

Examining Relationships Between Participation in Community-Based Exercise Programs and Fall Risk Factors in Older Adults

Lauren Trevis, Kinesiology
Mentor: Dr. Kathy Gunter, Kinesiology

College of Public Health and Human Sciences, Oregon State University, Corvallis, OR

INTRODUCTION

Fall Prevalence:

- Worldwide, 28-35% of adults > 65 fall annually; this increases for those > 70.
- Falls often result in hospitalization and early mortality.
- Falls account for ~50% of injury-related hospital stays for those over 65.

Project Purpose:

The Better Bones & Balance (BBB) program was developed at OSU to reduce risks for falls and fractures in older adults. **Our aim was to compare BBB program participants' performance on functional tasks associated with fall risk to similarly-aged individuals who participate in other community-based fitness classes.** This was a cross-sectional study.

METHODS

Fall-Risk and Demographic Survey



- 22-question survey assessing physical activity behaviors, participation in community-based fitness classes, and fall risk factors.
- Survey was sent out to current BBB instructors to gain their opinion on wording and formatting.
- Given to participants to fill out prior to functional data collection.

Functional Fall-Risk Assessments

Functional Assessment Test Battery

- Timed Up and Go
- 30-second Chair Stand
- 5 Times Sit-to-Stand
- 2-Minute Step Test
- Tandem Stance
- Single-Leg Stance



Participants perform single leg stance and Timed up and Go

Why These Tests?

- Limit Ceiling affect in active populations
- Safety**
- Feasibility and **ease of implementation** in community-based setting
- Translation into BBB Instructor-Training protocol for longitudinal study across BBB Program
- Relation to **Fall-Risk**

Data Collection Protocol

- Data collection held in the community-based classes
- Participants were **partnered** to complete assessments in **circuit**
- Participants recorded scores for each other after receiving directions from head researcher

Collection of Reliability Data

- Because the participants collected data themselves, we wanted to ensure participant-collected data were reliable.
- Student research-assistants shadowed and scored participant-pairs
- Researcher scores were later compared to participant recorded scores.



Researcher providing instructions to participant

ANALYSES and RESULTS

Data Analyses

- T-tests were used to examine between-group descriptive differences (Table 1).
- Two-way contingency analyses were conducted to evaluate whether proportions of responses on categorical variables were different between groups (Table 1).
- Normality tests identified deviation from normality in Tandem and Single Stance, and Timed Up and Go (TUG) scores.
- Mann-Whitney U tests were used to analyze group differences in balance scores (Table 2).
- Analyses of covariance were used to analyze group differences on functional outcomes adjusted for age and past history of PA (Table 2).
- Analyses of mathematically transformed TUG scores did not differ from results of non-transformed data. Thus non-transformed analyses are presented in Table 2.

Descriptive Data

Table 1 Between Group Comparisons of Descriptive Data

Measured Variable (units)	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
≥ 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
≥ 4 Rx medications (%)	17.8%	NA	18.2%	NA	0.959
Taking anti-psychotic/-depressive meds (%)	20%	NA	9.1%	NA	0.154
Physical Activity Behaviors					
PA History (yrs.)	18.95	18.07	26.69	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 PA 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

BBB Participants Compared to Non-BBB Participants:

- Were **older**
- Reported **more chronic conditions and diseases**
- Had **less physical activity history**
- Had no significant differences in other descriptive data pertaining to fall risk.



Functional Data

Table 2 Between Group Comparisons of Functional Performance Scores

Measured Variable (units)	BBB ^a n=92		Non-BBB ^b n=33		95% Confidence		Sig [*] 0.008
	Adj. Mean	SD	Adj. Mean	SD	Lower Bound	Upper Bound	
^^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

^aCovariates 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 0.05 level; ^^Mann-Whitney U test, significant at 0.05

Functional Outcomes

- BBB group scored significantly better than non-BBB group on TUG.**
- No significant differences in any other variables.
- Ceiling effect on Tandem Stance.

Inter-rater Reliability

- Data collected by researchers and participants were highly correlated and found to be **very reliable** ($p < 0.001$)
- Thus we have confidence in translating this protocol in practice across BBB programming.

Table 3 Intraclass Correlation Coefficients for Functional Tests

Measured Variable (# comparisons)	ICC Value	95% Confidence		df1	df2	Sig [*] 0.05
		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*
5 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 Test (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 0.05 level

DISCUSSION

Differences in Descriptive Data

- Differences in descriptive variables such as chronic conditions and diseases may suggest that BBB attracts a specific population of older adults at higher risk for falls and fracture than participants in other types of community-based fitness classes.
- This difference may in part be due to the way BBB is marketed as a research based programs for fall and bone loss prevention.
- In addition, it may be this risk that has prompted BBB participants to become active, thus the difference in the lifetime physical activity between groups.
- BBB may be more likely to get previously non-active adults up and moving.**

Significant Difference in TUG scores

- Study results show that **BBB may be better at promoting strength and mobility as evidenced by higher TUG scores among BBB participants** compared other types of community-based fitness class participants.
- Fast gait speed has many other positive correlations with health aging including decreased mortality.
- Despite the differences, **both BBB and non-BBB groups scored significantly below the fall risk cutoff** score of 13.5 seconds.

Ceiling Affect on Tandem Stance

- 87.5% of BBB and 72.6% on Non-BBB participants achieved the 30-second maximum.
- A resulting ceiling affect was created, skewing the data.
- The tandem stance is **not a discriminating test in this active population and will be omitted when we translate this test battery into practice.**



Tandem Stance Task

Strengths

- Fills a gap** in program understanding about how BBB participants compare to non-BBB peers
- Adds to body of evidence showing BBB and other community-based participants out score age-matched peers on TUG and 30-second chair stand.**
- BBB sample was large, and **inter-rater reliability was very high supporting feasibility of translation** to practice. This will enable program-wide longitudinal data collection on BBB participants.

Weaknesses

- Challenges recruiting non-BBB participants resulting in **unequal sample sizes.**
- Chronic disease data was analyzed as a single variable** (# of conditions), but the type and degree of disability was not assessed, not was it clear how or if reported conditions influenced functional performance.



CONCLUSIONS

- Participants in community-based fitness classes show high performance on functional tasks, regardless the class type.
- BBB participants may be drawn to exercise later in life due to an increased risk for osteoporosis.
- BBB may promote mobility and strength and thus better performances on the Timed Up and Go compared to other community-based fitness classes.
- Future Areas of Study:** Annual implementation of test battery in BBB classes to track performance of program participants.