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ORIGINAL RESEARCH

DISSEMINATING A CLINICALLY EFFECTIVE PHYSICAL ACTIVITY PROGRAM TO PRESERVE MOBILITY IN A COMMUNITY SETTING FOR OLDER ADULTS

J. LAUSSEN[1], C. KOWALESKI[2], K. MARTIN[1], C. HICKEY[2], R.A. FIELDING[1], K.F. REID[1]

1. Nutrition, Exercise Physiology and Sarcopenia Laboratory, Jean Mayer USDA Human Nutrition Research Center on Aging, Tufts University, Boston, MA; 2. The Fit-4-Life Program, City of Somerville Council on Aging, Health and Human Services Department, Somerville, MA.
Corresponding author: Kieran Reid, PhD, MPH, Nutrition, Exercise Physiology and Sarcopenia Laboratory, Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University, 711 Washington Street, Boston, MA 02111, USA, Phone: +1-617-556-3081, Fax: +1-617-556-3083, E-mail: kieran.reid@tufts.edu

Abstract: *Background:* As the population of older adults continues to increase, the dissemination of strategies to maintain independence of older persons is of critical public health importance. Recent large-scale clinical trial evidence has definitively shown intervention of moderate-intensity physical activity (PA) reduces major mobility disability in at-risk older adults. However, it remains unknown whether structured PA interventions, with demonstrated efficacy in controlled, clinical environments, can be successfully disseminated into community settings to benefit wider populations of older adults. *Objective:* To assess the dissemination of an evidence-based PA program for older adults by evaluating program participation and its impact on mobility, strength and quality of life. *Setting:* An urban senior center. *Participants:* Fifty older adults (71.2 ± 8 years aged; BMI: 30.1 ± 7 kg/m2). Intervention: Average of 8.0 ± 1.8 months of participation in the Fit-4-Life Program, a community-based PA and nutrition counseling intervention. *Measurements:* Mobility (Short Physical Performance Battery (SPPB)), self-reported physical activity (CHAMPS questionnaire), leg strength, grip strength, and quality of life (Quality of Well-Being Self-Administered (QWB-SA) scale) were assessed at baseline and follow-up. *Results:* Mean attendance was 55.8%. Fourteen participants were lost to follow-up. Those who dropped-out engaged in less PA at baseline (78 ± 108 mins/wk) compared to those who completed follow-up (203 ± 177 mins/wk, P=0.01). Participants exhibited sustained increases of PA (65 ± 153 mins/wk, P= 0.08), and there were meaningful improvements in SPPB (0.5 ± 0.2, P< 0.01), knee extensor strength (2.6 ± 4.4 kg, P< 0.01) and QWB-SA (0.04 ± 0.09, P= 0.05). *Conclusion:* The dissemination of a clinically efficacious PA intervention into a community-based setting can improve mobility, strength and quality of life for older adults. This knowledge may be helpful for the design and implementation of larger-scale PA intervention studies designed to preserve mobility in older adults within community-based settings.

Key words: Physical activity, mobility, community-based, older adults.

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Introduction

As the population of older adults continues to grow in the United States (1), so too does the need to preserve independence and quality of life into late life (2). Many factors impact independence in the elderly, but mobility, the ability to complete ambulatory tasks, is particularly significant (3). Older adults who lose their mobility are at greater risk of chronic disease, disability, nursing home admission, and mortality (4, 5). Targeting mobility loss may be an effective intervention to address this public health concern.

The Lifestyle Interventions and Independence for Elders (LIFE) Study, a large, multi-center, randomized controlled clinical trial recently demonstrated that structured moderate-intensity physical activity intervention improved physical function and prevented the onset of mobility disability in functionally-limited older adults (6, 7). In fact, the LIFE Study was the first study of its kind to definitively show that physical activity (PA) can preserve mobility in at-risk older adults. The LIFE Study's PA intervention appears to be a promising strategy to maintain independence, but how to best implement this program at the community-level has not yet been examined (8).

At this point, the health-preserving effects of regular physical activity for older adults are well established (9, 10). However, the widespread implementation of evidence-based physical activity programs that specifically focus on preserving mobility and independence in older persons is lagging behind physical activity research trials (11, 12). There is a need to better understand the transition of research from the clinic to community settings, specifically as it pertains to physical activity interventions for older populations. To our knowledge, it is unknown if the LIFE PA intervention, which has demonstrated efficacy in controlled, clinical environments, can be successfully disseminated in real-world community settings to benefit wider populations of vulnerable older adults.

Thus, to address this knowledge gap, we evaluated the effectiveness of The Fit-4-Life Program, a community-based physical activity and nutrition counseling program for older adults in an urban senior center in Greater Boston.

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We incorporated and adapted the evidence-based LIFE PA intervention into The Fit-4-Life Program. By analyzing the Fit-4-Life Program's participation rates and impact on mobility, strength, and quality of life, we conducted a preliminary investigation on whether the LIFE PA intervention can be effectively disseminated into a community-based setting that provides essential services for older adults. Such knowledge may be particularly helpful for informing the design and implementation of larger-scale translational studies to preserve mobility among older adults in community-based settings.

Methods

Fit-4-Life Program

The Fit-4-Life Program was initiated through a community engagement partnership between the Jean Mayer USDA Human Nutrition Research Center on Aging (HNRCA) at Tufts University and the Somerville, MA, Council on Aging (SCOA). It consisted of group-based physical activity sessions and nutrition counseling for older adults at an urban senior center within the Greater Boston area. The physical activity component of the Fit-4-Life Program was adapted from the evidence-based LIFE Study PA intervention (6, 7). To establish the program, the HNRCA investigators (KR and RF) attended a series of weekly and monthly meetings and trained the SCOA staff at the senior center. All program funding, resources, staff and management were provided by the SCOA.

For the current investigation, we conducted analysis on the first 50 participants that enrolled in the Fit-4-Life Program. The program was open to all older adults (aged 60+) who lived in or around the Somerville community and who were eligible to receive services provided by the SCOA senior center. There were no other specific inclusion or exclusion criteria; however, all participants were required to obtain written medical clearance from their primary health care provider in order to participate. Participants learned of the program through newsletter advertisements, word of mouth and announcements at the community centers.

Mobility, strength, quality of life and participation rates were analyzed. All data was collected and stored in a de-identified, coded database by the Fit-4-Life Program coordinator and then provided to the HNRCA investigators for analysis. This analysis was approved by the Institutional Review Board at Tufts Medical Center and Tufts University Health Sciences Campus.

Physical Activity Intervention

Exercise sessions were supervised by the SCOA Fit-4-Life Program coordinator who was trained by the HNRCA investigators in leading group-based exercise programs. Adapted from the evidence-based program of the LIFE studies, the physical activity sessions were approximately 60 minutes consisting of walking, light strength training, stretching and balancing training (8). All participants were encouraged to participate in two group-based physical activity sessions and one nutrition counseling session every week. There was no set duration of participation as the goal of the Fit-4-Life Program was to help community members engage in and sustain regular physical activity indefinitely.

Fit-4-Life Program Measures

The Fit-4-Life Program coordinator was trained to capture health-related and physical function outcome measures. It was recommended that all measurements be conducted and entered into a database at baseline and in six month intervals. It was determined prior to analysis that only the first follow-up visit would be examined.

Descriptive measurements such as age, gender, blood pressure, height and weight were collected. Blood pressure was measured using an automatic blood pressure monitor (OMRON Healthcare, Inc., Bannockburn, IL, USA). Height was assessed by a wall-mounted scale, and weight was measured using a portable digital scale. Body mass index (BMI) was calculated.

Physical activity level was assessed by the Community Healthy Activities Model Program for Seniors (CHAMPS) physical activity questionnaire (13). CHAMPS quantified self-reported PA for a typical or normal week during the past month. PA was reported as total minutes of moderate intensity physical activity per week.

Mobility was assessed by the short physical performance battery (SPPB). The SPPB is a summary of three tests that include timed standing balance with feet in different positions, gait speed over a 4-meter course, and timed chair-rise (5x). Each task is scored 0-4 with a total possible score of 0-12 (5). The SPPB is a strong predictor of nursing home admission and mortality. Furthermore, an SPPB score of 9 or below is an indicator for increased risk of disability (14).

Grip strength was measured using an adjustable, hydraulic dynamometer (JAMAR® 5030JI, Sammons Preston, Bolingbrook, IL, USA). While seated with their elbow resting on the table, participants were asked to squeeze the dynamometer twice, as hard as possible, with a 10-second rest period separating each attempt. The peak force was recorded to the nearest kilogram.

Isometric knee extensor strength was evaluated using a portable digital dynamometer (Model WB-2C, Neuroscience Research Australia, Randwick, NSW 2031, AU)(15). Participants were instructed to sit in an armless chair, with both feet on the ground and knees flexed at 90 degrees. A nylon belt was placed around the lower frontal part of one leg just proximal to the lateral malleoli. The dynamometer was secured behind the chair. Participants were asked to extend one leg as hard as possible. The test was performed three times on both right and left sides. The peak force was reported to the nearest 0.1 kg.

Quality of Well Being Self-Administered (QWB-SA) questionnaire was utilized to assess health problems participants may have experienced over a three day period (16).

The average score of the five sections was reported: presence/absence of 19 chronic symptoms or problems, acute physical and mental symptoms, mobility, physical activity, and social activities. Score ranges 0-1 with one representing higher quality of well-being.

Program Participation

Attendance was reported as percent of physical activity sessions attended over total possible physical activity sessions from enrollment until follow-up visit. Participants were advised to attend two sessions per week. Attendance at nutrition counseling sessions was not considered for this analysis because data from the nutritional counseling component was not documented in the database. For participants that did not complete the follow-up assessment, total possible sessions was calculated based on two weekly exercise sessions and mean time to follow-up for all other participants. Reasons for discontinuing the program were also recorded and categorized into the following reasons: medical/illness, caregiving responsibilities, moved/long-term travel, death, and lost interest.

Statistical Analysis

All statistical analyses were performed using SPSS version 22.0 for Windows (SPSS Inc., Chicago, IL, USA). Results with a p-value of < 0.05 were considered statistically significant. Means and standard deviations were used for baseline descriptive characteristics. Differences at baseline between participants lost to follow-up and participants that completed follow-up were analyzed using independent T-tests. Paired T-tests were used to examine differences of means in all outcome measures at baseline and at follow-up. Sub analysis was conducted on participants who scored 9 or below on the SPPB at baseline.

Results

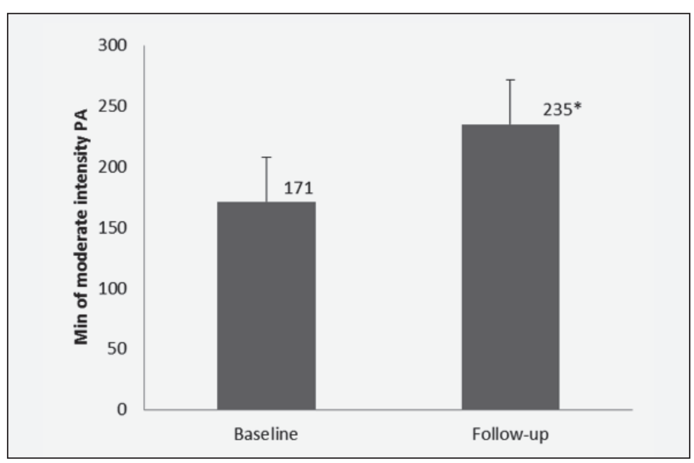
Fifty participants were assessed at baseline. Mean BMI at baseline was 30.1 ± 6.8 with 40% of participants having a BMI ≥30. See Table 1 for complete description of baseline characteristics. Mean time of participation until follow-up was 8.0 ± 1.8 months, and of the participants with follow-up visit data, 73% completed the follow-up visit within 6-9 months. There was a trend for a statistically significant increase of 65 minutes (95% CI [-8, 139]) of weekly moderate intensity physical activity (P=0.08) (Figure 1). There were statistically significant improvements in SPPB score (Figure 2a). Total SPPB improved by 0.5 (95% CI [0.14, 0.89]; P<0.01) from baseline to follow-up. Examination of SPPB subcomponent scores revealed 0.10 (95% CI [-0.08, 0.26]) increases in gait speed score, 0.41 (95% CI [0.15, 0.67]) increases in chair stand performance, but no change in balance score (95% CI [-0.31, 0.31]) (figure 2b). Of note, a sub analysis of participants with SPPB score of ≤9 (n=20) at baseline exhibited a 0.8 (95% CI [-0.01, 1.61]) improvement in total SPPB score at follow-up. Additionally, there were statistically significant improvements in knee extensor strength and QWB-SA (Table 2).

Table 1
Baseline Characteristics of All Participants

	Mean ± SD (N = 50)	Range (min, max)
Female	42 (84%)	--
Age (y)	71.2 ± 7.9	(60, 86)
Weight (kg)	78.2 ± 19.1	(47.3, 138.5)
BMI	30.1 ± 6.8	(19.4, 52.4)
Systolic BP (mmHg)	134.8 ± 16.1	(103, 177)
Diastolic BP (mmHg)	74.8 ± 8.2	(56, 94)
SPPB	9.4 ± 2.4	(4, 12)
Moderate Intensity PA (CHAMPS; min/week)	175 ± 170	(0, 570)
Duration to Follow-up (months)	8.0 ± 1.8	(5.1, 12.1)

Overall average attendance was 55.8% ± 27.4%. Fourteen (28%) participants were lost to follow-up for the following reasons: 3 medical-related, 2 moved away or were away on long term travel, 2 needed to attend to caregiving responsibilities, 6 lost interest, and 1 died. Attendance excluding participants lost to medical-related reasons was 57.6% ± 27.1%. At baseline, participants lost to follow-up engaged in significantly less moderate intensity PA (78 ± 108 mins/wk) compared to those who completed follow-up (203 ± 177 mins/wk, P=0.01). There were no other statistically significant differences between participants lost to follow-up and the remaining study cohort, including BMI and SPPB.

Figure 1
Self-reported moderate intensity physical activity (PA) at baseline and follow-up



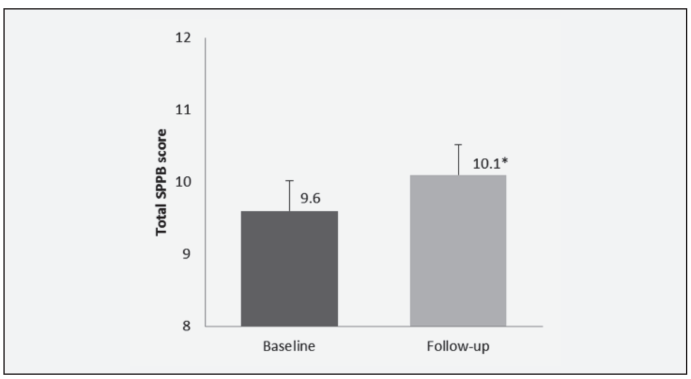
*P= 0.08. Sig. of paired T-test comparing means at baseline and follow-up. Mean duration of Fit-4-Life Program participation until follow-up was 8.0 ± 1.8 months.

Table 2
Change in outcome measures from baseline to follow-up visit

	Mean ± SD	Mean Change (95% CI)*	P value
Weight (n = 30)			
Baseline	78.3 ± 17.2	0.1 (-1.2, 1.3)	.92
Follow-up	78.4 ± 16.7		
Knee Extension (left, kg) (n = 22)			
Baseline	12.1 ± 7.5	2.6 (0.7, 4.6)	.01
Follow-up	14.7 ± 9.3		
Grip Strength (kg) (n = 28)			
Baseline	21.5 ± 7.3	0.3 (-1.3, 1.9)	.72
Follow-up	21.8 ± 6.0		
QWB-SA (n = 26)			
Baseline	.619 ± .098	.037 (.000, .074)	.05
Follow-up	.656 ± .102		

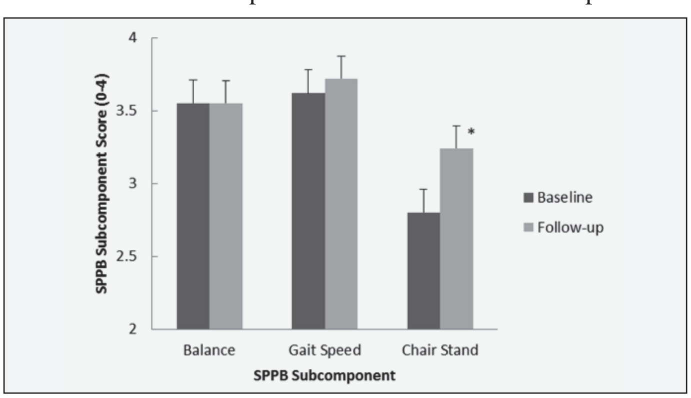
*Mean Change = follow-up visit – baseline

Figure 2a
SPPB at baseline and follow-up



*P < 0.01. Sig. of paired T-test comparing means at baseline and follow-up; Mean duration of Fit-4-Life Program participation until follow-up was 8.0 ± 1.8 months.

Figure 2b
SPPB subcomponent at baseline and follow-up



*P < 0.01. Sig. of paired T-test comparing means at baseline and follow-up; Mean duration of Fit-4-Life Program participation until follow-up was 8.0 ± 1.8 months.

Discussion

This present study evaluated the dissemination of an evidence-based physical activity program for older adults through a community engagement partnership. Following participation in the Fit-4-Life Program, older adults experienced significant and meaningful improvements in mobility, lower-extremity strength, and quality of life. Additionally, our investigation revealed that participants who engaged in lower levels of physical activity at baseline were less likely to adhere to the program.

The Fit-4-Life physical activity program was adapted after the LIFE Study's evidence-based PA intervention, which has demonstrated efficacy in improving mobility for functionally-limited older adults in controlled, clinical settings (7, 8). The initiation of the Fit-4-Life Program was not a formal translational study but rather an attempt to disseminate the LIFE study's physical activity intervention to the community. Prior to program implementation, the study investigators dedicated significant effort to building relationships with community staff to ensure there were overlapping goals and shared sense of responsibility for the success of the program. Study investigators trained the senior center's health and wellness coordinator in leading physical activity sessions and administering clinical assessments. Additionally, a study representative monitored physical activity sessions and assessments during the first three months of the program. Although not specifically considered for implementation of the Fit-4-Life Program, many of the strategies and techniques utilized to implement the program were aligned with the RE-AIM framework (17).

Previous studies have demonstrated that community-based physical activity programs can effectively impact physical activity levels and physical performance in older adults (18, 19). However, the present study was the first to assess the dissemination of an evidence-based PA program designed to target mobility-loss through a community engagement program. The principal finding of this analysis showed that overall mean SPPB, a strong indicator of mobility and nursing home admission, increased by 0.5 points; a magnitude of change considered clinically meaningful (5, 20). Furthermore, additional analysis showed the participants with lower mobility improved and exhibited greater gains (0.8 point increase); demonstrating this program may be equally, if not more, effective for a more vulnerable population. Along with statistically significant increases in lower extremity muscle strength and quality of life, these findings suggest the LIFE Study PA intervention may be effectively disseminated into non-research settings where older adults typically spend their time.

Adherence to PA in the LIFE trials is comparable to the Fit-4-Life Program's attendance. The LIFE-P and main LIFE study reported rates of 71% and 63%, respectively, excluding medical leave (6, 7). Whereas, overall the Fit-4-Life Program attendance was 56%, and 58% excluding medical related drop outs. The LIFE trials utilized retention strategies, such as behavioral counseling, to bolster program adherence that were beyond the scope of the Fit-4-Life Program due to limited resources. Analysis of baseline characteristics of participants lost to follow-up suggests baseline physical activity may be a predictor of program adherence. Older adults who become physically active later in life are still capable of obtaining the purported health benefits of exercise, and offering center- and group-based PA interventions are typically effective strategies to increase physical activity levels in the elderly (21-23). However, there is little research on strategies to maintain long-term participation in center- and group-based programs. If more sedentary individuals are less likely to sustain participation, this should be considered in the development and initiation of similar programs. This finding may be informative for larger translational studies that aim to replicate these data on a wider scale.

This study has limitations that primarily stem from the fact the Fit-4-Life Program was not established as research trial but rather the dissemination of a community engagement program using evidence-based PA intervention. First, there was no control group to compare the change in variables for those who participated. Additionally, although there was a trend for increased self-reported physical activity, there were no objective measurements that captured dose of the program, fidelity to original LIFE study PA intervention, or physical activity outside of exercise sessions. Second, all PA sessions and assessments were conducted by one or two staff members at the SCOA, which introduced potential bias in obtaining outcome measurements. Therefore, results should be interpreted with caution. Third, attendance at nutrition sessions was not documented in the provided database, so we were unable to assess the impact of the added social interaction. Lastly, because staff and resources were limited, the program coordinator was not always able to complete assessments at the recommended interval of 6 months or able to complete the whole battery of assessments for each participant. That being said, because the Fit-4-Life Program lacked the same control and regulation of a randomized controlled trial, this analysis was able to assess the effectiveness of an evidence-based PA program as it would organically occur in a real-world, practical setting.

In conclusion, this study demonstrated that the dissemination of an evidence-based community engagement PA intervention to target mobility-loss effectively improved physical function, leg strength and quality of life in older adults in the community. This knowledge may be helpful for planning and designing future implementation and translation of larger-scale studies of PA to preserve mobility in older adults within a variety of real-world community settings.

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Conflict of interest: None

References

1. Werner CA. The Older Population: 2010. http://www.census.gov/prod/cen2010/briefs/c2010br-09.pdf. Accessed April 21, 2015.
2. Lonergan ET, Krevans JR. A national agenda for research on aging. N Engl J Med 1991;324(25):1825-8.
3. Guralnik JM, LaCroix AZ, Abbott RD, et al. Maintaining mobility in late life. I. Demographic characteristics and chronic conditions. Am J Epidemiol 1993;137(8):845-57.
4. Hirvensalo M, Rantanen T, Heikkinen E. Mobility difficulties and physical activity as predictors of mortality and loss of independence in the community-living older population. J Am Geriatr Soc 2000;48(5):493-8.
5. Guralnik JM, Simonsick EM, Ferrucci L, et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. J Gerontol 1994;49(2):M85-M94.
6. Investigators LS, Pahor M, Blair SN, et al. 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):1157-65.
7. Pahor M, Guralnik JM, Ambrosius WT, et al. Effect of structured physical activity on prevention of major mobility disability in older adults: the LIFE study randomized clinical trial. JAMA 2014;311(23):2387-96.
8. Rejeski WJ, Axtell R, Fielding R, et al. Promoting physical activity for elders with compromised function: the lifestyle interventions and independence for elders (LIFE) study physical activity intervention. Clin Interv Aging 2013;8:1119-31.
9. Almeida OP, Khan KM, Hankey GJ, Yeap BB, Golledge J, Flicker L. 150 minutes of vigorous physical activity per week predicts survival and successful ageing: a population-based 11-year longitudinal study of 12 201 older Australian men. Br J Sports Med 2014;48(3):220-5.
10. Hupin D, Roche F, Gremeaux V, et al. Even a low-dose of moderate-to-vigorous physical activity reduces mortality by 22% in adults aged≥ 60 years: a systematic review and meta-analysis. Br J Sports Med 2015;49(19):1262-7.
11. White SM, McAuley E, Estabrooks PA, Courneya KS. Translating physical activity interventions for breast cancer survivors into practice: an evaluation of randomized controlled trials. Ann Behav Med 2009;37(1):10-9.
12. Dzewaltowski DA, Estabrooks PA, Glasgow RE. The future of physical activity behavior change research: what is needed to improve translation of research into health promotion practice? Exerc Sport Sci Rev. 2004;32(2):57-63.
13. Stewart AL, Verboncoeur CJ, McLellan BY, et al. Physical activity outcomes of CHAMPS II: a physical activity promotion program for older adults. J Gerontol A Biol Sci Med Sci 2001;56(8):M465-70.
14. Guralnik JM, Ferrucci L, Simonsick EM, Salive ME, Wallace RB. Lower-

Extremity Function in Persons over the Age of 70 Years as a Predictor of Subsequent Disability. N Engl J Med 1995;332(9):556-62.
15. Sherrington C, Lord SR. Reliability of simple portable tests of physical performance in older people after hip fracture. Clin Rehab 2005;19(5):496-504.
16. Andresen EM, Rothenberg BM, Kaplan RM. Performance of a self-administered mailed version of the Quality of Well-Being (QWB-SA) questionnaire among older adults. Med Care 1998;36(9):1349-60.
17. Belza B. the PRC-HAN Physical Activity Conference Planning Workgroup (2007). Moving ahead strategies and tools to plan, conduct, and maintain effective community-based physical activity programs for older adults: A brief guide. Center for Disease Control http://www cdc gov/aging/pdf/Community-Based_Physical_Activity_Programs_For_Older_Adults pdf.
18. Wilcox S, Dowda M, Leviton LC, et al. Active for life: final results from the translation of two physical activity programs. Am J Prev Med 2008;35(4):340-51.
19. Belza B, Shumway-Cook A, Phelan EA, Williams B, Snyder SJ, LoGerfo JP. The effects of a community-based exercise program on function and health in older adults: The EnhanceFitness Program. J Appl Gerontol2006;25(4):291-306.
20. Perera S, Mody SH, Woodman RC, Studenski SA. Meaningful change and responsiveness in common physical performance measures in older adults. J Am GEriatr Soc 2006;54(5):743-9.
21. Brawley LR, Rejeski WJ, King AC. Promoting physical activity for older adults: the challenges for changing behavior. Am J Prev Med. 2003;25(3 Suppl 2):172-83.
22. Conn V, Valentine J, Cooper H. Interventions to increase physical activity among aging adults: A meta-analysis. Ann Behav Med 2002;24(3):190-200.
23. Hamer M, Lavoie KL, Bacon SL. Taking up physical activity in later life and healthy ageing: the English longitudinal study of ageing. Br J Sports Med 2013:bjsports-2013-092993.