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Timed Up and Go (TUG) Test and Its Effectiveness in Fall Risk Screening and Assessing the Success of the Stepping on Program in Fall Prevention

Eric Estes
University of North Dakota

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TIMED UP AND GO (TUG) TEST AND ITS EFFECTIVENESS IN FALL RISK SCREENING AND ASSESSING THE SUCCESS OF THE STEPPING ON PROGRAM IN FALL PREVENTION

By

Eric Estes
University of North Dakota

A Scholarly Project
Submitted to the Graduate Faculty of the Department of Physical Therapy School of Medicine University of North Dakota In partial of the requirements For the degree of Doctor of Physical Therapy

Grand Forks, North Dakota
May
2016
This Scholarly Project, submitted by Eric Estes 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

<table>
<thead>
<tr>
<th>Title</th>
<th>Timed Up and Go (TUG) Test and Its Effectiveness in Fall Risk Screening and Assessing the Success of the Stepping On Program in Fall Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>Doctor of Physical Therapy</td>
</tr>
</tbody>
</table>

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Signature: [Signature]

Date: 10/30/15
# TABLE OF CONTENTS

LIST OF TABLES.......................................................................................... v
LIST OF FIGURES......................................................................................... vi
ACKNOWLEDGEMENTS............................................................................. vii
ABSTRACT....................................................................................................... viii
CHAPTER
   I. INTRODUCTION...................................................................................... 1
   II. METHODOLOGY................................................................................... 5
      a. Participants ....................................................................................... 5
      b. Instrumentation ............................................................................... 5
      c. Procedure ......................................................................................... 8
      d. Reliability........................................................................................ 9
   III. RESULTS ............................................................................................ 10
   IV. DISCUSSION/CONCLUSION............................................................... 14

APPENDIX A: Approved IRB Form............................................................. 19
APPENDIX B: Participant Consent Form................................................... 28
APPENDIX C: Stepping On Workshop Participant Evaluation................... 33
   Exercises at a Glance............................................................................. 37
   Week 7 Survey....................................................................................... 38
   3 Month Survey................................................................................... 40
   Fall Risk Survey.................................................................................. 41
   Activities-specific Balance Confidence (ABC) Scale............................ 42
APPENDIX D: Balance Test Score Sheet.................................................... 44

REFERENCES............................................................................................... 45
LIST OF TABLES

Table

1. Normative Data by Age Group ............................................................ 3
2. Participant Characteristics with TUG Scores ................................... 7
3. TUG Individual Results .................................................................. 12
LIST OF FIGURES

Figure

1. TUG results and fall risk cut-off..........................................................13
ACKNOWLEDGEMENTS

I would like to thank Meridee Danks, PT, DPT for all of her work and involvement in this project. Her passion for fall prevention and involvement in the Stepping On program made this project possible.
ABSTRACT

Background: The Timed Up and Go (TUG) test is a functional assessment that has been proven effective at identifying individuals at a risk for falls. The Stepping On program aims toward fall prevention through education, exercise, and shared experiences among participants. With previous evidence displaying positive, significant results for Stepping On and the TUG, a utilization of this assessment to track participants’ progress in the course is indicated.

Objective: The purpose of this study was 1) to determine if the Stepping On program displays a decrease in fall risk through the application of the TUG and 2) if the TUG is an effective screening tool for a fall risk assessment with Stepping On participants. A separate part of the study also evaluated the effectiveness of the Stepping On program in fall risk reduction with: Cognitive TUG, 30 Second Chair Stand Test (30sCST), Gait Speed via the GAITRite, and the Four-Stage Balance Test (FSBT).

Methods: Fourteen female participants with an average age of 87.2 years (80-94) were recruited for the Stepping On program, and agreed to participate in additional functional screening. The Falls Risk Survey, the Activities-specific Balance Confidence (ABC) scale, and functional assessments were administered on Week 2 and Week 7 of the program. Week 7 and 3-month follow up surveys were also completed by the participants to monitor their confidence and perception of fall risk.
**Results:** Eight of the 14 participants completed both the initial and final TUG assessment to determine the effectiveness of the *Stepping On* program by utilizing this functional test. Of the eight individuals, three displayed improved scores. One of these individuals dropped below fall risk, and another into ‘normal mobility’ (<11 sec) for their age group (80-89 years of age). Five of the eight were classified at a high fall risk (>13.5 sec). In determining the effectiveness of the TUG for fall screening, this study found seven of the 14 participants classified at a fall risk, four without previous falls to be without a fall risk, and three without previous falls at a fall risk. These results give the TUG a sensitivity of 100% and a specificity of 57% at determining a fall risk for this study.

**Conclusion:** Based on the results, the TUG displayed 37% participant improvement in the *Stepping On* program as an effective course in decreasing fall risk. However, due to a high average age (87.2) of the participants, a majority use of assistive devices, residency in an assisted living facility, and various co-morbidities, improvements in function over a seven week period may not be expected.
CHAPTER I
INTRODUCTION

Reducing the risk of falls in the community-dwelling, elderly population prevents increased morbidity and mortality and also reduces the high medical costs of treatment. *Stepping On* is a 7-week, fall prevention program that targets community-dwelling elders who have fallen in the past year or have a fear of falling. Each class is two hours long and is held one time each of the seven weeks. The physical therapist’s role in the program is evident and present throughout the program. The participants are provided four strength and four balance exercises during the second week of the course (see Appendix C). Instruction and further fall-prevention education is provided by the physical therapist during the second and sixth weeks of the program. Exercises are reviewed as necessary throughout the program as well as weekly collection of their activity logs to assess compliance.

This program has continued over the past decade due to its effectiveness in displaying positive results by assessing fall reports and using functional assessments. In 2004, the original *Stepping On* research displayed a 31% increase in preventing falls.\(^1\) This improvement was based on the participants filling out a self-report falls schedule over 14 months. The “Get Up and Go” (GUG) was the functional assessment among the multiple test and measures administered to assess a variety of factors between the two groups tested. With the overall improvement in falls noted, the GUG specifically had better average scores with the *Stepping On* group of 1.92±0.99 compared to the control
group with an average score of 2.11±1.11. These scores were based on a 1 to 5 scale described below.

The “Timed Up and Go” (TUG) test first originated as an extension from the “Get Up and Go” (GUG) measure that was developed in 1986 by Mathias et al. The procedure of the GUG is similar to the TUG. The main difference is the GUG does not have a time component, but instead focuses on a balance assessment that is rated on a 1 to 5 scale (1=normal, 2=slightly abnormal, 3=mildly abnormal, 4=moderately abnormal, 5=severely abnormal) based on the administrator’s perception of the subject’s balance during the test. In 1991, the original research for the TUG was published by Podsiadlo et al. to determine test reliability, correlation with other measures, as well as the predictability for the patient to go outside alone safely. Due to the few equipment requirements, minimal time to complete, effective test reliability and validity, medical professionals began implementing this test into examinations.

The Timed Up and Go (TUG) Test has been, and continues to be, an effective tool for indicating predictability factors of falls. Pertaining to the Stepping On program parameters, this study is geared towards the effectiveness of the TUG when evaluating fall risk for the community-dwelling, elderly (>65 years) population. Since the introduction of the original research, there have been numerous studies geared towards the geriatric population that have examined how this test can be administered to provide the most relevant information for screening the individual at risk.

On an international scale, the TUG has been validated through large cohort studies of community-dwelling, elderly individuals in Britain, Taiwan, Ireland, Norway, Japan and the United States. These cohort studies provide significant results
in determining the risk of an individual suffering a fall in the future. This credits the test’s generalization among various cultures throughout the world.

With research indicating the TUG to be reliable and valid, it is important to establish normative values to allow the clinician application towards individual results. Any individual who takes longer than 13.5 seconds to complete the TUG is classified under a high risk for falls. More recent research in Britain found the cut-off score to be 12.6 seconds. In addition, they specify that the individual is 3.7 times more likely to experience a future fall when scoring higher than 12.6 seconds. With each one-second increase in their TUG time, there is a 10% increase in likelihood for a future fall.

Normative data helps tailor these cut-off scores to specific age groups. Age specific cut-off scores reflecting ‘normal mobility’ include: less than eight seconds for ages 60-69, less than nine seconds for ages 70-79, less than 10 seconds for males and less than 11 seconds for females ages 80-89. The table below displays these results provided from the original source by Shumway-Cook et al. Another study stated that elderly females between 65 and 85 years-old, should perform the test in less than 12 seconds to display ‘normal mobility’. 11,12

Table 1. Normative Data by Age Group

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>Gender</th>
<th>N</th>
<th>X</th>
<th>SD</th>
<th>CI*</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-69</td>
<td>Male</td>
<td>15</td>
<td>8</td>
<td>2</td>
<td>7-8</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>22</td>
<td>8</td>
<td>2</td>
<td>7-9</td>
</tr>
<tr>
<td>70-79</td>
<td>Male</td>
<td>14</td>
<td>9</td>
<td>3</td>
<td>7-11</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>22</td>
<td>9</td>
<td>2</td>
<td>8-10</td>
</tr>
<tr>
<td>80-89</td>
<td>Male</td>
<td>8</td>
<td>10</td>
<td>1</td>
<td>9-11</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>15</td>
<td>11</td>
<td>3</td>
<td>9-12</td>
</tr>
</tbody>
</table>

Along with the mentioned factors that display the effectiveness of the TUG, this test correlates with several other functional measures and outcomes to further assist in
determining the patient’s status. The functional factors and measures displaying significant correlation with the TUG are the Berg Balance Scale, Barthel Index, gait speed, Functional Stair Test, postural sway, step length, step frequency, and Functional Gait Assessment. The TUG is shown to demonstrate the most significance in determining individuals who will experience recurrent falls. This test has also displayed effectiveness in predicting activities of daily living (ADL) disability levels and nursing home admission. Associated results of the individual’s residential and physical mobility status display significant predictors of their TUG performance.

There has been varying research results regarding the sensitivity and specificity of the TUG in regards to fall risk. The original research by Shumway-Cook in 2000, reports sensitivity and specificity both at 87%. A 2010 study in Ireland by Greene et al reported a sensitivity of 77.3% and a specificity of 75.9%. Since this study, thorough research has compiled a systematic review of community-dwelling, elderly individuals reporting a specificity of 74% and a sensitivity of 31%. The more recent findings have also been confirmed in the British research published by Kojima et al in 2015. This indicates that the TUG is more effective at determining if an individual is at a fall risk, than it is at classifying an individual is not at a fall risk.

Trending research in Ireland is focusing on performing the TUG with body sensors on the flanks and shins of the tested individuals to gain a better concept of their fall risk. Continual research is being performed with the cognitive, manual, and imaginary TUG to incorporate the crucial cognitive factors into assessing fall risk. A more detailed analysis of the cognitive TUG is included in another portion of this research study.
A recent study by Ory et al.\textsuperscript{17} collected from 32 Stepping On programs over the three states of Colorado, New York, and Oregon that implemented TUG to assess for fall risk reduction. Analysis of TUG pre-post results for all participants displayed a significant decrease in scores. The improvement of 'high risk' participants (>12 sec) decreased from 17.6 to 14.4 seconds. Overall improvement scores decreased from 13.5 to 11.4 seconds. This shows that as a whole (254 participants), the average TUG score initially was be classified as 'high risk', while the final average score falls under the article's 12 second cut-off and thus is within the 'low risk' parameters. This is a large-scale model of what this study aims to show through for this particular Stepping On program.

The purposes of this study are: 1) to determine if the Stepping On program displays a decrease in fall risk through the application of the TUG and 2) if the TUG is an effective screening tool for a fall risk assessment with Stepping On participants.
CHAPTER II

METHODOLOGY

Participants

This *Stepping On* program formally recruited 22 individuals for the session in which TUG research data was collected. Of the 22 individuals contacted, 13 were present for the first session of the 7-week course, with one participant joining after the course began. All 14 participants were Caucasian females with an average age of 87.2 years (80-94). This fulfills the criteria specified by *Stepping On* as all participants are older than 65 years of age, and all having experienced a fall in the past year or have a fear of falling that limits daily function.\(^{18}\) Participant characteristics are listed below in Table 2.

This research has received University of North Dakota approval through the Institutional Review Board (IRB). Each participant voluntarily signed a consent form, a fall risk survey, a Week 7 survey, an Activities-specific Balance Confidence (ABC) Scale questionnaire, and an anticipated 3 Month Survey. These forms can be found in Appendices A, B, and C.

Instrumentation

Setting up and performing the TUG requires minimal equipment and time to facilitate. The required materials include: an arm chair measuring approximately 46
Table 2. Participant Characteristics with TUG

<table>
<thead>
<tr>
<th>Subject #</th>
<th>Gender</th>
<th>Age</th>
<th>Last Year</th>
<th>Worry About Falling</th>
<th>TUG Week 1 (sec)</th>
<th>TUG Week 7 (sec)</th>
<th>&gt; 4 Meds</th>
<th>Minimally Active &gt; 30 min/day</th>
<th>LE Sensation Deficits</th>
<th>Med Hx</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>92</td>
<td>0</td>
<td>Yes</td>
<td>13.52</td>
<td>12.69</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>R knee pain</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>92</td>
<td>2</td>
<td>Yes</td>
<td>23.87</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
<td>Yes</td>
<td>L ankle surgery; Dizzy</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>89</td>
<td>2</td>
<td>Yes</td>
<td>28.0</td>
<td>31.28</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Bilat TKA</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>87</td>
<td>0</td>
<td>No</td>
<td>21.2</td>
<td>23.09</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes-knee</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>94</td>
<td>0</td>
<td>No</td>
<td>11.96</td>
<td>10.59</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>80</td>
<td>0</td>
<td>No</td>
<td>11.25</td>
<td>11.84</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes-knee</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>84</td>
<td>6-7</td>
<td>Yes</td>
<td>49.93</td>
<td>-</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>L knee pain</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>85</td>
<td>0</td>
<td>No</td>
<td>18.77</td>
<td>-</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>R hip pain</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>80</td>
<td>2</td>
<td>No</td>
<td>29.84</td>
<td>-</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>R rotator cuff tear</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>87</td>
<td>0</td>
<td>No</td>
<td>13.32</td>
<td>-</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>84</td>
<td>2</td>
<td>Yes</td>
<td>32.4</td>
<td>19.88</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes-knee</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>89</td>
<td>#?</td>
<td>Yes</td>
<td>30.13</td>
<td>35.62</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>R TKA; OA L knee</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>90</td>
<td>0</td>
<td>No</td>
<td>28.06</td>
<td>38.53</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>89</td>
<td>#?</td>
<td>Yes</td>
<td>-</td>
<td>31.78</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

7
centimeters in height, two meter sticks or a tape measure, tape to mark the distance to cross before the subject turns around, a gait belt for safety as needed, and a stopwatch to time the assessment. The tape line is placed three meters away from the front of the arm chair to signify where the subject must walk beyond before turning around. The use of an assistive device is appropriate for the test if the individual uses it general ambulation. Once the equipment is gathered and the brief set-up is complete, the TUG is ready to be administered.

The instructions for the TUG are relatively straightforward and are explained clearly to the participants before they begin. Subjects are given verbal instructions and a demonstration by the facilitator of where to turn around. If the subject begins too soon or does not walk beyond the tape before turning around, a re-test is administered. Subjects were provided one successful scoring attempt. Consistent, verbal instructions for this study were stated as follows: “You will begin by sitting in this arm chair. When I say ‘go’ I want you to get up from the chair and walk at your normal and safe pace beyond the tape line, turn around, walk back to the chair, and sit down.” The timing starts on the word “go” and stops when the subject sits back down in the arm chair. The subject performs the test once and their time is recorded. During the test, observations of gait deviations and use of an assistive device are noted, as well at present ailments from current injuries or previous surgeries verbally described by the participant.

Procedure

Before any of the Stepping On participants took part in our research study, they were clearly informed of the research and confidentiality, and displayed understanding by signing a consent form. Next, the participants filled out surveys and questionnaires (see
Appendices B and C) to provide a better understanding of each participant’s function, along with possible factors that can increase their risk for falls. All 14 participants met the inclusion criteria previously listed in this chapter.

Once the participants completed the written document portion of the research, they were each randomly assigned to one of four testing stations. The four stations consisted of differing functional tests that assess fall risk including the TUG and cognitive TUG, 30 Second Chair Stand Test, Four-Stage Balance Test, and the GAITRite to measure gait speed. As stations became available, the participants were directed to an open station until all tests were completed. The form utilized to record participants’ scores for the aforementioned tests is located in Appendix D.

Reliability

The reliability of the TUG has been tested in the forms of test-retest, inter-rater, and intra-rater. The TUG has been found to display an excellent test-retest reliability of 0.92,\(^5\) inter-rater reliability of 0.91-99,\(^9\)\(^,\)\(^10\)\(^,\)\(^13\) and intra-rater reliability of 0.92.\(^13\) During both Week 2 and Week 7, the participants performing the TUG were administered by one of two researchers, pointing to the necessity for the test to display high ratings of inter-rater reliability.
CHAPTER 3

RESULTS

The first purpose of this study was to assess if the Stepping On program displayed a decrease in fall risk through application of the TUG. The results for this specific program show that this was not the case for the majority of the participants who completed the TUG during both Week 2 and 7. Of the 14 participants, eight completed both the beginning and ending TUG assessments. Of these eight participants, three displayed a faster, improved score while five had slower, decreased scores. The other six participants had incomplete results with five missing Week 7 and one missing Week 2. Reasons for incomplete participation were: one individual joining the program while in session, two failing to complete the program due to disinterest, two due to medical issues, and one attending to a family emergency.

The second purpose of the study was to determine if the TUG is an effective screening tool for fall risk assessments. A cut-off score of 13.5 seconds was utilized to determine if the participant was at a fall risk. Those scoring higher than 13.5 seconds were classified as having a fall risk. All 14 of the research study’s participants performed the TUG at least one time. Of these 14, ten had scores higher than 13.5 and thus at a high fall risk. Seven of the 14 participants had experienced at least one fall in the past year. All seven of these participants scored higher than 13.5 seconds on the TUG, accurately classifying them at a fall risk. The remaining four participants that scored less than 13.5
seconds have all been free from falls for at least the past year. Based on the results, though from a relatively small sample size, the TUG accurately showed seven participants with recent falls to be at a fall-risk, four without recent falls to be without fall-risk, and informed three individuals without falls recently that they are at a risk of falls based on their higher score. These results give the TUG a sensitivity of 100% and a specificity of 57% at determining a fall risk for this study. A visual depiction of the results are displayed in Table 3 and Figure 1.
Table 3. TUG Individual Results

<table>
<thead>
<tr>
<th>Subject – Assistive Device</th>
<th>Age</th>
<th>Week 1 (sec)</th>
<th>Week 7 (sec)</th>
<th>Change in time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - none</td>
<td>92</td>
<td>13.52</td>
<td>12.69</td>
<td>(-)0.83</td>
</tr>
<tr>
<td>2 - pushed WC</td>
<td>92</td>
<td>23.87</td>
<td>N/A</td>
<td>N/A (medical issue)</td>
</tr>
<tr>
<td>3 - FWW</td>
<td>89</td>
<td>28.00</td>
<td>31.28</td>
<td>(+)3.28</td>
</tr>
<tr>
<td>4 - FWW</td>
<td>87</td>
<td>21.20</td>
<td>23.09</td>
<td>(+)1.89</td>
</tr>
<tr>
<td>5 - 4WW</td>
<td>94</td>
<td>11.96</td>
<td>10.59</td>
<td>(-)1.37</td>
</tr>
<tr>
<td>6 - none</td>
<td>80</td>
<td>11.25</td>
<td>11.84</td>
<td>(+)0.59</td>
</tr>
<tr>
<td>7 - FWW</td>
<td>84</td>
<td>49.93</td>
<td>NT (disinterest)</td>
<td>N/A</td>
</tr>
<tr>
<td>8 - SEC</td>
<td>85</td>
<td>18.77</td>
<td>NT (disinterest)</td>
<td>N/A</td>
</tr>
<tr>
<td>9 - none</td>
<td>80</td>
<td>29.84</td>
<td>NT (medical issue)</td>
<td>N/A</td>
</tr>
<tr>
<td>10 - FWW</td>
<td>87</td>
<td>13.32</td>
<td>NT (family emergency)</td>
<td>N/A</td>
</tr>
<tr>
<td>11 - FWW</td>
<td>84</td>
<td>32.40</td>
<td>19.88</td>
<td>(-)12.52</td>
</tr>
<tr>
<td>12 - 4WW</td>
<td>89</td>
<td>13.13</td>
<td>35.62</td>
<td>(+)22.49</td>
</tr>
<tr>
<td>13 - 4WW</td>
<td>90</td>
<td>28.06</td>
<td>38.53</td>
<td>(+)10.47</td>
</tr>
<tr>
<td>14 - 4WW</td>
<td>89</td>
<td>NT (joined program late)</td>
<td>31.78</td>
<td>N/A</td>
</tr>
</tbody>
</table>

NT=Not Tested    N/A=Not Applicable    FWW=Front Wheeled Walker

4WW=Four Wheeled Walker    SEC=Single End Cane
Figure 1. TUG results and fall risk cut-off
CHAPTER 4
DISCUSSION

The results of the TUG test implemented on the participants during Week 2 and 7 of the program are written in summary and listed in table form, along with other factors that can contribute to their score. This is displayed visually in Figure 3 and Table 1 for further clarity. These results allow for answers to the purposes designed for this study. This section will discuss the findings in the context of these questions, as well as factors that affected the TUG scores outside of the participants' physical capabilities.

The first purpose of the study sought to determine if the Stepping On program reduced participants' fall risk through the use of the TUG. Three of the eight (37%) participants displayed decreased times by the end of the Stepping On program. There are various possibilities why five out of the eight participants displayed increased times after the completion of the program. The primary ideas considered are the high average age of the participants (87.2 years), the use of assistive devices by 11 of the 14 participants, inconsistent compliance with the home exercises and safety concerns if done independently, the TUG assessment was implemented at the end of the Week 2 class and at the beginning of the Week 7 class, various comorbidities provided in Table 2, as well as the seven weeks not allowing ample time to display significant improvement.

The second purpose of the study pursued significance regarding the effectiveness of the TUG as a screening tool. When comparing the TUG scores to the participants'
self-reported recent falls as an indicator of fall-risk, the TUG displayed good validity in categorizing the participants in the proper category. As noted previously, a current review by Kojima et al\textsuperscript{4} found through sensitivity and specificity results that the TUG is more effective at determining if an individual \textit{is} at a fall risk, than it is at classifying an individual \textit{is not} at a fall risk. The results from this small sample, however, show that the TUG is a quick, useful test to use for initial determination if an individual \textit{is not} at a fall risk. This is indicated through the results of 100\% sensitivity and 57\% specificity.

Once the data collection was completed, there were various factors considered that may have altered the participants' scores. Besides the TUG, the research group implemented the cognitive TUG immediately following the basic TUG, along with a gait velocity assessment, 30 second sit to stand, single-leg stance assessments, and written questionnaires in no particular order. The testing was structured in a station-to-station format where the participants completed all of the functional tests in a relatively short time frame. With all of these tests going on at the same time, there were opportunities for distraction, confusion, and physical fatigue. Further data analysis options are available to assess correlation of the other assessments with the TUG.

Further analysis can be applied through previous research pertaining to the TUG. Recent research found that individuals that take longer than 12.6 seconds to complete the TUG are 3.7 seconds more likely to fall.\textsuperscript{4} This finding places 12 of the 14 participants in this increased fall risk category when considering their Week 2 and 7 scores (see Table 3). The same 12 individuals are above the 12 second ceiling for 'normal mobility' classification in the most recent and closest age-specific normative data of 65-85 years old.\textsuperscript{11,12} In a convenient similarity, separate research pertaining specifically to the TUG
and *Stepping On* found the classification cut-off between high and low fall risk classification to be at 12 seconds.\(^{17}\)

A correlation from Table 2 regarding the amount of previous falls by a participant and their TUG score appeared significant. When an individual stated that they had experienced falls in the past year, their TUG scores were significantly higher than those not experiencing falls in the past year. It is worth noting that during this 7-Week *Stepping On* program, there were no falls experienced by any of the participants in this study.

There were possible situational factors affecting test scores when specifically focusing on the TUG and cognitive TUG. Ideally, the functional tests were to be facilitated by one researcher instructing the TUG, and another instructing the cognitive TUG. Due to time constraints and the flow of participants, both researchers divided the participants and instructed both tests at separate stations simultaneously. Even slight variation in instruction, precision application of the stopwatch, or verbal cues can vary the outcomes from subject to subject.

Due to the previously mentioned format of testing, some variation in testing parameters of the TUG could have affected scores. Typically, a trial run is allowed for the participant to practice the TUG before their assessment for time is initiated. Although, the original research of the TUG did not implement a trial run.\(^{3}\) With the various tests causing time constraints, along with consideration of the participants’ average age, and the cognitive TUG immediately following, excluding the trial run minimized the assessment time as well as fatigue of the participants. Unfortunately, providing solely verbal and demonstrative instruction did not clarify all parameters of the
test, leading to restart situations. For example, participants would fail to sit down in the chair at the end of the test. This was the portion that was not demonstrated as the subject was already sitting in the chair during the instructions. Also, without the trial run, the TUG often played the role of the trial run to the cognitive TUG immediately following. This often lead to faster times in the cognitive TUG in comparison to the TUG, which was not anticipated. Another consideration may be that the cognitive TUG provided a beneficial distraction to their typical ambulation hesitancy and thus led them to complete the test faster than without a cognitive task.

Limitations

The specific Stepping On program for this research met the criteria fully for participant qualification. However, this group of participants was unique in respect to gender dominance with all females in attendance, a high average age for the group (87.2 years), a high use of assistive devices, all assistive living facility residents, and safety concerns with some individuals (three utilizing wheelchairs for longer distance transportation) performing exercises independently. These factors affected the legitimacy of the results when testing the effectiveness of the Stepping On program, as well as providing a skewed display of a general geriatric, community-dwelling population.

Recommendations

Increasing exercise effectiveness and compliance for this age group in the assisted living facility setting, through supervised group exercise three times per week for the participants is recommended. This would help the participants develop a routine of exercising and see the positive results that develop with consistent, continual application.
Conclusion

The results of this study displayed a 37% decrease in fall risk through the application of the TUG. In addition, the TUG displayed validity in appropriately classifying those experiencing recent falls at a fall risk, and those without recent falls at no fall risk. This classification was based off of the participant's time required to complete the TUG. These outcomes suggest that the TUG is useful as a fall-risk screening tool in determining the initial risk of the individual. With the continuous courses of the Stepping On program, there is opportunity to further assess the TUG and its effectiveness in assessing fall risk in the community-dwelling, elderly population.
March 13, 2015

The Protocol Change Form and all included documentation for the above-referenced project have been reviewed and approved via the procedures of the University of North Dakota Institutional Review Board.

Attached is your revised consent form that has been stamped with the UND IRB approval and expiration dates. Please retain this original on file. You must use this original, stamped consent form to make copies for participant enrollment. No other consent form should be used. It must be signed by each participant prior to initiation of any research procedures. In addition, each participant must be given a copy of the consent form.

You have approval for this project through the above-listed expiration date. When this research is completed, please submit a termination form to the IRB. If the research will last longer than one year, an annual review and progress report must be submitted to the IRB prior to the submission deadline to ensure adequate time for IRS review.

The forms to assist you in filing your project termination, annual review and progress report, adverse event/unanticipated problem, protocol change, etc. may be accessed on the IRS website:

http://und.edu/research/resources/human-subjects

Sincerely,

Michelle L. Bowles,
M.P.A., M.P.H.
IRB Coordinator

Enclosures

Cc: Chair, Physical Therapy

The University of North Dakota is an equal opportunity/affirmative action employer.
University of North Dakota Human Subjects Review Form

All research involving human participants conducted by faculty, staff, and students associated with the University of North Dakota, must be reviewed and approved as prescribed by the University’s policies and procedures governing the use of human subjects. It is the intent of the University of North Dakota (UND), through the Institutional Review Board (IRB) and Research Development and Compliance (RD&C), to assist investigators engaged in human subject research to conduct their research along ethical guidelines reflecting professional as well as community standards. The University has an obligation to ensure that all research involving human subjects meets regulations established by the United States Code of Federal Regulations (CFR). When completing the Human Subjects Review Form, see the "IRB Checklist" for additional guidance.

Please provide the information requested below. Handwritten forms are not accepted — responses must be typed on the form.

Principal Investigator: Meridee Danks and Beverly Johnson

Telephone: 777-3161
E-mail Address: meridee.danks@med.und.edu
Complete Mailing Address: 5th North Colonnade Road, Stop 9037, Grand Forks, ND 58202-9037

School/College: UND: MHS
Department: Physical Therapy

Student Advisor (if applicable):
Telephone:
E-mail Address:
Address or Box #:
School/College: ______________
Department: ________________

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

Proposed Project Dates: Beginning Date: 9-12-2012 Completion Date: ____________

Funding agencies supporting this research: NA

Did the contract with the funding entity go through UND Grants and Contracts Administration? YES or NO

Attach a copy of the contract. Do not include any budgetary information. The IRB will not be able to review the study without a copy of the contract with the funding agency.

Does any researcher associated with this project have an economic interest in the research, or act as an officer or a director of any outside entity whose financial interests would reasonably appear to be affected by the research? If yes, submit on a separate piece of paper an additional explanation of the financial interest. The Principal Investigator and any researcher associated with the project should have a Financial Interests Disclosure Document on file with their department.

School/College: UND: MHS
Department: Physical Therapy

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

Proposed Project Dates: Beginning Date: 6-12-2012 Completion Date: ____________

Funding agencies supporting this research: NA

Did the contract with the funding entity go through UND Grants and Contracts Administration? YES or NO

Attach a copy of the contract. Do not include any budgetary information. The IRB will not be able to review the study without a copy of the contract with the funding agency.

Will any data be collected at or obtained from another organization outside the University of North Dakota? YES or NO

If yes, list the names of all organizations:

Did the project involve any human participants whose financial interests would reasonably appear to be affected by the research? If yes, submit on a separate piece of paper an additional explanation.

Did the project involve any human participants whose financial interests would reasonably appear to be affected by the research? If yes, submit on a separate piece of paper an additional explanation.

Letters from each organization must accompany this proposal. Each letter must indicate that the organization understands its obligations and agrees to participate in the study. Letters must include the name and title of the individual signing the letter and should be printed on organizational letterhead.

Letters must include the name and title of the individual signing the letter and should be printed on organizational letterhead.

Revised 04/02/12
Does any external site where the research will be conducted have its own IRE?  
- Yes [ ]  
- No [ ]  
- NA [ ]

If yes, does the external site plan to rely on UND’s IRE for approval of this study?  
- Yes [ ]  
- No [ ]  
- NA [ ]

If your project has been or will be submitted to other IREs, list those Boards below, along with the status of each proposal.

<table>
<thead>
<tr>
<th>Board Name</th>
<th>Date Submitted</th>
<th>Status</th>
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Include the name and address of the IRE, contact person at the IRE, and a phone number for that person.

Type of Project:  
- New Project [ ]  
- Continuation/Revision [ ]  
- Student Research Project [ ]  
- Dissertation/Thesis/Independent Study [ ]

If the project involves a protocol change for a previously approved project, if yes, submit a signed copy of this form with the changes marked or highlighted.

Does your project involve abstracting medical record information?  
- Yes [ ]  
- No [ ]

If yes, complete the HIPAA Compliance Application and submit it with this form.

Does your project include Genetic Research?  
- Yes [ ]  
- No [ ]

Subject Classification: This study will involve subjects who are in the following special populations: Check all that apply.

- Children (< 18 years) [ ]
- Pregnant Women/Fetuses [ ]
- Prisoners [ ]
- Cognitively impaired persons or persons unable to consent [ ]
- Other [ ]

Please use appropriate checklists when children, prisoners, pregnant women, or people who are unable to consent will be involved in the research.

This study will involve: Check all that apply.

- Deception (Auth. Waiver or Alteration of Informed Consent Requirements) [ ]
- Radiation [ ]
- New Drugs (IND) IND # ______ Attach Approved [ ]
- Investigational Device Exemption (IDE) # ______ Attach Approved [ ]
- Non-approved Use of Drugs [ ]
- None of the above will be involved in this study [ ]

If yes, please provide a brief explanation (limit to 200 words or less) of the rationale and purpose of the study, introduction of any sponsor(s), and justification for use of human subjects or special populations (e.g., vulnerable populations such as children, prisoners, pregnant women).

Falls are a major concern in the elderly population. Falls can lead to impairments, functional limitations and disabilities. The North Dakota Department of Health, Division of Injury Prevention and Control has initiated the Stepping On program in several communities across North Dakota. The Stepping On program is an established multifaceted community-based program using small-group-based learning, designed to improve fall self-efficacy, encourage behavioral change, and to reduce falls. Two-hour sessions are conducted weekly for 7 weeks with a follow-up home visit and a 3-month booster session. The aim of this study is to test whether the Stepping On program is effective in reducing falls in elderly people living at home.
II. **Procedure Description**

Please provide a thorough description of the procedure to be used by addressing the instructions under each of the following categories.

1. **Subject Selection.**
   a) Describe recruitment procedures (i.e., how subjects will be recruited, who will recruit them, where and when they will be recruited and for how long) and include copies of any advertisements, fliers, etc., that will be used to recruit subjects. Subjects will be recruited from participants in the Stepping On program by word of mouth at Holy Family Church, Northwood Senior Center, Grand Forks Senior Center, and Calvary Lutheran Church. The Stepping On program is being set-up at these locations.

   b) Describe your subject selection procedures and criteria, paying special attention to the rationale for including subjects from any of the categories listed in the "Subject Classification" section above. Subjects need to be attendees of the Stepping On program which is designed for individuals who are 65 or older and living in either an own home and able to walk independently outside their home.

   c) Describe your exclusionary criteria and provide a rationale for excluding subject categories. Exclusion criteria includes any cognitive problems associated with dementia and being homebound (unable to independently leave home).

   d) Describe the estimated number of subjects that will participate and the rationale for using that number of subjects. The goals recruit approx 12 subjects at each site (Holy Family, Northwood, Grand Forks Senior Centers and Calvary Lutheran Church) to participate in the research study. The Stepping On program recommends limiting the number of participants to no more than 15 for the 7-week program.

   e) Specify the potential for valid results. If you have used a power analysis to determine the number of subjects, describe your method. Only 10-15 people will be attending the Stepping On program at each site so this will limit the number.

2. **Description of Methodology.**
   a) Describe the procedures used to obtain informed consent. Participants of the Stepping On program will be asked if they would like to be part of this study on the introduction day of the program. If they are interested they will be given an informed consent form to review. Questions will be addressed and if willing to participate signatures will be obtained. Each volunteer will be given a copy of the consent form.

   b) Describe where the research will be conducted. Document the resources and facilities to be used to carry out the proposed research. Please note staffing, funding, and space available to conduct this research. Holy Family Church in Grand Forks, ND, Northwood Senior Center in Northwood, ND, Grand Forks Senior Center and Calvary Lutheran Church in Grand Forks, ND.

   c) Indicate who will carry out the research procedures. Meredith Danks and Rev. Johnson, physical therapists from UND physical therapy department; UND-PT students will be assisting as needed.

   d) Briefly describe the procedures and techniques to be used and the amount of time that is required by the subjects to complete them. Assessments will occur at Weeks 1 and 7 and then at 3 month booster session and at 6 months post Stepping On program ended. Assessment will include the following:

   1. Baseline Questionnaire and Fall Risk Survey – are filled out as part of the Stepping On program. Questionnaires are to gather demographic, mobility and falls information. Time to complete is ~10 minutes.
Additional test performed (beyond Stepping On gathered information)

2. Activities-specific Balance Confidence (ABC) Scale - subject rates level of confidence in doing everyday activities with not falling using a 0-100% scale (0 = no confidence to 100 = completely confident). Total score is sum of 16 individual activity scores, which is then averaged, the higher the score the less concern the subject has about falling. Time to complete is less than 5 minutes.

3. Sit to Stand Test (8TS) - the subject will be asked to go from a sit to stand for 30 seconds. The number of repetitions will be completed in 30 sec and the length of time to complete the first 5 sit to stands will be 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 second trial will be performed with the subject performing a cognitive task (i.e. subtracting by 3s or spelling words) while walking. 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. GAITRite electronic walkway may be used if available to allow the researchers to gather greater data on subjects walking during the above 10 meter walk.

5. Four-Test Balance Scale (FTBS) - This is a balance test that progressively challenging. The test is stop if the person is unable to perform task for the required amount of time. Initially, the subject is asked to stand with feet together for 10 seconds with eyes open; if able to perform this activity the subject is then asked to stand in a semi-tandem position (feet touching but one foot slightly ahead of the other) for 10 sec; if able to do so, the subject then is asked to perform a tandem stand (heel to toe) for 10 sec; if able to do so, the subject will be progressed to one leg stand for up to 30 seconds. If subject is unable to stand for 30 sec, time of trial will be recorded. 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. Fall and Activity Survey and Stepping On Participation Evaluation - each subject will be given a survey following the completion of Stepping On sessions at Week 7, 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.

7. Describe audio/visual procedures and proper disposal of tapes. NA

8) Describe qualifications of the individuals conducting all procedures used in the study.

Meridee Danks has been a practicing physical therapist for 28 years and has a specialty certification in Neurologic Physical Therapy. Bev Johnson has been a practicing physical therapist for 30+ years and has Doctoral of Science in Geriatrics. UND-PT students will be supervised & trained as needed.

9) Describe compensation procedures (payment or class credit for the subjects, etc.)

NA
Attachments Necessary: Copies of all instruments (such as survey/interview questions, data collection forms completed by subjects, etc.) must be attached to this proposal.

   a) Clearly describe the anticipated risks to the subjects/other including any physical, emotional, and financial risks that may result from this study.
      There is a minimal risk of loss of balance with the balance assessments (TUG/TIFS/etc). Each of these tests will be performed with a safety belt and spotter to prevent any falls. The subject will be instructed that they can quit the activity at any time if they do not feel safe performing it.
   b) Indicate whether there will be a way to link subject responses and/or data sheets to consent forms, and if so, what the justification is for having that link.
      There will be a link to each subject in order to compare survey information at each check time. Once all the data (after 6-month check) is collected the link will be destroyed.
   c) Provide a description of the data monitoring plan for all research that involves greater than minimal risk.
      NA
   d) If the PI will be the lead-investigator for a multi-center study, or if the PI’s organization will be the lead site in a multi-center study, include information about the management of information obtained in multi-site research that might be relevant to the protection of research participants, such as unanticipated problems involving risks to participants or others, interim results, or protocol modifications.
      NA

4. Subject Protection.
   a) Describe precautions you will take to minimize potential risks to the subjects (e.g., sterile conditions, informing subjects that some individuals may have strong emotional reactions to the procedures, debriefing, etc.).
      A safety belt and spotter will be used during each balance assessment. Subjects will be informed that they can stop any activity that they do not feel safe performing.
   b) Describe procedures you will implement to protect confidentiality and privacy of participants (such as coding subject data, removing identifying information, reporting data in aggregate form, not violating a participant’s space, not intruding where one is not welcome or trusted, not observing or recording what people expect not to be public, etc.). If participants who are likely to be vulnerable to coercion and undue influence are to be included in the research, define provisions to protect the privacy and interests of these participants and additional safeguards implemented to protect the rights and welfare of these participants.
      All data will be coded and identifying information removed once all data is gathered. Any reporting will be in aggregate form. The assessments will be performed in a private room. Follow-up surveys will be sent back to researcher with ID number only.
   c) Indicate that the subject will be provided with a copy of the consent form and how this will be done.
      Each subject will be provided with a copy of the consent form.
   d) Describe the protocol regarding record retention. Please indicate that research data from this study and consent forms will both be retained in separate locked locations for a minimum of three years following the completion of the study.
      1. The research data will be stored separately from the consent forms and other personal data.
      2. Only the researchers will have access to the data.
      3. The data will be kept a minimum of 3 years and will be shredded once data analysis is completed.
      4. Consent forms/personal data and data will be stored in separate files in the locked office of the researcher.
      5. The consent forms will be kept a minimum of 3 years and then will be shredded.

Revised 04/02/12 5
e) Describe procedures to deal with adverse reactions (referrals to helping agencies, procedures for dealing with trauma, etc.).

Referrals will be made to family physician if subjects have concerns regarding their balance.

Subject will be referred for medical treatment if required for any injury that may occur during assessment. The responsibility of cost related to any treatment will be the responsibility of the subject.

III. Benefits of the Study

Clearly describe the benefits to the subject and to society resulting from this study (such as learning experiences, services received, etc.). Please note: extra credit and/or payment are not benefits and should be listed in the Protocol Description section under Methodology.

Subjects will be able to have their balance assessed at no cost. They will be able to see if there was any benefit of attending Stepping On program. General benefit to society to see how effective a preventative balance program can be.

IV. Consent Form

Clearly describe the consent process below and be sure to include the following information in your description (Note: Simply stating "see attached consent form" is not sufficient. The items listed below must be addressed on this form):

1. The person who will conduct the consent interview
2. The person who will provide consent or permission
3. Any waiting period between informing the prospective participant and obtaining consent
4. Steps taken to minimize the possibility of coercion or undue influence
5. The language to be used by those obtaining consent
6. The language understood by the prospective participant or the legally authorized representative
7. The information to be communicated to the prospective participant or the legally authorized representative

1. Merideth Dans and Bev Johnson will conduct the consent interview.
2. Researchers listed above will provide the consent form.
3. No waiting period,
4. Prospective subjects will be told that research is voluntary and that if they do decide to participate that they are able to stop at any time without any penalty,
5. English
6. English
7. The consent form will indicate the assessments to be performed and the amount of time to perform them and who will be performing the assessments.

A copy of the consent form must be attached to this proposal. If no consent form is to be used, describe the procedures to be used to protect human subjects and complete the Application for Waiver or Alteration of Informed Consent Requirements. Refer to Form IC 701-A, Informed Consent Checklist, and make sure that all the required elements are included. Please note: All records attained must be retained for a period of time sufficient to meet federal, state, and local regulations, sponsor requirements, and institutional policies. The consent form must be written in language that can easily be read by the subject population and any use of jargon or technical language should be avoided. The consent form should be written at an upper grade level as 10th grade reading level, and it is recommend that it be written in the third person (please see the example on the IRB website). A two inch by two inch blank space must be left on the bottom of each page of the consent form for the IRB approval stamp.

Necessary attachments:

- Signed Student Consent to Release of Educational Record Form (students only);
- Investigator Letter of Assurance of Compliance;
- Consent form, or Waiver or Alteration of Informed Consent Requirements (Form IC 701-A);
- Surveys, interview questions, etc. (if applicable);
- Printed web screens (if survey is over the Internet), and.
By signing below, you are verifying that the information provided to the Human Subjects Review Team and attached information is accurate and that this project will be completed as indicated.

(Principal Investigator) Date: 3/15/15

(Advisor) Date:

Requirements for submitting proposals:
Additional information can be found on the IRE web site at: http://und.edu/research/research-economic-development/institutional-review-board.

Original Proposals and all attachments should be submitted to Institutional Review Board, 264 Centennial Drive Step 7134, Grand Forks, ND 58201-7134, or brought to Room 214, Twamley Hall.

Prior to receiving IRB approval, researchers must complete the required IRE human subjects’ education. Please go to:

The criteria for determining what category your proposal will be reviewed under is listed on page 3 of the IRB Checklist. Your reviewer will assign a review category to your proposal. Should your proposal require full Board review, you will need to provide additional copies. Further information can be found on the IRE website regarding required copies and IRB review categories, or you may call the IRB office at 701 777-4279.

In cases where the proposed work is part of a proposal to a potential funding source, one copy of the completed proposal to the funding agency (agreement/contract if there is no proposal) must be attached to the completed Human Subjects Review Form. If the proposal is non-clinical, 5 copies of the proposal is required. If the proposed work is being conducted for a pharmaceutical company, 5 copies of the company’s protocol must be provided.
APPENDIX B
INFORMED CONSENT

TITLE: The Effectiveness of the “Stepping On” Program for Reducing the Incidence of Falls in the Elderly

PROJECT DIRECTOR: Meredith Banks 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 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 the 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.

Date: 
Subject Initial: ---
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 Fall Risk Survey - 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. Time to complete is ~10 minutes.

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

2. Activities-specific Balance Confidence (ABC) Scale - subject rates level of confidence in doing everyday activities with out falling using a 0-100% scale (0 = no confidence to 100 = completely confident). Total score is sum of 15 individual activity scores, which is then averaged, the higher the score the less concerns the subject has about falling. 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 for 30 seconds. The number of repetitions will be completed in 30 sec and the length of time to complete the first 5 sit to stands will be 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 second trail will be performed with the subject performing a cognitive task (i.e. subtracting by 3s or spelling words) while walking. 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 finally, the subject stands on one leg for up to 30 seconds with eyes open. If subject is unable to stand for the allotted 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. Fall and Activity Survey and Stepping On Participation Evaluation - each subject will be given the 2 survey's following the completion of Stepping On session at Week 7, at 3-month booster session and at the 6 month 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 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 weaknesses that will be identified by the assessment scores.

ALTERNATIVES TO PARTICIPATING IN THIS STUDY

You can decide to participate 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 no payments from other agencies, organizations, or companies to conduct this research study.

CONFIDENTIALITY

The results 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 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 use 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 701-777-2834 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 if 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 ________________
Stepping On Workshop Participant Evaluation

Workshop Date: ____________  Today's Date: ____________

Please help us to assist improvements in 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 Pacific Islander
   - Black or African American
   - Hispanic or Latino
   - Other, please specify:
4. What is your marital status? (Check only one)
   - Married
   - Widowed
   - Divorced
   - Never married
   - Single (living with someone)
5. Have you talked with the first person?
   - No
   - Yes
   - If yes, what was the name of that person?
6. How many people live in your household (including yourself)? ______

7. What is your location of residence?
   - Rural/Outdoors
   - Small town or village
   - City/suburb of a city

34
8. Overall, how much did you learn from these sessions?

<table>
<thead>
<tr>
<th>Level</th>
<th>Notice</th>
<th>Some</th>
<th>A lot</th>
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</thead>
<tbody>
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9. Place an X in the box to indicate your response:

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<tr>
<th>Place an X in the box to indicate your response.</th>
<th>Notice</th>
<th>Some</th>
<th>A lot</th>
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10. My understanding of how shoes can influence the ability to get around safely.

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<tr>
<th>Before Participation</th>
<th>Notice</th>
<th>Some</th>
<th>A lot</th>
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11. My understanding of the importance of balance and strength exercises for preventing falls.

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<tr>
<th>Before Participation</th>
<th>Notice</th>
<th>Some</th>
<th>A lot</th>
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12. My understanding of the relation between self-esteem and fall prevention.

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<tr>
<th>Before Participation</th>
<th>Notice</th>
<th>Some</th>
<th>A lot</th>
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<tr>
<th>Before Participation</th>
<th>Notice</th>
<th>Some</th>
<th>A lot</th>
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14. My understanding of the relationship between motivation and falls.

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<tr>
<th>Before Participation</th>
<th>Notice</th>
<th>Some</th>
<th>A lot</th>
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</table>

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

<table>
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<tr>
<th>Before Participation</th>
<th>Notice</th>
<th>Some</th>
<th>A lot</th>
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</table>
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
Balance Exercises

Sideways Walking

Sit-to-Stand

Heel-Toe Standing

Heel-Toe Walking

Strength Exercises

Side Hip Strengthening

Front Knee Strengthening

Heel Raises

Toe Raises
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?
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.

<table>
<thead>
<tr>
<th>Balance Exercises:</th>
<th># times/week</th>
<th># of repetitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sit-to-Stand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sideways Walking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heel-toe standing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heel-toe walking</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strength Exercises:</th>
<th># times/week</th>
<th># of reps &amp; weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side-hip-strengthening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee-strengthening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heel raises</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toe raises</td>
<td></td>
<td></td>
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</tbody>
</table>

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?
Fall Risk Survey

ID #: _______ Age: _______ Gender: 男 Female Date: _______

<table>
<thead>
<tr>
<th>Fall Risk Factor</th>
<th>Factor Present</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any falls in the last year?</td>
<td>□ Yes □ No</td>
<td>If yes, how many?</td>
</tr>
<tr>
<td>Do you use an assistive device? (Cane, Walker, etc.)</td>
<td>□ Yes □ No</td>
<td>If yes, what kind?</td>
</tr>
<tr>
<td>Do you worry about falling when standing or walking?</td>
<td>□ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>Do you spend less than 30 minutes per day 5-7 days per week being physically active?</td>
<td>□ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>Do you take more than 4 prescription medications?</td>
<td>□ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>Has it been longer than 1 year since your last vision check?</td>
<td>□ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>Do you have vision impairments? (glasses, macular degeneration, glaucoma, etc.)</td>
<td>□ Yes □ No</td>
<td>If yes, what kind?</td>
</tr>
<tr>
<td>Have you had any surgeries in the last year? (Hip, Knee, etc.)</td>
<td>□ Yes □ No</td>
<td>If yes, what kind?</td>
</tr>
<tr>
<td>Do you have any heart rate or rhythm issues?</td>
<td>□ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>Do you have any sensation loss to your legs or feet?</td>
<td>□ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>Are you depressed?</td>
<td>□ Yes □ No</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL: 41
Instructions to Participants:
For each of the following, please indicate your level of confidence in doing the activity without losing your balance or becoming unsteady from choosing one of the percentage points on the scale from 0% to 100%. If you do not currently do the activity in question, try and imagine how confident you would be if you had to do the activity. If you normally use a walking aid to do the activity or hold onto someone, rate your confidence as if you were using these supports. If you have any questions about answering any of these items, please ask the administrator.

The Activities-specific Balance Confidence (ABC) Scale

For each of the following activities, please indicate your level of self-confidence by choosing a corresponding number from the following rating scale:

0% 10 20 30 40 50 60 70 80 90 100%
no confidence completely confident

*How confident are you that you will not lose your balance or become unsteady when you...
1. ... walk around the house? _____ %
2. ... walk up or down stairs? _____ %
3. ... bend over and pick up a slipper from the front of a closet floor _____ %
4. ... reach for a small can off a shelf at eye level? _____ %
5. ... stand on your tiptoes and reach for something above your head? _____ %
6. ... stand on a chair and reach for something? _____ %
7. ... sweep the floor? _____ %
8. ... walk outside the house to a car parked in the driveway? _____ %
9. ... get into or out of a car? _____ %
10. ... walk across a parking lot to the mall? _____ %
11. ... walk up or down a ramp? _____ %
12. ... walk in a crowded mall where people rapidly walk past you? _____ %
13. ... are bumped into by people as you walk through the mall? _____ %
14. ... step onto or off an escalator while you are holding onto a railing? _____ %
15. ... step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing? _____ %
16. ... walk outside on icy sidewalks? _____ %

APPENDIX D
Balance Test Score Sheet

Name: ___________________________ Age: _______ Date: ___________

• 30-Second Chair Stand Test
  Purpose: To assess leg strength/endurance, fall risk, balance, and proprioception.
  Score: ______ reps  Average #: 60-69 yrs ≥ 12 reps
  70-79 yrs ≥ 10 reps
  80-84 yrs ≥ 9 reps

• Four-Test Balance Scale
  Purpose: Assess stability, balance, and falls risk.
  Single-Leg Stance (SLS) Score: ______ sec  Fall Risk: < 10 sec
  Tandem Stance Score: ______ sec  Normal for SLS: 60-69 yrs = 22.3 sec
  (Vellas & M) 70-79 yrs = 14.2 sec
  80-89 yrs = 8.5 sec

*Only test if unable to do above test:
  Semi-Tandem Stance Score: ______ sec
  Narrow-Base Stance Score: ______ 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

• Cognitive Timed-Up-And-Go
  Purpose: Assess walking speed while focusing on something else (i.e. walk & talk)
  Score: ______ sec  Fall Risk: > 15 sec  Normal: < 1.2 sec > TUG

• Walking Speed
  Purpose: Assess your everyday walking speed
  Score ______ sec  Fall Risk: < 1.0 m/s  Normal: 60-69 yrs = 1.2 m/s
  70-79 yrs = 1.1 m/s
  80 + yrs = 1.0 m/s

• Activities-specific Balance Confidence (ABC) Scale
  Purpose: Assess balance confidence when performing common everyday activities.
  Score _______ Fall Risk: < 67% avg  Normal: 80% or >

Participant #: ______
REFERENCES


