INTI JOURNAL | Vol.2023:22
eISSN:2600-7320

# Effectiveness of Resistance Training on Walking Speed among Geriatric Population

Bharathi. K, Kumaresan Abathsagayam*, Aravindan T, Surya Vishnuram, Prathap Suganthirababu, Vignesh Srinivasan, Vinodhkumar Ramalingam, & Ramana Kameswaran

Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamilnadu, India.

***Email:** kumaresan.scpt@saveetha.com

## Abstract

Muscle weakness is most related to slower walking pace and greater risk of impairment and slips in elderly. Walking speed is important component on balance and stability in older adults. Walking with lower acceleration and shorter step length is likely to greater risk of falling. The individual geriatric affected with low walking speed will be improved by resistance training program. The aim of research is to determine the effect of resistance training on walking speed among geriatric population. The study conducted was Quasi-experimental studywith10 geriatrics conducted at Saveetha Medical College. The patients were assessed using spontaneous walking speed before and after treatment. The patients were given resistance training technique (30 minutes per session) for 3 sessions per day for 2weeks. The statistical analysis reveals that p value <0.0001 is statistically significant. As result, the resistance training was found to be effective in geriatrics. The findings from this study indicated that resistance training technique is an efficacious intervention strategy to improve walking speed in geriatric population.

## Keywords

Geriatric population, Walking speed, Resistance training

## Introduction

Muscle weakness is linked to decreased speeds ranging, as well as a higher risk of impairments and slips in the elderly. However, muscle strength can be improved in these individuals, particularly if their muscles have been considerably stressed by training exercises. Progressive resistance training is the most typical approach to this sort of exercise, in which individuals work against an external force that rises as their muscle contract (Latham et al 2004).

PRT is an intensity exercise during which individuals worked out the muscles against this external force that was set at a particular frequency for each individual and modulated during the course work. Skeletal muscular strength is the maximum force-generating capacity of skeletal muscle. This condition appears to be facilitated by a persistent muscle loss, which is caused by a decrease in myocytes total number, contraction velocity, and muscle grade.

**Submission**: 2 June 2023; **Acceptance:** 3 July 2023

Peak muscular strength, which is a combination of muscle shortening and acceleration, declines faster and more dramatically than strength. The breakdown of type II motor units, a decrease in muscle activation, and fundamental modifications in muscle fiber force and force producing capacity with order could all be contributing factors to this rapid decrease (Waters et al 2010).

Cross-sectional research has identified substantial relationships between strength training and functional capacity individuals, suggesting that muscle strength is an essential element of effective task completion. The importance of having enough muscular strength to complete everyday functioning duties cannot be overstated. (Fielding et al 2002).

Correspondingly, the European Working Group on Sarcopenia in the Elderly proposed a method for functional assessment of Sarcopenia in the elderly that employs age and biological sex cut points for muscle strength, endurance, and muscular strength declines. Muscle fiber size and function decrease significantly as people become older. As a result, strength training has been presented as a secure and reliable technique helped for minimizing muscle wasting in adults, with policy statements from the American College of Sports Medicine suggesting this for all adults. The steady increase in tension placed on the muscle during resistance training activity is known as progressive resistance training (Straight et al 2016).

Promoting strength training exercise in older persons is one way to assist lower these financial and functional consequences. Resistance exercise has been shown in several research on aged adults to enhance lower body muscular mass and strength, and it is reasonable to expect that stronger. It provides a more-firm support framework. Limb stiffness has been recognized as a substantial risk element for injuries, as have functional tasks such as walking pace, stability, and curl up performance (Schilcht et al 2001).

In elderly persons, walking speed is a significant indication. Walking at less than 1m/s is related with an increased risk of functional impairment, severe medical outcome, overall morality in older persons, according to many recent studies. Improving one's walking pace has also been connected to living a longer life. As relative to other broad physical factors, an increase of at least 0.1m/s in SWS(4m) over 1 year predicts survival in older persons for at least 8 years, with a 58 percent drop in absolute risk of mortality. There has been a continuous accumulation of research proving the favorable impact of physical exercise on walking speed over the previous few decades. Periodic strength training appears to be the most beneficial workout technique for increasing walking speed, according to a recent meta-analysis (Potheir et al 2018).

Despite their damaged physical abilities, the elder subject’s acceleration pattern presented the identical levelness. The strong relationships between lower extremity power, acceleration, and stride frequency are consistent with prior research, and they suggest that typical age leg length reduction may be the key limiting factor in elderly adults stepping at the same velocity as younger people. As a result, walking at lower pace and decreased stride frequency is unlikely to increase the chance of falling in older adults with optimal physiological capacity. Walking is now well known as a major cause of fall in the elderly, and various cross-sectional studies have showed

considerable changes in movement patterns as people get older. Shorter maximum number of generations and longer hours invested in double limb had been discovered to become the cause of this (Menz et al 2003). The original study goal is to see how effective resistance training is at increasing walking speed in the elderly.

## Methodology

### Participants and selection criteria

The study was conducted as quasi experimental study at Saveetha Medical College and the sample was collected from the outpatient geriatric department. Total of 10 subjects were randomly selected based on inclusion criteria.

The subject of age around 60 years and above of both genders were included in study and those who were not interested to take part in study, subjects with history of recent lower limb orthopedic surgery, COPD, deformity, chronic knee pain with osteoarthritis were excluded in study.

The Spontaneous walking speed (SWS) was used as an outcome measure. The participants were required to walk for 30 minutes at a reasonable speed. All of the participants were given 2 tests to walk down a 37-meter corridor. They were given a buzzer sound to start and finish each trial, and the distance walked in meters was measured. Each subject's mean pre- and post-training SWS values (m/s) were computed.

### Procedure

The subjects were explained about the study and underwent walking speed assessment based on the Spontaneous Walking Speed Grading. The subjects underwent resistance training to find out if any improvement seen on the walking speed. The resistance training includes leg press, leg extension and standing leg curl. Treatment session includes repetition of 15 times with 2 sets given for 4 sessions per 2 weeks. Post training assessment was done after 2 weeks.

## Results

The study was a Quasi –Experimental study among a group of 10 subjects. The mean value and standard deviation of data was calculated. The pre and post values were compared using Spontaneous Walking Speed.

Paired t-test used to analyze significant changes between pre and post-test. P value <0.0001 was considered statistically significant.

Table 1. Pre and post-test value of mean and SD value

| | **Mean** | **SD** | **t-value** | ***p* value** |
|---|---|---|---|---|
| **Pre-Test** | 1.1760 | 0.0523 | | |
| **Post-Test** | 1.3210 | 0.0520 | 31.9818 | <0.0001 |

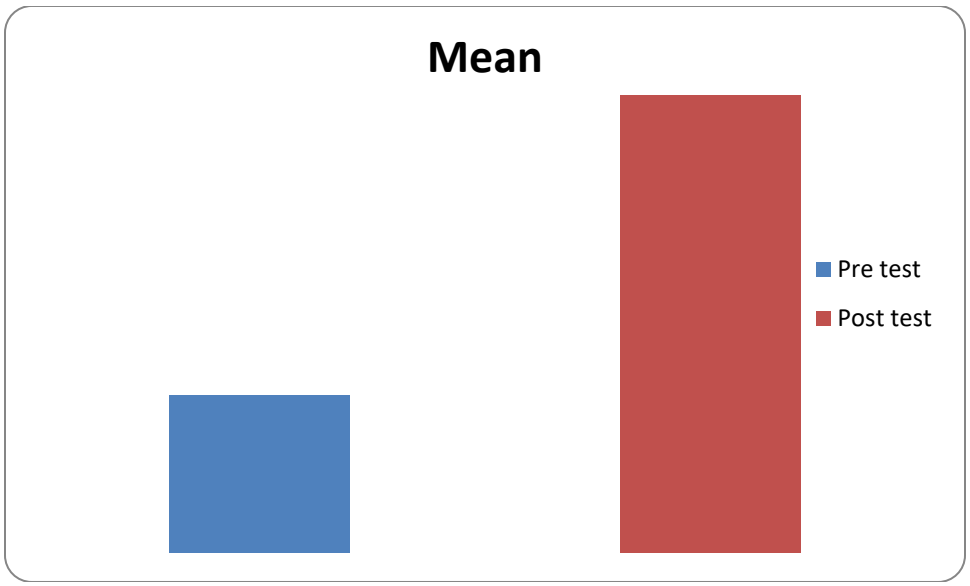


Figure. 1. Pre and post-test value of mean

The data acquired are statistically significant between pre and post-test with mean value of 1.1760 in pre-test and 1.3210 in post-test and standard deviation of 0.0523 in pre-test and 0.0520 in posttest according to statistical analysis. The *p* value being <0.0001 statistically signify the importance of resistance training which directly influence the walking speed. As result, the resistance training was found to be effective in geriatric population.

## Discussion

The purpose of this study is to find out the effectiveness of resistance training on walking speed among the geriatric population. Spontaneous walking speed is the perfect measure. It reflects physiological changes in stride length, step length, and cadence. The difference in relationship between muscle strength and walking speed partly depends on biomechanics imbalance. Spontaneous walking speed is used as an outcome measure in the geriatrics with lower walking speed.

The significant connections among lower extremity strength, acceleration, and stride frequency are consistent with past findings, implying that normal aging-related limb strength loss may be the primary limiting factor keeping older people from going at the same velocity as younger generations. Because cognitive characteristics can affect walking speed and step length, it's likely

that the movement patterns exhibited in older people are partly due to a reluctance to walk faster rather than an inability to do so. This is supported by the observation of a slower walking pace on the uneven surface - a more difficult circumstance that could result in a more erratic gait pattern as a result of falling. Walking with a reduced pace and shorter stride frequency is unlikely to affect in geriatrics with adequate physical modifications.

Leg length is an important gait trait that contributes to the slowing of walking speed in older adults. It suggests that being older is linked to a slower gait speed. Leg length was the only gait trait linked to relative decrease, with greater leg length indicating beneficial (Elble et al 1991).

In elderly people, strength training has been found to increase gait velocity and dynamic balance. Muscle mass increases in lock - step with gravity's center of mass. High movement rates are associated to poor balance in the elderly, and are thought to be produced by a shift in the centre of gravity. Older persons with quick movement kinematics and poor balance had the highest chance of falling, according to the study. Strength training may aid in the improvement of balance and control of the center of gravity in older people. This improved middle of force control and balance may result in slow, more regulated walk and possibly fewer falls. (Bao T et al, 2018).

In older people, the walking speed test reflects both functional and physiological changes. As a result, it's now used as a crucial clinical indicator of the health of older persons. Time of life changing body structure elements may have an impact on fast walking speed. Walking performance difficulties have been linked to reduced skeletal muscle mass (SMM), and elevated body waste has been linked to a slower walking speed. Furthermore, age-related muscular weakness has been associated to diminished functionality and a higher mortality rate in the elderly. Changes in physical endurance of the muscles used to walk, such as the gluteus, quadriceps, hamstrings, and gastrocnemius, could explain the positive effect of RT on walking speed performance (Santos et al 2017).

Strength training (RT) is such a type of exercise that improves body mass and muscle strength while also slowing down the ageing process. RT promotes an increase in walking capacity, according to the findings of some studies. The major and new finding of their study was that the improvement exhibited in the RT programme is associated to gains in lower limb muscular strength and muscle quality, rather than changes in muscle mass or body fat in older women. Changes in lower limb muscle strength influence this progression. On the other hand, changes in muscle body composition waste appear to be unrelated to changes in walking capacity. Improvements in muscle strength are not required to exhibit results, according to the findings of this study (Santos et al 2017).

This study emphasized the peculiar benefits on Spontaneous walking speed of resistance training as powerful tool to prevent functional decreases in elderly person. As result of this analyze propose that resistance training improves walking speed in geriatric population.

## Conclusion

The study's results suggest that utilizing resistance training technique can be an effective intervention strategy for enhancing walking speed among the geriatric population. It also proved that resistance training can be a valuable tool for improving mobility in older adults.

## Acknowledgements

Not applicable.

## References

Bao, T., Carender, W. J., Kinnaird, C., Barone, V. J., Peethambaran, G., Whitney, S. L., ... & Sienko, K. H. (2018). Effects of long-term balance training with vibrotactile sensory augmentation among community-dwelling healthy older adults: A randomized preliminary study. *Journal of NeuroEngineering and Rehabilitation, 15*(1), 1–13.

Buchner, D. M., Cress, M. E., De Lateur, B. J., Esselman, P. C., Margherita, A. J., Price, R., & Wagner, E. H. (1997). The effect of strength and endurance training on gait, balance, fall risk, and health services use in community-living older adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 52*(4), M218–M224.

Buchner, D. M., Larson, E. B., Wagner, E. H., Koepsell, T. D., & De Lateur, B. J. (1996). Evidence for a non-linear relationship between leg strength and gait speed. *Age and Ageing, 25*(5), 386–391.

Damush, T. M., & Damush, J. G., Jr. (1999). The effects of strength training on strength and health-related quality of life in older adult women. *The Gerontologist, 39*(6), 705–710.

Elble, R. J., Thomas, S. S., Higgins, C., & Colliver, J. (1991). Stride-dependent changes in gait of older people. *Journal of Neurology, 238*(1), 1–5.

Fielding, R. A., LeBrasseur, N. K., Cuoco, A., Bean, J., Mizer, K., & Singh, M. A. F. (2002). High-velocity resistance training increases skeletal muscle peak power in older women. *Journal of the American Geriatrics Society, 50*(4), 655–662.

Fritz, S., & Lusardi, M. (2009). White paper: "Walking speed: The sixth vital sign". *Journal of Geriatric Physical Therapy, 32*(2), 2–5.

Guralnik, J. M., Ferrucci, L., Simonsick, E. M., Salive, M. E., & Wallace, R. B. (1995). Lower-extremity function in persons over the age of 70 years as a predictor of subsequent disability. *New England Journal of Medicine, 332*(9), 556–562.

Himann, J. E., Cunningham, D. A., Rechnitzer, P. A., & Paterson, D. H. (1988). Age-related changes in speed of walking. *Medicine and Science in Sports and Exercise, 20*(2), 161–166.

Jerome, G. J., Ko, S. U., Kauffman, D., Studenski, S. A., Ferrucci, L., & Simonsick, E. M. (2015). Gait characteristics associated with walking speed decline in older adults: Results from the Baltimore Longitudinal Study of Aging. *Archives of Gerontology and Geriatrics, 60*(2), 239–243.

Latham, N. K., Bennett, D. A., Stretton, C. M., & Anderson, C. S. (2004). Systematic review of progressive resistance strength training in older adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 59*(1), M48–M61.

Maki, B. E. (1997). Gait changes in older adults: Predictors of falls or indicators of fear? *Journal of the American Geriatrics Society, 45*(3), 313–320.

Menz, H. B., Lord, S. R., & Fitzpatrick, R. C. (2003). Age-related differences in walking stability. *Age and Ageing, 32*(2), 137–142.

Pothier, K., Gagnon, C., Fraser, S. A., Lussier, M., Desjardins-Crépeau, L., Berryman, N., ... & Bherer, L. (2018). A comparison of the impact of physical exercise, cognitive training and combined intervention on spontaneous walking speed in older adults. *Aging Clinical and Experimental Research, 30*(8), 921–925.

Santos, L., Ribeiro, A. S., Schoenfeld, B. J., Nascimento, M. A., Tomeleri, C. M., Souza, M. F., ... & Cyrino, E. S. (2017). The improvement in walking speed induced by resistance training is associated with increased muscular strength but not skeletal muscle mass in older women. *European Journal of Sport Science, 17*(4), 488–494.

Schlicht, J., Camaione, D. N., & Owen, S. V. (2001). Effect of intense strength training on standing balance, walking speed, and sit-to-stand performance in older adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 56*(5), M281–M286.

Skelton, D. A., Young, A., Greig, C. A., & Malbut, K. E. (1995). Effects of resistance training on strength, power, and selected functional abilities of women aged 75 and older. *Journal of the American Geriatrics Society, 43*(10), 1081–1087.

Straight, C. R., Lindheimer, J. B., Brady, A. O., Dishman, R. K., & Evans, E. M. (2016). Effects of resistance training on lower-extremity muscle power in middle-aged and older adults: A systematic review and meta-analysis of randomized controlled trials. *Sports Medicine, 46*(3), 353–364.

Waters, D. L., Baumgartner, R. N., Garry, P. J., & Vellas, B. (2010). Advantages of dietary, exercise-related, and therapeutic interventions to prevent and treat sarcopenia in adult patients: An update. *Clinical Interventions in Aging, 5*, 259–267.

Winter, D. A., Patla, A. E., Frank, J. S., & Walt, S. E. (1990). Biomechanical walking pattern changes in the fit and healthy elderly. *Physical Therapy, 70*(6), 340–347.

Wolfson, L., Whipple, R., Derby, C., Judge, J., King, M., Amerman, P., ... & Smyers, D. (1996). Balance and strength training in older adults: Intervention gains and Tai Chi maintenance. *Journal of the American Geriatrics Society, 44*(5), 498–506.

Yogev-Seligmann, G., Hausdorff, J. M., & Giladi, N. (2008). The role of executive function and attention in gait. *Movement Disorders, 23*(3), 329–342.