercises, adapted from the Exercise: A Guide from the National Institute on Aging (National Institute on Aging, 2004), combined with promotion of walking, leads to meaningful and measurable changes in physical activity and physical function.

Assessment of physical functioning has emerged as a major component in the evaluation of older persons. Physical performance measures, including the SPPB used in the present study, offer several advantages over self-report measures in terms of validity, reproducibility, sensitivity to change, applicability to cross-sectional studies, and the ability to characterize high levels of function (Guralnik et al., 1994). Perera and colleagues (2006) took several well-validated measures of physical activity, including the SPPB, and found that a small meaningful change in both the clinical and research setting could be inferred with an increase in SPPB score of 0.5 points or more, which the present study found for our population. This test has been shown to be practical and safe, and low scores are predictive of both death and nursing home admission (Guralnik et al., 1994). Approximately 60% of Americans who reach age 65 need long-term care at some time in their lives, with a private room in a nursing home costing an average of $203 per day, or $74,095 annually (American Association of Homes and Services for the Aging, 2006). In 2000, over 31,000 Georgians resided in a nursing home (He et al., 2005).

Considering these figures, any increase in physical function, and subsequent decrease in disability or nursing home admission, can have a large impact on older adults.

The Dietary Guidelines for Americans and the Healthy People 2010 objectives both focus on physical activity as a key factor in healthy aging, as well as a way to reduce functional decline associated with aging and maximize the benefits of reduced disease and disability (USDHHS and USDA, 2005). Physical activity data gathered for the Behavioral Risk Factor Surveillance System in 2005 show that only 32.8% of adults over the age of 65 report engaging in 30 or more minutes of moderate physical activity five or more days per week (National Center for Chronic Disease Prevention & Health Promotion, 2005). Results from the present study show that 46% of participants report engaging in 30 or more minutes of moderate activity five or more days per week at pre-test, with an increased number of participants (51%) reporting this level of activity at post-test. In addition, there was a statistically significant increase in minutes of physical activity per day by 6.5 minutes and days of activity per week by 0.6 days. On average, participants reported being active for five out of seven days per week at post-test, with at least 30 minutes of moderate activity, which brings this population close to the 2005 Dietary Guidelines for Americans goal to "engage in at least 30 minutes of moderate-intensity physical activity on most, preferably all, days of the week." This level of physical activity has been shown to make important contributions to health, including overall sense of well-being, maintenance of a healthy body weight, lower risk of developing chronic disease, lower mortality rate, and management of mild to moderate depression and anxiety (USDHHS and USDA, 2005).

Previous research using focus groups with older adults from various cultural backgrounds identified walking as the exercise of choice across all groups (American Dietetic Association, 2005). While it is difficult to assess step counts of older adults with complete accuracy, pedometers have been shown to work for both assessment and motivational purposes (Cyarto et al., 2004). Because of the challenges in collecting weekly step count measures for four months, this study principally compared step counts collected for one week after pedometers were distributed (usually during weeks 1 to 2 of the 16-week intervention) with step counts collected near the last of the 16 sessions, along with the time elapsed between the two collection periods. Although detailed records were not kept, it was noted that many participants had problems in reporting of these step counts including difficulty in using the pedometer, remembering to use the pedometer, and remembering to record step counts. These problems led to a small group of participants in this arm of the study, but these participants were still able to achieve a gain in overall steps per day. Over an average of 11.8 weeks, these participants had a statistically significant increase of 577 steps per day. Previous studies have shown that setting a goal of 10,000 steps per day may be overly ambitious, intimidating, and possibly even unsafe, especially for this population. For this reason, a more reasonable goal of increasing steps by 5% to 10% per week may be more obtainable and more likely to lead to a permanent lifestyle change (Berlin et al., 2006). The present study increased step counts by an average of 1.64% per week and 19% over the course of 11.8 weeks, which are meaningful and statistically significant changes. Even though the average weekly gains may be relatively small, the gains over the several-week period were notable.

In addition to measures of physical activity and physical function, barriers to physical activity were also assessed. All eight barriers were decreased from pre-test to post-test, except for reporting "it's too late to improve my health" and "30 minutes daily is too much for me." There are several possible reasons why some barriers did not decrease. For example, reasons for not reporting a change in "it's too late to improve my health" may include discouragement due to the time it takes to see health benefits and possible new diagnoses while enrolled in the intervention. Reporting no change in "30 minutes daily is too much for me" may be an indicator that those involved in regular physical activity now know that 30 minutes daily is not easy, especially considering time to prepare for, and possible travel necessary to engage in some types of physical activity, such as at a club or gym. The lack of change in these two barriers apparently did not deter participants from achieving an overall increase in the number of minutes and days being physically active. After the intervention, the significant increase of 8.7% seen in the number of participants who reported already being physically active on all or most days of the week further illustrates the improvement in physical activity of this group. Previous studies in the same population reported by McCamey et al. (2003) also showed significant improvement in physical activity participation and physical function. In this previous study, however, gains in physical performance (0.3) points on the SPPB were smaller, possibly due to fewer chair exercises (only five), meeting with the educator less often, and less overall focus on physical activity.

While this study showed several benefits in improving physical activity and physical function, it was not without limitations. Possible limitations include the variability in educators throughout the state, the inclusion of only congregate meal

participants, difficulty in measuring and reporting step counts, and the number of participants that dropped out of the study. These issues were addressed during the development, implementation, and analysis of the study. Wellness Coordinators and educators throughout the state of Georgia received detailed educational materials developed by The University of Georgia to help standardize the intervention. In addition, one staff person visited each of the 12 regions on up to three occasions to answer questions, standardize collection of data and implementation of the intervention, and to provide additional education concerning the intervention if needed. To accommodate the high potential drop out rate among participants, and possible exclusion due to lack of physical and cognitive abilities, a large number of participants were recruited. Detailed information on how often participants performed the recommended chair exercises and how often they walked was not collected; rather the focus was on promoting these activities during the 16 sessions at the senior centers. Problems were encountered with both the measuring and reporting of step counts; thus there were only a small number of participants who provided step counts at pre- and post-test. However, there was a significant increase in step counts in this relatively small number of participants.

Overall, the results of this study are very encouraging and show much potential for continued intervention and improvement in this population. Many factors influenced the overall success of the program, including the approach taken with the intervention. First, the intervention materials were designed by experts in both the fields of nutrition and physical activity, and based on their extensive experience working with the target population. The materials were adapted from previous materials for this population, including the National Institute on Aging and the Administration on Aging (2004), to

help ensure that the materials were appropriate for the target audience. The duration of the intervention was sufficient to see improvements in physical activity and physical function, and was conducted in an environment that may have allowed the participants to feel both safe and comfortable. The intervention reached a diverse population of older adults in terms of age (48 to 96), ethnicity (55% minority), and frailty (SPPB) who benefited from the intervention.

In addition, a theory-driven approach to nutrition, health, and physical activity education can be effective. Incorporating principles from the health belief model (Strecher and Rosenstock, 1997) and suggestions from other researchers working with older adults, such as dividing concepts into small "chunks" of information, and successfully building upon concepts in subsequent lessons, was apparently effective for this older adult population (Miller et al., 2002). Sixteen successive lessons, given on a weekly basis, were used to prevent "information overload" for participants. All information provided, including chair exercises, was delivered in manageable pieces of information in order not to appear too difficult or overwhelming for participants. For example, promotion of walking was initiated in weeks one and two, four chair exercises were introduced during weeks five and six, and then four additional chair exercises were introduced every two weeks until participants had been introduced to all 16 chair exercises. Multiple education sessions with repetition over an extended period of time allowed participants to make gradual changes in physical activity habits, and enabled both the participants and educators to assess changes in physical activity and physical function and address barriers to these changes.

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Table 3.1. Characteristics of Participants in the Older Americans Act Nutrition Program in Georgia for 2005-2006

Variable	N	Pre-test (All participants)	N	Pre-test (Completers)[a]
ALL PARTICIPANTS				
Age, y, mean (SD)	590	75 (8)	418	75 (8)
< 60, %		2.5		1.7
60-69, %		23.2		19.9
70-79, %		45.6		48.6
80-89, %		24.9		25.4
> 90, %		3.7		4.6
Body mass index, mean (SD)	586	30.2 (6.8)	400	29.6 (6.7)
Underweight, %		1.9		2.3
Normal weight, %		20.8		23.5
Overweight, %		32.6		32.0
Obese, %		44.7		42.2
Race and ethnicity, %	590		418	
White		44.4		44.3
African American		54.9		55.5
Hispanic		0.2		0.2
Asian		0.2		0.0
Other		0.3		0.0
Sex, %	592		418	
Male		15.9		17.0
Female		84.1		83.0
Education, y, mean (SD)	588	11 (3)	416	11 (3)
Overall health,[b] mean (SD)	591	1.7 (0.8)	416	1.7 (0.8)
Poor, %		5.4		4.8
Fair, %		35.7		34.6
Good, %		44.5		46.9
Very good, %		12.7		11.8
Excellent, %		1.7		1.9
Diabetes, % yes	590	43.4	417	41.3
High blood pressure, % yes	584	74.8	413	74.1
Heart disease, % yes	584	30.8	414	29.5
Arthritis, % yes	587	71.2	413	71.2
Joint pain, % yes	584	68.5	411	68.4

[a]Completed both the pre-test and post-test.
[b]Lower score indicates poorer health status and ranges between 0 and 4.

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Table 3.1. (continued) Characteristics of Participants in the Older American Act Nutrition Programs in Georgia for 2005-2006

Variable	N	Pre-test (All participants)	N	Pre-test (Completers)[a]
STEP COUNT PARTICIPANTS ONLY				
Age, y, mean (SD)	96	73 (7)	78	74 (8)
< 60, %		1.0		1.3
60-69, %		29.2		24.4
70-79, %		47.9		47.4
80-89, %		19.8		24.4
> 90, %		2.1		2.5
Body mass index, mean (SD)	96	28.3 (6.0)	76	27.9 (5.6)
Underweight		3.1		2.6
Normal weight		28.1		30.3
Overweight		36.5		35.5
Obese		32.3		31.6
Race and ethnicity, %				
White	95	69.5	78	66.7
African American		30.5		33.3
Hispanic		0.0		0.0
Asian		0.0		0.0
Other		0.0		0.0
Sex, %				
Male	96	18.8	78	14.1
Female		81.2		85.9
Education, y, mean (SD)	95	12 (3)	78	11 (3)
Overall health,[b] mean (SD)	96	1.9 (0.8)	77	1.9 (0.9)
Poor, %		3.1		3.9
Fair, %		29.2		23.3
Good, %		51.0		53.3
Very good, %		12.5		14.3
Excellent, %		4.2		5.2
Diabetes, % yes	96	46.9	78	48.7
High blood pressure, % yes	95	69.5	77	72.7
Heart disease, % yes	93	25.8	77	24.7
Arthritis, % yes	95	64.2	77	62.3
Joint pain, % yes	96	62.5	78	61.5

[a]Completed both the pre-test and post-test.
[b]Lower score indicates poorer health status and ranges between 0 and 4.

Table 3.2. Short Physical Performance Battery and Sit-and-Reach Results for Participants in the Older American Act Nutrition Program in Georgia for 2005-2006

Variable	N	Pre-test[a]	N	Pre-test[b]	Post-test	Change	*P* Value
Short Physical Performance Battery (SPPB)[c]							
Total Score, mean (SD)	592	6.9 (2.8)	400	6.9 (2.7)	7.4 (2.8)	0.5 (2.1)	< .001
Poor (%)		28.4		28.2	23.0	-5.2	
Moderate (%)		52.4		55.3	51.7	-3.6	
Good (%)		19.2		16.5	25.3	8.8	
Chi-Square							.009
Standing balance,[e] mean (SD)	592	2.8 (1.3)	406	2.8 (1.3)	2.9 (1.3)	0.1 (0.3)	.21
Poor[d] (%)		37.3		40.6	37.4	-3.2	
Good[d] (%)		62.7		59.4	62.6	3.2	
Chi-Square							.39
8 foot walk,[f] mean (SD)	592	2.6 (1.2)	406	2.6 (1.1)	2.8 (1.2)	0.2 (1.1)	< .001
Seconds, mean (SD)	592	4.8 (3.7)	406	4.9 (3.6)	4.4 (3.3)	-0.5 (3.5)	< .001
Poor[d] (%)		44.4		45.1	36.7	-8.4	
Good[d] (%)		55.6		54.9	63.3	8.4	
Chi-Square							.02
Chair stands,[g] mean (SD)	592	1.5 (1.3)	401	1.5 (1.2)	1.7 (1.3)	0.2 (1.1)	< .001
Seconds, mean (SD)	592	13.2 (9.6)	401	13.5 (9.5)	12.2 (8.5)	-1.3 (9.2)	< .001
Poor[d] (%)		77.0		79.3	72.1	-7.2	
Good[d] (%)		23.0		20.7	27.9	7.2	
Chi-Square							.02
Chair Sit and Reach							
Mean (SD)	568	-2.4 (4.6)	384	-2.5 (4.5)	-1.4 (3.9)	1.1 (4.2)	< .001

[a]All participants who completed the pre-test.
[b]Completed both the pre-test and post-test.
[c]The Short Physical Performance Battery (SPPB) total score, ranging from 0-12, is based on the combined scores, ranging from 0-4, of the standing balance, 8 foot walk, and fiver chair stands.

(continued on the next page)

[d]The poor range is indicative of a score of 0-2 and the good range is indicative of a score of 3-4 on each area of the SPPB.
[e]The standing balance test consists of a timed semi-tandem stand, followed by either a timed tandem (completers of semi-tandem) or side-by-side (non-completers of semi-tandem) stand.
[f]The 8 foot walk is a timed walk, which can be done with an assistive device.
[g]The chair stand exercise consists of five timed chair stands.

Table 3.3. Physical Activity Data for Participants in the Older Americans Act Nutrition Program in Georgia for 2005-2006

Variable	N	Pre-test[a]	N	Pre-test[b]	Post-test	Change	*P* Value
How many days of the week do you participate in physical activity?							
Mean (SD)	592	4.2 (2.5)	411	4.3 (2.4)	4.9 (2.4)	0.6 (2.7)	< .001
About how many minutes of physical activity do you do on the days you are physically active?							
Mean (SD)	592	36.3 (34.4)	402	35.7 (33.2)	39.8 (42.2)	4.1 (43.6)	.08
Average Minutes of Daily Physical Activity[c]							
Mean (SD)	592	24.8 (30.8)	396	25.1 (29.4)	31.6 (39.6)	6.5 (40.7)	< .001
On how many days of the last seven days did you participate in at least 30 minutes of moderate physical activity?							
Mean (SD)	587	4.1 (2.6)	414	4.3 (2.6)	5.0 (2.5)	0.7 (2.8)	< .001
On how many of the last seven days did you participate in a specific exercise session other than what you do around the house as part of your daily activities?							
Mean (SD)	589	2.4 (2.3)	413	2.5 (2.3)	3.0 (2.5)	0.5 (2.8)	< .001

[a]All participants who completed the pre-test.
[b]Completed by the pre-test and post-test.
[c]Average minutes of daily physical activity were calculated by multiplying the number of days of activity per week by the number of minutes of physical activity per day and dividing by 7 days per week.

Table 3.4. Step Count Data for Participants in the Older Americans Act Nutrition Program in Georgia for 2005-2006

Variable	N	All Participants	N	First Count	Last Count	Change	*P* Value
Step counts per week[a], mean (SD)	96	19849 (17394)	78	20842 (18679)	24881 (18248)	4039 (12200)	.006
Average step counts per day, mean (SD)	96	2836 (2485)	78	2977 (2668)	3555 (2607)	577 (1743)	.006
Time elapsed between step count measures, weeks, mean (SD)	NA[b]	NA[b]	78	NA[b]	NA[b]	11.8 (3.5)	NA[b]

[a]Step counts were taken from the Bibb County, Cedartown, Forsyth County, Gilmer County, Harriet Darnell, Houston County, Jackson County, LaFayette/Walker County, Morgan County and Rome Senior Center sites.
[b]Time elapsed is only reported as a change to show the length of time between the first and the last step count collection for all participants following the intervention.

Table 3.5. Barriers to Physical Activity of Participants in the Older Americans Act Nutrition Program in Georgia for 2005-2006

Variables	N	Pre-test[a]	N	Pre-test[b]	Post-test	Change	*P* Value
I already am this physically active on all or most days of the week.							
% Yes	577	62.4	401	64.1	72.8	8.7	.01
I have a health condition that keeps me from being active.							
% Yes	572	37.4	388	36.6	33.5	-3.1	.41
It costs too much.							
% Yes	567	3.2	381	2.9	2.4	-0.5	.82
I don't have time.							
% Yes	567	6.5	381	6.0	3.9	-2.1	.24
I don't like to.							
% Yes	567	18.3	385	16.6	12.2	-4.4	.10
It's not safe.							
% Yes	565	12.2	382	12.8	7.9	-4.9	.03
It's too late to improve my health.							
% Yes	570	3.9	386	4.2	5.4	1.2	.50
30 minutes daily is too much for me.							
% Yes	574	13.9	388	14.2	14.4	0.2	1.00

[a]All participants who completed the pre-test.
[b]Completed both the pre-test and post-test.

Table 3.6. Linear Regression Model Comparing Amounts of Daily Physical Activity with Characteristics of Participants in the Older Americans Act Nutrition Program in Georgia for 2005-2006

Variables	Parameter Estimate (SEM)	*P* Value[a]
N	514	
Intercept	32.85 (20.1)	.10
Age, y	-0.11 (0.19)	.56
Sex (0=male, 1=female)	-2.64 (3.73)	.48
Race and ethnicity (1=white, 2=black)	-1.75 (2.84)	.54
Education, y	0.74 (0.43)	.08
Overall health (0=poor, 1=fair, 2=good, 3=very good, 4=excellent)	0.97 (1.79)	.59
Diabetes (0=no, 1=yes)	-1.01 (2.80)	.72
High blood pressure (0=no, 1=yes)	4.32 (3.26)	.19
Heart disease (0=no, 1=yes)	1.91 (3.16)	.55
Arthritis (0=no, 1=yes)	1.84 (3.54)	.60
Joint pain (0=no, 1=yes)	2.27 (3.47)	.51
Body mass index (BMI), kg/m²	-0.19 (0.22)	.40
Total SPPB score (0-5=poor, 6-9=moderate, 10-12=good)	0.11 (0.55)	.84
Health condition interfering with activity (0=no, 1=yes)	-7.28 (3.10)	.02
It costs too much (0=no, 1=yes)	45.28 (9.42)	< .001
Do not have time (0=no, 1=yes)	1.98 (6.08)	.75
Do not like to exercise (0=no, 1=yes)	-6.17 (3.68)	.09
Exercising is not safe (0=no, 1=yes)	-6.60 (4.57)	.15
It's too late to improve my health (0=no, 1=yes)	1.20 (7.56)	.87
30 minutes daily is too much (0=no, 1=yes)	-15.83 (4.18)	< .001

[a] *P* values of ≤ .05 are considered statistically significant.

Table 3.7. Linear Regression Model Comparing Physical Function Scores with Characteristics of Participants in the Older Americans Act Nutrition Program in Georgia for 2005-2006

Variables	Parameter Estimate (SEM)	*P* Value[a]
N	528	
Intercept	14.35 (1.50)	< .001
Age, y	-0.09 (0.01)	< .001
Sex (0=male, 1=female)	-0.03 (0.30)	.92
Race and ethnicity (1=white, 2=black)	-0.77 (0.23)	< .001
Education, y	0.13 (0.03)	< .001
Overall health (0=poor, 1=fair, 2=good, 3=very good, 4=excellent)	.0.05 (0.14)	.72
Diabetes (0=no, 1=yes)	-0.39 (0.22)	.08
High blood pressure (0=no, 1=yes)	0.29 (0.26)	.27
Heart disease (0=no, 1=yes)	-0.40 (0.25)	.11
Arthritis (0=no, 1=yes)	-0.53 (0.28)	.06
Joint pain (0=no, 1=yes)	0.13 (0.28)	.64
Body mass index (BMI), kg/m²	-0.01 (0.02)	.76
Daily physical activity, minutes	0.00 (0.00)	.19
Health condition interfering with activity (0=no, 1=yes)	-1.34 (0.23)	< .001

[a] *P* values of ≤ .05 are considered statistically significant.

Table 3.8. Linear Regression Model Comparing Change in Amounts of Daily Physical Activity with Characteristics of Participants in the Older Americans Act Nutrition Program in Georgia for 2005-2006

Variables	Parameter Estimate (SEM)	*P* Value[a]
N	306	
Intercept	7.35 (33.74)	.83
Age, y	0.34 (0.33)	.30
Sex (0=male, 1=female)	0.60 (5.94)	.92
Race and ethnicity (1=white, 2=black)	-7.02 (4.92)	.15
Education, y	-0.48 (0.72)	.51
Change in overall health[b]	-2.82 (3.37)	.40
Change in BMI [b]	-0.43 (0.79)	.58
Change in total SPPB Score [b]	3.98 (1.21)	.001
Change in health condition interfering with activity[b]	-10.70 (5.63)	.06
Change in it costs too much[b]	-2.21 (15.74)	.89
Change in not having time[b]	-18.55 (13.59)	.17
Change in not liking to exercise[b]	-8.92 (8.08)	.27
Change in exercising is not safe[b]	-2.57 (9.39)	.78
Change in it's too late to improve my health[b]	-7.85 (10.88)	.47
Change in 30 minutes daily is too much[b]	-14.74 (7.04)	.04
Overall health at pre-test (0=poor, 1=fair, 2=good, 3=very good, 4=excellent)	0.78 (3.63)	.83
Diabetes (0=no, 1=yes)	-3.09 (4.91)	.53
High blood pressure (0=no, 1=yes)	-9.30 (5.64)	.10
Heart disease (0=no, 1=yes)	7.85 (5.63)	.16
Arthritis (0=no, 1=yes)	-16.80 (5.99)	.005
Joint pain (0=no, 1=yes)	12.86 (5.72)	.03
Body mass index (BMI) at pre-test, kg/m²	0.22 (0.39)	.58
Total SPPB at pre-test (0-5=poor, 6-9=moderate, 10-12=good)	2.38 (1.04)	.02
Health condition interfering with activity at pre-test (0=no, 1=yes)	-13.79 (7.07)	.05
It costs too much at pre-test(0=no, 1=yes)	-4.74 (22.53)	.83
Do not have time at pre-test (0=no, 1=yes)	-31.70 (17.77)	.08
Do not like to exercise at pre-test (0=no, 1=yes)	-12.85 (9.66)	.18
Exercising is not safe at pre-test (0=no, 1=yes)	2.88 (11.41)	.80

(continued on the next page)

Table 3.8. (continued) Linear Regression Model Comparing Change in Amounts of Daily Physical Activity with Characteristics of Participants in the Older Americans Act Nutrition Program in Georgia for 2005-2006

Variables	Parameter Estimate (SEM)	*P* Value[a]
It's too late to improve my health at pre-test (0=no, 1=yes)	-18.14 (16.33)	.27
30 minutes daily is too much at pre-test (0=no, 1=yes)	-16.07 (9.04)	.08

[a]*P* values of ≤ .05 are considered statistically significant.
[b]Changes were calculated by subtracting pre-test values from post-test values.

Table 3.9. Linear Regression Model Comparing Change in Physical Function Scores with Characteristics of Participants in the Older Americans Act Nutrition Program in Georgia for 2005-2006

Variables	Parameter Estimate (SEM)	*P* Value[a]
N	318	
Intercept	5.33 (1.57)	< .001
Age, y	-0.03 (0.02)	.04
Sex (0=male, 1=female)	-0.03 (0.28)	.93
Race and ethnicity (1=white, 2=black)	0.10 (0.23)	.67
Education, y	-0.06 (0.03)	.08
Change in overall health[b]	0.37 (0.15)	.01
Change in body mass index (BMI) [b]	0.01 (0.04)	.86
Change in daily physical activity[b]	0.01 (0.00)	.002
Change in health condition interfering with activity[b]	-0.09 (0.26)	.73
Total SPPB at pre-test (0-5=poor, 6-9= moderate, 10-12=good)	-0.35 (0.04)	< .001
Overall health at pre-test (0=poor, 1=fair, 2=good, 3=very good, 4=excellent)	-0.15 (0.17)	.38
Body mass index (BMI) at pre-test, kg/m²	0.00 (0.02)	.99
Daily physical activity at pre-test, minutes	0.01 (0.00)	.02
Health condition interfering with activity at pre-test (0=no, 1=yes)	-0.50 (0.31)	.11
Diabetes (0=no, 1=yes)	-0.01 (0.23)	.97
High blood pressure (0=no, 1=yes)	0.69 (0.26)	.009
Heart disease (0=no, 1=yes)	-0.21 (0.26)	.43
Arthritis (0=no, 1=yes)	0.15 (0.29)	.59
Joint pain (0=no, 1=yes)	0.09 (0.27)	.75

[a] *P* values of ≤ .05 are considered statistically significant.
[b] Changes were calculated by subtracting pre-test values from post-test values.

CHAPTER 4

CONCLUSION

The overall goal of this study was to quantify the impact of a physical activity intervention on physical function in older adults in senior centers throughout the state of Georgia. The specific aims were to conduct a pre-test to determine estimated physical activity and physical function, examine the association of physical activity patterns with performance on the physical function test, and determine the effects of the physical activity intervention on changes in physical function. It was hypothesized that pre-intervention levels of physical activity, physical function, and step counts will be low, but that the intervention would increase the average daily amount of physical activity, average physical function scores, and average daily step counts.

At pre-test, the average Short Physical Performance Battery (SPPB) score was 6.9 on a 12-point scale, average minutes of physical activity per day were 25.1, and average daily step counts were 2,977 steps. These numbers support the hypothesis that pre-intervention levels of all variables would be low. Following the intervention, participants had increased each of these measures significantly, achieving an average of 7.4 points on the SPPB, 31.6 minutes of physical activity per day, and 3,555 steps per day. The changes also support the hypothesis that the intervention would increase all variables. Younger age, higher education, and answering no to having a "health condition interfering with activity" were found to be the strongest predictors of SPPB scores at

pre-test, while a lower total SPPB score at pre-test and less daily physical activity at pre-test were the biggest predictors of change in total physical function.

The results of this nutrition, health, and physical activity education intervention show that improvements in health and physical function are possible even in an older population. This 16-week educational intervention, which included education programs on fruits, vegetables, diabetes self-management, and instructor-led chair exercises, was only conducted for one hour once per week by a trained educator. Even with this relatively small amount of time, participants were able to make significant changes in physical activity behaviors and physical function measures. Intense physical activity did not appear necessary to make such gains, because participants were only exposed to 16 chair exercises and encouraged to walk on their own, with the motivation of a pedometer. The key message of being physically active as much as possible was the central theme of all 16 lessons, with the use of pedometers to measure walking introduced at the first lesson, and chair exercises introduced at the fifth lesson. These central themes were then reviewed in each subsequent lesson, along with tips on being physically active, as well as safety measures and tips on decreasing participants' barriers to physical activity.

This study indicates that even more improvement can be made in participants' physical activity behaviors. At post-test, participants were reporting being active for an average of 31.6 minutes on five out of seven days of the week and 53.5 % reported being active at least 30 minutes on five out of seven days of the week, compared to 46.8% at pre-test. While this was a significant increase from pre-test values, more progress can still be made. In addition, only 25.3% of participant's had a physical function considered "good" (a score of 9 to 12) on the SPPB, leaving room for further improvement. Future

studies should include more intensive physical activity, with more consideration for the diversity of activity levels in individuals. A program more tailored to the physical function of individual participants will allow for further improvement in physical function for those already at a moderate or high level of function.

In conclusion, the positive outcomes of this study provide evidence that older adults, in particular those who visit congregate meal sites, can benefit from an educator-led nutrition, health, and physical activity intervention aimed at improving their physical activity and physical function.

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APPENDICES

APPENDIX A

POWER ANALYSIS

The targeted number of enrolled participants was 3,000 (about 500 per AAA) and a subset of those enrolled in the intervention and completed the pre-tests (per AAA: about 70 in the physical activity interventions; statewide: n = 815). Our previous studies had drop out rates between the pre-tests and post-tests of 17% for an intervention promoting physical activity (McCamey et al., 2003). Assuming a drop out rate of 25%, the anticipated number of total participants completing the intervention and the post-tests was 615.

The proposed sample sizes had adequate power to show a ten percentage point change in following recommended behaviors (Borenstein and Cohen, 1988). Only 308 participants were needed at the post-test to show that a ten percentage point change in following a recommended behavior is statistically significant (e.g., from 45% at pre-test to 55 % at post-test, power = 0.08, α = 0.05), while 136 were needed to show a 15 percentage point change, and 76 were needed to show a 20 percentage point change. Thus, this study design could accommodate drop out rates approaching 40% and still have adequate power to detect changes in behavior of 15% or more. The previous study reported by McCamey et al. (2003) found an increase of eight percent (from 80% to 88%) in the number of older adults who reported being physically active on most days of the week, as well as an increase of ten percent (from 32% to 42%) of adults in the high

category of physical function. This study proposed slightly larger changes due to the increased frequency and intensity of the physical activity intervention.

APPENDIX B

EXPANDED SHORT PHYSICAL PERFORMANCE BATTERY

Study ID _____
Date _____
Tester Initials _____

PHYSICAL PERFORMANCE BATTERY

1. STANDS

The participant must be able to stand unassisted without the use of a cane or walker. You may help the participant to get up.

Now let s begin the evaluation. I would now like you to try to move your body in different movements. I will first describe and show each movement to you. Then I d like you to try to do it. If you cannot do a particular movement, or if you feel it would be unsafe to try to do it, tell me and we ll move on to the next one. Let me emphasize that I do not want you to try to do any exercise you feel might be unsafe.

Do you have any questions before we begin?

A. SIDE-BY-SIDE STAND

1. *Now I will show you the first movement (DEMONSTRATE).*

2. *I want you to try to stand with your feet together, side-by-side, for about 10 seconds.*

3. *You may use your arms, bend your knees, or move your body to maintain your balance, but try not to move your feet. Try to hold this position until I tell you to stop.*

4. Stand next to the participant to help him/her into the side-by-side position.

5. Supply just enough support to the participant s arm to prevent loss of balance.

6. When the participant has his/her feet together, ask *Are you ready?*

7. Then let go and begin timing as you say, *Ready, begin.*

8. Stop the stopwatch and say *stop* after 10 seconds or when the participant steps out of position or grabs your arm.

9. If participant is unable to hold the position for 10 seconds, record result, and go to the measured walks.

B. SEMI-TANDEM STAND

1. *Now I will show you the second movement (DEMONSTRATE).*

2. *Now I want you to try to stand with the side of the heel of one foot touching the big toe of the other foot for about 10 seconds. You may put either foot in front, whichever is more comfortable for you.*

3. *You may use your arms, bend your knees, or move your body to maintain your balance, but try not to move your feet. Try to hold this position until I tell you to stop.*

4. Stand next to the participant to help him/her into the semi-tandem position

5. Supply just enough support to the participant s arm to prevent loss of balance.

6. When the participant has his/her feet together, ask *Are you ready?*

7. Then let go and begin timing as you say, *Ready, begin.*

8. Stop the stopwatch and say *stop* after 10 seconds or when the participant steps out of position or grabs your arm.

9. If participant is unable to hold the position for 10 seconds, record result and go to the measured walk test.

C. TANDEM STAND

1. *Now I will show you the third movement (DEMONSTRATE).*

2. *Now I want you to try to stand with the heel of one foot in front of and touching the toes of the other foot for about 10 seconds. You may put either foot in front, whichever is more comfortable for you.*

3. *You may use your arms, bend your knees, or move your body to maintain your balance, but try not to move your feet. Try to hold this position until I tell you to stop.*

4. Stand next to the participant to help him/her into the semi-tandem position.

5. Supply just enough support to the participant s arm to prevent loss of balance.

6. When the participant has his/her feet together, ask *Are you ready?*

7. Then let go and begin timing as you say, *Ready, begin.*

8. Stop the stopwatch and say *stop* after 10 seconds or when the participant steps out of position or grabs your arm.

SCORING:

A. SIDE-BY-SIDE STAND

Held for 10 seconds .. _ **1 point**
Not held for 10 seconds ._ **0 points**
Not attempted . ... . _ **0 points**
If 0 points, end Stands Test

Number of seconds held if less than 10 seconds __.___seconds

IF NOT ATTEMPTED, CIRCLE ANSWER:

Tried but unable 1
Participant could not stand unassisted. 2
Not attempted, you felt unsafe 3
Not attempted, participant felt unsafe.. ...4
Participant unable to understand instructions ..5
Other (SPECIFY)_____6
Participant refused ...7

B. SEMI-TANDEM STAND

Held for 10 seconds . _ **1 point**
Not held for 10 seconds.. .. _ **0 points**
Not attempted ... _ **0 points**
If 0 points, end Stands Test

Number of seconds held if less than 10 seconds . __.___seconds

C. TANDEM STAND

Held for 10 seconds _ **2 points**
Held for 3 to 9 seconds .. . _ **1 point**
Not held for at least 3 seconds ... _ **0 points**
Not attempted . _ **0 points**

Number of seconds held if less than 10 seconds . __.___seconds

D. TOTAL STANDS SCORE _____(sum points)

Comments: _____

2. MEASURED WALKS

Now we are going to observe how you normally walk. If you use a cane or other walking aid and would feel more comfortable with it, then you may use it.

A. FIRST USUAL WALK

1. *This is our walking course. I want you to walk to the other end of the course at your usual speed, just as if you were walking down the street to go to the store. Walk all the way past the other end of the tape before you stop. I will walk with you. Do you feel this would be safe?*

2. Demonstrate the walk for the participant.

3. *When I want you to start, I will say: Ready, begin.*

4. Have the participant stand with both feet touching the starting line.

5. *WHEN THE PARTICIPANT IS PROPERLY POSITIONED AT STARTING LINE, SAY: Ready, begin.*

6. Press the start/stop button to start the stop watch as the participant begins walking.

7. Walk behind and to the side of the participant.

8. Stop timing when one of the subject s feet is all the way across the end line.

B. SECOND USUAL WALK

Now I want you to repeat the walk. Remember to walk at your usual pace, and go all the way past the other end of the course.

Measured Walks

Length of walk test course: Four meters . _
Three meters _

A. Time for First Usual Walk (in seconds)

1. Time for 3 or 4 meters __ __ . __ __seconds
2. IF NOT ATTEMPTED/COMPLETED: Refused _ Unable _ Felt Unsafe _
(GO TO CHAIR STANDS TEST)
3. Aids for first walk None _ Cane _ Other _

Comments: _____

_____

B. Time for Second Usual Walk (in seconds)

1. Time for 3 or 4 meters __ __ . __ __seconds
2. IF NOT ATTEMPTED/COMPLETED Refused _ Unable _ Felt Unsafe _
3. Aids for second walk None _ Cane _ Other _

WHAT IS THE TIME FOR THE FASTER OF THE 2 WALKS?

Record the shorter of the two times ..__ __ . __ __seconds [If only 1 walk done record that time]

If the participant was UNABLE to do the walk: _ **0 points**

For 4 Meter Walk:		**For 3 Meter Walk:**	
If time is more than 8.70 seconds :	**1 point**	If time is more than 6.52 seconds : ...	**1 point**
If time is 6.21 to 8.70 seconds: .	**2 points**	If time is 4.66 to 6.52 seconds: .	**2 points**
If time is 4.82 to 6.20 seconds: .	**3 points**	If time is 3.62 to 4.65 seconds: .	**3 points**
If time is less than 4.82 seconds: . .	**4 points**	If time is less than 3.62 seconds: ..	**4 points**

3. CHAIR STANDS

A. *Do you think it would be safe for you to try to stand up from a chair without using your arms?*

B. *The next test measures the strength in your legs.*

C. (Demonstrate and explain the procedure): *First, fold your arms across your chest and sit so that your feet are on the floor; then stand up keeping your arms folded across your chest.*

D. *Please stand up keeping your arms folded across your chest.* (Record result).

E. If participant cannot rise without using arms, say *Okay, try to stand up using your arms.* This is the end of their test. Record result and go to the scoring page.

REPEATED CHAIR STANDS

A. *Do you think it would be safe for you to try to stand up from a chair five times without using your arms?*

B. (Demonstrate and explain the procedure): *Please stand up straight as **QUICKLY** as you can five times, without stopping in between. After standing up each time, sit down and then stand up again. Keep your arms folded across your chest. I ll be timing you with a stopwatch.*

C. When the participant is properly seated, say: *Ready? Stand* and begin timing.

D. Count out loud as the participants arises each time, up to five times.

E. Stop if participant becomes tired or short of breath during repeated chair stands.

F. Stop the stopwatch when he/she has straightened up completely for the fifth time.

G. If the participant sits down after the fifth stand-up, stop timing as she/he begins to sit down.

H. Also stop:
1. If participant uses his/her arms
2. After 1 minute, if participant has not completed rises
3. At your discretion, if concerned for participant s safety.

I. IF THE PARTICIPANT STOPS AND APPEARS TO BE FATIGUED BEFORE COMPLETING FIVE STANDS, CONFIRM THIS BY ASKING: *Can you continue?*

J. If participant says *Yes*, continue timing. If participant says *No*, stop and reset the stopwatch.

SINGLE CHAIR STAND

		YES	NO
A.	Safe to stand without help	_	_
B.	Results:		
	Participant stood without arms _		
	Participant used arms to stand _		
	Test not completed. _		
C.	IF NOT COMPLETED/or NOT ATTEMPTED:		
	Unable to stand _		
	Participant refused _		

(Go to Scoring Page).

REPEATED CHAIR STANDS

		YES	NO
A.	Safe to stand five times	_	_

B. IF FIVE STANDS DONE SUCCESSFULLY. RECORD TIME IN SECONDS

Time to complete five stands __ __ . __ seconds

C. IF NOT COMPLETED/or NOT ATTEMPTED:

Unable to complete repeated stands _

Participant unable to understand instructions . _

Participant refused . _

SCORING REPEATED CHAIR STANDS

If the participant was unable to complete the 5 chair stands: _ **0 points**

If chair stand time is 16.7 seconds or more: _ **1 points**

If chair stand time is 13.7 to 16.6 seconds: .. _ **2 points**

If chair stand time is 11.2 to 13.6 seconds: .. _ **3 points**

If chair stand time is 11.1 seconds or less: .. . _ **4 points**

SCORING BATTERY OF TESTS

TOTAL TEST SCORES

Balance test score _____ points

Measured walks _____ points

Chair stands _____ points

TOTAL SCORE _____ (sum points)

APPENDIX C

PHYSICIAN CLEARANCE

Physician's Clearance to Participate in Physical Activity and Walking

Your patient, _____, has indicated an interest in participating in a nutrition, physical activity, and walking program offered at their local senior center. The program is designed to help older adults eat better and walk more, and was developed by the Georgia Division of Aging Services and the University of Georgia. Participants will wear step counters to monitor the number of steps they take each day. About every two weeks each participant will be given a daily step goal based on the average daily steps from the previous week. The new step goal will be about a 10% increase. Also, about every one or two weeks, there will be lessons on nutrition, physical activity, and walking at the senior centers. Along with the lessons, about five to thirty minutes of group physical activity, including chair exercises for improving flexibility, balance, and strength will be offered. When and where possible, a group walking activity will also be included.

RELEASE TO REQUEST PERMISSION FROM PHYSICIAN

I give permission to _____to ask my physician if I may participate in the physical activity and walking program at my senior center.

I give my physician my approval to sign the form.

Participant signature: _____ Date: _____

Participant printed name: _____

PHYSICIAN SIGNATURE

My patient,_____ has medical approval to participate in the physical activity and walking program at their senior center.

___ The patient has no known contraindications to moderate physical activity.

___ The patient has conditions in which moderate physical activity is contraindicated.

Physician Signature: _____ Date: _____

Physician printed name: _____

Physician address: _____

Physician phone: _____

Physician FAX: _____

Form adapted from: Eat Better & Move Better, A Guide Book for Community Programs, National Resource Center on Nutrition, Physical Activity and Aging, Florida International University, funded by grants from the Administration on Aging, US Department of Health and Human Services.

APPENDIX D

INTERVENTION PRE-TEST/POST-TEST

LIVE HEALTHY GEORGIA – SENIORS TAKING CHARGE!
CONSENT FORM (NO DIABETES)

I, _____, agree to participate in the research study titled "Live Healthy Georgia – Seniors Taking Charge" conducted by Dr. Mary Ann Johnson in the Department of Foods and Nutrition at the University of Georgia and at my local Senior Center. I understand that participation is voluntary and I do not have to take part if I do not want to. I can stop taking part anytime without giving any reason and without penalty. I can ask to have all information concerning me removed from the research records, returned to me, or destroyed. My decision to participate will not affect the services that I receive at the Senior Center.

By participating in this study, I may improve my nutrition and physical activity habits. This study will also help the investigators learn more about good ways to help older adults improve their nutrition and physical activity habits. This study will be conducted at my local Senior Center. If I volunteer to take part in this study, I will be asked to do the following things:

1) Answer questions about my health, nutrition and physical activity.
2) Obtain physician approval to participate in a physical activity program.
3) Attend two sessions for collecting information about my health, fitness, food, and nutrition habits. The first session will last about 60 minutes and the second session will last about 30 minutes.
4) Attend up to 8 nutrition and physical activity programs that will last about 30 to 60 minutes each over a four month period. I will learn how to use a step counter and record my number of daily steps.
5) Take part in a physical activity program of chair exercises and walking to improve my strength, balance, endurance, and flexibility.
6) Someone from the study may contact me to clarify my information throughout the study.

The instructor may provide food to taste. Mild to no risk is expected by tasting food. However, I will not taste foods that I should not eat because of swallowing difficulties, allergic reactions, dietary restrictions, or other food-related problems.

There is minimal risk to participation in this study. I may experience some discomfort or stress when the researchers ask me questions about my nutrition, health, and physical activity habits. There is a possibility that I could temporarily injure a muscle or be sore from physical exertion. This risk is minimized by ability to rest at any time. If additional care is needed, then my insurance company or myself will be responsible for any expense that may be incurred. The Senior Center where the programs are conducted and the University of Georgia and their employees shall not incur any liability for incidents that may occur during or as a result of my participation in this study.

The leaders will advise me to stop exercising if I experience any discomfort or chest pains. No information concerning myself or provided by myself during this study will be shared with others without my written permission, unless law requires it. I may choose not to answer any question or questions that may make me uncomfortable. I will be assigned an identifying number and this number will be used on all of the questionnaires I fill out. Data will be stored in locked file cabinets under the supervision of Dr. Mary Ann Johnson at the University of Georgia; only the staff involved in the study will have access to these data and only for the purpose of data analyses and interpretation of results. My identity will not be revealed in any reports or published materials that might result from this study. The data will be destroyed by January 1, 2012.

If I have any further questions about the study, now or during the course of the study I can call Ms. Tiffany Sellers (706-542-4838) or Dr. Mary Ann Johnson (706-542-2292). I will sign two copies of this form. I understand that I am agreeing by my signature on this form to take part in this study. I will receive a signed copy of this consent form for my records.

Signature of Participant	Participant's Printed Name	Date

Participant Address and Phone

Signature of Investigator	Mary Ann Johnson Printed Name of Investigator	Date

Email: mjohnson@fcs.uga.edu

Signature of Staff who Reads Consent Form to Participant	Printed Name of Staff	Date

For questions or problems about your rights as a research participant please call or write: The Chairperson, Institutional Review Board, University of Georgia, 612 Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-3199; E-Mail Address IRB@uga.edu

UGA project number: 2006-10022-0 DHR project number: 050801 Date: October 10, 2005 maj

UGA IRB APPROVAL

OCT 26 '05 OCT 25 '06

DHR INSTITUTIONAL REVIEW BOARD

Project # 050801

Consent Form Approval Period

From 10-26-05 To 10-7-06

Authorization MP

LIVE HEALTHY GEORGIA – SENIORS TAKING CHARGE!

		Line 1
ID of Participant:		1-4
Phone number to use to clarify information and get step counts:		
1. County:		10-12
2. Date (M/D/Y): ___/___/___		13-18
3. Age of Participant: ___ ___		19-21
4. Gender: Male (0) Female (1)		22
5. Ethnicity: White (1) Black (2) Hispanic/Latino (3) Asian (4) Other (5)		23
6. How many years did you complete in school: ___ years		24-25
7. How would you rate your overall health? Circle one: Poor (0) Fair (1) Good (2) Very good (3) Excellent (4)		26
8. Do you use any tobacco products such as cigarettes, cigars, pipe, or chewing tobacco?	No (0) Yes (1)	27
9. Do you have diabetes?	No (0) Yes (1)	28
10. Do you have high blood pressure?	No (0) Yes (1)	29
11. Do you have heart disease such as angina, congestive heart failure, heart attack or other heart problems?	No (0) Yes (1)	30
12. Do you have arthritis?	No (0) Yes (1)	31
13. During the past 30 days, have you had symptoms of pain, aching, or stiffness in or around a joint?	No (0) Yes (1)	32
14. Do you always have enough money to buy the food you need?	No (0) Yes (1)	33
15. How many over the counter medications do you take?		34-35
16. How many prescription medications, including insulin, do you take?		36-37
Think about the fruits and vegetables you usually eat each day, such as 100% juices; fresh, frozen or canned fruits; fruits for dessert, as well as potatoes, salads, slaws, and other fresh, frozen or canned vegetables. A serving is a piece of fruit or about ½ cup of most fruits and vegetables; ¼ cup of dried fruits (such as raisins); or 1 cup of raw leafy greens used in salads. The next questions are about your usual intake of fruits and vegetables at each meal and for snacks <u>each day.</u>		
17. How many servings of fruit do you usually have with breakfast?	0 1 2 3 4 5	38
18. How many servings of vegetables do you usually have with breakfast?	0 1 2 3 4 5	39
19. How many servings of fruit do you usually have with lunch?	0 1 2 3 4 5	40
20. How many servings of vegetables do you usually have with lunch?	0 1 2 3 4 5	41
21. How many servings of fruit do you usually have with your evening meal?	0 1 2 3 4 5	42
22. How many servings of vegetables do you usually have with your evening meal?	0 1 2 3 4 5	43
23. How many servings of fruit do you usually have as snacks each day?	0 1 2 3 4 5	44
24. How many servings of vegetables do you usually have as snacks each day?	0 1 2 3 4 5	45
25. How many fruits and vegetables should older people eat each day? (Circle the participant's response) 0 1 2 3 4 5 6 7 8 9 10 "5 a day" "5 or more a day" "7 to 10 a day" DK Missing		46-47
26. On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?	0 1 2 3 4 5 6 7	48

What keeps you from eating more fruits and vegetables? *Circle all that apply.*		
27. Chewing or dental problems	No (0) Yes (1)	49
28. Cooking problems	No (0) Yes (1)	50
29. Cost	No (0) Yes (1)	51
30. Difficulties with digestion	No (0) Yes (1)	52
31. Don't like taste	No (0) Yes (1)	53
32. Grocery store does not have what I like	No (0) Yes (1)	54
33. Lack of storage space	No (0) Yes (1)	55
34. Not in season	No (0) Yes (1)	56
35. Spouse doesn't like them	No (0) Yes (1)	57
36. Takes too much time	No (0) Yes (1)	58
37. Too heavy to carry home from the store	No (0) Yes (1)	59
38. Too many are recommended	No (0) Yes (1)	60
39. Too much trouble	No (0) Yes (1)	61
40. Transportation problems	No (0) Yes (1)	62
41. Doctor told me not to eat some fruits and vegetables. If yes, please list:	No (0) Yes (1)	63
42. Other reasons that keep you from eating more fruits and vegetables. If yes, please list:	No (0) Yes (1)	64
43. How many of the last SEVEN DAYS have you followed a healthful eating plan?	0 1 2 3 4 5 6 7	65
44. On average, over the past month, how many DAYS PER WEEK have you followed an eating plan prescribed by your health care provider?	0 1 2 3 4 5 6 7	66
45. On how many of the last SEVEN DAYS did you eat high fat foods such as high fat red meats or full-fat dairy foods?	0 1 2 3 4 5 6 7	67
46. On how many of the last SEVEN DAYS did you participate in at least 30 minutes of **moderate** physical activity? Examples of **moderate** activities are regular walking, housework, yard work, lawn mowing, painting, repairing, light carpentry, ballroom dancing, light sports, golf, or bicycling on level.	0 1 2 3 4 5 6 7	68
47. On how many of the last SEVEN DAYS did you participate in a specific exercise session other than what you do around the house or as a part of your daily activities?	0 1 2 3 4 5 6 7	69
48. On how many of the last SEVEN DAYS, did you participate in specific exercises for your arthritis?	0 1 2 3 4 5 6 7	70
49. How many days of the week do you participate in physical activity?	0 1 2 3 4 5 6 7	71
50. About how many minutes of physical activity do you do on the days you are physically active?	____ minutes	72-74
What keeps you from being physically active for at least 30 minutes on all or most days of the week? *Circle all that apply.*		
51. I already am this physically active on all or most days of the week	No (0) Yes (1)	75
52. I have a health condition that keeps me from being active	No (0) Yes (1)	76
53. It costs too much	No (0) Yes (1)	77
54. I don't have time	No (0) Yes (1)	78
55. I don't like to	No (0) Yes (1)	79
56. It's not safe	No (0) Yes (1)	80
57. It's too late to improve my health	No (0) Yes (1)	81
58. 30 minutes daily is too much for me	No (0) Yes (1)	82

List of FV barriers selected from John and Ziebland, 2004 (http://ber.oxfordjournals.org/cgi/reprint/19/2/165). 4

Diabetes Risk - Could You Have Diabetes and Not Know It?

	Circle the answers		Line 2
1. Are you 65 years old or older?	Yes (9)	No (0)	10
2. Are you between 45 and 64 years of age?	Yes (5)	No (0)	11
3. Are you under 65 years of age AND get little or no exercise?	Yes (5)	No (0)	12
4. Do you have a sister or brother with diabetes?	Yes (1)	No (0)	13
5. Do you have a parent with diabetes?	Yes (1)	No (0)	14
6. Are you a woman who had a baby weighing more than nine pounds at birth?	Yes (1)	No (0)	15
7. What is your current height without shoes? _____ feet and ____ inches			inches 16-18
8. What is your current weight without clothes? _____ pounds			19-21
9. Is weight equal to or above that listed in the chart?	Yes (5)	No (0)	22

Height in feet and inches without shoes	Weight in pounds without clothing
4 feet, 10 inches	129
4 feet, 11 inches	133
5 feet	138
5 feet, 1 inches	143
5 feet, 2 inches	147
5 feet, 3 inches	152
5 feet, 4 inches	157
5 feet, 5 inches	162
5 feet, 6 inches	167
5 feet, 7 inches	172
5 feet, 8 inches	177
5 feet, 9 inches	182
5 feet, 10 inches	188
5 feet, 11 inches	193
6 feet	199
6 feet, 1 inches	204
6 feet, 2 inches	210
6 feet, 3 inches	216
6 feet, 4 inches	221

10. TOTAL Score: 23-24

If 10 points are more, then you are at high risk for having diabetes. Only your health care provider can check to see if you have diabetes. Take this sheet to your health care provider to find out for sure.

If 3 to 9 points, then you are probably at low risk for having diabetes now. But don't just forget about it. Keep your risk low by losing weight if you are overweight, being active most days, and eating low fat meals that are high in fruits, vegetables, and whole grain foods.

Diabetes Facts You Should Know

Diabetes is a serious disease that can lead to blindness, heart disease, strokes, kidney failure, and loss of limbs.

You are at great risk for diabetes if:

You are 45 and older * You are overweight * You have high blood pressure * You have a family history of diabetes *

For more information, call 1-800-Diabetes(342-2883) or visit www.diabetes.org

WAIST CIRCUMFERENCE:
Instructions for Measuring Waist Circumference

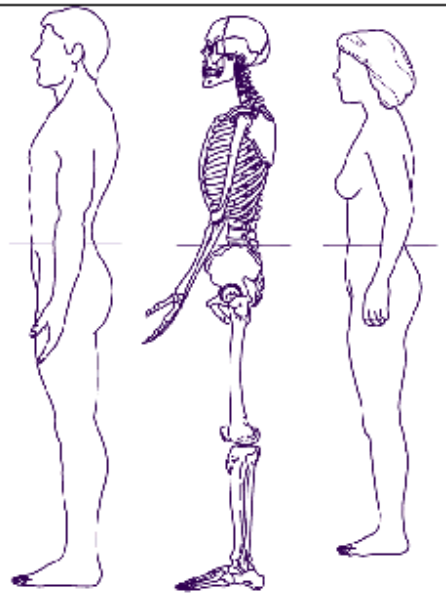
The measurement should be made under the clothes.

To measure waist circumference, locate the upper hipbone and the top of the right iliac crest. Place a measuring tape in a horizontal plane around the abdomen at the level of the iliac crest. Before reading the tape measure, ensure that the tape is snug, but does not compress the skin, and is parallel to the floor. The measurement is made at the end of a normal expiration.

A high waist circumference is associated with an increased risk for type 2 diabetes, dyslipidemia, hypertension, and CVD in patients with a BMI between 25 and 34.9 kg/m2.

High-Risk Waist Circumference
Men: > 40 in (> 102 cm)
Women: > 35 in (> 88 cm)

http://www.nhlbi.nih.gov/guidelines/obesity/prctgd_c.pdf



59. Waist Circumference = _____ INCHES		Line 3 10-13
60. How was measurement made? (1) Under clothes OR (2) Over clothes	1 2	14
61. Chair Sit-and-Reach: sit in stable chair, knees straight, bend over, reach with arms straight to toes, then measure with a ruler: Number of inches person is short of reaching the toes: ___ ___ . ___ (-) *or* Number of inches person reaches beyond toes: ___ ___ . ___ (+) *Measure to the nearest ½ inch*		15-18 19-22
62. What is your current height without shoes? _____ feet and ____ inches		23-25
63. What is your current weight without clothes? _____ pounds		26-28
64. How was weight measurement made? PREFERRED: With a scale and without shoes (1) With a scale and with shoes (2) Self-report (3)		29

ID: _____ DATE (M/D/Year): _____ STAFF NAME: _____ PHYSICAL PERFORMANCE

	Physical Performance Test-Task Descriptions Equipment: Stopwatch, 8-Ft Tape Measure, Ruler, Folding Chair	RECORD TIME IN SECONDS	LINE 4 UGA Staff can score with open coding
ASB	**STANDING BALANCE:** **Time each item until >10.0 sec. OR until participant moves feet or reaches for support.** **1a) SEMI-TANDEM** (heel of one foot placed at mid-position of the other) *If can hold for 10 seconds, move to **1b)** *If can NOT hold for 10 seconds, move to **1c)** **1b) TANDEM** (heel to toe, one foot directly in front of the other) **1c) SIDE-BY-SIDE** (toes lined up evenly and feet touching)	**Time to the nearest 10th second:** **a)** ___ ___ . ___ > 10.0 sec. Go to **b)** < 10.0 sec. Go to **c)** **b)** ___ ___ . ___ **c)** ___ ___ . ___	10-13 14-17 18-21
ASB D	**DOMAIN SCORE:** If A= <10 & C= 0-9, score= 0 A= <10 & C= 10, score= 1 A= ≥10 & B= 0-2, score= 2 A= ≥10 & B= 3-9, score= 3 A= ≥10 & B= ≥10, score= 4	**SCORE:** _____	22
AFW	**8 FOOT WALK:** **Participant begins at standing position and will walk a straight distance of 8-feet, measured with tape on the floor.** **Instruct the participant to walk at normal gait using any assistive devices. If possible, have them begin walking a few feet before starting mark, and continue walking a few feet past the 8-foot mark. Tester will start and stop watch at the distance marks.** **Complete the walk twice.**	**Time to the nearest 10th second:** **1)** ___ ___ . ___ **2)** ___ ___ . ___ Use best (lowest) time **Assistive device used?** NO (0) YES (1) Describe _____	23-26 27
AFW D	**DOMAIN SCORE:** 1= ≥5.7 2= 4.1-5.6 3= 3.2-4.0 4= ≤3.1	**SCORE:** _____	28
ACS	**CHAIR STANDS:** **Participant is asked to stand one time from a seated position in an armless, straight-backed chair (such as a folding metal chair) with their arms folded across their chest.** **If able, participant is asked to stand-up and sit-down 5 times as quickly as possible while being timed.** **If not able to perform, then the test is complete.**	**Time to the nearest 10th second:** **1)** ___ ___ . ___	29-32
ACS D	**DOMAIN SCORE:** 1= ≥16.7 2= 13.7-16.6 3= 11.2-13.6 4= ≤11.1	**SCORE:** _____	33
TDS	**TOTAL SCORE: Add all 3 domain scores (1-12)**	**TOTAL SCORE:** __ __	34-35
Coding: 8 = physically unable, 9=refused, 7=not applicable. Good function (score of 10 to 12); moderate function (score of 6 to 9); poor function (score of 0 to 5).			

7

THE END

APPENDIX E

STEP COUNT LOG AND STEP COUNT CHART

Step Count Log: Enter Weekly Total

Name of Senior Center: _____ Educator: _____

	Record Step Count at Lessons: Fruits, Vegetables, Physical Activity **Record date M/D/Y and counts**								Record Step Counts Lessons: Diabetes Self-Management **Record date M/D/Y and counts**								Reason no step count information (sick, moved, etc?)
Lesson #	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	
IDs																	

STEP COUNT CHART
RECORD YOUR STEPS EACH DAY AND BRING TO THE SENIOR CENTER TO SHARE YOUR PROGRESS!

ID: _____ SENIOR CENTER: _____ MONTH: _____ YEAR: _____

MY DAILY GOAL	MON	TUES	WED	THURS	FRI	SAT	SUN	WEEKLY TOTAL	DID I MEET MY GOAL? IDEAS TO MEET MY GOAL