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The Effectiveness of the "Stepping On" Program for Reducing the Incidence of Falls in the Elderly

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THE EFFECTIVENESS OF THE "STEPPING ON" PROGRAM FOR REDUCING

THE INCIDENCE OF FALLS IN THE ELDERLY

By

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A Scholarly Project

Submitted to the Graduate Faculty of the

Department of Physical Therapy

School of Medicine

University of North Dakota

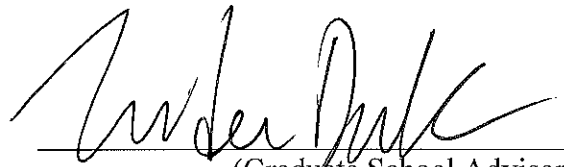In partial requirements

For the degree of

Doctor of Physical Therapy

Grand Forks, North Dakota

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This Scholarly Project, submitted by Lisa Yonker, Jacqueline Maddock, and Kathleen Breuer in partial fulfillment of the requirements for the Degrees of Doctor of Physical Therapy from the University of North Dakota, has been read by the Faculty Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

_____
(Graduate School Advisor)

_____
(Chairperson, Physical Therapy)

PERMISSION

Title   The Effectiveness of the "Stepping On" Program for Reducing the
                 Incidence of Falls in the Elderly

Department   Physical Therapy

Degree   Doctor of Physical Therapy

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ABSTRACT

Background: One in three adults greater than 65 years of age have had an accidental fall in their lifetime. In 2012, accidental falls cost the U.S. healthcare system $30.1 billion dollars. Strength, balance, and coordination deficits contribute to an individual experiencing a fall. Studies have shown that community based-exercise programs for older adults can improve strength, balance, and coordination and reduce the risk of falls.

Objective: The purpose of this study was to discover whether participant balance and confidence improved following the completion of the Stepping On program. Also, the study evaluated the effectiveness of Stepping On in reducing fall risk by determining whether balance tests including: Five Time Sit-to-Stand (FTSS), Four-Stage Balance Test (FSBT), Timed Up and Go (TUG), and Gait Speed via GAITRite, identify individuals at risk of falling and if the tests could be effectively administered in community fall prevention programs.

Methods: Ten participants were recruited from two Stepping On programs being offered in the local area. Baseline questionnaires were collected from participants at the Week 2 and Week 7 sessions. Balance assessments (FTSS, FSBT, TUG, and Gait Speed) were performed at Week 2 and Week 7 to determine fall risk of the participants. The Falls Efficacy Scale International (FES-I) and Falls Behavior Scale (FaB) were also completed at Week 2, Week 7, and a 3 month recheck to determine participants' confidence and perceived fall risk.

Results: T- tests were performed comparing balance test scores from Week 2 to Week 7. There was a significant improvement in times on the TUG ($p=0.015$). A significant decrease was also found in the total number of tests that identified a participant's fall risk from Week 2 to Week 7 ($p=0.034$). All the participants subjectively reported balance and confidence improvement following the program.

Conclusion: Significance was found with improved times on the TUG from Week 2 to Week 7, demonstrating a decrease of participants' fall risk. These findings suggest that the TUG can be used as a quick balance screening tool to help identify objective benefits from community-based fall prevention programs. The TUG could be an effective addition to fall prevention programs to help participants understand their perceived risk and strategize ways to help prevent falls.

CHAPTER I

INTRODUCTION

An accidental fall is defined as when an individual comes to rest on a surface

lower than their base of support that is not due to trauma or a medical condition.[1] One in

three adults, greater than 65 years of age, have had an accidental fall in their lifetime.[2]

People at a fall risk include those with loss of strength in their lower extremities, females,

increasing age (particularly those of 80 years of age),[3] recent surgery or illness, history of

falling, impaired mobility, and those with a fear of falling.[4]

Falls increase the risk of mortality, morbidity, disability, and frailty in older

adults. In 2012, the cost of falls in the United States healthcare system was $30.1

billion.[5] The average cost of a hospitalization after a fall has been reported as $34,294.[6]

Up to 42% of falls can be prevented by an exercise program that aims to prevent falls.[3]

Specifically, exercise programs that help with strengthening and balance can reduce the

occurrence of falls and improve function in older adults.

Barnett et al[3] studied a community-based group exercise program led by

experienced instructors and with a heavy emphasis on balance exercises. The authors

included 163 community dwelling adults, ages 65 years and older. The program showed a

significant reduction in the number of falls (40%) and an overall reduction in the risk of

falling as well as the risk in falls injuries in the intervention group compared to the

control within the 12 month trial period. The number of fall injuries had also decreased

by 34%.[3]

A systematic review by Martin et al[7] evaluated randomized controlled trials with participants that were 65 years and older that were community dwelling and ambulatory. The authors included studies that evaluated group exercise versus individual exercise versus no intervention. The review demonstrated an improvement of group based exercise over no intervention in preventing falls and quality of life and that participants reported higher satisfaction and adherence to exercise when participating in group therapy.

Specific exercise programs for older adults include Tai Chi, Otago Exercise Program, Bone Builders, Stepping On, and individualized home exercise programs. Otago and Stepping On are evidence-based fall prevention programs that promote individualized exercise. A study, based on the Otago Exercise Program and the Visual Health Information Balance and Vestibular Exercise Kit, looked at balance and strengthening home exercise program.[8] It included a warm-up, strengthening, balance, and walking program. They found that the exercises were effective in reducing falls along with improving physiological and functional performance in older people. Some of the strengthening and balance exercise included were calf raises, toe raises, backwards walking, sideways walking, single leg stance, side hip strengthening, and heel toe walking. These types of exercises are all apart of Stepping On program. Participants in the program perform exercises at home, as well as in class to help improve balance and promote self-awareness.

In addition to exercises, Stepping On has a group education component. Stepping On is an international program that targets older individuals (65 years and older) who are at risk for falling. It is a 7-week program designed to reduce the risk of falls, improve

participant's knowledge about falls, and to inspire change in community dwelling older individuals. Criteria for admission into the program include the following:[9]

- Have fallen in the past year

- Have a fear of falling

- Those who are able to walk independently, with or without an assistive device

- Cognitively intact

- Live in their own home or other independent living facility

- Are able to speak conversation English or the language in which the group is being facilitated

There are seven two-hour sessions that look at the importance of exercise, home hazards, vision, footwear, medication, bone health, sleep, and how to be safe in the community. Participants are required to attend 5 of the 7 Stepping On sessions to receive a certificate of completion. The goals of the Stepping On program include "to facilitate the older person's taking control, explore different coping behaviors, and encourage follow-through on safety strategies in everyday life."[9] Experts are invited to certain session to speak on various topics including police officers, pharmacists, nutritionists, optometrists, and physical therapists. The Stepping On exercise and education program has been shown to increase self-efficacy, encourage behavior change, and decrease falls in the elderly population by 31%.[10]

Session 2 and 6 of the Stepping On program is led by a physical therapist with topic focusing on exercise and moving around safely. The goals of this session are: (1) to help identify barriers and benefits of doing regular exercise, (2) how a walking aid can help, (3) how to perform exercises and use the exercise equipment, (4) addressing safety

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in multiple situations (transfers, climbing curbs, stairs), and (5) how to get up if you have fallen.[9]

Fear of falling is commonly correlated with an increasing amount of falls. Wen-Ni[11] studied 43 individuals living in a senior living facility to determine the correlation between fear of falling and the Berg Balance Scale (BBS). Significantly lower scores on the BBS were correlated with a higher fear of falling. Likewise, participants who scored higher on the BBS demonstrated a lower fear of falling. Higher scores on the BBS are associated with higher levels of balance, and lower scores are associated with lower function. This demonstrates that balance test scores can provide insight to fall risk. The BBS is a more challenging balance test that incorporates tandem and single-leg stance used in this study.

Since fear of falling is associated with decreased performance on balance tests, these tests can be used to measure an individual's risk of falling. A study by Guralnik et al[12] demonstrated balance tests such as tandem/semi-tandem, standing up from a chair, and walking speed (8-ft course) were evaluated and found to significantly relate to early mortality and admission into a nursing home. Higher times on sitting up from chair were correlated to more significant disability, and lower times with tandem/semi-tandem standing and walking speed were also correlated to more disability.

The purpose of this study was to discover whether participant balance and confidence improved following the completion of the Stepping On program. It also looked at the effectiveness of Stepping On by determining whether balance tests including: Five Time Sit-to-Stand (FTSS), Four-Stage Balance Test (FSBT), Timed Up

and Go (TUG), and Gait Speed via GAITRite, identify individuals at risk of falling and if

the tests could be effectively administered in community fall prevention programs.

CHAPTER II

METHODOLOGY

Participants who were enrolled in the Stepping On program were recruited to be participants in this research. The Institutional Review Board (IRB) of North Dakota approval (IRB # 201209-047) was obtained by the University of North Dakota Physical Therapy Department to perform balance assessments and surveys on the participants of the Stepping On program. Each participant was required to complete a consent form prior to participating in the study. See Appendix A for a copy of the approved IRB proposal and Appendix B for a copy of the consent form.

Subjects

Baseline questionnaires were administered to collect balance and falls information from 10 older adults from two locations (one rural, one urban) that were participating in the Stepping On Program. There were five volunteer participants from each site. Demographics and co-morbidities of each participant were obtained Week 2 of the program (See Table 1). The population included 8 females and 2 males, ranging in age from 66-84 years (m = 75.6). All participants included in this study attended at least 5 of the 7 Stepping On sessions which is required to get a certificate signifying completion of the program.

Procedure

Demographic and subjective data were gathered through questionnaires at Week 2, Week 7, and 3 month recheck of the Stepping On program, in addition to completing

the Falls Efficacy Scale-International (FES-I) and Falls Behavior Scale (FaB) at Week 2 and Week 7. See Appendix C for subjective and demographic surveys. Specific balance assessments were performed as outlined below. Participants' balance was measured on Week 2 and Week 7 of the Stepping On program. Trained students, supervised by researcher, from the University of North Dakota Physical Therapy program performed the balance assessments. See Appendix D for written verbal instructions given to each participant for the balance tests and a copy of the balance assessments.

Week 2 Questionnaire

Demographic information was obtained from all participants through a survey at the Week 2 session. This included gender, race, and marital status. This survey also asked whether or not the participant had fallen in the last year and if they live alone.

Week 7 Recheck Survey

Upon completion of the seven week Stepping On program, the participants answered questions regarding their balance and confidence during daily activities. Some of the questions inquired if they had any falls, their level of daily activity prior to and during the program, and how often they have been performing each exercise throughout the program.

3-Month Recheck Survey

An additional survey was dispersed at the 3-month recheck. Participants were contacted for their survey responses if they did not attend the scheduled 3-month recheck. In total, four out of ten participants either attended the 3-month recheck session or responded to the survey via mail. The 3-month recheck survey consisted of questions regarding balance/confidence, vision, safety, exercises (frequency/community programs),

Table 1. Demographic Information

Participant	Age	Gender	Household Size*	Comorbidities	History of Falls (y/n)
1 – (uses cane for ambulation)	84	Female	1	Degenerative Joint Disease in the low back; left hip pain	Yes
2	67	Female	1	Knee Pain (OA)	No
3	76	Female	1	None reported	Yes
4	79	Female	1	None reported	No
5	82	Female	1	Bilat. TKA; spinal stenosis	Yes
6	66	Male	2	Plate in L ankle	Yes
7	79	Female	1	R meniscal tear; extensive back surgery; osteoporosis	Yes
8	76	Male	2	None reported	Yes
9	76	Female	2	Back pain	No
10	71	Female	2	None reported	No

*A household size of one indicates that the participant lives alone; a household size of two indicates the participant lives with someone else.

medications, things they learned from the program. The recheck also asked about the frequency participants have still been performing the Stepping On exercises or if they have not been performing the exercises, what prevented them from doing so.

The Falls Efficacy Scale International

The Falls Efficacy Scale International (FES-I) was completed by participants during Week 2 and Week 7 of the Stepping On program. The FES-I determines an individual's perception of balance and confidence. It consists of 16 questions about basic activities that individuals rank between 1 and 4 (1=not concerned at all, 4=very concerned). A longitudinal study by Delbaere et al[13] studied 500 community dwelling individuals (70-90 years old) over a 12-month period. The study demonstrated good

validity and reliability of FES-I. The authors discovered that FES-I scores increased regardless if the participant had fallen, but scores also increased more rapidly if the participant had experience a fall. They recommend using the FES-I for clinical and research purposes to demonstrating fear of falling.

<div align="center">The Falls Behavior Scale</div>

The Falls Behavior Scale for the Older Person (FaB) is a questionnaire that consists of 30 statements which the reader rates on a 4-point scale. The questions relate to one's behaviors regarding awareness and protective measures that they might perform in their daily lives to potentially avoid a fall.[14] The behaviors and actions in the questionnaire are both habitual and intentional behaviors. The assessment is scored by adding up the ranked scores of each statement (0-4) to get a total summed score. Then the total summed score is divided by the number of questions answered (questions with responses of *"Does not apply"* are then eliminated from the scoring). The 30 questions may be classified into 10 sub-categories: Cognitive Awareness, Protective Mobility Behaviors, Avoidance, Awareness, Pace, Practical Strategies, Activities That Cause Displacement, Being Observant, Coping with Changes in Levels, and Getting to the Phone. This assessment was chosen to be used with this study because it is currently used in conjunction with the Stepping On program as an outcomes measure tool.[9] When it was developed, the FaB was found to be reliable with a Cronbach alpha internal consistency of 0.84 and valid with a Content Validity Index of 0.93 (28/30) in determining the presence or absence of respondents' protective behaviors.[15] As the age ranges increase, the total FaB mean scores also increase. This would indicate an increase

in safer, protective behaviors initiated to avoid falling. The means and standard

deviations for age and gender from the initial comparative group are in the following

table:[14]

Table 2. FaB Age Predicted Normative Data

Age	65-74 years old		75-85 years old		85-98 years old	
Gender	Mean	SD	Mean	SD	Mean	SD
Females	2.5	0.4	2.92	0.4	3.1	0.3
Males	2.7	0.4	3.15	0.4	3.3	0.3

Five Time Sit to Stand

The Five Time Sit to Stand (FTSS) was tested on each participant during Week 2

and Week 7 of the Stepping On program to judge participants' balance and determine

whether or not they improved during the program. The same chair height (43 cm) was

used for each participant regardless of participant height. Participants were told to stand

up and sit down five times in a row as quickly as they were able to without using hands if

possible while the researcher used a stop-watch to time how long it took the participant to

perform the activity. During Week 2 for Group A, only the initial trial was recorded.

Prior to performing Week 2 balance tests with Group B, researchers determined that

participants generally would perform better if they were given a practice trial and then

recorded the second trial. Group B underwent two trials during Week 2 and Week 7 for

the FTSS, and the second trial was record. Group A's Week 7 testing utilized two trials

with the second trial being recorded.

The Five Time Sit to Stand demonstrates good intra-rater reliability and test re-test reliability.[16] It also demonstrates no significant difference in mentioned reliability measures for experienced versus inexperienced raters. Studies have also shown it to be a good measure of validity when determining patient populations with balance problems.[17] Research has determined the minimal detectable change for the FTSS to be 4.2 seconds in healthy elderly individuals.[18] Participants were considered to be at a fall risk if they took greater than 12 seconds to complete the task. Age related normative data is shown in Table 3.[19]

Table 3. Five Time Sit to Stand Age Related Normative Data

Age	Mean
60-69 years	11.4 seconds
70-79 years	12.6 seconds
80-89 years	14.8 seconds

The Four-Stage Balance Test

The Four-Stage Balance Test (FSBT) consists of maintaining the static position of four different stances: narrow base (feet together), semi-tandem, tandem, and single-leg stance. In the narrow base stance, the individual's feet were touching and the heels aligned with one another. With the semi-tandem stance, one foot was placed slightly in front of the other (generally, in the instep of the other) and they were touching as much as possible. For the tandem stance, one foot was placed directly in front of the other so that the toes of one foot were touching the heel of the other foot and that the two feet together

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were in a straight line as much as possible. For the single-leg stance, individuals stood on

one foot and could have the other foot at any position in space. For all of the positions,

the participants wore shoes and had a gait belt on to ensure safety. See Figure 1 for a

diagram of the four different stances.[20]
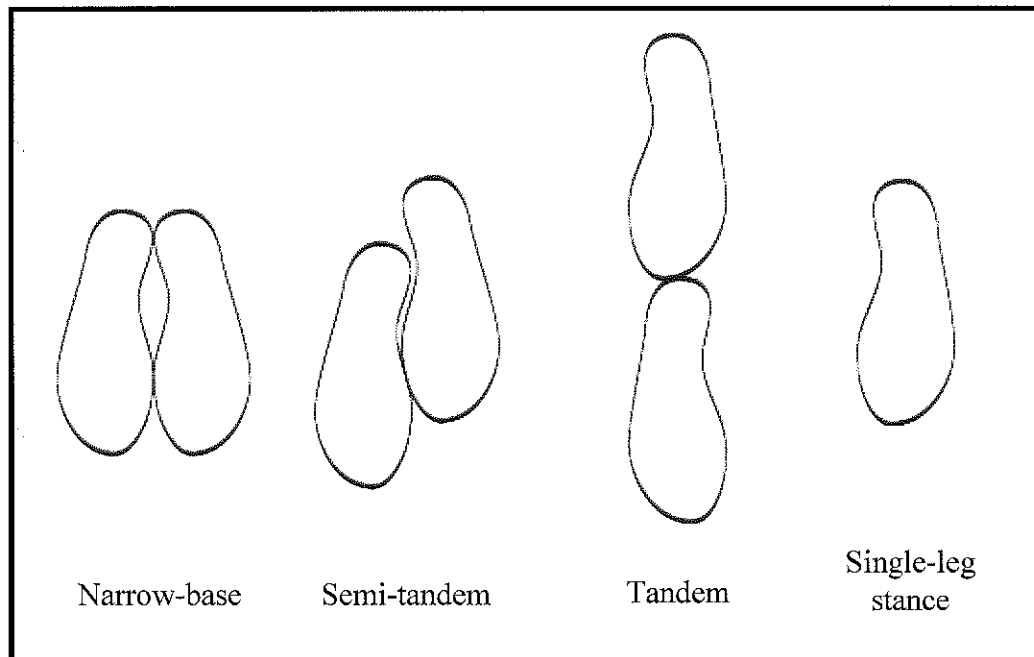
Figure 1. Four Stage Balance Test positioning of feet.[20]

The directions, guidelines, and pictures that were used were all from the Center

for Disease Control's guidelines under the Four-Stage Balance Test.[21] The directions

remained the same with the exception of the time limit. Participants were told to try to

maintain each stance for 30 seconds. If they were able to hold the stance for longer than

10 seconds, they would go on to the next, more challenging stance regardless of whether

or not they were able to hold the stance for the full 30 seconds. The time to hold each

position was extended from 10 seconds to 30 seconds to help minimize the ceiling effect

of higher functioning individuals. The interviewer showed a picture and explained the guidelines of each stance prior to testing. A demonstration was given if further instruction was needed. Participants were allowed to use the tester or a table to help them get into the position and to steady themselves. Time began when they were in the position, had let go of the support, and verbalized that they were ready. Participants were allowed to move their arms, hips, and body as much as they needed to maintain the stance. Time was stopped if the participants needed to step out of the stance, used the tester or table for support, or when they reached 30 seconds. They could have either foot forward and were allowed to try the stance both ways if they wanted to determine their preference as per the CDC website recommendations and directions.

There is limited research on the FSBT and data were not found for neither the normative values nor the minimal detectable change of the entire test. However, research studies are more readily available on the single-leg stance. Springer et al[22] has shown the single-leg stance (aka unipedal stance) to have good inter-rater reliability (ICC=0.994). The single-leg stance can also be used to determine fall risk. In a study by Jacobs et al,[23] a fall risk was indicated elderly people with Parkinson's disease if they were unable to hold the stance for 10 seconds. Limited research has been done with determining fall risk values for the SLS. For this study, 10 seconds was used as a cut-off to determine fall risk based on the Berg Balance Scale which has shown to be a reliable balance test in determining fall risk.[11] Age-related norms were provided for the single-leg stance to be:[24]

Table 4. Age Related Normative Data for the Single Leg Stance[24]

Age	Mean
60-69 years	27 seconds
70-79 years	17.2 seconds
80-89 years	8.5 seconds

Timed Up and Go Test

The Timed Up and Go (TUG) measures the amount of time it takes to stand up from a chair, walk 3 meters, turn around a cone, walk back to the chair, and sit down. It has been reported by the American Geriatrics Society, American Academy of Orthopaedic Surgeons, and the British Geriatrics Society that the TUG test is a key screen to identify individuals with a fall risk.[25] Shummway-Cook et al[26] reported the TUG to be a sensitive (87%) and specific (87%) for community dwelling older adults who are at risk for falling.

Participants were tested initially at Week 2 and then again at Week 7 of the Stepping On Program. The chair height used was 43 cm and the height of the arm rests were between 63.5-65.5cm. Participants were instructed upon the word "Go" to stand up from their chair, walk towards the cone at their normal walking speed, go around the cone, walk back towards the chair, and sit down. Two trials were performed using trial one as a practice and the second trial as their recorded time. Faster times on the TUG signifies better performance and a time of ≥ 13.5 seconds identifies those in the community who are at an increased risk of falling.[27] For older adults the minimal

detectable change on the TUG is 4 seconds.[28] Steffen et al[29] described age related

normative data as demonstrated in Table 5.

Table 5. TUG Age Related Normative Data

Age	Gender	Mean
60-69 years	Males	8 seconds
	Females	8 seconds
70-79 years	Males	9 seconds
	Females	9 seconds
80-89 years	Males	10 seconds
	Females	11 seconds

GAITRite Walkway System

The GAITRite is a portable electronic mat that has pressure sensors built into it

that become activated when the mat is walked on. A computer calculates temporal and

spatial gait parameters, which include gait speed, foot placement, step time, candence,

step length, and base of support. For the purposes of this study, the GAITRite system

was used only to obtain participants' gait speed.

The average gait speed for individuals over 60 years of age with no known

impairments have a comfortable walking speed of 0.60 – 1.45 m/s and a fast walking

speeds of 0.84-2.1 m/s.[30,31,32] Research identified that 0.6 – 1.0 m/s was considered a

yellow flag and <0.6 m/s was considered a red flag, signifying an increased risk of

falling. Reasons for changes in gait speed in older adults include compensation for

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muscle weakness, balance impairments, and increased energy cost.[33] Minimal detectable change in gait speed for older adults is 0.19 m/s.[28]

Age, gender, and height were inputted into the computer software and were given an identification number to keep the information confidential. Subjects were instructed to walk across the mat at a comfortable walking speed when the instructor said "Go." In order to get an accurate representation of walking speed, each participant began walking 3-feet in front of the mat and continued to walk 3-feet past the mat. One trial was obtained at Week 2 and at Week 7 of the Stepping On program. Steffen et al[29] showed that there was high inter-retest reliability in gait speed, which suggests that one trial of the test could represent sufficient performance.

CHAPTER III

RESULTS

After gathering data for the balance tests, t-tests were performed to evaluate

improvements in scoring from Week 2 to Week 7. Table 6 illustrates Week 2 and Week

7 balance test scores for each participant. Participants 2, 4, 9, 10 were not included in the

statistical analysis of balance tests. Participants 4, 9, and 10 had a ceiling effect as they

not demonstrate a fall risk with any of the balance tests on Week 2. Participant 2 did not

attend the Week 7 session so balance test data was not obtained.

Paired sample t-tests were used to compare the TUG at Week 2 and Week 7.

Significance was found: M_{week2}=11.6267, SD_{week2}=2.845220, M_{week7}=10.15,

SD_{week7}=2.40, t(5)=3.63, p=0.015, (95% CI: 0.43-2.53). This indicates that

improvements in participants' TUG time between Week 2 and Week 7. The

improvements in TUG time signifies increases in participants' gait speed and balance

while performing the test.

Paired sample t-tests were used to compare the number out of 4 test showing risk

at Week 2 compared to Week 7. Significant difference was found: M_{week2}=2.42,

SD_{week2}=1.43 and M_{week7}=1.33, SD_{week7}=1.03, t (5)=2.89, p=0.034, (95% CI: 0.12-2.05).

This indicates that participants performed better overall on the balance tests.

Improvements on the four balance tests decrease participants' fall risk. The final row of

Table 6 demonstrates the number of tests out of four that participants' score identified

them as being at a risk of falling from Week 2 to Week 7.

All of the participants subjectively reported that their balance and confidence had improved following the Stepping On program. The following are comments from the Week 7 and 3 Month surveys regarding what information was most useful to them:

- "Tandem walking and knowing what help is available when needing extra help."

- "Doing the exercises and one-on-one involvement"

- "Before the program I didn't pay that much attention [to the environment]"

- "Paying more attention to activities"

- "Becoming more aware of things to watch for"

- "The overall program"

Table 6. Balance Assessments and Surveys

Participant	1	2	3	4	5	6	7	8	9	10
FES-I										
Week 2	48.00	25.00	29.00	23.00	25.00	33.00	19.00	26.00	26.00	-*
Week 7	63.00	17.00	24.00	29.00	23.00	32.00	21.00	37.00	27.00	22.00
FaB										
Week 2	2.93	2.55	2.34	2.86	2.57	3.10	3.10	2.53	2.67	1.77
Week 7	3.24	2.69	2.72	2.82	2.57	3.40	3.07	2.40	3.43	1.83
FTSS (seconds)										
Week 2	12.82	12.44	10.44	8.00	14.30	18.12_1	22.59_1	11.72	8.87	10.81
Week 7	9.87	NT	6.06	8.19	13.34	16.00_1	34.19_1	11.25	8.64	11.31
SLS (seconds)										
Week 2	Unable	11.17	6.52	Unable	15.61	Unable	2.72	7.87	24.82	17.19
Week 7	Unable	NT	14.53	27.50	7.53	Unable	3.53	25.72	27.16	15.31
TUG (seconds)										
Week 2	15.13	7.38	10.25	8.70	10.60	12.37	14.09	7.32	7.03	8.78
Week 7	12.72	NT	9.12	8.07	9.90	9.34	13.09	6.71	7.72	6.69
Gait Speed (m/s)										
Week 2	0.80	1.50	1.21	1.19	1.21	0.97	0.89	1.43	1.29	1.24
Week 7	0.60	NT	1.14	1.46	1.30	1.26	1.02	1.54	1.31	1.43
Fall Risk (# of positive tests)										
Week 2	4/4	1/4	1/4	1/4	1/4	3/4	4/4	1/4	0/4	0/4
Week 7	2/4	NT	0/4	0/4	2/4	2/4	2/4	0/4	0/4	0/4

1 – Indicates that the participant used their hands on the arm rests
NT – Not tested. Participant did not attend Week 7 session.
*Participant 10 did not complete the FES-I at Week 2.

CHAPTER IV

DISCUSSION

The purpose of this study was to discover whether participant balance and confidence improved following the completion of the Stepping On program. Participants showed a significant decrease in the total number of fall risk identifiers (Time Up and Go, Five Time Sits to Stand, Four Stage Balance Test, GAITRite – refer to Table 6). Fall risk was indicated by: TUG > 13.5 seconds, FTSS > 12 seconds, SLS < 10 seconds, and gait speed < 1.0 m/s. This demonstrates that participating in the Stepping On program is beneficial and can reduce participants' risk of falling. The Stepping On program focuses on increasing participants strength, balance, and awareness of what causes falls, and helps strategize ways to prevent falling. This increased awareness, along with adherence to balance/strengthening exercises, is presumably what helps decrease patient risk. Future studies could focus more on particular components, such as the exercises or presentations that focus on awareness, in order to determine which components might be most significant in decreasing fall risk.

Another purpose of this study looked at the effectiveness of Stepping On by determining whether balance tests including: Five Time Sit-to-Stand (FTSS), Four-Stage Balance Test (FSBT), Timed Up and Go (TUG), and Gait Speed via GAITRite, identify individuals at risk of falling and if the tests could be effectively administered in community fall prevention programs. The balance tests chosen were based on CDC recommendations for assessing fall risk. The Timed Up and Go (TUG) showed

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significance in detecting the risk of falls in participants of the Stepping On program. Though no participants demonstrated the minimal detectable change (MDC = 4.0 seconds) in the TUG, it was significant in demonstrating improved times. The TUG can be easily administered, taking less than 5 minutes to complete. This test is a simple tool that can be used by any clinician to determine if their patients are at risk of falling. Also, it can be used as a functional assessment to show measurable improvements in patients. Other research articles used varying numbers of trials in administering the TUG, which makes it difficult to determine how many trials of the TUG are needed. For this study two trials were performed with the first trial being a practice and the second trial recorded. Future research should look at how many trials are necessary for proper administration of the TUG.

Though the Five Time Sit to Stand (FTSS) is an easily administered balance test, it did not have statistically significant findings for identifying if a participant was considered a fall risk. The process for data collection during the FTSS was particularly flawed. In Group A's Week 2 balance tests, only one trial was performed, and later the researchers of this study decided that utilizing two trials would give a more accurate reading of the participants capabilities because the first trial would be primarily for practice, and consequently all subjects performed better during their second trial. The minimal detectable change for the FTSS is 4.2 seconds.[18] Participant 3 score improved by 4.38 seconds, indicating this participant's individual risk of falling decreased on this test. This could be due to a number of things from educational and exercise components of the program, increased confidence, or improved balance.

Future studies should standardize the process for performing balance tests, like the FTSS, to prevent error and should examine the best method for the amount of trials to utilize. An alternative test that could be used is the 30-second Sit to Stand. The 30-second Sit to Stand did not seem applicable to the participants in this study due to the level of fatigue it may cause. The 30-second Sit to Stand may focus more on strength and endurance rather than balance. It is important to compare the two to determine which is best at determining fall risk.

The Four Stage Balance Test (FSBT) did not show significance in determining a fall risk. A larger sample size may show greater significance; however, the FSBT is still useful in the clinical setting when evaluating balance. The FSBT does not require a lot of time to complete (max of 5 minutes per participant), does not require a lot of equipment (stop watch, picture of stances, and object to steady participant), and it is easily administered and scored. Values from the FSBT are easily compared to identify any increase or decrease in performance and provide objective data.

Every participant was able to complete the initial narrow base stance as well as the semi-tandem stance. The semi-tandem stance is an exercise that is included in the Stepping On program, so participants practiced this on a daily basis. In the future, it is recommended that the FSBT be done in reverse, ie Single-Leg-Stance (SLS) first, in order to save time. If participants are unable to complete 10 seconds in the SLS, then they may go back a level to the tandem, then semi-tandem, and lastly the narrow base stance as needed. A time of 30 seconds in all stances is recommended in order to avoid a ceiling effect for higher functioning individuals.

Participant gait speed measured via GAITRite did not have any statistical significance change from Week 2 to Week 7. The GAITRite is an easily administered test that takes less than 5 minutes to administer. The downside about the GAITRite is that in order to use it the facility needs to purchase the walkway mat and software, which is expensive. An alternate test that has good reliability at measuring gait speed is the 10 Meter Walk Test. The 10 Meter Walk Test can be easily administered and does not require purchasing of any equipment. The minimal detectable change (MDC) for gait speed is reported at 0.19 m/s.[28] Three participants (4, 6, 10) individually increased their gait speed by 0.19 m/s or greater. This indicates that their risk of falling for this balance test decreased. This could be due to multiple reasons, such as the education component of the Stepping On program, increased strength from the exercises, or improved balance and confidence.

The Falls Behavior (FaB) scores did not show any clinically significant changes from Week 2 to Week 7. This scale is more useful as an educational component and evaluation tool rather than a tool used to directly determine a participants fall risk. Areas of increased education are easily identified on an individual basis when looking at a participants survey and finding scores of 1 or 2 which indicate riskier behaviors. Areas may also be identified by the categories, previously mentioned, in which lower scores were obtained. When evaluating a group, categories that the group scored low in or specific items may be addressed by the instructor or therapist. A low score may have also been a misinterpretation of an item and may only need clarification of the situation. Specific questions in which additional clarification is commonly needed are identified in the FaB Instruction Manual. Limitations of the FaB include difficulty scoring

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subcategories, limited comparison values and normative data, and cross-cultural applications of the questions and answers. It is recommended that the FaB is continued to be used for measuring the education component of the Stepping On program. It is also recommended that this tool be used for patients in regular clinical settings that have displayed a risk of falling or decreased safety awareness as an educational tool.

The functional status of the participants varied throughout the group. Some of the participants were younger than others and came to the class to gather the information for a loved one or for their own knowledge even if they had not experienced a fall in the past. Participants 9 and 10 were high-level functioning individuals contributing to a ceiling effect and did not have a single fall risk identifier at the initiation of the program. Participant 1 had a progressive co-morbidity, of a spinal stenosis that was progressively worsening throughout the span of the program, and had an effect on her balance test scores from Week 2 to Week 7. Refer to Table 1 for a list of other participants co-morbidities. Future studies should identify co-morbidities with the patient population to determine which participants may or may not be appropriate for data analysis.

The limitations of this study include the small sample size and the inclusion/exclusion criteria. Participants that enrolled in the Stepping On sessions included in this study were not turned away even if they were not considered a fall risk, making it difficult to prevent ceiling effect. Also, co-morbidities with patients made it difficult to control for extraneous variables outside of the program that may have increased or decreased fall risk. The subjectivity surrounding the question asking about whether or not participant balance and confidence has improved could cause a bias

towards wanting to please the physical therapist. Future studies should ask specific towards what contributed toward their improved balance and confidence.

Participant 7 fell while shopping when a store employee bumped into her with a cart. Though the participant did not sustain significant injuries, the proximity of the fall to the Week 7 balance testing did affect her scores negatively due to soreness. Future studies should ask for the reasons and circumstances that caused falls, whether it was due to the environment (ice, rain, etc.) or the individual (balance strength, alertness). Also, future studies should examine how many falls the participant has had before, during, and after the program to determine improvements or set-backs.

Conclusion

The purpose of this study was to discover whether participant balance and confidence improved following the completion of the Stepping On program. Every participant self-reported improved confidence and balance. However, caution should be used when considering subjective information. This study did not compare confidence to the FaB and FES-I. Future studies could compare subjective report to objective surveys in order to determine significance.

This study also looked at the effectiveness of Stepping On by determining whether balance tests including: Five Time Sit-to-Stand (FTSS), Four-Stage Balance Test (FSBT), Timed Up and Go (TUG), and Gait Speed via GAITRite, identify individuals at risk of falling and if the tests could be effectively administered in community fall prevention programs. These balance tests are inexpensive, time efficient, and are recommended by the CDC, so they can be used as a screening tool for a community fall

prevention program. This study specifically recommends using the TUG for balance screening due to efficiency and significance in demonstrating a change in time.

Stepping On is a community fall prevention, education, and exercise program that can be used to decreased the fall risk of individuals 65 and older or those at an increased risk of falling. The data from this study indicates that the program subjectively improved patient balance and confidence, as well as decreased the number of fall risk identifiers based on the balance tests in this study. This demonstrates that fall prevention programs can be useful in decreasing falls.

APPENDIX A

REPORT OF ACTION: PROTOCOL CHANGE
University of North Dakota Institutional Review Board

Date: 9/4/2013   Project Number: IRB-201209-047

Principal Investigator: Danks, Meridee; Johnson, Beverly

Department: Physical Therapy

Project Title: The Effectiveness of the "Stepping On" Program for Reducing the Incidence of Falls in the Elderly

The above referenced project was reviewed by a Designated Member for the University's Institutional Review Board
on ___9/4/2013___ and the following action was taken:

[X] Protocol Change approved. **Expedited Review**   Category No. ___4 + 7___
[X] Next scheduled review must be before: __JUL 2 1 2014__
    [X] Copies of the attached consent form with the IRB approval stamp dated ___SEP 4 2013___
        must be used in obtaining consent for this study.

[ ] Protocol Change approved. **Exempt Review**   Category No. _____
    This approval is valid until _____ as long as approved procedures are followed.
    No periodic review scheduled unless so stated in the Remarks Section.
    [ ] Copies of the attached consent form with the IRB approval stamp dated _____
        must be used in obtaining consent for this study.

[ ] Minor modifications required. The required corrections/additions must be submitted to RDC for review and
    approval. **This study may NOT be started UNTIL final IRB approval has been received.**
    (See Remarks Section for further information.)

[ ] Protocol Change approval **deferred. This study may not be started until final IRB approval has been received.**
    (See Remarks Section for further information.)

[ ] Protocol Change **disapproved. This study may not be started until final IRB approval has been received.**

REMARKS: Any unanticipated problem or adverse occurrence in the course of the research project must
         be reported within 5 days to the IRB Chairperson or RDC by submitting an Unanticipated
         Problem/Adverse Event Form.

         Any changes to the Protocol or Consent Forms must receive IRB approval prior to being
         implemented (except where necessary to eliminate apparent immediate hazards to the subjects
         or others).

PLEASE NOTE: Requested revisions for student proposals MUST include adviser's signature. All revisions
             MUST be highlighted and submitted to the IRB within 90 days of the above review date.

[ ] Education Requirements Completed. (Project cannot be started until IRB education requirements are met.)

cc: Chair, Physical Therapy

Signature of Designated IRB Member   9/4/2013
Signature of Designated IRB Member   Date
UND's Institutional Review Board

If the proposed project (clinical medical) is to be part of a research activity funded by a Federal Agency, a special assurance
statement or a completed 310 Form may be required. Contact RDC to obtain the required documents.

(Revised 10/2006)

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APPENDIX B

INFORMED CONSENT

TITLE:	**The Effectiveness of the "Stepping On" Program for Reducing the Incidence of Falls in the Elderly**
PROJECT DIRECTOR:	**Meridee Danks and Beverly Johnson**
PHONE #	**701-777-2831**
DEPARTMENT:	**Physical Therapy**

STATEMENT OF RESEARCH

A person who is to participate in the research must give his or her informed consent to such participation. This consent must be based on an understanding of the nature and risks of the research. This document provides information that is important for this understanding. Research projects include only subjects who choose to take part. Please take your time in making your decision as to whether to participate. If you have questions at any time, please ask.

WHAT IS THE PURPOSE OF THIS STUDY?

You are invited to be in a research study that will look at the effectiveness of education and exercise in reducing falls. You have been identified as a possible subject as you are presently participating in the "Stepping On" program. The purpose of this research study is to test whether the Stepping On program is effective in reducing falls in older people living at home. Participants need to be 65 or older, live in on their own, and be able to walk independently in the community.

HOW MANY PEOPLE WILL PARTICIPATE?

Approximately 10-12 people at each site will take part in this study being performed by University of North Dakota Department of Physical Therapy.

HOW LONG WILL I BE IN THIS STUDY?

Your participation in the study will last the same length of time you will be in the Stepping On program (7 weeks with a 3 & 6-month follow-up). The assessment times will be at the same days as when you will be attending your Stepping On program. Each visit will take about *20* minutes during the Day 1, Day 7, 3-month & 6-month recheck of the Stepping On program.

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WHAT WILL HAPPEN DURING THIS STUDY?

Assessments will occur at Week 1 and 7 sessions and then at 3 month booster session and at 6 month recheck at the same site. Assessment will include the following:
1. Baseline Questionnaire and Falls Behavioral Scale (FaB) for the Older Person- are filled out as part of the Stepping On program. Questionnaire is to gather demographic, mobility and fall information. You are free to skip any questions that you prefer not to answer. The FaB is 30 statements that describe things people do in their everyday lives and the participants circles: never, sometimes, often, always or doesn't apply. Time to complete is ~10 minutes.

Additional test performed (beyond Stepping On gathered information), include:

2. Falls Efficacy Scale - International (FES-I) - subject rates level of confidence in doing everyday activities with out falling using a four point Likert scale (1 = not at all concerned, 4 = very concerned). Total score is sum of 16 individual activity scores, the lower the score the less concerns the subject has about falling. Scores can range from 16 (not at all concerned) to 64 (very concerned). Time to complete is less than 5 minutes.

3. Sit to Stand Test (STS) - the subject will be asked to go from a sit to stand 5 times while being timed by researcher. The time is then recorded. This is an objective measurement of strength and balance. Time to complete ~ 3 minutes.

4. Timed Up and Go test (TUG) - the test requires that subjects stand up from a chair, walk 10 ft, turn around, and return. The time to complete the activity is recorded. A safety belt will be used when performing the assessment. Time to complete is 1 minute. This is an objective measure of balance in an activity of daily function. If available, the GAITRite electronic walkway may be used to allow the researchers to gather greater data on subjects walking parameters during the 10 meter walk.

5. Four-Test Balance Scale – This is a four part balance test, each part progressively challenges a person balance. The subject first will try to balance for 10 seconds with feet together, then with feet together but one slightly ahead of the other, progressing to one foot in front of the other (heel-toe) and lastly, the subject stands on one leg for up to 30 seconds with eyes open. If subject is unable to stand for the alotted time for any part the test will be stopped. A safety belt will be used during this assessment. Time to complete is 3-5 minutes. This is an objective measure of balance and strength.

6. Four-Square Step Test (FSST) - subjects are asked to step forward, sideways, backwards and then sideways, then reverse the sequence, using four squares marked on the floor with a 1/2 inch PVC piping. This test looks at dynamic balance and involves a cognitive component. The subjects will wear a safety belt and a spotter will be used to prevent any falls. Time to complete is ~5minutes.

Date_____
Subject Initials:_____

7. <u>Fall and Activity Survey</u> - each subject will be given a survey following the completion of Stepping On session, at 3-month Booster session and at the 6 months recheck to record any falls that have occurred and to monitor follow through of assigned strength and balance exercises. Fall is defined as an event that results in a person unintentionally coming to rest on the ground, floor, or other lower level. (Buchner) If a subject is unable to attend the Booster session and/or at the 6-month recheck they will be contacted by phone or mail in regards to the survey.

WHAT ARE THE RISKS OF THE STUDY?

There may be some risk from being in this study, mainly with the potential to lose your balance. This risk will be minimized by use of safety precautions. For each physical balance assessment a safety belt and spotter will be used to prevent any falls. You can decide not to perform any assessment that you do not feel comfortable/safe performing.

WHAT ARE THE BENEFITS OF THIS STUDY?

You benefit personally from being in this study. However, we hope that, in the future, other people might benefit from this study because it may help identify benefits of prevention education and exercise on falls in the elderly population. You may benefit by knowing your balance strengths and weakness that will be identified by the assessment scores.

ALTERNATIVES TO PARTICIPATING IN THIS STUDY

You can decide to participant only in the Stepping On program and not in the research study.

WILL IT COST ME ANYTHING TO BE IN THIS STUDY?

You will not have any costs for being in this research study. Nor will you be paid for being in this research study.

WHO IS FUNDING THE STUDY?

The University of North Dakota and the research team are receiving <u>no</u> payments from other agencies, organizations, or companies to conduct this research study.

CONFIDENTIALITY

The records of this study will be kept private to the extent permitted by law. In any report about this study that might be published, you will not be identified. Your study record may be reviewed by Government agencies, the UND Research Development and Compliance office, and the

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Date_____
Subject Initials: _____

University of North Dakota Institutional Review Board Any information that is obtained in this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of assigning you an identification number that will be used instead of your name on any data that is kept. Your signed consent form and your data will be stored separately in a locked room. Only the researchers will have access to any identifiable information. If we write a report or article about this study, we will describe the study results in a summarized manner so that you cannot be identified.

IS THIS STUDY VOLUNTARY?

Your participation is voluntary. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. Your decision whether or not to participate will not affect your current or future relations with the University of North Dakota or the Stepping On program

CONTACTS AND QUESTIONS?

The researchers conducting this study are Meridee Danks and Beverly Johnson. You may ask any questions you have now. If you later have questions, concerns, or complaints about the research please contact **Meridee Danks or Beverly Johnson at 701-777-2831** during the day.

If you have questions regarding your rights as a research subject, or if you have any concerns or complaints about the research, you may contact the **University of North Dakota Institutional Review Board at (701) 777-4279**. Please call this number if you cannot reach research staff, or you wish to talk with someone else.

Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

Subjects Name: (Print) _____

_____   _____
Signature of Subject   Date

I have discussed the above points with the subject or, where appropriate, with the subject's legally authorized representative.

_____   _____
Signature of Person Who Obtained Consent   Date

Approval Date: __**SEP   4 2013**__
Expiration Date: __JUL 2 1 2014__
University of North Dakota IRB

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Date_____
Subject Initials: _____

APPENDIX C

Stepping On Workshop Participant Evaluation

Workshop Site: _____   Today's Date: _____

Please help us to make improvements to the design of the *Stepping On* program by completing this evaluation and returning it to one of the Leaders. Thank you.

1. What is your age? _____

2. What is your gender?
    ___ Male
    ___ Female

3. What is your race?
    ___ American Indian or Alaska Native
    ___ Asian or Asian-American
    ___ Black or African-American
    ___ Hawaiian Native or Pacific Islander
    ___ Hispanic
    ___ White or Caucasian
    ___ Other: _____

4. What is your current marital status? (Check only one.)
    ___ Married
    ___ Divorced
    ___ Widowed
    ___ Separated
    ___ Never married
    ___ Partnered (living with someone)

5. Have you fallen within the last year?
    ___ No
    ___ Yes
        If yes, what was the cause of the fall? _____

6. How many people live in your household (including yourself)? _____

7. What is your location of residence?
    ___ Rural/countryside
    ___ Small town
    ___ City/suburb of a city

Place an X in the box to indicate your response.

	Nothing	←------	Some	------→	Alot
8. Overall, how much did you learn from these sessions?	☐	☐	☐	☐	☐

Please rate your level of knowledge on each of the following:

	Low	←--------	Moderate	----→	High

9. My understanding of how vision can influence the ability to get around safely.

	Low		Moderate		High
Before Participation	☐	☐	☐	☐	☐
Now, After Participation	☐	☐	☐	☐	☐

10. My understanding of the importance of balance and strength exercises for preventing falls.

Before Participation	☐	☐	☐	☐	☐
Now, After Participation	☐	☐	☐	☐	☐

11. My knowledge of recognizing hazards in home environments.

Before Participation	☐	☐	☐	☐	☐
Now, After Participation	☐	☐	☐	☐	☐

12. My understanding of the relation between safe footwear and fall prevention.

Before Participation	☐	☐	☐	☐	☐
Now, After Participation	☐	☐	☐	☐	☐

13. My confidence in applying safe strategies in mobility situations.

Before Participation	☐	☐	☐	☐	☐
Now, After Participation	☐	☐	☐	☐	☐

14. My understanding of the relation between medications and falls.

Before Participation	☐	☐	☐	☐	☐
Now, After Participation	☐	☐	☐	☐	☐

15. My knowledge of the importance of good bone health and fall prevention.

Before Participation	☐	☐	☐	☐	☐
Now, After Participation	☐	☐	☐	☐	☐

16. Which of your behaviors are you most likely to change?

17. List the three most important things you learned in this workshop.

   a.

   b.

   c.

18. Which topic was least interesting?

19. Other comments concerning the workshop

Date _____   ID # _____

Stepping On Survey – Week 7

1.   Do you feel your balance and confidence have improved while performing daily
     activities as a result of participating in the Stepping On Program?

     Balance   Yes _____   No _____

     Confidence   Yes _____   No _____

     If yes, what information helped you the most?

2.   A fall is any event that led to an unplanned, unexpected contact with a supporting
     surface such as the floor. Have you fallen since starting the Stepping On Program?

     Yes _____   No _____   If yes, how many falls since the program began: _____

     Describe the cause of fall(s) and any injuries that occurred:

3.   How would you rate your present level of daily physical activity? (circle one)

     Inactive/Low   **Moderate**   **High**

     If your physical activity is limited, what do you think is the major reason?

_____

4.   Have you performed the Stepping On exercises faithfully?

     Yes___ No___

     If no, what has kept you from performing the exercises as per the recommended
     amount of times?

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If yes, record on the chart below how often each week you perform the Stepping On exercises, the number of repetitions you do of each exercise, and the amount of weight you use with the strength exercises?

Balance Exercises:

	# times/week	# of repetitions
Sit-to-Stand		
Sideways Walking		
Heel-toe standing		
Heel-toe walking		

Strength Exercises:

	# times/week	# of reps & weight
Side-hip-strengthening		
Knee-strengthening		
Heel raises		
Toe raises		

5. Do you have any difficulties performing the above exercises?

   Yes _____   No _____   If yes, describe what difficulties you are having?

6. Had you been actively exercising at home prior to the Stepping On program?

   Yes _____   No _____   If yes, what type of exercise did this include?

   How frequently do you perform these? _____

7. Do you participate in community exercise groups (other than Stepping On program)?

   Yes _____   No _____   If yes, what group and/or type of exercise?

   How often do you attend? _____

Date _____   ID # _____

Stepping On Survey – 3 months after

1. Do you feel your balance and confidence have improved while performing daily activities as a result of participating in the Stepping On Program?

   Balance   Yes___   No___

   Confidence   Yes___   No___   If yes, what strategies have helped you?

2. Do you feel that the Stepping On Program has helped you?

   Yes___   No___   If yes, how has it helped you?

3. Have you had any falls since completing the Stepping On Program?

   Yes___   No___   If yes, how many falls:_____
                                 What was the cause(s) of the fall(s)?

4. How often do you perform the Stepping On exercises usually? (Circle below)

   Strength: ≥3x/week 2x/week   1x/week   < than 1x/week   Not at all

   Balance: ≥3x/week 2x/week   1x/week   < than 1x/week   Not at all

   If you have not been doing the exercises regularly, what has kept you from doing so?

5. Have you joined or continued any community exercise groups since the Program?

   Yes___   No___   If yes, what group?

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Falls Efficacy Scale-International (English)

I would like to ask some questions about how concerned you are about the possibility of falling. For each of the following activities, please circle the opinion closest to your own to show how concerned you are that you might fall if you did this activity. Please reply thinking about how you usually do the activity. If you currently don't do the activity (example: if someone does your shopping for you), please answer to show whether you think you would be concerned about falling IF you did the activity.

		Not at all concerned 1	Somewhat concerned 2	Fairly concerned 3	Very concerned 4
1	Cleaning the house (e.g. sweep, vacuum, dust)				
2	Getting dressed or undressed				
3	Preparing simple meals				
4	Taking a bath or shower				
5	Going to the shop				
6	Getting in or out of a chair				
7	Going up or down stairs				
8	Walking around in the neighborhood				
9	Reaching for something above your head or on the ground				
10	Going to answer the telephone before it stops ringing				
11	Walking on a slippery surface (e.g. wet or icy)				
12	Visiting a friend or relative				
13	Walking in a place with crowds				
14	Walking on an uneven surface (e.g. rocky ground, poorly maintained pavement)				
15	Walking up or down a slope				
16	Going out to a social event (e.g. religious service, family gathering, or club meeting)				
	Sub Total				
				TOTAL	/64

The Falls Behavioural (FaB) Scale for the Older Person

The FaB Scale is a list of 30 statements that describes things we do in our everyday lives. Please read each statement carefully.

Circle how much each statement describes the things you do in your daily life. For example:

Never	Some-times	Often	Always

Only circle *'Doesn't apply'* if the situation is something to which you are not exposed (for example, if you do not have a phone).

Would this describe the things you do in your daily life?	Circle which one applies			
1. When I stand up I pause to get my balance.	Never	Some-times	Often	Always	
2. I do things at a slower pace.	Never	Some-times	Often	Always	
3. I talk with someone I know about things I do that might help prevent a fall.	Never	Some-times	Often	Always	
4. I bend over to reach something only if I have a firm handhold.	Never	Some-times	Often	Always	Doesn't apply
5. I use a walking stick or walking aid when I need it.	Never	Some-times	Often	Always	Doesn't apply
6. When I am feeling unwell I take particular care doing everyday things.	Never	Some-times	Often	Always	Doesn't apply
7. I hurry when I do things.	Never	Some-times	Often	Always	
8. I turn around quickly.	Never	Some-times	Often	Always	

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Would this describe the things you do in your daily life?	Circle which one applies				

Now, these are things you do indoors

9.	To reach something up high I use the nearest chair, or whatever furniture is handy, to climb on.	Never	Some-times	Often	Always	Doesn't apply
10.	I hurry to answer the phone.	Never	Some-times	Often	Always	Doesn't apply
11.	I get help when I need to change a light bulb.	Never	Some-times	Often	Always	
12.	I get help when I need to reach something very high.	Never	Some-times	Often	Always	
13.	When I am feeling ill I take special care of how I get up from a chair and move around.	Never	Some-times	Often	Always	Doesn't apply
14.	When I am getting down from a ladder or step stool I think about the bottom rung/step.	Never	Some-times	Often	Always	Doesn't apply

Now, these are about lighting and eyesight

15.	I notice spills on the floor.	Never	Some-times	Often	Always	
16.	I use a light if I get up during the night.	Never	Some-times	Often	Always	
17.	I adjust the lighting at home to suit my eyesight.	Never	Some-times	Often	Always	
18.	I clean my spectacles.	Never	Some-times	Often	Always	Doesn't apply
19.	When wearing bifocals or trifocals I misjudge a step or do not see a change in floor level.	Never	Some-times	Often	Always	Doesn't apply

Now, these are about shoes

20.	When I buy shoes I check the soles to see if they are slippery.	Never	Some-times	Often	Always	

Now, these are things outdoors

21.	When I walk outdoors I look ahead for potential hazards.	Never	Some-times	Often	Always	
22.	I avoid ramps and other slopes.	Never	Some-times	Often	Always	

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Would this describe the things you do in your daily life?	Circle which one applies				
23. I go out on windy days.	Never	Some-times	Often	Always	
24. When I go outdoors I think about how to move around carefully.	Never	Some-times	Often	Always	
25. I cross at traffic lights or pedestrian crossings whenever possible.	Never	Some-times	Often	Always	Doesn't apply
26. I hold onto a handrail when I climb stairs.	Never	Some-times	Often	Always	Doesn't apply
27. I avoid walking about in crowded places.	Never	Some-times	Often	Always	
28. I keep shrubbery and plants trimmed back on the pathways to my front/back doors.	Never	Some-times	Often	Always	Doesn't apply
29. I carry groceries up the stairs only in small amounts.	Never	Some-times	Often	Always	Doesn't apply

And, finally, these are about medications

30. I ask my pharmacist or Dr. questions about side effects of my medications.	Never	Some-times	Often	Always	Doesn't apply

Thank you for completing the Falls Behavioural Scale for the Older Person

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APPENDIX D

Balance Test Score Sheet

Name: _____ . Date: _____

Five Times Sit-To-Stand Test
Purpose: Assess fall risk, postural control, and proprioception.

Score: _____ sec   **Low Fall Risk: = 12-15 sec**
High Fall Risk: > 15 sec
Normal: 60-69 yrs = 11.4 sec
70-79 yrs = 12.6 sec
80-89 yrs = 12.7 sec

Four-Test Balance Scale
Purpose: Assess stability, balance, and falls risk.

Narrow-Base Stance   Score: _____ sec
Semi-Tandem Stance   Score: _____ sec
Tandem Stance   Score: _____ sec
Single-Leg Stance   Score: _____ sec
Fall Risk: < 10 sec

Normal for Single-Leg Stance: 60-69 yrs = 27 sec
70-79 yrs = 17.2 sec
80-99 yrs = 8.5 sec

Timed-Up-And-Go Test
Purpose: Assess fall risk by walking speed, reaction time, and turning ability.

Score: _____ sec   Fall Risk: > 13.5 sec
Normal: 60-69 yrs = 8.1 sec
70-79 yrs = 8.5 sec
80-89 yrs = 11.3 sec

Walking Speed

Time: _____ m/sec   **Red Flag: <.6m/s; Yellow Flag: 0.6-1.0 m/s**
Normal: 60-69 = 1.2 m/sec men, 1.4 m/sec women
70-79 = 1.1 m/sec men, 1.3 m/sec women
➢ 80 = 1.0 m/sec

Testing Instructions

Five Time Sit to Stand

Equipment: Stopwatch and chair

Set Up: Place a chair with a backrest up against a wall to prevent it from sliding

Directions: "Sit down in the chair with your back against the backrest and your arms across your chest. If you need to use your arms to sit up, then put your arms on the arm rests. When I say go I want you to
- Stand up and sit down five times in a row
- Make sure you stand up completely each time
- You do not need to come all the way back to the back rest between repetitions

The test begins when I say go and ends when you sit down for the fifth time."

Recording: The test begins when the word "Go" is said and ends when the participant sits down on the chair for the fifth time.

Four Stage Balance Test

Equipment: Stopwatch, gait belt, a chair/table, and a picture of the stance positions.

Set Up: Open area, with only a table or chair to help the participant steady themselves into the position. Demonstrate the stance positions, provide directions, and begin the test.

Directions: "There are four different stance positions that progress in difficulty. Starting with the position that is the least difficult, try to stand in each position for 30 seconds. If you are able to remain in that stance for 10 seconds, you will move on to the next stance. Hold the position until I tell you to stop. You can move your arms and body as much as you need to in order to keep your balance but don't move your feet. If you move your feet, step out of the position, or steady yourself using the instructor, a table, a chair, wall, etc., then the time will be stopped. You may use the instructor or the table to help you to get into the position and help steady yourself. Time will begin when you ready and not holding on to external support."

Recording: Time begins when you say, "Begin" or when the participant verbalizes that they are ready. Time ends if 30 seconds is reached or if the participant fails to maintain the position.

Timed Up and Go Test

Equipment: Stopwatch and gait belt.

Set Up: Measure a 3 meter (9.8 feet) walkway and place a chair at the beginning of the walkway.

Directions: "Sit down in the chair with your back against the chair and your arms on the armrests." "When I say Go I want you to
- Stand up from the chair
- Walk towards the cone a your normal walking speed
- Go around the cone
- Walk back towards the chair
- And sit down"

Recording: Time it takes to from when the word Go is said until when the participant sits back down in the chair.

GAITRite Walkway System

Equipment: GAITRite and laptop with the software.

Set Up: Roll out the walkway and secure it at both ends to the floor. Connect the GAITRite to the laptop and open the software on the computer. Mark a line 3 feet before the walkway and another line 3 feet after the walkway.

Directions: "When I say Go I want you to walk over the walkway at your normal walking speed and to continue to walk past the walkway. Make sure not to stop walking on the walkway or look down when walking."

Recording: Gait speed calculated from the software.

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