Published in final edited form as:

J Am Geriatr Soc. 2009 July ; 57(7): 1166–1174. doi:10.1111/j.1532-5415.2009.02301.x.

The Veterans LIFE Study: A Randomized Trial of Primary Care Based Physical Activity Counseling For Older Men

Miriam C. Morey, Ph.D.^{*,†}, Matthew J Peterson, Ph.D.^{*,†}, Carl F. Pieper, Dr. PH.[†], Richard Sloane, MPH[†], Gail M. Crowley, MSN, ANP-C^{*,†}, Patricia A. Cowper, PH.D.[†], Eleanor S. McConnell, Ph.D.^{*,†,§}, Hayden B. Bosworth, Ph.D.^{†,‡,§}, Carola C. Ekelund, P.T.^{*}, and Megan P. Pearson, M.A.^{*}

^{*}Durham VA Medical Center, GRECC

[†]Duke University Medical Center (Aging Center, Older Americans Independence Center, Department of Medicine, Department of Biostatistics and Bioinformatics, or Duke Clinical Research Institute)

[‡]VA Medical Center HSR&D

[§]Duke University School of Nursing

Abstract

BACKGROUND—Slow gait is predictive of adverse health outcomes and increased health service utilization. Physical activity counseling (PAC) may enhance mobility among elders. Primary care settings are appropriate for PAC because most older adults see their primary care physician annually. Innovative use of automated telephone messaging facilitates physician counseling.

OBJECTIVE—To determine the effects of multi-component PAC promoting physical activity (PA) guidelines on gait speed and related measures of PA and function in older veterans.

DESIGN, SETTING, AND PARTICIPANTS—Randomized controlled trial of 398 male veterans, ages 70 and over receiving primary care at the Veterans' Affairs Medical Center of Durham, N.C.

INTERVENTION—Twelve months of usual care (UC) or multi-component PAC consisting of baseline in-person and biweekly then monthly telephone counseling by a lifestyle counselor, one-time clinical endorsement of PA and monthly automated telephone messaging by primary care provider, and quarterly tailored mailings of progress in PA.

MEASUREMENTS—Gait speed (usual and rapid), self-reported PA, function and disability at baseline, 3, 6 and 12 months.

RESULTS—Although no between-group differences were noted for usual gait speed, rapid gait speed improved significantly more for the PAC group (1.56 (0.41) m/s to 1.68 (0.44) m/s) compared to UC (1.57 (0.40) m/sec to 1.59 (0.42) m/sec, $p = 0.04$). Minutes of moderate/vigorous PA increased

Address correspondence to: Miriam C. Morey, Ph.D., Associate Director of Research, GRECC (182), VA Medical Center, 508 Fulton St. Durham, NC 27705., Tel: (919) 286-0411 x 6776, Fax: (919) 286-6823, e-mail: morey@geri.duke.edu.

Author Contributions: Study concept and design: MCM, CFP, MJP, GMC, PAC, HBB, ESM. Acquisition of data: MCM, CCE, MPP, MJP, GMC. Analysis and interpretation of data: MCM, CFP, PAC, RS, MJP, HBB, ESM. Drafting of the manuscript: MCM. Critical revision of the manuscript for important intellectual content: MCM, CFP, ESM, PAC, RS, MJP, CCE, MPP, GMC, HBB. Statistical analysis: MCM, CFP, RS, PAC. Obtained funding: MCM, CFP, MJP, GMC, PAC, ESM, HBB. Study supervision: MCM, MPP.

Presented as Late Breaking News at the 2007 Gerontological Society of America annual scientific meeting.

Trial Registration clinical trials.gov Identifier: NCT00435188

Financial Disclosures: Supported by research grant VA Rehabilitation Research and Development # E3386R and NIH grant AG028716. The views expressed by the authors do not necessarily reflect the views of the Department of Veterans Affairs.

significantly in the PAC group (from a mean (SD) 57.1 (99.3) min/wk to 126.6 (142.9) min/week) compared to the UC group (from 60.2 (116.1) to 69.6 (116.1) min/wk, $p < 0.001$). Changes in other functional/disability outcomes were small.

CONCLUSIONS—In this group of older male veterans, multi-component PA significantly improved rapid gait and PA. Translation from increased PA to overall functioning was not observed. Integration with primary care was successful.

Keywords

aging; counseling; health promotion; physical activity; primary care; mobility limitation; veterans; randomized clinical trial

INTRODUCTION

The number of older adults living with disabilities is increasing dramatically. Efforts to maximize disability-free living include promotion of physical activity (PA).⁽¹⁾ Despite the fact that PA has been shown to be both safe and effective, even for the most vulnerable elders, physical activity counseling (PAC) is not well integrated into primary care for elders.^(2, 3) The primary care setting is appropriate for PAC because over 90% of older adults visit their primary care provider at least once a year.⁽⁴⁾ The U.S. Preventive Task Force conclusion that there was insufficient evidence that PA counseling by primary care providers was effective may have further hindered efforts to incorporate PA counseling into primary care.⁽⁵⁾ Recent studies in primary care settings have reported significant improvements in PA among elders.^(6, 7) High PA is consistently associated with higher physical function.^(8, 9) It is unclear whether improved PA initiated from primary-care based settings translates into improved functional status.⁽¹⁰⁾

The Durham Veterans Affairs (VA) Medical Center has supported a facility-based supervised exercise program for older veterans, Gerofit, for over 20 years.⁽¹¹⁾ The Veterans “Learning to Improve Fitness and Function in Elders” (LIFE) Study evolved out of a desire to offer PA programs to older veterans who lived too far away to participate in a facility-based program. Because home-based PA is less intensive than facility-based PA, we designed a PAC program that emphasized walking and leg strengthening, two key components of PA that are associated with improved physical function.⁽¹²⁾ A multi-component PAC program was compared to usual care (UC). The underlying theoretical framework stems from the Nagi disablement model which describes a continuum from pathology to impairment to functional limitations to ultimate disability.⁽¹³⁾ We hoped to break the pathway to disability by targeting impairments in cardiorespiratory and musculoskeletal systems; thereby reducing functional limitations (i.e. improved functional status or physical function) and ultimately disability. The primary aim of the Veterans LIFE Study was to determine whether PAC would increase PA sufficiently to improve performance-based measures of physical function as measured by change in both usual and rapid gait speed (important predictors of functional status), as the primary endpoints.^(14, 15) We also examined, as secondary outcomes, change in minutes of moderate/vigorous endurance and strength PA, PA self-efficacy, physical performance, and self-rated health, function, and disability.

METHODS

A complete description of the Veterans LIFE Study has been published elsewhere.⁽¹⁶⁾ In brief, the study was a randomized controlled trial comparing a 1-year multi-component PAC program to UC. The research protocol was reviewed and approved by the Durham VA institutional review board with written consent obtained from all patients.

Settings and Participants

The medical records of all patients ages 70 and over who were followed at the Durham VA Medical Center were first reviewed (see Figure 1). Patients were eligible for the study if they could walk 30 feet without human assistance and did not engage in regular PA. Patients were excluded if they had a terminal diagnosis, conditions that would preclude enhancing PA, dementia, or severe hearing or visual loss. The primary care provider provided a final eligibility determination using our criteria. A total of 3,995 medical records were examined and recruitment packages were sent to 1917 patients after receiving provider approval. Of these, 1567 potentially eligible patients were contacted by telephone for recruitment into the study and 398 were randomized to PAC or UC. Prescreening, enrollment and recruitment were ongoing from July 2004 through March 2006. Randomization was computer generated by a statistician and delivered in sealed envelopes stored in the Veterans LIFE Study office until randomization.

Physical Activity Counseling and Usual Care

The stated PA objectives of the PAC group were to walk or perform lower extremity PA for 30 minutes or more on five or more days each week and to perform 15 minutes of lower extremity strength training on three days each week. The PAC intervention was based on social cognitive theory and the transtheoretical “stage of change” model.^(17, 18) PAC consisted of five components. (1) Baseline Counseling: individual in-person baseline counseling delivered by a lifestyle health counselor with 20 years of experience in exercise counseling using a structured protocol, “The LIFE Program Planning the First Step,” that was modified for older adults with chronic illnesses from the Physician-based Assessment and Counseling for Exercise (PACE) project.^(19, 20) Individuals also received the National Institute of Aging exercise workbook,⁽²¹⁾ elastic bands of different resistances, an exercise poster depicting leg strengthening exercises, and a pedometer. (2) Telephone Counseling: telephone counseling calls were delivered by the same lifestyle counselor, initially at 2-week intervals for 6 weeks and then monthly for the 12-month intervention period. Each call followed a structured protocol designed to assess PA goals, quantify actual PA, offer support and reinforcement, discuss barriers, problem solve, and assign new PA goals. (3) Provider Endorsement: each primary care provider was asked to endorse the LIFE study or PA during the primary care visit closest to study enrollment. (4) Provider Messaging: telephone encouragement by the primary care provider was delivered monthly using automated telephone messaging. Each provider recorded a brief message of PA endorsement that was personalized to the specific patient. Providers were encouraged to modify the script to suit their personal style. (5) Tailored Report: an individually tailored progress report was mailed to study participants each quarter, with a message directed at progress towards the achievement of PA objectives and a graph depicted reported minutes of endurance and strength exercises over time.

Individuals randomized to UC were asked to continue their normal daily activities and were informed that they would be offered a reduced, three-month version of PAC upon conclusion of the study.

Measures

The primary outcomes, usual and rapid gait speed were measured from an 8-foot walk test using a Speedtrap wireless timing device that records walking time with 1/100 second accuracy. The fastest usual and rapid gait from two trials was recorded. Other physical performance measures included a two-minute endurance walk,⁽²²⁾ tests of standing balance and chair stands, which, combined with gait speed, comprise the Short Physical Performance Battery (SPPB) described by Guralnik and colleagues.⁽¹⁵⁾ Scores for the SPPB range from 0–12 with higher scores indicating better performance. Grip strength was measured in kilograms (kg) with a hydraulic hand dynamometer.

Physical activity was assessed using the well-validated Community Healthy Activities Model Program for Seniors (CHAMPS).^(23, 24) The CHAMPS assesses frequency and minutes of a range of physical activities from which moderate and vigorous activities can be abstracted. PA self-efficacy and motivation were assessed separately for endurance and leg strengthening using 5-point Likert scales asking about confidence in ability and motivation to perform endurance and strength activities.⁽²⁵⁾

Self-rated health, physical function and disability were assessed using question 1 and the physical function subscale of the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) and the Late Life Function (LLF) and Disability (LLD) instruments, respectively.^(26–28) The LLF score assesses overall physical functioning while the LLD has two scores: (a) limitations in the capability of participating in life tasks and (b) frequency of participating in social and community tasks. Raw data from all of these scales are normalized and range from 0 to 100 with higher scores indicating better function and less disability. Self-report of diseases was derived from a list of 35 medical conditions adapted from the Older Americans Resources and Services survey.⁽²⁹⁾ Similarly, we used a checklist of 22 symptoms.⁽³⁰⁾ All assessments were made at baseline, three, six, and 12 months by individuals blinded to randomization status. All research staff underwent two to four weeks of training in the physical assessments and interviewing techniques prior to patient contact.

Statistical Analyses

The primary and secondary outcomes were analyzed by a mixed models analysis of variance procedure using maximum likelihood estimation. The method allows for estimation in the presence of missing values.⁽³¹⁾ All individuals with at least one follow-up were included in the mixed model analyses. Baseline values of the outcome of interest, group, time (month of follow-up), and the group by time interaction were included as predictors in each model. To control for Type-I error and assess the overall differences between groups during and at the end of the study, the statistical significance for group and the group by time interaction was assessed by the change in log-likelihood. The overall effect of group (intervention vs. UC) was assessed by comparing the maximum likelihood fit of the full (covariates plus group and group by time interaction) and reduced (covariates only) models.

The statistical power for gait speed has been reported previously.⁽¹⁶⁾ We powered the sample size for this study to be able to detect a between group difference of 0.10m/sec in both usual and rapid gait speeds. Effects of this magnitude have been shown as indicators of a clinically meaningful improvement in functional as they have been related to improved survival, recovery from hip fracture and other important functional outcomes.^(15, 32–34)

RESULTS

Of 398 patients randomized, 355 (89.2%) completed the final assessment. Return for follow-up was similar for both groups with slightly more withdrawals in the PAC group [16 (8%)] than in the UC group [11 (5.5%)]. Seventeen withdrawals reported being too busy or gave no reason. Four individuals in the PAC group and two in the UC group withdrew because of illness or pain that interfered with their ability to walk. Three individuals moved from the area, and one developed dementia and was withdrawn at the request of his primary care provider. There was one death in the PAC group and six in the UC group. Only three events (heel pain, knee strain and fall) were attributed to increased PA. There were no differences between dropouts and individuals completing the trial except for usual gait speed which was significantly lower in the drop outs (-0.9m/sec , $p = 0.016$).

The mean (SD) age was 77.6 (4.9) and ranged from 70 to 92 (see Table 1). The racial composition was similar to the racial composition of individuals over age 65 in our county.

Approximately 55% percent had attended college, trade school, or had a college degree; 21% had not graduated from high school. Study participants averaged five medical conditions; the most frequently cited were hypertension (73%), arthritis (65%), and heart conditions (47%). The most common symptoms reported were shortness of breath with exertion (68%), shortness of breath at rest (65%), and memory loss (52%). Reported exercise minutes were very low, averaging about 6 minutes per day. Only 13% of study participants engaged in any strengthening activities.

Change in gait speed

Usual gait speed increased significantly in both groups over time ($p < 0.001$, overall time effect); in the PAC group it increased 1.03 (0.25) m/sec to 1.15 (0.28) m/sec, in the UC group from 1.03 (0.24) m/s to 1.12 (0.25) m/sec, but, adjusting for baseline gait speed and the other covariates, this difference in change between groups was not significant (Figure 2 and Table 2). Rapid gait speed increased significantly over time in the PAC group from 1.56 (0.41) to 1.68 (0.44) m/sec, compared to no change in the UC group, $p = 0.04$.

Change in physical activity

Significant group differences were observed in PA (Table 2). The PAC group showed notable increases in moderate/vigorous PA frequency, from 15.9 times per week to 22.4 times per week, compared to no change in the UC group ($p < 0.001$). Reported minutes of moderate/vigorous endurance and strength exercises also increased significantly more in the PAC group in comparison to UC. (Table 2 and Figure 3). When examined within the context of meeting the intervention goal of 150 minutes or more of moderate/vigorous PA per week, the proportion of individuals meeting the goal increased from 13% at baseline to 32% at 12 months in the PAC group ($p < 0.001$) in contrast to the UC group which stayed relatively flat throughout (14% – 16%, $p = 0.38$). Following the initial baseline counseling session, 79% of individuals in the PAC group chose to perform strength training activities consisting of forward and side leg raises, hip extension, hip and knee flexion using the elastic exercise bands or, squats, toe rises, chair stands, and stair climbing without the bands. Sixteen percent reported access to gym equipment and were prescribed leg press, hamstring curl, and leg extension exercises according to standard guidelines. Five percent elected to use a combination of both the band exercises and gym equipment. By the end of the study, 81% were doing home-based strength exercises, mostly without use of the exercise bands. Self-efficacy for endurance and strength exercises increased in the PAC group, but not significantly more than the UC group. Individuals in the PAC group however, were significantly more motivated than the UC group to perform endurance and strengthening exercises.

Change in physical performance, physical function and disability

Except for grip strength, which declined over time, both groups improved in measures of physical performance. Individuals in the PAC group tended to walk a greater distance during the 2 minute walk than individuals in the UC group ($p = 0.08$). An unanticipated finding was that the UC group had a better 12-month outcome than the PAC group for the SPPB ($p = 0.03$). Changes over time in self-reported physical function and disability were negligible.

Integration with providers

As validation of the providers role in this project information regarding intervention fidelity relative to the providers, acceptability, and costs is presented. Clinical endorsements for the LIFE Study were documented in the medical records for over 90% of patients in the PAC group, and over 98% of the automated telephone messages were successfully delivered. Fifteen of 30 providers responded to a post-study survey, with 80% reporting that the intervention made PAC easier. On average, clinic time spent endorsing PA per patient was reported by the

providers to be three minutes or less. Direct costs for physician time were estimated at \$4.00 per patient for clinic endorsement of PA and \$8.00 per patient for physician time (estimated at five minutes) for recording the PA endorsement message based on average annual primary care physician salary and fringe. Other feedback relative to physician/patient interactions was favorable; 85% of PAC participants recalled receiving a provider LIFE Study endorsement in clinic and 91% reported that the monthly provider telephone endorsement motivated them to exercise.

DISCUSSION

Physical activity is positively associated with functional status.^(8, 9) The Veterans LIFE study sought to determine whether a PAC program targeting endurance and leg strength delivered in concert with primary care would result in improved gait speed, a known indicator of functional status.⁽³⁵⁾ The mean baseline usual and rapid gait speeds were lower than gait speeds reported for healthy men in their seventies indicating that this was an appropriate target group.^(36, 37) Other baseline physical performance scores placed these study participants at high risk for hospitalization, increased health care utilization, and mortality.^(35, 38) Following participation in this trial, individuals in both groups achieved notable improvements in usual gait speed, greater than 0.10m/sec and large enough to be considered clinically meaningful, but the magnitude of change in the PAC did not significantly exceed that observed in UC.⁽³⁴⁾ The baseline range of usual gait speeds in this study was large, from 0.18m/sec to 1.87m/sec with 20 % of the sample walking at what would be considered a normal walking speed. Although both groups improved in usual gait speed over time, the PAC group was consistently higher at each measurement point even though the difference was not statistically significant. It is possible that change in usual gait speed was muted somewhat by the lack of impairment in usual gait speed in a portion of the sample.

For rapid gait speed the PAC group improved significantly relative to UC. Few studies have reported significant changes in rapid gait speed with exercise training and there is also a paucity of information about clinically meaningful changes in rapid gait. We specifically added strength training to our intervention because we felt strength training would be most likely to influence rapid gait. To our knowledge, we are among the first to report a significant improvement in rapid gait speed, that is, greater than 0.10m/sec with a home-based PAC intervention. Other studies reporting improved rapid gait were generally short-term facility based programs of high intensity strength training.^(39, 40) Rapid gait speed is an indicator of functional reserve, and improved rapid gait speed may assist the person in coping with external stressors requiring a rapid mobility response, such as crossing a street to avoid oncoming traffic. Palombaro and colleagues reported that a change in rapid gait speed of 0.10 m/sec to be the minimally clinically meaningful change in older adults after hip fracture.⁽³³⁾ Improvements of this magnitude were observed, on average, with our intervention, thus we believe the changes noted in this study have clinical relevance. The improvement in rapid gait speed is important given the relatively low intensity of exercise bands and weight bearing exercises such as squats and chair stands. We are gratified to note that our design anticipated changing PA guidelines; which now incorporate specific recommendations for strength training in newly released PA guidelines.⁽⁴¹⁾

The underlying mechanism of this study centered on our ability to increase PA activity in this population. Participants receiving PAC increased their levels of PA, both endurance and strength, substantially. These results are important considering the baseline study sample was highly sedentary with 41% of individuals reporting zero minutes of weekly PA. In contrast to UC, the PAC group on average experienced a more than two-fold increase in PA. Unfortunately, despite the significant improvements in PA in the PAC group, apart from rapid gait, there were relatively few improvements in our measures of physical function and

disability. The improvements in usual gait and physical performance in the control group further confound the findings. Nonetheless, self-efficacy and motivation improved in the PAC group and may mediate the association between PA and downstream changes in physical function. While improved PA has potential for substantial health and cost benefit, it may require a longer duration before benefits accrue. Direct medical costs of sedentary older adults are significantly higher than among active older adults.⁽⁴²⁾ A recent study examining health care costs among participants (40% male, mean age 72) in a health plan sponsored health club benefit, found that seniors visiting health clubs twice a week incurred \$1252 lower health care costs at two years compared to seniors reporting fewer than two health club visits per week.⁽⁴³⁾ Although the intensity of our intervention was lower than would be delivered in a facility-based program, favorable gains in PA were noted and our study participants overwhelmingly preferred a home-based to a facility-based approach (88%).

To place the impact of this trial into context we compare our results to three recent primary care based PAC trials which reported functional outcomes.^(7, 44, 45) The trial most similar to ours was reported by Dubbert et. al for a sample of 224 older veterans receiving PAC compared to an education control group.⁽⁴⁴⁾ Reported PA increased in the PAC group compared to control but there was no difference in usual gait speed, a trend towards improved six-minute walk time, and no changes in the SF-36 physical function subscale. The Telewalk trial, which consisted of 168 older adults who received 12 weeks of PAC and mailed materials for 12 months reported significant improvements in PA with no changes in SF-36 physical function in a counseling group compared to usual care.⁽⁷⁾ Similarly, the Green Prescription trial, which had direct provider counseling with telephone follow-up by exercise specialists, also reported significant improvements in PA with positive changes in several subscales of the SF-36 but not physical function.⁽⁴⁵⁾ Collectively these studies show that primary care based PAC is an effective means of increasing PA, but that changes in PA are not necessarily accompanied with changes in functional status.

Another recently published study that is not primary care based, LIFE-P (this study is distinct from the Veterans LIFE study despite the acronym) reported more robust changes in measures of physical performance than we observed.⁽⁴⁶⁾ The LIFE-P study was limited to elders with baseline functional deficits and had a substantial facility based component which is likely to result in more robust improvements. In addition, LIFE-P had a screening behavioral run-in which permitted exclusion of individuals who might not be adherent to PA. Our study recruited patients on the basis of PA status rather than functional status and did not include a behavioral wash-in. Additional studies are needed to determine whether different approaches to PA promotion should be based on functional status rather than activity status.

An innovative aspect of our intervention was the use of automated telephone messaging by physicians to endorse PA. To our knowledge we are the first to use automatic telephone counseling for provider counseling. Integrating regular physician endorsement of evidence-based PA counseling in a time efficient manner was viewed positively, as both providers and patients found this method of PA endorsement acceptable. The automated messaging helped facilitate continued participation of providers by placing minimal demand on provider time. Lack of time is a key barrier to provider counseling,^(47, 48) and our method provides a cost effective strategy for overcoming this barrier.

There are limitations of the study to consider. First, PA was assessed by self-report and it is possible that individuals in the PA group may have over reported PA. A second limitation is our inability to explain the improvements in physical performance noted in UC. It is possible that improvements noted in UC are due to a learning effect over time given the three follow-up visits, or to a Hawthorne effect in which control or placebo groups experience improvement simply by study participation, or to the fact that the study was unblinded and patients were

aware of the study objectives. A final limitation is that this study was conducted in a VA medical center; transition to community private practices would present new challenges for successful implementation.

Nonetheless, some practical considerations for busy community practices would be easy to implement. For example, most practices have automated appointment reminder systems. The addition of ongoing physician counseling would be relatively inexpensive and could be used for other lifestyle modification counseling as well. Accessing expertise in PA counseling may seem a daunting task but it is not. Varieties of professions have the requisite expertise and can be accessed in many communities at health clubs, therapy programs, and through some disease management programs. For example, the American College of Sports Medicine website (www.acsm.org) offers a certified professional locator by city and zip code and has launched a new program to facilitate physician counseling (www.may-kithappen.org). The PA branch of the Centers for Disease Control (http://www.cdc.gov/nccdphp/dnpa/physical/health_professionals/index.htm) has multiple resources for supplemental information that could make PA counseling in a clinic setting easier and more effective. In addition, selected health insurance companies provide incentives and resources aimed at enhancing PA.

In conclusion, this study demonstrates that PAC, consistent with the most recent public health recommendations for older adults, can be integrated into routine primary care with minimum time burden on primary care physicians. Sedentary older adults with a range of functional states can be targeted to receive consistent, evidence-based counseling approaches that, when integrated with endorsements from their primary care physician result in significant improvements in PA and rapid gait. Moving forward it is important to determine the sustainability of PA in the absence of continued high volume counseling. Future efforts should also explore the relative merit of targeting PA interventions to individuals with explicit functional deficits or sedentary lifestyle and whether the intensity of PA components can be increased to a level that favorably alters functional trajectories.

ACKNOWLEDGEMENTS

We gratefully acknowledge the leadership and support of the many colleagues who facilitated this project: Dr. Harvey Jay Cohen, for his constant leadership, support and review of manuscript; Ms. Teresa Howard for her unbelievable recruitment efforts and overall contribution to the project; Ms. Jennifer Chapman and Dee Carbuccia for their unflagging enthusiasm and hard work associated with this project; Ms. Heather Macdonald for her extensive programming and computer assistance; Ms. Lesa Hall for her design and media support; the participating primary care providers who gave generously of their time Nirmala M. Amaldoss, MD, Lori A. Bastian, MD, Charles Beauchamp, MD, Linda R. Bellefeuille, RN, NP, Cedric Bright, MD, Srobona T. Chatterjee, MD, Catherine M. Cone, PA-C, Rowena J. Dolor, MD, David Edelman, MD, Kenneth Goldberg, MD, Wendy O. Henderson, MD, Mahlon D. Grimsley, PA, Max A. Isbell, PA, Catherine P. Kaminetzky, MD, Sheri A. Keitz, MD, Sue Lander, ANP, David B. Matchar, MD, Douglas McCrory, MD, Carol D. McMorrow, PA-C, Robert R. Minton, PA-C, Thomas F. Newcomb, MD, Eugene Z. Oddone, MD, Robert E. Peoples, PA, Susan M. Rakley, MD, India F. Reid, MD, Amy Rosenthal, MD, David L. Simel, MD, William F. Smith, PA, Jeannette F. Stein, MD, James Tulskey, MD, Ernest G. Daniels, MD, John D. Whited, MD, John W. Williams, MD, William S. Yancy, Jr., MD, Diane Zimmerman, PA-C, Marisa D. Christensen, MD, Bill C. Logan, MD, Rajani Potu, MD, Pablo M. Rabosto, MD, William R. Knaack, MD, Susan Hastings, MD, and Katja Elbert-Avila, MD; the numerous clinic nurses and appointment clerks; and the many kind veterans who enriched our lives and gave so generously of their time to participate in this research project. None of those acknowledged received compensation for their contributions.

Sponsor's role: Sponsors did not participate in the design or conduct of the study, collection, analysis, or interpretation of the data, or in the preparation, review, or approval of the manuscript.

REFERENCES

1. U.S. Department of Health and Human Services. Washington, D.C: 2002. Physical activity fundamental to preventing disease. Report No.: <http://aspe.hhs.gov/health/reports/physicalactivity>. Accessed February 10, 2009.
2. Fiatarone Singh MA. Exercise comes of age: rationale and recommendations for a geriatric exercise prescription. *J Gerontol Med Sci* 2002;57A(5):M262–M282.
3. Dauenhauer JA, Podgorski CA, Karuza J. Prescribing exercise for older adults: A needs assessment comparing primary care physicians, nurse practitioners, and physician assistants. *Gerontol Geriatr Educ* 2006;26(3):81–99. [PubMed: 16446273]
4. National Center for Health Statistics. Health, United States, 2003. Hyattsville, MD: 2003.
5. Eden KB, Orleans CT, Mulrow CD, et al. Does counseling by clinicians improve physical activity? A summary of evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2002;137(3):208–215. [PubMed: 12160371]
6. Kerse N, Elley CR, Robinson E, et al. Is physical activity counseling effective for older people? A cluster randomized, controlled trial in primary care. *J Am Geriatr Soc* 2005;53(11):1951–1956. [PubMed: 16274377]
7. Kolt GS, Schofield GM, Kerse N, et al. Effect of telephone counseling on physical activity for low-active older people in primary care: a randomized, controlled trial. *J Am Geriatr Soc* 2007;55(7):986–992. [PubMed: 17608869]
8. Boyle PA, Buchman AS, Wilson RS, et al. Physical activity is associated with incident disability in community-based older persons. *J Am Geriatr Soc* 2007;55(2):195–201. [PubMed: 17302655]
9. Brach JS, Simonsick EM, Kritchevsky S, et al. The association between physical function and lifestyle activity and exercise in the health, aging and body composition study. *J Am Geriatr Soc* 2004;52(4):502–509. [PubMed: 15066063]
10. Keysor JJ, Jette AM. Have we oversold the benefit of late-life exercise? *J Gerontol Med Sci* 2001;56A(7):M412–M423.
11. Morey M. Celebrating 20 years of excellence in exercise for older veterans. *Federal Practitioner* 2007;24(10):49–57.
12. Morey MC, Pieper CF, Cornoni-Huntley J. Physical fitness and functional limitations in community-dwelling older adults. *Med Sci Sports Exerc* 1998;30(5):715–723. [PubMed: 9588614]
13. Nagi, S. Disability Concepts Revisited: Implication for Prevention. In: Pope, A.; Tarlov, A., editors. *Disability in America: Toward a National Agenda for Prevention*. Washington, D.C: National Academy Press; 1991. p. 1309–1327.
14. Guralnik JM, Ferrucci L. Assessing the building blocks of function: Utilizing measures of functional limitation. *Am J Prev Med* 2003;25(2):112–121. [PubMed: 14552934]2003/10
15. Guralnik JM, Ferrucci L, Pieper CF, et al. Lower extremity function and subsequent disability: consistency across studies, predictive models, and value of gait speed alone compared with the short physical performance battery. *J Gerontol Med Sci* 2000;55A(4):M221–M231.
16. Morey M, Peterson M, Pieper C, et al. Learning to improve fitness and function in elders (Project LIFE): methods, design and baseline characteristics of a randomized trial. *J Rehabil Res Dev* 2008;45(1):31–42. [PubMed: 18566924]
17. Marcus BH, King TK, Clark MM, et al. Theories and techniques for promoting physical activity behaviors. *Sports Med* 1996;22(5):321–331. [PubMed: 8923649]
18. King AC, Sallis JF, Dunn AL, et al. Overview of the Activity Counseling Trial (ACT) intervention for promoting physical activity in primary health care settings. *Med Sci Sports Exerc* 1998;30(7):1086–1096. [PubMed: 9662678]
19. Project LIFE investigators. Project LIFE Physical Activity Assessment and Counseling protocols. 2005 [Accessed February 10, 2009]. [cited; Available from: <http://www.research.va.gov/resources/pubs/LIFE-modules.cfm>]
20. Patrick K, Sallis JF, Long B, et al. A new tool for encouraging activity. *Phys Sports Med* 1994;22(11):45–52.
21. National Institute on Aging. Exercise: A Guide from the National Institute on Aging. June 2001 Ed: U.S. Department of Health and Human Services. 2001.

22. Brooks D, Parsons J, Tran D, et al. The two-minute walk test as a measure of functional capacity in cardiac surgery patients. *Arch Phys Med Rehabil* 2004;85(9):1525–1530. [PubMed: 15375829]
23. Stewart AL, Sepsis PG, King AC, et al. Evaluation of CHAMPS, a physical activity promotion program for older adults. *Ann Behav Med* 1997;19(4):353–361. [PubMed: 9706362]
24. Stewart AL, Mills KM, King AC, et al. CHAMPS physical activity questionnaire for older adults: outcomes for interventions. *Med Sci Sports Exerc* 2001;33(7):1126–1141. [PubMed: 11445760]
25. McAuley E, Elavsky S, Motl RW, et al. Physical activity, self-efficacy, and self-esteem: longitudinal relationships in older adults. *J Gerontol B Psych Sci Soc Sci* 2005;60(5):P268–P275.
26. Ware JE, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36). *Med Care* 1992;30(6):473–483. [PubMed: 1593914]
27. Jette AM, Haley SM, Coster WJ, et al. Late life function and disability instrument: I. development and evaluation of the disability component. *J Gerontol Med Sci* 2002;57A(4):M209–M216.
28. Haley SM, Jette AM, Coster WJ, et al. Late life function and disability instrument: II. development and evaluation of the function component. *J Gerontol Med Sci* 2002;57A(4):M217–M222.
29. Fillenbaum, GG. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988. Multidimensional Functional Assessment of Older Adults.
30. Morey MC, Zhu CW. Improved fitness narrows the symptom-reporting gap between older men and women. *Journal of Women's Health* 2003;12(4):381–390.
31. Laird N, Ware J. Random effects models for longitudinal data. *Biometrics* 1982;38:963–974. [PubMed: 7168798]
32. Hardy SE, Perera S, Roumani YF, et al. Improvement in usual gait speed predicts better survival in older adults. *J Am Geriatr Soc* 2007;55(11):1727–1734. [PubMed: 17916121]
33. Palombaro KM, Craik RL, Mangione KK, et al. Determining meaningful changes in gait speed after hip fracture. *Phys Ther* 2006;86(6):809–816. [PubMed: 16737406]
34. Perera S, Mody SH, Woodman RC, et al. Meaningful change and responsiveness in common physical performance measures in older adults. *J Am Geriatr Soc* 2006;54(5):743–749. [PubMed: 16696738]
35. Studenski S, Perera S, Wallace D, et al. Physical performance measures in the clinical setting. *J Am Geriatr Soc* 2003;51(3):314–322. [PubMed: 12588574]
36. Bohannon RW. Comfortable and maximum walking speed of adults age 20–79 years: reference values and determinants. *Age and Aging* 1997;26:15–19.
37. Bohannon RW, Andrews AW, Thomas MW. Walking speed: reference values and correlates for older adults. *J Ortho Sports Phys Ther* 1996;24(2):86–90.
38. Newman AB, Simonsick EM, Naydeck BL, et al. Association of long-distance corridor walk performance with mortality, cardiovascular disease, mobility limitation, and disability. *JAMA* 2006;295(17):2018–2026. [PubMed: 16670410]
39. Lopopolo RB, Greco M, Sullivan D, et al. Effect of therapeutic exercise on gait speed in community-dwelling elderly people: a meta-analysis. *Phys Ther* 2006;86(4):520–540. [PubMed: 16579669]
40. Hunter GR, Treuth MS, Weiniser RL, et al. The effects of strength conditioning on older women's ability to perform daily tasks. *J Am Geriatr Soc* 1995;43:756–760. [PubMed: 7602026]
41. Nelson ME, Rejeski WJ, Blair SN, et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation* 2007;116(9):1094–1105. [PubMed: 17671236]
42. Agency for Healthcare Research and Quality, Centers for Disease Control, U.S. Department of Health and Human Services. Physical activity and older Americans; 2001. 2002 Jun.
43. Nguyen HQ, Ackermann RT, Dubbert PM, Maciejewski M, et al. Managed-Medicare health club benefit and reduced health care costs among older adults. *Prev Chronic Dis* 2008;5(1):A14. [PubMed: 18082003]
44. Dubbert PM, Morey MC, Kirchner KA, et al. Counseling for home-based walking and strength exercise in primary care. *Arch Int Med* 2008;168(9):979–986. [PubMed: 18474762]
45. Elley CR, Kerse N, Arroll B, et al. Effectiveness of counseling patients on physical activity in general practice cluster randomised controlled trial. *BMJ* 2003;326(7393):793. [PubMed: 12689976]
46. The LIFE Study Investigators*[*See Appendix for List of LIFE Study Investigators]. Effects of a physical activity intervention on measures of physical performance: results of the Lifestyle

Interventions and Independence for Elders pilot (LIFE-P) study. *J Gerontol A Biol Sci Med Sci* 2006;61(11):1157–1165. [PubMed: 17167156]

47. Anderson RT, King A, Stewart AL, et al. Physical activity counseling in primary care and patient well-being: Do patients benefit? *Ann Behav Med* 2005;(2):146–154. [PubMed: 16173911]
48. Jacobson DM, Strohecker L, Comptom MT, et al. Physical activity counseling in the adult primary care setting: Position statement of the American College of Preventive Medicine. *Am J Prev Med* 2005;29(2):158–162. [PubMed: 16005814]

Figure 1.
Participant Flow Chart

Figure 2. Gait Speed, Change Over Time Usual and Rapid Speed

Omnibus P value provides the overall differences between groups at the end of the study for group and group by time interaction assessed by the change in log-likelihood on two degrees of freedom controlling for baseline gait speed, age, race, education, and number of diseases.

Figure 3. Change in Combined Moderate/Vigorous Endurance and Strength Minutes over Time
Omnibus P value provides the overall differences between groups at the end of the study for group and group by time interaction assessed by the change in log-likelihood on two degrees of freedom controlling for baseline exercise minutes, age, race, education and number of diseases.

Table 1

Baseline Patient Characteristics

Characteristics	Physical Activity Counseling (N=199)	Usual Care (N=199)
Age, mean (SD), years	77.7 (5.0)	77.4 (4.9)
Race, No (%) white	151 (75.9)	157 (78.9)
Education, No (%)		
High school graduate, GED, or less	91 (45.7)	92 (46.2)
Some college, technical, or trade school	56 (28.1)	52 (26.1)
College graduate or more	52 (26.1)	55 (27.6)
Body mass index, mean (SD)	28.9 (4.7)	29.1 (4.6)
Self-rated health		
Number of diseases, mean (SD)	5.2 (2.5)	5.5 (2.7)
Number of symptoms, mean (SD)	6.7 (4.4)	7.1 (4.1)
Health quality of life, No (%) excellent or very good	71 (35.7)	76 (38.2)
Use of assistive devices, No (%) yes	40 (20.1)	39 (19.6)

Table 2
Gait, Physical Activity, Physical Performance, Self Rated Health, Function, and Disability Measures: Baseline and Follow-up

Measure	Intervention				Usual Care				*P	
	% or Mean (SD)				% or Mean (SD)					
Primary Gait	Baseline (n=199)	3 month (n=184)	6 month (n=181)	12 month (n=178)	Baseline (n=199)	3 month (n=189)	6 month (n=181)	12 month (n=177)		
	Gait speed, usual m/s	1.03 (0.25)	1.09(0.29)	1.11(0.29)	1.15 (0.28)	1.03 (0.24)	1.07 (0.25)	1.10 (0.25)	1.12 (0.25)	.47
	Gait speed, rapid m/s	1.56 (0.41)	1.62 (0.50)	1.60 (0.43)	1.68 (0.44)	1.57 (0.40)	1.58 (0.42)	1.59 (0.38)	1.59 (0.42)	.04
Physical activity	Exercise frequency /wk	15.9 (9.4)	22.7 (9.8)	22.7 (9.9)	22.4 (12.0)	16.8 (9.8)	17.6 (9.4)	17.4 (10.0)	16.8 (9.2)	<.001
	Endurance PA, min/wk	37.9 (82.8)	65.1 (90.2)	69.3 (85.7)	72.3 (114.8)	35.8 (88.4)	38.8 (73.4)	48.5 (100.1)	43.7 (97.1)	.002
	Strength PA, min/wk	18.5 (43.4)	56.3 (50.4)	58.4 (62.9)	54.9 (54.9)	23.2 (54.7)	27.1 (61.0)	24.7 (54.0)	25.4 (57.4)	<.001
Self-efficacy strength	3.6 (1.0)	3.6 (1.1)	3.6 (1.1)	3.6 (1.1)	3.4 (1.1)	3.3 (1.1)	3.4 (1.1)	3.3 (1.1)	.07	
Self-efficacy endurance	3.3 (1.1)	3.2 (1.2)	3.3 (1.2)	3.4 (1.1)	3.2 (1.1)	3.3 (1.1)	3.2 (1.1)	3.1 (1.1)	.06	
Motivation strength	3.6 (0.9)	3.6 (0.9)	3.8 (0.8)	3.7 (0.9)	3.6 (0.9)	3.4 (1.1)	3.3 (1.1)	3.4 (1.0)	<.001	
Motivation endurance	3.4 (1.0)	3.5 (0.9)	3.6 (0.9)	3.6 (0.9)	3.4 (1.0)	3.3 (1.0)	3.2 (1.1)	3.3 (1.1)	.007	
Physical Performance	Grip strength, kg	33.0 (7.2)	32.6 (7.1)	31.7 (7.5)	30.9 (6.9)	33.7 (7.3)	32.8 (6.8)	32.3 (7.3)	32.2 (6.5)	.33
	SPPB, score	9.2 (2.2)	9.6 (2.3)	9.7 (2.1)	9.6 (2.1)	9.2 (1.9)	9.5 (2.1)	9.8 (2.0)	9.8 (2.1)	.03
	2 min walk, m	146.0 (36.3)	151.7 (37.8)	151.4 (39.1)	150.9 (38.5)	145.4 (32.8)	145.6 (34.9)	146.2 (34.3)	147.5 (34.7)	.08
Self Rated Health and Physical Function										
SF-Self-Rated Health (% excellent / very good)	35.7	44.6	38.7	44.0	38.2	39.4	31.1	39.4	.29	
SF-Physical Function	SF-Physical Function	68.0 (22.2)	70.0 (22.4)	70.2 (21.9)	69.9 (22.1)	62.9 (23.1)	63.1 (24.0)	63.9 (23.1)	62.7 (23.8)	.35
	SF-Pain	68.8 (24.7)	69.8 (26.1)	69.1 (25.3)	70.7 (26.0)	65.8 (25.7)	67.5 (25.0)	65.7 (26.0)	65.3 (26.2)	.42
	SF-Vitality	57.6 (21.5)	58.4 (20.8)	59.8 (18.9)	57.7 (21.8)	56.2 (20.6)	56.2 (21.0)	56.3 (21.2)	56.4 (20.9)	.50
Late Life Function	61.9 (11.4)	62.6 (12.0)	62.4 (11.8)	62.4 (11.6)	59.5 (9.2)	60.0 (10.0)	59.8 (10.2)	59.4 (10.2)	.84	
Disability	LLD Limitations	60.2 (5.6)	60.9 (6.0)	60.7 (6.3)	60.3 (5.5)	59.9 (5.2)	60.0 (6.0)	59.2 (5.8)	59.1 (5.6)	.01
	LLD Frequency	68.2 (18.3)	69.6 (18.2)	70.8 (18.1)	72.3 (18.7)	67.3 (17.3)	68.9 (17.4)	68.7 (17.8)	70.3 (18.9)	.57

* Omnibus P value provides the overall differences between groups at the end of the study for group and group by time interaction assessed by the change in log-likelihood on two degrees of freedom.