Functional status and fall risk among older adult participants in community-based exercise programs: do Better Bones & Balance® participants outperform their peers?

by
Lauren Elaine Trevis

A THESIS

submitted to

Oregon State University

Honors College

in partial fulfillment of
the requirements for the
degree of

Honors Baccalaureate of Science in Kinesiology
(Honors Scholar)

Presented June 6th, 2018
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AN ABSTRACT OF THE THESIS OF

Lauren Elaine Trevis for the degree of Honors Baccalaureate of Science in Kinesiology presented on June 6, 2018. Title: Functional status and fall risk among older adult participants in community-based exercise programs: do Better Bones & Balance® participants outperform their peers?

Abstract approved: _____

Katherine B. Gunter

Purpose: This study examines the relationship between community-based fitness class participation and risk for falls in adults aged 55 or older. Our aim was to compare scores on fall risk factors between community-based Better Bones & Balance® (BBB) participants and active peers who engage in other (non-BBB) community-based fitness classes. **Methods:** 92 BBB participants (mean age: 70.1 $\pm$ 7.8) and 33 non-BBB participants (mean age: 68.2 $\pm$ 8.2) were recruited from community-based fitness facilities in Linn and Benton Counties. Participants completed a 25-question survey and six functional assessments to evaluate fall risk factors. **Results:** Examination of descriptive variables exposed significant differences in age, presence of disease/chronic condition, and history of physical activity. After controlling for these differences, we found BBB participants scored significantly better ($p \geq 0.003$) on the Timed Up and Go (TUG) compared to non-BBB participants. All participants scored well below the cut off for fall risk in TUG (14 seconds). **Conclusion:** Engaging in community-based fitness classes in general have a positive effect on fall risk in adults aged 55 and older. Participating in BBB may have a greater effect on reducing TUG scores than other types of community-based classes.

Key Words: Better Bones & Balance®, Community-Based Fitness, Older Adults, Fall Prevention, Fall Risk Assessment, Healthy Aging.

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Honors Baccalaureate of Science in Kinesiology project of Lauren Elaine Trevis presented on June 6th, 2018.

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I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

Lauren Elaine Trevis, Author

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INTRODUCTION -

Falls are the leading cause of unintentional injury deaths and nonfatal injuries resulting in hospital admissions among older adults (those over age 65) (Burns & Kakara, 2018). In the United States, approximately 28.7% of older adults report falling at least once in a year, resulting in 29 million falls (Bergen, Stevens, & Burns, 2016). Recent population-level data show falls contributed to 7 million injuries in a year, resulting in 2.8 million older adults receiving emergency room treatment for a fall, and 800,000 of those emergency room visits lead to further hospitalization (Bergen et al., 2016). In the same year (2014), 27,000 deaths were attributed to falls in the United States (Bergen et al., 2016). Despite awareness of the problem and efforts to intervene, the prevalence of fall-related deaths among adults $\geq$ 65 has increased from 18,334 in 2007 to 29,668 in 2016 (Burns & Kakara, 2018).

Numerous factors place an individual at a greater risk of falling, many of which are not modifiable by the individual. These include older age, female sex, certain medical factors (such as arthritis), previous falls, poor vision, and polypharmacy (defined as regularly taking 4 or more prescription medications) (Lord, Sherrington, & Menz, 1999; National Institute of Health, 2013; World Health Organization, 2007).

A primary concern for the increasing prevalence of falls and fall-related consequences in the U.S. centers on shifting U.S. demographics. Research supports that advancing age is accompanied with elevated fall risk, and is the strongest un-modifiable risk factor for falls (Bergen et al., 2016; Lord et al., 1999; World Health Organization, 2007). In the year 2014, the population of Americans over the age of 65

increased by 1.6 million to reach a total of 47.8 million. By the year 2060, adults aged 65 will account for nearly one in four Americans (United States Census Bureau, 2017). And for the first time in U.S. history, by 2035 the proportion of adults 65 and over is projected to be larger than the proportion of children under 18 (Vespa, Armstrong, & Medina, 2018).Thus, the predicted population increase in the United States should be a point of concern for future fall incidence. If something is not done to proactively decrease modifiable risk factors for falls, we can expect the prevalence of fall-related deaths will continue to climb.

Although age and other non-modifiable risk factors cannot be changed through intervention, several risk factors leading to elevated fall risk can be influenced through behavioral modifications. These risk factors include inactivity/sedentary lifestyle, impaired balance and gait, muscle weakness, and fear of falling (Lord et al., 1999; National Institute of Health, 2013; World Health Organization, 2007). Other modifiable factors include ensuring proper vision care, home safety, and managing medications (National Council on Aging, 2012).

A variety of techniques can be employed to reduce fall risk in older adults. Risk reduction strategies can be tailored to individuals' needs based on the risk factors they possess. Removal of environmental hazards by installing safety features in the person's home, reduction in medication (if possible), use of proper eye glasses, and having a discussion with the individual about their increased risk are all interventions which can help reduce fall risk (Lord et al., 1999).

Physical activity is a strong predictor for fall risk factors associated with strength, balance, and mobility, and strong evidence supports the effectiveness of

physical activity interventions for fall prevention in community-based settings (Sherrington, Whitney, et al., 2008). Whether single modality programs (e.g., balance training or walking) versus multi-modality programs that focus on strength, balance, and aerobic fitness are better to reduce falls is not clear. In general, being physically active is linked to a variety of benefits for older adults. Group exercise in particular has been shown to improve performance on a variety of different fall risk measures. However, not all group exercise programs have been shown to similarly decrease fall risk (Sherrington, Tiedemann, Fairhall, Close, & Lord, 2011). For instance, Sousa et al found that community-based classes that included both resistance training and aerobic training were more effective at reducing fall risk factors among older male adults than those with just aerobic exercise training (Sousa, Mendes, Silva, & Oliveira, 2017). Another study found that an aerobic cycling class was less effective than walking-based exercise classes at influencing fall risk factors in older adults (Buchner et al., 1997). There have been no studies examining participation in Better Bones & Balance® in comparison to other multiple modality community-based fitness programs.

Better Bones & Balance®: Previous Research Related to Fall and Fracture Risk

Better Bones & Balance® (BBB) was developed and tested in a laboratory setting at Oregon State University in 1995. The aim of the program is to reduce the risk of hip fracture in older adults by increasing bone mass and improving performance on functional fall risk factors. The program incorporates static and dynamic balance activities, lower body resistance training with weighted vests,

aerobic activities, and bone-loading exercises such as stomps and jumps. (McNamara & Gunter, 2012; Shaw & Snow, 1998). Early studies showed participants increased strength, improved balance, and enhanced function compared to sedentary controls (Shaw & Snow, 1998), and that long-term participation led to significantly less bone loss among program participants compared to controls (Snow, Shaw, Winters, & Witzke, 2000).

BBB was translated into a community-based exercise program in 1998 and has since been adopted and implemented in communities throughout Oregon, Washington, California, and beyond. It is delivered in community centers, fitness facilities, assisted living settings, and retirement communities. All instructors are certified and trained through the annual BBB Instructor Training program and are required to participate in continuing education regularly to maintain certification (Gunter, 2018).

Research conducted on the community-based program participants has shown that BBB is an effective way for older adults to reach the recommended guidelines for physical activity—particularly those for skeletal and cardiovascular health (McNamara, Pavol, & Gunter, 2013). Additionally, research has shown that individuals who consistently participated in the BBB program for six months had better lower body strength and power compared to sedentary individuals and individuals who participated in a walking program for six months (Dinger, 2013). In addition, BBB participants had higher functional mobility, as measured by the four-square step test, compared to walkers. Together, these results suggest that participation in the BBB program may have a greater positive influence on fall risk in

older adults compared to being sedentary or participation in walking as the only means of exercise (Dinger, 2013; Gunter & McNamara, 2010). Research has also shown that BBB participants outperform sedentary peers on functional assessments associated with risk for falls (i.e. 30 second chair stand, timed up and go, tandem walk, tandem and single legged stance) (Gunter & McNamara, 2010).

Thus, research to-date has consistently shown the benefits of participation in BBB on fall risk compared to walking or being sedentary. As of yet, no study has examined performances on functional tasks associated with risk for falls on BBB program participants in comparison to participants in other community-based fitness classes.

Statement of Purpose

An abundance of data show that exercise can improve balance, strength, and mobility (Sherrington et al., 2011). Characteristics of exercise programs that have the greatest potential to reduce fall risk include exercises that specifically challenge balance and expose participants to at least two hours of targeted exercise training per week (Sherrington, Lord, & Close, 2008). The BBB program, when delivered with fidelity, includes these characteristics. To date, BBB participants' performances on functional tests associated with fall risk have not been compared to similarly aged individuals participating in other types of community-based fitness classes that also include exposures of recommended time and balance elements (yoga, tai chi, Zumba, weight training, etc.).

Therefore, the objective of this study was to compare functional tasks related to fall risk between BBB participants and participants in other (non-BBB)

community-based fitness classes. Due to the steady rise in age of Americans, this research is particularly important for informing the selection of strategies to reduce fall-related injuries and support public health initiatives aimed at promoting healthy aging. This study was approved by the Oregon State University Institutional Review Board, protocol #8116.

METHODS-

Study Design and Recruitment

This was a cross-sectional study. Data were collected over seven months on a rolling basis until a sufficient sample size was achieved. Data were collected using a survey and six different functional assessments.

Adults aged 55 and older were eligible to participate. This threshold reflects the typical low-end of the age-range that captures most BBB class participants based on BBB program data (unpublished). Further eligibility requirements included: participation in BBB (exclusively) or other participation in other community-based fitness classes, and, in both groups, regular attendance for $\geq$ five of the previous six months.

Participants were recruited through community-based organizations located in Oregon's Linn and Benton Counties. Instructors of classes targeting adults and older adults at participating organizations were contacted via email explaining the study and requesting permission to attend a class to give a five-minute informational talk and recruit participants. Upon invitation, research assistants described the study, invited participation and handed out consent forms and surveys to interested students. If a class majority wanted to participate, instructors scheduled a single class session with the study team for the purpose of collecting functional data. All participant questions were addressed and consent and survey forms were also collected at this data collection session. In a few cases, only a handful of participants were interested or eligible. In these instances, a single session on site at the organization was

scheduled and participants from different classes were able to attend, with at least one instructor from the organization also in attendance for consistency of protocol.

Participant Survey

The participant survey consisted of 25 questions about demographics, risk factors for falls, medical history, physical activity behaviors and community-based exercise class participation (Appendix 1).

Functional Assessments

The functional assessment battery was comprised of six physical performance tests measuring factors related to risk for falls (i.e., balance, strength, mobility). Tests were selected based on previous use with this population as well as validity, reliability, safety, and ease of implementation in the community-based setting. The following tests were included: 1) Timed Up and Go (TUG), 2) Five Times Sit to Stand, 3) 30 Second Chair Stand, 4) Tandem Stance, 5) Single-Leg Stance, and 6) 2-Minute Step Test (Table 1). All assessments have been shown to predict fall risk among older adults, with the exception of the 2-minute step test, which provides an understanding of participants' cardiorespiratory fitness using a movement pattern common in daily life, and emphasized in the BBB program (Alexandre, Meira, Rico, & Mizuta, 2012; Cho, Bok, Kim, & Hwang, 2012; Muir, Berg, Chesworth, Klar, & Speechley, 2010; Murphy, Olson, Protas, & Overby, 2003; Reider & Gaul, 2016).

Table 1. Assessment Descriptions and Fall-Risk Cutoff Values

Name of Assessment	Variable Measured	Assessment Description	Unit of Measure	Fall Risk Cutoff
Timed Up and Go	Mobility. Associated with fall risk.	Participant gets up out of a chair, walks 10 feet, turns 180 degrees, and returns to the chair to take a seat as quickly as possible.	Two trials recorded in seconds. Best score recorded.	> 14 seconds[a]
Five Times Sit to Stand	Lower body strength and power. Associated with fall risk.	Participant stands and returns to a seated position five times as quickly as possible.	Two trials recorded in seconds. Best score recorded.	> 15 seconds [b]
30 Second Chair Stand	Lower body endurance. Associated with fall risk.	Participant stands and returns to a seated position as many times as possible in 30 seconds.	One trial recorded in number of repetitions.	Repetitions based on age range: [c] 60-64 - < 12 65-69 - < 11 70-74 - < 10 75-75 - < 10 80-84 - < 09 85-89 - < 08 90-94 - < 04
2-Minute Step Test	Cardiorespiratory endurance.	Midway between hip and knee is measured and marked on the wall. Participant must march with knees as high as the tape mark for two minutes.	One trial recorded. Number of steps taken by the right leg recorded.	No cutoff for fall risk
Tandem Stance	Balance. Associated with fall risk.	Participant stands heal to toe for a maximum of 30 seconds.	One trial recorded in seconds.	< 10 seconds[d]
Single Legged Stance	Balance. Associated with fall risk.	Participant stands on one leg for a maximum of 30 seconds.	One trial recorded in seconds.	< 5 seconds [e]

[a] = (Shumway-Cook, Brauer, & Woollacott, 2000) [b] = (Buatois et al., 2008) [c] = (Centers for Disease Control and Prevention, 2017) [d] = (Rossiter-Fornoff, Wolf, Wolfson, & Buchner, 1995) [e] = (Vellas et al., 1997)

In-Class Data Collection Process

In order to measure all class members within the duration of a typical class period (50 minutes), participants were paired to collect data for one another. The room was set up as a circuit with at least one station per assessment depending on the time needed to complete the task and the number of students in the class. Partner pairs were instructed how to complete each station, how to use their stopwatch, and were given time to practice with the stopwatches. They were allowed to complete stations one by one as they became available. This enables some degree of randomization with respect to the order tests were completed by each pair of participants. Participants were instructed to avoid doing the 30-second chair stand and 5-time sit-to-stand back-to-back to avoid undue fatigue. At the two-minute step test, a researcher was stationed to help determine step height and monitor safety. Early reliability tests showed this task was one that participants struggled to complete with accuracy due to the multi-faceted set of responsibilities (i.e. timing, counting steps, observing consistent step height, and monitoring safety).

Sample Size

Sample size determination was based on a previous study comparing similarly aged Better Bones & Balance® participants (70.1 $\pm$ 7.8 years) to non-exercising controls (68.1 $\pm$ 7.6). This group of participants also performed the 30-second Chair Stand Task and thus these scores were used to determine sample size based on

expected differences. The BBB participant group (N=69) sample mean was 19.9 ± 4.2 repetitions while the comparison group mean was 16.4 ± 7.7 (McNamara et al., 2013). Using these values assuming 80% power and an alpha level of 0.05, the estimated sample size was calculated as 46 (23 per group). Since we had not previously conducted a study comparing BBB participants to active adults, we expected a smaller difference and increased the sample size for recruitment by 25% (29 per group). The sample size of the current study (N=115; BBB: n=92; Non-BBB: n=33) is sufficient to detect differences based on the 30-second Chair Stand data.

Reliability

Measures of inter-rater reliability were obtained for all functional assessments to assure data collected by class participants were consistent and the process was reliable. To collect these data, a third rater (trained research assistant) randomly selected participant pairs and passively observed and recorded participants' scores on each observed task as participants went through the assessments.

Participants did not view the scores recorded by the researcher, and the researcher did not review the scores recorded by participants until all tasks were complete. After each session, researcher-recorded scores were matched with participant-recorded scores. Data were entered into SPSS and intraclass correlation coefficients were derived for each assessment using single-rating, absolute-agreement, 2-way, random-effects models. Data show the estimated reliability between a trained researcher and class participant scores range from 0.944 to 0.995 across all six tests, indicating high reliability. Table 2 presents the reliability statistics.

Table 2 Intraclass Correlation Coefficients for Functional Assessments

Assessment (# Comparisons)	ICC Value	95% Confidence Interval		*df1*	*df2*	Sig.*
		Lower Bound	Upper Bound			
Single-Leg Stand (n=24)	0.995	0.988	0.998	23	23	<0.001
Tandem Stance (n=24)	0.993	0.984	0.997	23	23	<0.001
Five Times Sit-to-Stand (n=46)	0.944	0.901	0.969	45	45	<0.001
30-Second Chair Stand (n=19)	0.993	0.983	0.997	18	18	<0.001
2-Minute Step (n=13)	0.987	0.957	0.996	12	12	<0.001
Timed Up and Go (n=49)	0.958	0.927	0.976	48	48	<0.001

*Intraclass correlation coefficient significant at the 0.05 level

Statistical Analyses

Initial explorations of the data showed deviations from normality across three variables. A pattern of negative skew was evident for scores on both functional balance tests (Tandem Stance and Single-Leg Stance), and a significant positive skew was observed on the Timed Up and Go (TUG) scores. Mathematical transformations of the TUG scores improved normality and yielded similar results to the non-transformed data. Thus, we present the results based on analyses of the non-transformed TUG scores. In the case of the balance tests, transformations did not

improve normality of the distributions, and thus we applied non-parametric procedures to compare distributions on the Tandem Balance and Single-Leg Balance tests. All other continuous variables were normally distributed.

Between-group differences for descriptive variables were evaluated using independent samples t-tests. Two-way contingency analyses were conducted to evaluate whether proportions of responses on categorical descriptive variables differed between BBB and non-BBB participants. Further examination of the balance test scores revealed that most participants in both groups achieved the threshold score of 30-seconds, thereby significantly reducing sample variability. Thus, we categorized participants as having achieved the threshold score (30-seconds) or not and conducted two-way contingency analyses to examine differences in the proportion of participants who achieved the threshold score compared to those who did not between BBB and non-BBB groups. Analyses of covariance were used to evaluate differences between BBB and non-BBB groups on functional outcomes, adjusted for age and past history of physical activity. Bonferroni adjustments were implemented to control for experiment-wise error. Descriptive comparisons and two-way contingency analyses were considered statistically significant at the $p \leq 0.05$ level. Results for functional comparisons were considered significant at the $p \leq 0.008$.

RESULTS

Descriptions of recruited community-based fitness classes are presented in Table 3. All classes employ multi-modal exercise routines. Participant descriptive data are presented in Table 4. Better Bones & Balance® participants were significantly older (71.62 ± 7.79 versus 68.19 ± 8.21, respectively; p=0.036) and a higher proportion of BBB participants reported the presence of chronic conditions, injuries, and/or disease compared to non-BBB participants (62.9% versus 33.3%; p=0.013). The exact nature of these conditions was not consistently reported. Groups were similar with respect to race, ethnicity, history of falls, vision problems, and medication use. Current physical activity behaviors were similar between groups, though non-BBB participants reported significantly more years of historical participation in physical activity compared to BBB participants (29.69 ± 20.72 versus 18.95 ± 18.07, respectively; p= 0.010).

Table 3. Descriptions of Recruited Classes

Name of Community-Based Class	**Exercise Modalities**	**Number of Participants**
Better Bones & Balance®	Aerobic conditioning, balance, strength, mobility, bone loading.	92
Zumba & Zumba Gold	Aerobic conditioning, balance,	5
Yoga	Flexibility, balance, muscular endurance	1
Circuit Training	Muscle strengthening and endurance, balance, flexibility, aerobic conditioning	12
Tai Chi	Balance, strength, flexibility	1
Functional Fitness	Aerobic conditioning, muscular strength and endurance, agility.	3
Bones & Balance	Balance, lower body strength, aerobic conditioning	7
Strength and Tone	Muscle strength, endurance, and power, agility, balance, flexibility and aerobic conditioning	4

Table 4 Participant Descriptive Data

Variable	BBB[a] (N=92)		Non-BBB[b] (N=33)		Sig.*
	Mean	**SD**	**Mean**	**SD**	
Age (years)	71.62	7.79	68.19	8.21	**0.036**
Caucasian race (%)	98.8%	NA	97%	NA	0.451
No falls in the past year (%)	75.9%	NA	65.6%	NA	0.337
One fall in the past year (%)	11.5%	NA	25.0%	NA	0.866
$\geq$ 2 falls in the past year (%)	12.5%	NA	9.4%	NA	0.866
History of disease/chronic condition (%)	62.9%	NA	33.3%	NA	**0.013**
Wear corrective lenses for vision (%)	57.8%	NA	62.5%	NA	0.641
Taking $\geq$ 4 prescription medications (%)	17.8%	NA	18.2%	NA	0.959
Taking anti-psychotic, depressive meds (%)	20%	NA	9.1%	NA	0.154
Physical Activity History (yrs.)	18.95	18.07	29.69	20.72	**0.010**
Active Days past 7 days (days)	4.90	2.02	5.36	2.07	0.266
Aerobic PA past 7 days (avg. lower bound; min)	133.93	53.74	134.64	57.10	0.950
Aerobic PA past 7 days (avg. upper bound; min)	230.66	83.06	242.67	95.38	0.497
Muscle Strength Active past 7 days (days)	2.91	1.24	2.67	1.73	0.462

[a]= Better Bones and Balance Group; [b] = Non-Better Bones and Balance Group;

*Mean differences significant at the 0.05 level

To control for the potential influence of past history of physical activity, and participant age on group comparisons of functional performance, these variables were included as covariates in univariate analyses. History of disease had no effect on any of the models and was removed. Non-normally distributed variables were evaluated using the Mann-Whitney U test and two-way contingency table analyses (Tandem Stance, Single-Leg Stand). Results indicated that groups were similar across all evaluated assessments except the TUG test. BBB participants completed the TUG test more quickly than non-BBB participants (5.58 ± 0.11 seconds versus 6.26 ± 0.2 seconds, $p=0.003$). After applying a Bonferroni adjustment, significance was evaluated at $p \leq 0.01$ level. Between group differences on TUG scores remained significant after the Bonferroni adjustment. Table 5 presents results of adjusted group comparisons. Results of the two-way contingency table analyses showed 92.4% and 97% of BBB and non-BBB, respectively, achieved the 30-second threshold on the tandem stance, Pearson Chi-square = 0.850, $p=0.357$; and 61.4% and 63.3% of BBB and non-BBB participants, respectively, reached the 30-second threshold on the Single-Leg Stance test, Pearson Chi-Square = 0.104, $p=0.747$.

Table 5 Between Group Comparisons of Functional Performance Scores Adjusted for Age and PA History^

Variable	BBB[a] (N=92)		Non-BBB[b] (N=33)		95% Confidence Interval for Difference (a-b)		Sig.*
	Adj. Mean	SE	Adj. Mean	SE	Lower Bound	Upper Bound	(0.008)
*Single Leg Stance (sec)	24.663	0.939	20.072	1.592	0.866	8.316	0.949
*Tandem Stance (sec)	29.002	0.487	28.528	0.832	-1.470	2.417	0.376
5 Times Sit-to-Stand (sec)	7.546	0.254	7.594	0.434	-1.062	0.965	0.511
30 Second Chair Stand (#reps)	18.569	0.563	18.791	0.961	-2.469	2.023	0.844
Timed Up and Go (sec)	5.577	0.114	6.264	0.195	-1.142	-0.232	**0.003**
2-Minute Step Test (#steps)	103.36	1.851	108.799	3.138	-12.785	1.907	0.145

^Covariates are evaluated at the following values: Age = 70.51 years; PA History = 21.8647 years; [a]= Better Bones and Balance Group; [b] = Non-Better Bones and Balance Group; *Mean differences significant at the 0.008 level after Bonferonni adjustments

DISCUSSION-

The objective of this study was to determine whether participants in BBB performed differently on functional performance variables associated with risk for falls compared to participants in other community-based classes. Understanding how participating in different types of community-based fitness classes affects fall risk is essential for helping to promote effective fall prevention strategies to reduce fall risk among older adults.

Our findings suggest that participating in community-based fitness programs may positively influence performance on functional tasks associated with fall risk among older adults. Participants of both BBB and non-BBB groups in this study scored well above the fall-risk cutoffs on each of the functional assessments as shown in Table 1. We did observe that BBB participants completed the TUG task significantly quicker than their non-BBB counterparts (5.6 versus 6.3 seconds respectively, but the mean difference of 0.778 seconds was likely not clinically significant given the cut-point for fall risk is 14 seconds (Shumway-Cook et al., 2000). While both groups both scored well above the fall risk cut off, this data suggests that BBB may be better than other types of community-based fitness classes at improving or maintaining gait speed, a factor which is strongly correlated to fall risk (Viccaro, Perera, & Studenski, 2011).

Of interest in this study was the very high proportion of participants in both groups that achieved the 30-second threshold on the Tandem Stance (92.4% and 97% of BBB and non-BBB, respectively), meaning this is not a discriminative test in this active population of older adults. A secondary outcome of this project was to identify

a robust battery of tests to evaluate function and fall risk over time among BBB program participants. The tandem stance will not be included in this test battery. The Single-leg stance test has greater potential to be discriminative in this population and will be retained in the test battery.

There were descriptive differences to be noted. BBB participants were older, reported more chronic diseases/conditions, and reported less years of physical activity history. This may be due to the marketing strategies of the program. Since BBB is advertised as a research-based program for fall and fracture risk reduction, it is possible that individuals with osteoporosis or other chronic conditions that influence risk for osteoporosis, falls, and fracture would be attracted to the program. It may be an increased risk for falls that have prompted BBB participants to become active later in life. The study therefore suggests BBB may fill a niche that helps this population find a way to be active they enjoy and feel is beneficial to their health.

Previous research on the BBB program showed better performance on the 30-second chair stand, timed up and go, tandem walk, tandem and single legged stance compared to sedentary adults (Gunter & McNamara, 2010), and greater functional performance on the four-square step test compared to those who participated only in a regular walking program (Dinger, 2013). While BBB participants outscored their non-BBB peers in both studies, the degree of difference was smaller compared to walkers versus non-exercisers (Dinger, 2013; Gunter & McNamara, 2010). We found no significant difference between the BBB participants and other community-based fitness class participants on all but one functional assessment in our study. This therefore suggests that participating in multi-modal community-based classes may be

better for reducing risk for falls compared to participating in walking-specific programs.

Our results are consistent with other research on similar populations. A systematic review of randomized control trials found that programs with and without walking training were shown to be effective in fall prevention (Sherrington et al., 2011). However, Sherrington et al (2011) suggests that balance centered exercise programs are more affective when balance training is not sacrificed for walking exercise.

Programs shown to be better at reducing fall risk provide moderate to highly challenging balance training and are taken part in regularly for at least two hours a week (Sherrington et al., 2011). Among post-menopausal women with osteoporosis, balance and coordination exercise was found to be more effective for improving static and dynamic balance in participants (Dizdar, Irdesel, Dizdar, & Topsaç, 2017). All the non-BBB classes had some sort of moderate balance activity as a part of their programs (Table 1). This common denominator might be part of the reason for the high scores on the functional assessments across both BBB and non-BBB groups, and suggests that participation in community-based classes that challenge balance, regardless of the mode, may have similar capacity to positively influence functional fall risk factors. A study examining efficacy of EnhanceFitness and Silver Sneakers programs in relation to fall risk found these structured community-based classes, which include balance and strength training components, may be effective in reducing risk of falling in older populations (Greenwood-Hickman, 2015). Additional improvements in TUG in BBB groups may be due to the specificity of program goals

and exercise protocols designed not only to improve function but load the hip to reduce the rate of bone loss (Snow et al., 2000). The protocol involves chair stands, squats and mobility, all of which are components of the TUG task.

Data support that programs which specifically target a singular mode of fitness among older adults (e.g., balance) generally do the best job at influencing that particular outcome (e.g., balance) compared to other programs focused on a singular but different component of fitness (e.g. aerobic endurance). Takeshima et al. (2007) found that aerobic training was better than resistance, balance, and tai chi training at improving cardiorespiratory fitness, while upper and lower body strength as well as balance and agility were better improved by resistance, balance, and tai chi participation (Takeshima et al., 2007). The balance exercise protocol consisted of two 60-minute sessions per week of customized balance exercises targeting the visual, vestibular, and somatosensory systems done on either hard ground or foam pads (Takeshima et al., 2007). In general, all four interventions tried to adhere to ACSM guidelines (Takeshima et al., 2007). Interestingly, the balance group showed the greatest improvement in lower body strength and similar gains to resistance and tai chi training in terms of balance and agility (Takeshima et al., 2007). This suggests that balance training is more affective at fall risk reduction (as lower body strength is correlated to decreased fall risk) than resistance or tai chi training alone.

Based on the existing literature, and the results of this and previous studies comparing BBB to sedentary and walking groups, it appears that multimodal exercise may be best for fall risk reduction as long as balance and strength training are included. All the non-BBB community classes recruited for this study were multi-

modal in their exercise training design. Functional training, defined as a combination resistance, balance, and flexibility training, has been shown to improve gait speed and dynamic balance, both of which are negatively correlated to fall risk (Sannicandro, 2015).

However, despite the evidence-base, many older adults choose walking programs a their main source of physical activity (Eyler, Brownson, Bacak, & Housemann, 2003). Just about one quarter of surveyed older adults in the United States reported meeting physical activity guidelines by walking five times per week in 30-minute sessions (Eyler et al., 2003). In the UK, 71% of surveyed adults aged 60-64 years reported walking as a leisure time physical activity whereas only 19% reported participation in balance/flexibility exercise during leisure time (Martin et al., 2014). Among adults 65 and older in Australia, only 6% reported participating in balance training and 21.8% in balance-challenging activity (Merom et al., 2012). These statistics are concerning and prompt the implementation of more effective public health initiatives to increase participation in exercise shown to be more effective at fall prevention than simple aerobic training (such as walking).

Even so, walking is likely beneficial for fall risk reduction compared to being inactive (Dinger, 2013). In the United States in 2014, around one quarter of adults between 50 and 64 years reported no physical activity aside from work activities in the previous month (Watson, 2016). The number of sedentary Americans increases with age, reaching 35.3% reporting no additional physical activity outside of work by age 75 (Watson, 2016). Recall that sedentary lifestyle can lead to the development of many of the fall risk factors specified earlier in this report including gait speed,

presence certain chronic diseases, and impaired balance (Lord et al., 1999). Additionally, only 42.4% of adults 65-74 and 28.2% of those 75 and over meet the minimum requirements for aerobic activity and even fewer (4.5% and 5.2%, respectively) met the guidelines for muscle strengthening (U.S. Department of Health and Human Services 2014.) Thus, it is clear we need to do a better job of promoting multi-modal physical activity to this vulnerable age group. As the population continues to age, fall incidence is likely to continue increasing without intervention.

Strengths and Limitations

This study filled a gap in the literature and contributed to the evidence-base related to the BBB program. Specifically, we add comparisons between individuals in the BBB program to those who participate in other community-based fitness classes. Data from this study shows that BBB and other community-based exercise participants exhibit strong performances on functional risk factors for falls, as measured by the six functional assessments.

A significant strength of the study itself is the development of a reliable test battery and easily implemented and replicated testing protocol. Data showed the protocol resulted in high data reliability and implementation of the functional assessment data collection protocol moving forward will enable the BBB program to conduct annual evaluations program-wide. This will allow for collection of longitudinal data that can be used to better understand the effects of the program over time on fall risk factor reduction.

Better Bones & Balance® instructors and class participants were excited about the research, resulting in a large BBB sample population. However, other community-based class participants were more difficult to recruit. The result was a smaller than preferred non-BBB sample. Given that the two populations were more similar than previously groups compared to BBB, a larger sample would have yielded greater power to detect smaller differences.

Another limitation relates to the quality of data on some items in the survey. While the fall risk factor portion of the survey collected chronic condition and disease information from participants, many of the responses were vague about the timeline of their condition led us to question the reliability and usefulness of this data. If we had used a checklist of conditions, that might have enabled us to better control for their potential influence on functional outcomes. However, the in-class data collection protocol limited our ability to spend time following up with individual participants.

CONCLUSIONS-

In summary, participation in community-based fitness classes is associated with strong performances on functional fall risk factors in our sample of adults aged 55 and older. The BBB programs focus on fall prevention exercises may be the reason for significantly better TUG scores in the BBB group. However, both BBB and non-BBB groups scored well above the fall risk cutoffs for all functional tests administered, suggesting that multi-modal and balance-entwined community-based programs are in general beneficial to fall risk reduction.

Though we did not study this ourselves, the existing literature supports a discrepancy between clear evidence regarding the benefits of multimodal and balance centered community-based class participation, and actual participation in these classes (Martin et al., 2014; Merom et al., 2012) Instead older adults tend to gravitate to walking based programs, which, although better than sedentary lifestyle for fall risk, are not as effective at decreasing risk for falls (Eyler et al., 2003; Martin et al., 2014).

Better Bones & Balance®'s marketing to those with chronic diseases or increased fall risk may fill a niche in provoking previously inactive older adults to engage in a multimodal program. However, this study shows that benefits can be seen from a variety of other community-based classes. This gives older adults trying to get active, improve function, and reduce their risk for falls lots of choices to satisfy their personal preferences. Finding a program that is a good fit for an individual person can increase adherence to the program over time (E. Thompson & M. Wankel, 2006).

Future Areas of Research

Cross-sectional data can only tell so much about the effects of the BBB program on fall risk factor presence. Future areas of research should administer these same functional assessments longitudinally to better understand the effect of BBB on fall risk factors over time.

This study was meant to serve as a stepping-stone to a larger longitudinal study across the BBB program participant population. All assessments were chosen based on their ease of implementation in a community-based setting, and interrater reliability data shows potential for the same data collection protocol in future studies. In the near future, the BBB program plans to train their certified instructors in Oregon, Washington, and California to administer the assessments in order to carry out this longitudinal evaluation.

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APPENDIX

Appendix 1. *Survey: Examining Characteristics of Community Education Class Participants and Risk for Falls*

Please write name here: _____

Examining Characteristics of Community Education Class Participants and Risk for Falls

Thank you for your willingness to participate in this research study and fill out this survey. We will use the information you provide on this survey along with information about your performance on five balance, strength and mobility tasks to examine the relationship between participation in community-education fitness and non-fitness classes and risk for falls.

This survey has three parts. **Part I** will help us learn more about your personal physical activity behaviors. **Part II** will help us learn more about how you participate in community-education classes. **Part III** will help us learn more about other factors that may influence your risk for falls (e.g. age, health history, etc.).

Part I Physical Activity Behaviors

1. For how long have you been active, exercised or played sports? *Choose one category (i.e., days, weeks, months, etc.) and fill in the number of days, weeks, months, etc. you have been regularly active (defined as at least once per week on average).*

a. ___☐ days b. ___☐ week/s c. ___☐ month/s d. ___☐ year/s e. ☐ I am not regularly active

2. **Over the past 7 days**, how many how many minutes per day did you do moderate- **or** vigorous intensity physical activity or exercise?

Moderate physical activity or exercise is when you feel your heart rate is increasing from the activity and you are breathing harder than you do during usual non-exercise, or light physical activities.

Vigorous physical activity or exercise is when your heart rate and breathing is increased even more (you may be puffing and panting for example).

Please mark a box for each of the past 7 days.

	1 day ago (Yesterday)	2 days ago	3 days ago	4 days ago	5 days ago	6 days ago	7 days ago
Minutes per Day I did Moderate or Vigorous Physical Activity	☐ 30+	☐ 30+	☐ 30+	☐ 30+	☐ 30+	☐ 30+	☐ 30+
	☐ 20-29	☐ 20-29	☐ 20-29	☐ 20-29	☐ 20-29	☐ 20-29	☐ 20-29
	☐ 10-19	☐ 10-19	☐ 10-19	☐ 10-19	☐ 10-19	☐ 10-19	☐ 10-19
	☐ < 10	☐ < 10	☐ < 10	☐ < 10	☐ < 10	☐ < 10	☐ < 10
	☐ 0	☐ 0	☐ 0	☐ 0	☐ 0	☐ 0	☐ 0

3. **Over the past 7 days**, how many days did you exercise to make your muscles stronger (for example: lifting weights, doing lunges, push-ups, sit-ups, etc.)? **Please mark one box.**

☐ 0 days ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days ☐ 6 days ☐ 7 days

Part II Participation in Community Education Fitness Classes

4. Do you currently participate in Better Bones & Balance?

☐ Yes
☐ No

If you selected yes, please answer the following questions. If you answered no, continue on to the next page.

5. How often do you typically participate in Better Bones & Balance?

☐ Three or more days a week
☐ 1-2 days per week
☐ Once per week
☐ Other (please explain): _____

6. Please tell us your reason for participating in Better Bones & Balance (choose all that apply).

☐ I want to reduce my risk of falls
☐ I want to increase my balance
☐ I want to be more fit/healthy
☐ I want to be a part of my community and/or meet new people
☐ I want to learn something new
☐ Other (please explain): _____

7. How long is a typical class session (in minutes)?

☐ 50-60 minutes
☐ 80-90 minutes

8. How long have you participated in the Better Bones & Balance program?

☐ Less than 6 months
☐ 6 months – 1 year
☐ 1 year to 2 years
☐ 3 years or more

9. Have you noticed any of the following changes since you started participating in the Better Bones & Balance program? (select all that apply).

☐ I feel stronger ☐ I am less afraid of falls ☐ My balance is better
☐ I have not noticed any changes ☐ Other_____

10. Do you participate in any community-based fitness classes that are not Better Bones & Balance?

☐ Yes (Please list how many) _____
☐ No (Skip to question # 15)

If you selected yes, please answer the following questions. If you answered no, continue the next page.

11. Excluding Better Bones & Balance, how many days a week do you participate in community-based fitness classess?

☐ Three or more days a week
☐ 1-2 days per week
☐ Once per week
☐ Other (please explain): _____

12. As a whole, how many minutes per week do you spend in non-Better Bones & Balance community-based fitness classes?

☐ Over 150 minutes
☐ Less than 150 minutes

13. Excluding Better Bones & Balance, how long have you been participating in community-based fitness classes?

☐ Less than 6 months
☐ 6 months – 1 year
☐ 1 year to 2 years
☐ 3 years or more

Part III Factors that Influence Risks for Falls

14. What is your current age? _____

15. What is your biological sex?

a. Female
b. Male
c. I choose not to answer

16. Please tell us how you identify your race.

You may choose more than one or you may choose not to answer.

a. African American or Black
b. American Indian or Alaskan Native
c. Asian American or Asian
d. Native Hawaiian/ Pacific Islander
e. White
f. Other (describe if you like): _____
g. I choose not to answer

17. Is your ethnicity Hispanic, Latina/o or Spanish origin?

a. Yes
b. No
c. I choose not to answer

18. Have you had a fall in the past 12 months?

a. Yes
b. No
c. I don't remember

19. How many falls have you had in the <u>past 12 months</u>?

☐ 1 fall ☐ 2 falls ☐ 3 falls ☐ 4 falls ☐ Not sure, but at least 1 ☐ I have not fallen in the past 12 months

20. Consider each statement about falls and falling and respond by placing a check in the box that best represents your position. *There are no right or wrong answers.*

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. If I fall, chances are I will be hurt in some way.				
2. I am afraid of falling.				
3. If I fall, my life would change greatly.				
4. The thought of falling really frightens me.				
5. I will probably fall if I get dizzy or trip.				
6. One of my worst fears is that I will fall.				

Part III Factors that Influence Risks for Falls continued…

21. Do you have a disease, injury, or chronic condition (e.g heart disease, cancer, arthritis of the hip, etc.)?

- ☐ Yes
- ☐ No
- ☐ I Don't Know

22. **If YES,** please list your disease(s), injury(ies), and condition(s) in the space below:

23. Is it necessary for you to wear eyeglasses or contact lenses to see and move around safely?

a. Yes
b. No

24. Do you take four or more prescription medications? Please **DO NOT include** over-the-counter **supplements** in your count, *even if they are recommended by your doctor.*

a. Yes
b. No

25. Do you take one or more prescription medications for any of the following conditions: anxiety, depression, mood disorders, obsessive-compulsive disorders, panic disorders, ADHD, schizophrenia?

a. Yes
b. No

Thank you for filling out this survey!

5

Appendix 2. *Participant Data Collection Form*

Data Collection Form –Functional Performance Tasks

Community Based Class: _____ **Date:** _____

Participant Name: _____

Station 1: 30 Second Chair Stand

Record # of Repetitions in 30 Seconds: _____

☐ Check box if partner used hands to assist getting in or out of the chair

Station 2: Timed Up and Go

Please record to two decimal points

Trial #1: _____ Seconds

Trial #2: _____ Seconds

☐ Check Box if partner used hands to assist with getting out of the chair

Station 3: Two-Minute Step Test

Record # of Repetitions in 2 Minutes: _____

Station 4: Five Times Sit to Stand

Please record to two decimal points

Trial #1: _____ Seconds

Trial #2: _____ Seconds

☐ Check box if partner used hands to assist with getting in or out of the chair

Station 5: Tandem and Single Legged Stance

Tandem Stance Score in Seconds: _____

Single Leg Stance Score in Seconds: _____

How to Work your Stopwatch:

Although there are two styles of stopwatches, both work the same way.

Buttons Number 1 and 4:

These are the mode buttons. Pressing these buttons switches you between digital clock mode and stopwatch mode. If when you first get your stopwatch it shows the time instead of zeros, press this button once. After that, you will not need to press this button again unless you accidentally hit it. If by accident you press this button and lose the stopwatch function, keep pressing the button until your stopwatch reappears (it may still be counting if you did not stop it).

Button Number 2:

Pressing this button start and stops the time.

Button Number 3:

After you have stopped your timer, this button will clear the time, resetting the stopwatch to zero.

Appendix 3. *Interrater Reliability Data Collection Form*

Inter-reliability Scoring Form – Community Based Exercise Study 2017

30 Second Chair Stand — Used Hands to Assist?

1. Participant Name: _____ Repetitions: _____ ☐
2. Participant Name: _____ Repetitions: _____ ☐
3. Participant Name: _____ Repetitions: _____ ☐
4. Participant Name: _____ Repetitions: _____ ☐

Timed Up and Go — # Of Seconds

	Trial 1	Trial 2	
1. Participant Name: _____	_____	_____	☐
2. Participant Name: _____	_____	_____	☐
3. Participant Name: _____	_____	_____	☐
4. Participant Name: _____	_____	_____	☐

Two- Minute Step Test

1. Participant Name: _____ #Steps: _____
2. Participant Name: _____ #Steps: _____
3. Participant Name: _____ #Steps: _____
4. Participant Name: _____ #Steps: _____

Five Times Sit to Stand

	Score in Seconds: Trial 1	Trial 2	Used Hands to Assist?
1. Participant Name: _____	_____	_____	☐
2. Participant Name: _____	_____	_____	☐
3. Participant Name: _____	_____	_____	☐
4. Participant Name: _____	_____	_____	☐

Tandem Stance

1. Participant Name: _____ Seconds: _____
2. Participant Name: _____ Seconds: _____
3. Participant Name: _____ Seconds: _____
4. Participant Name: _____ Seconds: _____

Single Legged-Stance

1. Participant Name: _____ Seconds: _____
2. Participant Name: _____ Seconds: _____
3. Participant Name: _____ Seconds: _____
4. Participant Name: _____ Seconds: _____

Appendix 4. *IRB Approved Consent Form*

Oregon State University

College of Public Health and Human Sciences
Family and Community Health Extension Service
125 Ballard Hall
Corvallis, Oregon 97331
P 541-737-1737 F 541-737-0999

CONSENT FORM

Human Research Protection Program
Oregon State University
Study # 8116
Current Approval: 03/07/2018
Do not use after: 08/23/2018
Approved

Project Title: Functional Status and Fall Risk Among Older Adult Participants in Community-Based Exercise Programs. Do Better Bones & Balance Participants Outperform their Peers?
Principal Investigator: Dr. Kathy Gunter
Student Researcher: Lauren Trevis
Version Date: March 07, 2018

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1. WHAT IS THE PURPOSE OF THIS FORM?

This form contains information you will need to help you decide whether to participate in this research study or not. Please read the form carefully and ask the study team members questions about anything that is not clear.

2. WHY IS THIS RESEARCH STUDY BEING DONE?

The purpose of this research study is to learn about similarities or differences on measures of fall risk among participants of different community-based education classes. The goal is to better understand what types programs may be helpful to reduce fall risk. Information from this study will also be used by students toward completion of a thesis or dissertation.

3. Study Eligibility

In order to be eligible for this study you must meet the following criteria:

a. You are at least 55 years of age
b. You have been a participant in a fitness class for at least 5 of the last 6 months and attend class at least once a week on average.
c. You are able to fully participate in the community-based fitness class in which you are enrolled.

4. WHY AM I BEING INVITED TO TAKE PART IN THIS STUDY?

You are being asked to take part in this study because you are 55 years of age or older, , and have been participating in that class for at least 5 of the last 6 months for an average of at least one day a week. We will enroll up to 500 participants in this study.

5. WHAT WILL HAPPEN IF I TAKE PART IN THIS RESEARCH STUDY?

If you choose to participate in this study, the information you provide will be used in our research. The study activities include completion of a short survey, and participation in physical function assessments. You will also receive a report of your assessment scores.

Study Assessments

Survey: The survey includes questions asking you to describe your age, race, ethnicity, and biological sex. It includes questions asking you to describe any injuries, chronic conditions or diseases that you have and questions about your current physical activity behavior patterns. The survey also has questions about the community-based classes you participate in. You will be asked to provide information such as your currently enrolled exercise classes, length of participation, why you chose to become involved, and what benefits you have noticed since beginning to participate. There are up to 25 questions on the survey and we estimate it will take 10-20 minutes to complete.

Physical Function Assessments:
Functional assessments will take place either during your community-based class or during an outside scheduled data collection session. Tests were chosen for their relationship to fall risk, ease of implementation and safety.

Class participants will be asked to pair up and complete assessments on one another. Class instructors and research assistants will demonstrate each test, one at a time, and work with each pair of class participants to carry out each assessment before moving on to the next test. We expect the functional tests will take up one full class to measure all participants. The goal is to finish all assessments in one day, but it is possible that it will take two days to measure everyone in the class who would like to participate.

Assessment Name	Description	Purpose
Timed Up and Go	You will be asked to get up out of a chair, walk 8 feet, turn 180 degrees, return to the chair, and sit down as quickly as safely possible.	This assessment measures mobility. Two trials will be taken and the fasted time recorded.
5 Times Sit to Stand	In a chair, you will be asked to stand from and return to seated position as quickly as possible 5 times.	This assessment measures lower body strength. Two trials will be taken and the fastest time recorded.
30 Second Chair Stand	You will be asked to stand from a chair and sit back down again as many times as possible in 30 seconds.	This assessment measures lower body strength. One trial will be run and your score recorded.
2 Minute Step Test	Raising your knee to the midpoint between your kneecap and hip bone, you will be asked to complete as many full steps as possible in two minutes.	This assessment tests endurance. One trial will be run and your score recorded.
Tandem Stance	You will be asked to balance with one foot directly in front of the other for a maximum of 30 seconds.	This assessment tests balance. Two trials will be run and your best score recorded.

Single Leg Stance	You will be asked to balance on one foot for a maximum of 30 seconds.	This assessment tests balance. Two trials will be run and your best score recorded.

Study Duration: This is a cross-sectional study. This means that we will ask you to fill out the survey one time only and complete each of the functional assessments one time only. The surveys can be filled out in class or at home and returned to your instructor. As described, the functional assessments will take place during your regularly scheduled community-based class sessions or during a data collection session scheduled on another day. All participants will receive a report explaining their scores.

Storage of Data: Because it is not possible for us to know what studies may be a part of our future work, we ask that you give permission now for us to use de-identified data that we collect about you as part of this study without being contacted about each future study. Future use of these data will be limited to studies about benefits of physical activity for older adults.

Data stored from this research will be done so in an unidentified manner. If you agree now to future use of your data, but decide in the future that you would like to have your data removed from the research database, please contact Dr. Kathy Gunter at kathy.gunter@oregonstate.edu or 541-737-3624.

We will destroy all identifying information within one-year of collecting your data. Once the identifying information is destroyed, we will not be able to remove your specific information from the larger dataset as we will not be able to identify it as uniquely yours. Please check and initial the appropriate box below.

_____YES you may store my data for use in future studies.
Initials

_____ No you may not store my data for use in future studies.
Initials

Study Results: Your individual scores on the physical assessments will be shared with you at the time of data collection. Results from the study will be provided upon request in the form of a written abstract, report, or published manuscript after the study has been completed.

6. WHAT ARE THE RISKS AND POSSIBLE DISCOMFORTS OF THIS STUDY?

The possible risks and/or discomforts associated with the being in the study include experiencing muscle soreness after participation in our fitness and functional testing. If acquired, soreness usually lasts between 1 to 3 days. As with all exercise, it is also possible for loss of balance, falls, and/or injury to occur. Measures will be taken to prevent falls and injuries, and trained researchers will be present to help when necessary. You will be performing these assessments with a partner also

inattendance at your data collection event. Based on how you feel about your ability to complete these assessments, this may create some embarrassment.

Another potential risk involves the chance we could accidentally disclose information that identifies you. To help prevent this, we will be using identification codes on sensitive information instead of names and will be storing personal information in a locked file cabinet and on a password protected computer. The information will only be available for access by researchers trained in confidentiality who are working on the project.

7. WHAT HAPPENS IF I AM INJURED?

Oregon State University has no program to pay for research-related injuries. If you think that you have been injured as a result of being in this study, you are under no obligation to continue participating. We suggest you see a physician as soon as possible and do not resume regular exercise until after you have been cleared for such activity.

8. WHAT ARE THE BENEFITS OF THIS STUDY?

We do not know if you will benefit from being in this study. However, you will be given your individual results as well as the normative value for your age group for each functional exam. This will allow you to set a baseline for future improvement.

9. WILL I BE PAID FOR BEING IN THIS STUDY?

You will not be paid for being in this research study. However, all participants who complete the surveys and the functional tests will be given a Better Bones & Balance DVD (value of $12) as a thank you for their participation.

10. WHO WILL SEE THE INFORMATION I GIVE?

The information you provide during this research study will be kept confidential to the extent permitted by law. Research records will be stored securely and only trained researchers will have access to the records. Regulatory agencies and Oregon State University employees may access or inspect records pertaining to this research as part of routine oversight or university business. Some of these records could contain information that personally identifies you.

If the results of this project are published your identity will not be made public. Results will be made publically accessible through Oregon State's Scholars Archive. Information presented will include responses to the survey and scores from the functional assessments. The information will not be identifiable to you.

Study findings will be reported back to Linn Benton Community College's Community Education Program. Findings will also be presented as part of an undergraduate Honor's College Thesis and published in a scholarly journal.

11. WHAT OTHER CHOICES DO I HAVE IF I DO NOT TAKE PART IN THIS STUDY?

Participation in this study is voluntary. If you decide to participate, you are free to withdraw at any time without penalty or skip over survey questions that make you uncomfortable. If you choose to withdraw from this project before it ends, the researchers may keep information collected about you and this information may be included in study reports unless you request that it be destroyed.

If you choose not to participate, you will not be treated differently than those who do. You will have the option of taking the day off from class or making up the exercise in a different class time.

12. DOES ANY MEMBER OF THE STUDY TEAM HAVE A CONFLICTING INTEREST?

A conflict of interest occurs when a researcher or the University has a financial or other business interest that could affect the research. In some situations, the results of a study might lead to a financial gain for the investigator(s) and/or the University.

Oregon State University has a conflict of interest because sales of the BBB DVD may be impacted by study results. Proceeds from any sales of the DVD will be used to support Better Bones & Balance research and the Instructor Training Program. If you have any questions or concerns about this, please contact the OSU Institutional Review Board Office at 541-737-8008.

13. WHO DO I CONTACT IF I HAVE QUESTIONS?

If you have any questions about this research project, please contact: Dr. Kathy Gunter at 541-737-3624 or kathy.gunter@oregonstate.edu.

If you have questions about your rights or welfare as a participant, please contact the Oregon State University Human Research Protection Program (HRPP) office, at (541) 737-8008 or by email at IRB@oregonstate.edu

14. WHAT DOES MY SIGNATURE ON THIS CONSENT FORM MEAN?

Your signature indicates that this 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.

Do not sign after the expiration date: 08/23/2018

Participant's Name (printed): _____

_____ _____
(Signature of Participant) (Date)

_____ _____
(Signature of Person Obtaining Consent) (Date)