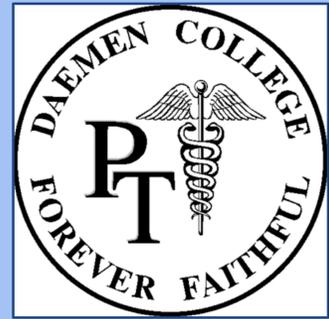


# The Effect of Country Line Dancing on Reducing Fall Risk in Community Dwelling Older Adults

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## PURPOSE

To determine if a 16-week country line dancing program is effective in improving balance and reducing fall risk in community dwelling older adults.

## BACKGROUND

Falls among individuals 65 years and older are one of the leading causes of disability in the United States.<sup>1</sup> By 2030, the number of falls among older adults treated in emergency departments is expected to reach 5.7 million annually.<sup>1</sup> In New York, older individuals comprise over 15% of the population.<sup>2</sup> This population is at a higher risk of sustaining a fall over any other age group. Impairments associated with falls include decreased leg strength, decreased gait speed, and increased postural sway. An increasing number of older individuals are now attempting to stay physically active and maintain a healthy lifestyle to improve their quality of life. Current evidence supports physical activity in the aging population due to its positive effects, such as decreased fall risk.<sup>1</sup> The Center for Disease Control and Prevention's Injury Center have identified evidence-based interventions to prevent falls among older adults as a "growth area" indicating the necessity to explore new interventions to treat this growing problem.<sup>1</sup> Country line dancing is a new form of group exercise for older individuals; however, evidence regarding its effectiveness is lacking. This project seeks to review the literature regarding the effectiveness of country line dancing to improve balance and reduce fall risk.

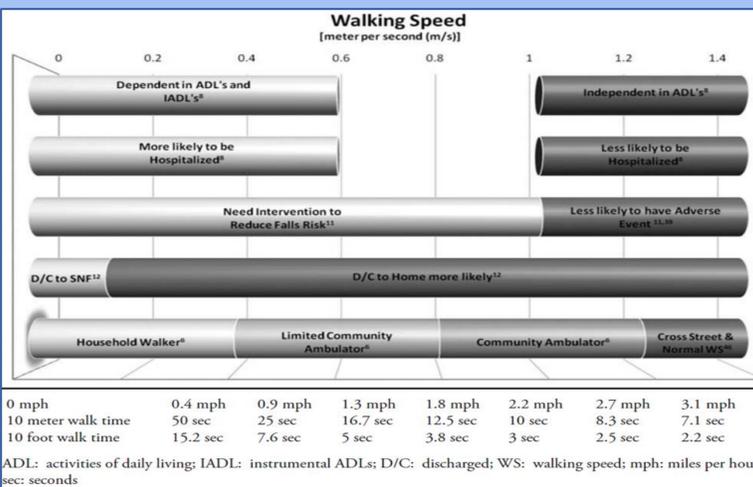


Figure 1: Walking speed is related to level of independence, rate of hospitalization, rehabilitation needs, discharge locations, and ambulation classification.<sup>7</sup>

## ANALYSIS

The Balance Tracking System (BTrackS), gait velocity assessment, and the modified 30-second sit to stand test are reliable tools to measure impairments that are predictive of fall risk.<sup>3,4,8</sup> These clinical assessments are quick, easy, and reliable methods that can be used to identify and monitor changes in impairments in older adults. Evidence supports the ability of these tools to identify changes that may warrant intervention in older adults over similar tests such as force plate measurements, the Performance Oriented Mobility Assessment, and the Timed Up and Go test, respectively. Dance is a new form of group exercise aimed at reducing fall risk in older adults. Krampe<sup>5</sup> implemented a dance therapy program in older adults aged 65 and older and assessed reaching distance, gait velocity, step length differential, and functional ambulation. The dance-therapy group demonstrated non-statistically significant improvements in several components of balance and mobility. Similarly, Bennett and Hackney<sup>6</sup> assessed the effects of an 8-week line dancing program on balance, muscle strength, lower extremity function, and gait speed. The line dancing group demonstrated significantly improved knee extensor strength and gait speed.

## LITERATURE REVIEW

Authors and Purpose	Subjects	Methods	Results
Levy SS, Thralls KJ, Kviatkovsky SA <sup>3</sup>  To examine the concurrent validity and 3-day test-retest reliability of Balance Tracking System (BTrackS) in community-dwelling older adults	49 community-dwelling adults with a mean age of 71.3 years  47 community-dwelling volunteers with a mean age of 75.8 participated in the 3-day test-retest reliability portion of the study  Inclusion criteria for both parts: - Being ambulatory - No hip, back and lower limb injuries in the past 6 months - Able to stand unassisted for 3 minutes	Force plate and BTrackS collected postural sway data from community-dwelling older adults (eyes open (EO) and eyes closed (EC)).  - Participants stood with hands on hips, shoulder width apart for 20 seconds each trial - 6 total trials, 3 with EO, 3 with EC - Participants were allowed to rest at any time during testing - Postural sway collected in M-L and A-P directions  3-day test-retest reliability of BTrackS data recorded the same way as in the concurrent validity portion in the second pool of community-dwelling adults.	BTrackS can be a useful objective measure in identifying and monitoring changes in balance that may require further attention over time.  BTrackS demonstrated excellent test-retest reliability that may allow clinicians to identify meaningful changes in balance that may warrant intervention.  Validity evidence for BTrackS was mixed with some bias potentially attributed to differences in COP calculation when compared to the Wii Balance Board (WBB) and Floor Plate (FP), which are both gold standard tools for measuring postural sway.  Repeated-measures analysis of variance revealed significant differences between the BTrackS and FP measures in the EO (P < .001) and EC (P < .001) conditions. BTrackS values were higher than FP in both cases.
Montero-Odasso M, Schapira M, Soriano ER, et al <sup>4</sup>  To assess if gait velocity could be sufficient to predict adverse events such as hospitalization for any cause, requirement for a caregiver, nursing home placement, falls, fractures, or death in healthy elderly persons	102 subjects aged 75 and older  Exclusion criteria: - Cognitive impairment - Depression - Unstable chronic lung disease - Life expectancy of less than 12 months - Terminal illness - Gait disorders related to neurological cause such as Parkinson's disease or previous stroke - Use of cane or walking device - Inability to attend appointments	Subjects performed 3 assessments: - Timed Up and Go (TUG) - Performance Oriented Mobility Assessment - Gait velocity (GV)  Subjects were placed into 3 groups: - Low GV (<0.7 m/s) - Median GV (0.7-1 m/s) - High GV (>1.1 m/s)  After a 2-year period, subjects were questioned regarding the following: requirement of a caregiver, hospitalization, new falls, new fractures, and mortality.	The research indicates that a slow GV alone is enough to predict risk for further adverse events.  Subjects in the low GV group at baseline demonstrated a higher incidence rate of total adverse events, hospitalizations, new falls, and requirement for a caregiver.  Participants with low GV were 2.5x more likely to have at least one adverse event compared with the other groups (P < .002).
Krampe J <sup>5</sup>  To examine the effects of dance-therapy on balance and mobility in older adults	24 subjects aged 65 years and older  Inclusion criteria: - Recruited from a single aging-in-place facility - A score of 23 or above on the Mini Mental Status Examination - Ability to stand up, with or without assistance, for short periods of times	24 subjects were randomly assigned into the treatment group or the control group.  Treatment group: 13 subjects - 6 weeks of 3 sessions per week for a total of 18 sessions - Sessions were 45 minutes in length consisting of 10 minute warm up, 30 minutes of dance, and 5 minutes of cool down  The subjects were assessed on: - Reaching distance - Gait velocity - Step length differential - Functional ambulation profile	The treatment group failed to demonstrate statistically significant scores on all assessments.  However, the treatment group demonstrated effects on several components of balance and mobility (p<0.002).
Bennett CG, Hackney ME <sup>6</sup>  To assess the effect of 8 weeks of line dancing on balance, muscle strength, lower extremity function, endurance, gait speed, and perceived mobility limitations	23 subjects aged 65 and older - 20 females, 3 males  Inclusion criteria: - Exercising fewer than 90 minutes a week - Self-reported difficulty walking ¼ mile or climbing a flight of stairs - Ability to follow and understand directions Exclusion criteria: - Use of an ambulatory assistive device - Neurological conditions such as Parkinson's disease or stroke - Use of portable oxygen - Internal cardiac defibrillator - Myocardial infarction within the previous 6 months	10 subjects participated in 8 weeks of line dancing and 10 subjects performed usual care activities for 8 weeks.  The dance group participated in a 1 hour twice a week dance session for 8 weeks.  The usual care group performed typical daily activities and were not allowed to engage in any new physical exercise.  Subjects were assessed on: - Berg Balance Scale - Knee extensor and flexor muscle strength using a force dynamometer - Short Physical Performance Battery (SPPB) - Gait speed - Endurance - Perceived mobility limitations	The line dancing group demonstrated significantly different knee extensor strength, SPPB scores, endurance, and gait speed.  Results found significant positive differences for the intervention group in lower extremity function (P < .01); endurance (P < .01); gait speed (P < .001); and self-reported mobility limitations (P < .05).  Mean gait speed in the dance group improved to 1.0 m/s.  Mean gait speed in the usual care group was 0.72 m/s.

## LIMITATIONS

Current best evidence that investigates dance-therapy to reduce fall risk in older adults has a number of limitations.<sup>5,6</sup> First, these studies fail to use the most reliable and valid tools to measure impairments that can identify and monitor fall risk in older adults. Research suggests that the BTrackS, gait velocity assessment, and 30-second sit to stand test are quick, easy, and reliable methods of measurement.<sup>3,4,8</sup> Additionally, the present studies are limited by the use of small sample sizes that effect the generalizability of the findings to the entire population of older adults with mobility impairments. Likewise, the present studies have few male participants, which further limits the generalizability of these findings to the entire population of older adults. Current best evidence also fails to recommend the most appropriate dosage of intervention, including frequency and intensity.

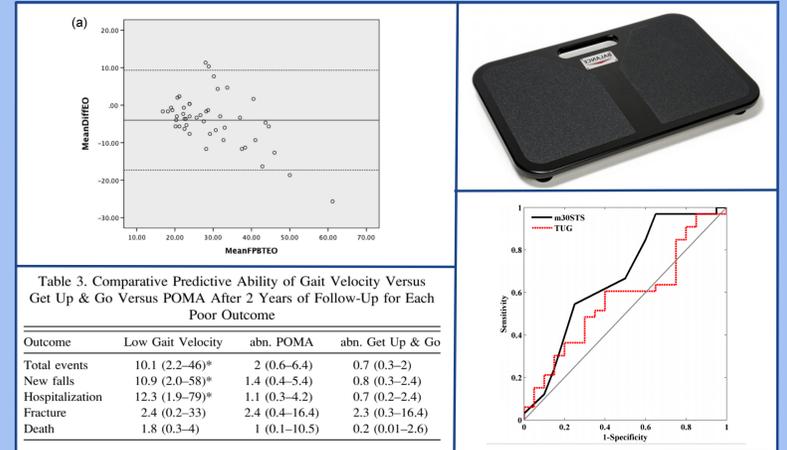


Figure 2: Top left: Bland-Altman plot for the eyes open condition. BTrackS values were higher than force plate values under both the eyes open and eyes closed conditions.<sup>3</sup> Top right: Image of BTrackS.<sup>3</sup> Bottom left: Impairment in GV is predictive of adverse events. Fifty percent of participants with low GV had a normal performance in the POMA, and almost 40% had a normal Get Up & Go test.<sup>4</sup> Bottom right: Receiver Operating Curves for the modified 30-second sit to stand and Timed Up and Go Test. The area under the curve was 0.67, which was statistically significant indicating it was more effective at predicting a fall than a random predictor. The area under the curve for the Timed Up and Go Test was 0.57, which was not statistically significant.<sup>5</sup>

## CONCLUSIONS

Falls among individuals age 65 and older can result in significant disability and long-term sequelae leading to a serious loss of function and independence.<sup>9</sup> Current best evidence has identified a number of possible fall risk factors and intervention programs. Falls among individuals in this population place stress on our healthcare system. Implementing a single intervention could prevent between 9,563 and 45,164 medically treated falls and avert \$92-442 million in direct medical costs.<sup>9</sup> Current interventions to address fall risk in these individuals include strength training, aerobic exercise, yoga, tai-chi, and other forms of dance exercise, such as zumba and salsa.<sup>9</sup> Country line dancing is a new form of group exercise for older individuals; however, evidence regarding its effectiveness in this population is lacking. This research project seeks to contribute to the evidence on current intervention programs and aim to establish a new method in reducing fall risk in older adults.

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