**Nick Camilleri**

**Evidence Based Practice Final Paper**

**November 3, 2012**

**PICO Question: In older adult populations aged 65+ with decreased gait speed, does a task-oriented gait training program increase gait speed more than a general strength and balance exercise training program?**

Difficulty walking is an extremely common physical therapy diagnosis in older adults and can have a severe impact on independence, participation levels, and quality of life in the geriatric population[[1]](#endnote-1),[[2]](#endnote-2). Moreover, older adults with difficulty walking are at a higher risk of falls and subsequent injuries2,[[3]](#endnote-3). Falls risk is an very important measure among elderly people due the very serious consequences that a fall can have on those in this population[[4]](#endnote-4). Not only are falls one of the most serious and frequent problems facing the elderly, but they have also been associated with mortality, morbidity, reduced function and participation, and premature nursing home admissions4. Additionally, older adults are at a higher risk of obtaining a serious injury from a fall due to some of the natural changes that occur in the human body with aging as well as a higher incidence of accompanying diseases4,[[5]](#endnote-5). An example of this is the increased number of fractures suffered as a result of falls in the elderly, due to the decreased bone mineral density and associated osteoporosis that is concurrent with the aging process.

The seriousness of a fall in this population indicates the necessity to be able to predict fall risk and to have indicators and specific areas to focus on. Gait speed has long been accepted as a good indicator of falls risk[[6]](#endnote-6). In fact, a pooled analysis performed by Studenski et al of 9 separate cohort studies not only proved a significant link between lower gait speeds and higher risk of falling, but also proved that faster gait speeds in older adults are associated with higher survival rates[[7]](#endnote-7).

Both difficulty walking and increased falls risk in older adults have been strongly associated with lower extremity muscle weakness, poor balance, and deconditioning1,2. As such, traditional therapeutic interventions used to combat these deficiencies have focused on improving lower extremity strength, increasing endurance and activity tolerance, and improving balance1. This formula has been shown mixed but modest results1 and as a result, other intervention strategies have been attempted. Slow and laborious gait patterns have been shown to have a greater energy cost and be less efficient than regular gait patterns that have good timing and coordination1,[[8]](#endnote-8). As such, it has been proposed that this also contributes to the increased falls risk and that focusing on improving timing and coordination of gait can help to increase gait speed and thereby decrease falls risk in older adults1. This review contrasts two different approaches to improving gait speed and decreasing falls risk in older adults by answering the following question: In older adult populations aged 65+ with decreased gait speed, does a task-oriented gait training program increase gait speed more than a general strength and balance exercise training program?

A traditional strengthening, stretching, and balance training program has long been utilized by therapists to help combat falls risk and improve gait steadiness and speed. A number of different studies have considered the effectiveness of this type of program in different settings and over different periods of time. Topp et al and Brown et al have produced two such studies in the older adult population[[9]](#endnote-9),[[10]](#endnote-10). Topp et al looked at the effect of a 12-week dynamic resistance strength program on gait velocity and balance in 55 older adults aged 65-85years old9. In this randomized controlled trial, the authors measured gait speed as well as dynamic and static balance before and after a 12-week protocol. The subjects were split into two groups; the intervention group (n=30) participated 3 times per week in a strengthening program that included 6 upper body exercises and 6 lower body exercises. Progressive resistance bands were used as the primary form of resistance and the exercises focused on strengthening all major muscle groups. The control group (n=25) did not perform any form of exercises during this time frame, however, they did attend two 3-hour driving courses in order to help maintain contact control. The results of this study revealed a slight increase in static and dynamic balance in the intervention group however, these improvements were not deemed to be significant as they very closely matched a similar pattern of improvement demonstrated by the control group9. Additionally, the results verified that the strengthening program had no signifiant effect on gait speed, as the intervention group had an average gait speed of 1.19ms-1 slower than their baseline speeds. This study was limited by a small sample size and a vague and general protocol. A more detailed and individualized program that focused on specific areas of weakness of each patient may have produced more useful data.

A similar study by Brown et al included all aspects of a traditional exercise program to improve gait speed and balance in older adults and analyzed the effectiveness of such a program on a number of important performance measures including gait speed10. A sample of 75 older-adults aged between 60-71yo were involved in the randomized controlled trial, of which 62 participated in the intervention program, while 13 participants were randomized to a control group. This intervention group participated in a program that consisted of lower extremity strengthening using resistive bands and ankle weights, core strengthening exercises, stretching of all major muscle groups of the lower extremity and standing balance exercises that required the participant to reposition his/her center of mass over the base of support under a variety of challenging conditions. The control group did not participate in any exercises over the 3 month time period. While it was found that this traditional program had many positive effects on lower extremity strength, static balance andrange of motion, there were no significant improvements in gait speed10. This study could have been improved by adding a long-term follow up to see if there was a lasting effect to the measures that did improve, and by adding a different treatment approach for comparison.

These two studies show that while there appear to be a number of benefits to a traditional strengthening and balance training program in older adults with difficulty walking, there does not appear to be a positive effect on gait speed. Since the importance of this marker for predicting longevity in older adults is well established7, exploring other options for addition to this type of program is essential in order to establish a protocol that has the best possible outcome for patients in this demographic. One strategy from improving general performance and independence in older adults that has been well researched is the idea of task-specific training[[11]](#endnote-11). A study by Manini et al explores this idea by comparing the effect a traditional strengthening program with a task-specific training program on impairment and functional measures in older adults who have difficulty with every day tasks11. This randomized trial separated the 31 participants into three groups: a resistance training group (RT), a functional training group (FT) and a combination group (CT) that received both resistance and task-specific training. All fo the participants were over 65years old, and measurements of gait speed, SF-36, single leg balance, a laundry basket lift and carry test, and a vacuuming test were taken before and after the 10 week protocol. Each of the groups participated in two 45min sessions per week. The RT group spent this time performing weighted exercises for upper and lower extremity strength, as well as core strength training. Members of the FT group were coached by physical therapists in performing tasks such as rising from a chair, climbing stairs, gait training, and carrying a laundry basket while walking. The CT group performed one day per week of training with the resistance group, and the other session for the week training with the functional group. The performance of each group differed greatly on the range of outcome measures. As expected, the RT group improved significantly on strength measures, while the FT group did not. All three groups had a decreased need to modify activities of daily living (RT: 21%, FRT: 26%, and FT: 28%) while the FT group and CT group improved their time required to perform functional activities significantly compared to the RT group. For the measure we are most interested in, gait speed, the FT group and the combination group both improved significantly while the RT group showed no change11. Although the authors failed to prove a significant improvement in gait speed, this was likely associated with the small sample size, which limited the power of this study. However, the positive impact of task-specific training is evident in this study and the major finding is that older adults adapt their skills according to their specific training regimen. Theoretically, if we apply this technique to taking a task-specific approach to improving gait quality and speed, we should see greater improvements in that area than with a generalized program.

Matsuda et al test this theory in their cohort study that looks at the effect of an exercise program that includes specific task-oriented gait trainging on the physical functioning and gait speed of frail older adults[[12]](#endnote-12). 72 older adults between the ages of 63 and 80yo (76% women) participated in the study that lasted 6-weeks. The program included progressive strength training, balance exercises, core strengthening, stretching, and unlike other studies we have discussed, it also included specific gait training that was individualized to the patient’s specific needs and focused on timing and coordination of gait12. Subjects participated in 1 hour of these activities, 4 times per week for the duration of the 6-week study. Every session was conducted and supervised by graduate physical therapy students who tailored the sessions to the needs of the individual subject, however, every session had to include some aspect of gait training. Unlike similar studies that did not include this task-oriented component, the results showed remarkable improvement in numerous functional measures including gait speed12. The participants improved their Timed Up and Go time by an average of 5.7seconds (57%), chair stand repetitions in 30 seconds improved by 2.4 (59%) and gait speed improved by 0.17m/s (33%). All of these improvements were deemed significant (p<.05). Moreover, self-efficacy of exercise-related beliefs also increased significantly11. While the main limitation of this study was the absence of a long-term follow up, the results do indicate that a program that includes a task-specific component to gait training can definitely improve gait speed and thus reduce falls risk.

With the potential benefits and limitations of both a traditional and task-specific approach to improving gait speed in older adults well established, it is critical to see a direct comparison of the two strategies and their effectiveness in this population. VanSwearing et al investigate whether an impairment-oriented (IO) intervention or a task-oriented (TO) approach would have a greater effect on gait speed and energy cost of walking in older adults with mobility limitations1. The IO approach refers to using a traditional method of strengthening, balance training, and endurance training, while TO approach focused on gait training with an emphasis on timing and control througout the gait cycle. 47 older adults participants (average age 77.2 ± 5.5, 65% female) were randomized into either the TO group or the IO group. All subjects completed their intervention twice per week for 12 weeks in sessions of 60 minutes. The TO protocol consisted of completing different stepping and walking patterns that got progressively more difficult as the subject improved. Additionally, treadmill paced walking was also completed in which the subjects spent 2-3mins walking at their usual pace, before the pace was increased by 10% for 30-60seconds. These intervals were then repeated 3 times. The IO protocol consisted of stretching, lower extremity strengthening using cuff weights and resistance bands, walking, standing balance training, and endurance training on a Nustep machine. At the conclusion of the study, it was found that while gait speed had increased in both groups, it had improved significantly more in the TO group (0.21m/s). the TC group also had a reduced energy cost of walking, 0.10 ± 0.03 mL/kg/m better than the IO group. This study was also limited by a lack of a long-term follow up as well as a limited number of outcome measures, however, it successfully showed that a task-oriented gait training program may in fact increase gait speed more than a general strength and balance exercise training program.

The current research supports the use of task-oriented gait training in older adults to improve gait speed1,11,12. While the importance of gait speed in predicting falls, secondary injury, and morbidity should not be underestimated, it is important to remember that it is not the only important factor to consider when designing a program for older adults with difficulty walk and decreased functional mobility. Many of the studies did not show evidence that strengthening and balance training alone improved gait speed, however, a number of positive improvements were seen in other areas including lower extremity strength, static and dynamic balance and activity tolerance7,8,8,10. All of these factors are important in maximizing the longevity and quality of life in older adults and as such should be considered when designing an individualized program. The inclusion of both traditional strength and balance training as well as individualized task-oriented gait training appears to be a combination that could potentially maximize functional improvements in elderly patients. Further research is needed to investigate the effectiveness of such a program and the sustainability of effects over a long-term period. This poses a good foundation for a capstone project to further investigate the literature and to prepare an evidence-based protocol for improving gait speed in older adults with difficulty walking.

1. References:

   VanSwearingen JM, Perera S, Brach JS, et al. A randomized trial of two forms of therapeutic activity to improve walking: effect on the energy cost of walking. Journal of Gerontol A Biol Sci Med Sci. 2009;64:1190–1198. [↑](#endnote-ref-1)
2. Brach JS , Studenski S , Perera S , VanSwearingen JM , Newman AB. Gait variability and the risk of incident mobility disability . J Gerontol A Biol Sci Med Sci . 2007 ; 62A: 983 – 988 . [↑](#endnote-ref-2)
3. Hausdorff JM , Rios DA , Edelberg HK . Gait variability and fall risk in community-living older adults: a 1-year prospective study. Arch Phys Med Rehabil . 2001; 82(8): 1050 – 1056. [↑](#endnote-ref-3)
4. Dionyssiotis, Y. Analyzing the problem of falls among older people. Int J Gen Med. 2012; 5: 805–813. [↑](#endnote-ref-4)
5. Nevitt MC, Cummings SR, Kidd S, Black D. Risk factors for recurrent non-syncopal falls. A prospective study. JAMA. 1989;261(18):2663–2668. [↑](#endnote-ref-5)
6. Maki, BE. Gait changes in older adults: predictors of falls or indicators of fear. J Am Geriatr Soc. 1997 Mar;45(3):313-20. [↑](#endnote-ref-6)
7. [Studenski S](http://www.ncbi.nlm.nih.gov/pubmed?term=Studenski%20S%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Perera S](http://www.ncbi.nlm.nih.gov/pubmed?term=Perera%20S%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Patel K](http://www.ncbi.nlm.nih.gov/pubmed?term=Patel%20K%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Rosano C](http://www.ncbi.nlm.nih.gov/pubmed?term=Rosano%20C%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Faulkner K](http://www.ncbi.nlm.nih.gov/pubmed?term=Faulkner%20K%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Inzitari M](http://www.ncbi.nlm.nih.gov/pubmed?term=Inzitari%20M%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Brach J](http://www.ncbi.nlm.nih.gov/pubmed?term=Brach%20J%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Chandler J](http://www.ncbi.nlm.nih.gov/pubmed?term=Chandler%20J%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Cawthon P](http://www.ncbi.nlm.nih.gov/pubmed?term=Cawthon%20P%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Connor EB](http://www.ncbi.nlm.nih.gov/pubmed?term=Connor%20EB%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Nevitt M](http://www.ncbi.nlm.nih.gov/pubmed?term=Nevitt%20M%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Visser M](http://www.ncbi.nlm.nih.gov/pubmed?term=Visser%20M%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Kritchevsky S](http://www.ncbi.nlm.nih.gov/pubmed?term=Kritchevsky%20S%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Badinelli S](http://www.ncbi.nlm.nih.gov/pubmed?term=Badinelli%20S%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Harris T](http://www.ncbi.nlm.nih.gov/pubmed?term=Harris%20T%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Newman AB](http://www.ncbi.nlm.nih.gov/pubmed?term=Newman%20AB%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Cauley J](http://www.ncbi.nlm.nih.gov/pubmed?term=Cauley%20J%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Ferrucci L](http://www.ncbi.nlm.nih.gov/pubmed?term=Ferrucci%20L%5BAuthor%5D&cauthor=true&cauthor_uid=21205966), [Guralnik J](http://www.ncbi.nlm.nih.gov/pubmed?term=Guralnik%20J%5BAuthor%5D&cauthor=true&cauthor_uid=21205966). Gait Speed and Survival in Older Adults. JAMA. 2011 Jan 5;305(1):50-8. [↑](#endnote-ref-7)
8. Malatesta D , Simar D , Dauvilliers Y , Candau R , Borrani F , Prefaut C. Energy cost of walking and gait instability in healthy 65- and 80-yrolds. J Appl Physiol . 2003 ; 95 : 2248 – 2256. [↑](#endnote-ref-8)
9. Topp R, Mikesky A, Wigglesworth J, Holt W, Edwards JE. The effect of a 12-week dynamic resistance strength training program on gait velocity and balance of older adults. Gerontologist. 1993;33(4):501–506.      [↑](#endnote-ref-9)
10. Brown M, Holloszy JO. Effects of a low intensity exercise program on selected physical performance characteristics of 60- to 71-year olds. Aging 1991;3:129–139. [↑](#endnote-ref-10)
11. Manini T, Marko M, VanArnam T, Cook S, Fernhall B, Burke J, Ploutz-Snyder L. (2007).  Efficacy of resistance and task-specific exercise in older adults who modify tasks of everyday life. 62(6):616-23. [↑](#endnote-ref-11)
12. Matsuda, P., Shumway-Cook, A., & Ciol, M. (2010).  The effects of a home-based exercise program on physical function in frail older adults. The Journal of Geriatric Physical Therapy, 33(2), 78-84. [↑](#endnote-ref-12)