

# Effects of a Single Session Reactive Step Training Intervention in the Geriatric Population

Mowder-Tinney JJ., Bonino S., Fay J., Bennett L., Charles G., DeBarr A., Gallina C., Garbeck J., Longo L., Papponetti S., Rose C., Tretowicz A.

## Introduction

On average, 33% of people older than 65 experience a fall each year and many are recurrent. Conventional physical therapy interventions have been proven to require at least 50 hours of training to decrease fall risk. Recent studies indicate a single session of repeated slip training, involving 24 slips or trips, cuts annual fall risk for older adults by 50%. However, the majority of studies lack translation into the clinical setting. The purpose of this study is to determine the efficacy of a one session step training program performed in a clinical setting on improving walking ability and decreasing risk and fear of falls in older adults.

## Subjects

Fourteen healthy older adults over the age of sixty-five participated in this study. See Figure 1 for participant demographics. Participants were excluded if they had an orthopedic condition, neurological diagnosis, recent hospitalization or injury, severe vertigo, etc. that affected their ability to walk.

Figure 1: Demographics Chart

	Single Task Group	Dual Task Group
Average Age of Participants (Years)	76.5 (SD=10.1)	78.0 (SD=3.01)
Gender (Female: Male)	6:0	6:2
Height (Feet)	4'10"-6'6"	5'-6'2"
Average Weight (lbs)	161.7 (SD=50.2)	173.8 (SD=36.0)
Average Pre-test Gait Speed (m/s)	0.99 (SD=0.20)	1.02 (SD=0.23)

## Materials/Methods

A convenience sample was screened using a health status questionnaire. Outcome measures included the Activities-Specific Balance Confidence Scale (ABC Scale), Four Square Step Test (FSST), reactive stepping portion of MiniBest, 10 Meter Walk Test (10MWT), and speed adjustment setting of a virtual reality treadmill. Single session of reactive step training was performed two weeks following pretesting. See Figure 2 for study timeline. The subjects completed the process detailed in the feasibility study. See Figure 3 for intervention set up. Seven subjects performed only slips/trips and 6 subjects experienced an additional auditory cue as a dual task. The Wilcoxon Signed Ranks and Mann-Whitney U nonparametric tests were used to analyze data, due to the small sample size.

Figure 2: Study Timeline

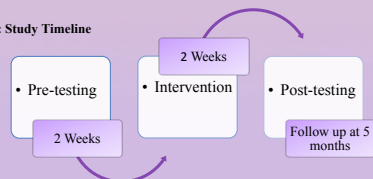


Figure 3: Intervention Setup



Figure 4: Reactive Balance Assessment:

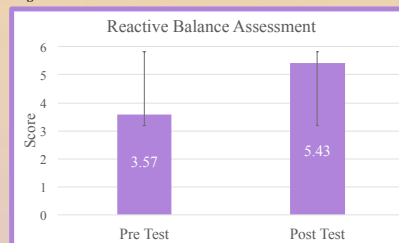


Figure 5: Speed Adjustment

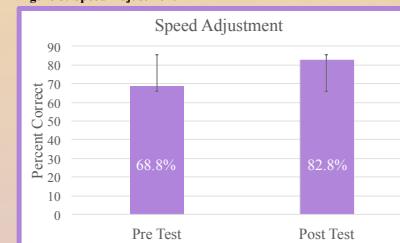
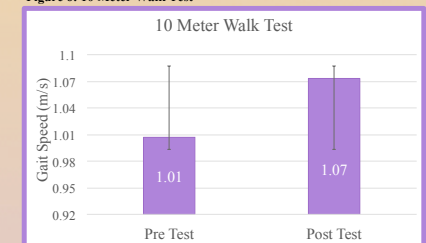


Figure 6: 10 Meter Walk Test



## Results

Fourteen healthy individuals (12 female; 2 male) greater than 65 years of age (Mean=77.36 SD=6.70) who met inclusion criteria were selected. There was no significant difference between the single and dual task groups for all post-test outcome measures. When data sets were combined, significant differences were found for pre/post comparisons in the 10MWT ( $p=.046$ ), FSST ( $p=.005$ ), reactive balance assessment ( $p=.010$ ), and speed adjustment ( $p=.002$ ). See Figures 4-7 for participants' average pre and post testing scores. No significant changes were detected in the ABC Scale over time as shown in Figure 8. Standardized effect sizes were either large or moderately large.

Figure 7: Four Square Step Test

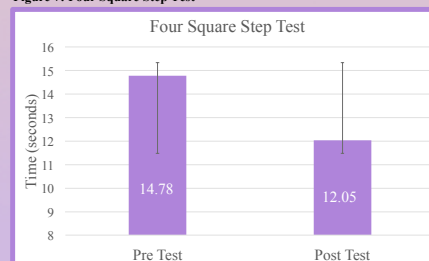
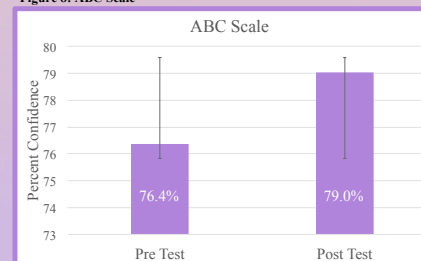


Figure 8: ABC Scale



## Conclusions

Overall, participants demonstrated statistically significant improvements in gait and balance measures, indicating a decrease in fall risk. Previous studies show that a single session of repeated slip training or perturbation training decreases fall risk for older adults using self-report data collected in a laboratory setting. Our study demonstrates functional improvements in a clinic setting. Although ABC scale scores did not improve, future studies may consider the impact of the number of sessions on this measure. In conclusion, this study indicates that a single session step training program significantly improves walking ability and decreases fall risk in older adults. Further research should consider diagnosis specific response to single session reactive step training for improved clinical application. The major limitation of this study was the small, homogeneous sample of convenience.

## Clinical Relevance

Clinicians can implement a single session of reactive step training in their clinical setting to improve functional outcome measures and decrease fall risk.

## References

1. Parijat P, et al. *Ann Biomed Eng.* May 2012;40(5):1111-1121.
2. Pai YC, et al. *J Gerontol A Biol Sci Med Sci.* December 2014;69(12):1586-1594.
3. McCrum C, et al. *European Review of Aging and Physical Activity.* 2017;14:3.
4. Papadimitriou A, et al. *New Zealand Journal of Physiotherapy.* 2017;45(1):31-49.
5. Yang F, et al. *J Biomech.* January 2013;46(1):63-69.

## Acknowledgements

Acknowledgements to Chris Greene, Adam Krahmer and Agape Physical Therapy for the use of their treadmill during data collection.