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Immediate Effects of Tendoachilles Stretch on Balance in Geriatric Population - An Experimental Study

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Abstract
Background and Objective: *Balance is a major concern in Geriatric population which makes the vulnerable to falls and secondary complications of falls leading to high rates of morbidity and mortality.(1,2) Hence, this present study is planned to see the immediate effects of Tendo – Achilles stretch on Balance using Timed Up and Go test (TUG) in Geriatric population.*
Subjects: *The participants were 60 years and above (14 female and 8 male, who are rescinding at Shantai Vrudhashram, Home for the Aged. Their mean age was 74.33 (SD= 10.67).*
Material And Method: *There were 30 participants aged 60 and above were recruited in the study based on the inclusion and exclusion criteria, the participants were asked to perform the TUG test and timing was noted down, after which it was followed by two sets of 30 seconds of Tendo – Achilles stretching and the subject was then asked to perform TUG again, and timing was noted.*
Results: *The TUG had improved in twenty eight out of thirty subjects with mean score point of 16.63 pretest (SD = 6.35) and posttest mean= 15.21 (SD = 6.04) (P= 0.0001*) and between 60 – 75 years pretest mean = 15.24 (SD = 2.71) and posttest mean= 14.14 (SD = 2.37) (P= 0.0055*) and ≥76 years pretest mean = 18.22 (SD= 8.37) and posttest mean = 16.43 (SD=8.49) (P= 0.0001*).*
Conclusion: *The result of the study indicates that the stretching as an intervention is effective in improving balance of the target population.*
Keyword: *Tendo – Achilles stretching, Timed Up and Go Test, Geriatric.*

INTRODUCTION

Balance, also known as postural stability can be defined as a term used to describe the dynamic process by which the body's position is maintained in equilibrium [at rest (static) or steady state motion (dynamic)]. [2] Balance is formed by a complex interaction between three various systems (1) the sensory/perceptual system: body position and motion detection, (2) the motor system: - organization and execution of motor synergies, and (3) the higher-level CNS processes: integration and activation plans, hence when one examines balance these areas must be focused upon. [3] As age advances people experience

changes in their entire body, from the CNS level up till their organ level, hence it has been found that due to aging processes balance often is impaired among geriatric population which happens to be one of the major concerns that makes them prone to falls and secondary complications of falls which can lead to high rates of morbidity and mortality,[1,2] also leads to dramatic consequences, such as dependency in activities of daily living (ADL), admission to nursing homes and fractures. Most of these factors are said to occur due to complex interactions between multiple risk factors which include muscle weakness, gait deficit, age over 80 years, visual deficits, cognitive impairments, history of falls, etc. Hence, training of the static and dynamic control is known to be of great importance in rehabilitation of geriatric population, as aging has effects on the three stages of information processing. [4, 5]According to a study it was stated the lower limb muscles may play a key role in standing[6,7,8,9] as part of the musculoskeletal system, with the calf muscle contractions responsible for controlling the postural sway.[10]

Calf muscle is said to be made up of the Gastrocnemius Lateral (GL) and Medial (GM) Heads, and the Soleus muscle, which originate from the medial and lateral condyle of the femur, soleal line, posterior shaft of tibia and back of head and shaft of fibula. The tendon of GM and GL fuse with Soleus tendon to for Tendo – Achilles tendon also known as tendocalcaneus which inserts into the middle one- third of the posterior surface of the calcaneum. [11]. The increase in age of the tendon behavior during postural tasks can affect the rate of contraction forces transmitting to the skeleton which influences the probability to make postural adjustments and maintain balance effectively. Calf tendon mechanical properties are a must in the anterior posterior sway in ankle movement that is responsible for balance as a feedback loop system in which the timing response to disturbance in balance is critical, as in such times even small delays can have negative effect on postural balance. Since postural stability declines in old age, there is deterioration of the ankle plantar flexors strength muscle activation capacity (AC) and tendon mechanical properties which can be associated with a problem in postural tasks that are challenging. [12] Stretching helps to lengthen not only the muscle but also the mind and spirit also helps to wake up the muscle and help to get ready for full movement. An ideal stretching session should consist of 30 seconds stretching of 2 sets with a 5 second break between each stretch which allows a consistent smooth flowing routine.[13] It has been seen that when a muscle is being stretched changes take place at myotendinous junction (MTJ) of the muscle.[14] leading to increase of the muscles flexibility..

The Timed Up and Go Test is a test used to check balance and commonly used to examine functional mobility in community- dwelling and older adults. This test requires the subjects to stand up, walk 3m (10 feet), turn, walk back, and sit down. Time taken to complete the test strongly correlates to the level of functional mobility. Older adults who are unable to complete the task in less than 20 seconds have been shown to be independent in transfer tasks involved in activities of daily living. Older adults requiring 30 seconds or longer completing the task tends to be more dependent in activities of daily living, require assistive devices for ambulation. *Functional mobility* is a term used to reflect balance and gait manoeuvres used in everyday life (walking, turning, standing up from a chair). [15] Intratester and intertesterreliability have been reported as high in geriatric populations. (N=10-30) (ICC= .99,[16] ICC[3,1]=.92-.96,[17] ICC=[3,3] = .98.[15] The test ret set reliability of measurements obtained from group of adults without cognitive impairments (n=844, age range of total sample [N=2,305]=69-104 years) was moderate(ICC [model not stated]= .56).[18] Hence, the present study is being carried out to check the effectiveness of Tendo – Achilles stretching as an intervention to improve balance in geriatric population.

MATERIALS AND METHOD

Institution Review Board Approval: The study was approved by the institutional review board and was conducted under the guidelines and rules and regulations of the ethical and human principles of research.

Participants: A total of 30 subjects were recruited from the old age home at Shantai Vrudhashram on the basis of the inclusion criteria 1. Age above 60 years, 2. Both male and female participants, 3.Subjects willing to participate in the study. Exclusion criteria were any recent lower extremity injuries in the last 6 months, neurological disorders: stroke, dementia, Alzheimer's, Parkinson's, etc., uncooperative patients, arterial or venous diseases of the lower limb: varicose veins, Deep Vein Thrombosis, etc. The subjects agreed to sign the informed consent form and a brief demographic data was recorded that included their age, height, weight and BMI.

PROCEDURE: The participant was recruited. The study was carried out at Shantai Vrudhashram Old Age Home at Jamboti Road, Bamanwadi. A brief history was taken from the patients about neurological, haematological, musculoskeletal as per to the inclusion criteria.

The study protocol was explained and a written informed consent was obtained from all the subjects. All subjects were the screened on the basis of the inclusion and exclusion criteria prior to their enrolment into the study. Subjects were then selected and a brief demographic data was noted, which included the age height weight and BMI. Height and weight were measure without shoes using a weighing machine and a metal tape respectively.

The subjects were first given a demo of the Timed Up and Go Test so that the procedure was properly understood by the subjects, after that the subjects were asked to perform the test and the time was noted down, after which two sets of Tendo – Achilles stretch was given for a duration of 30 seconds each stretch using a stop watch with 5 seconds rest between each stretch and later the subject were asked to perform the test again and the time was noted.

RESULTS

This study was done to see the immediate effects of Tendo – Achilles stretch on balance in the geriatric population. Out of a total of 30 participant, with a mean age=74.33. The gender distribution was a total of 14 females and 8 males' subjects.

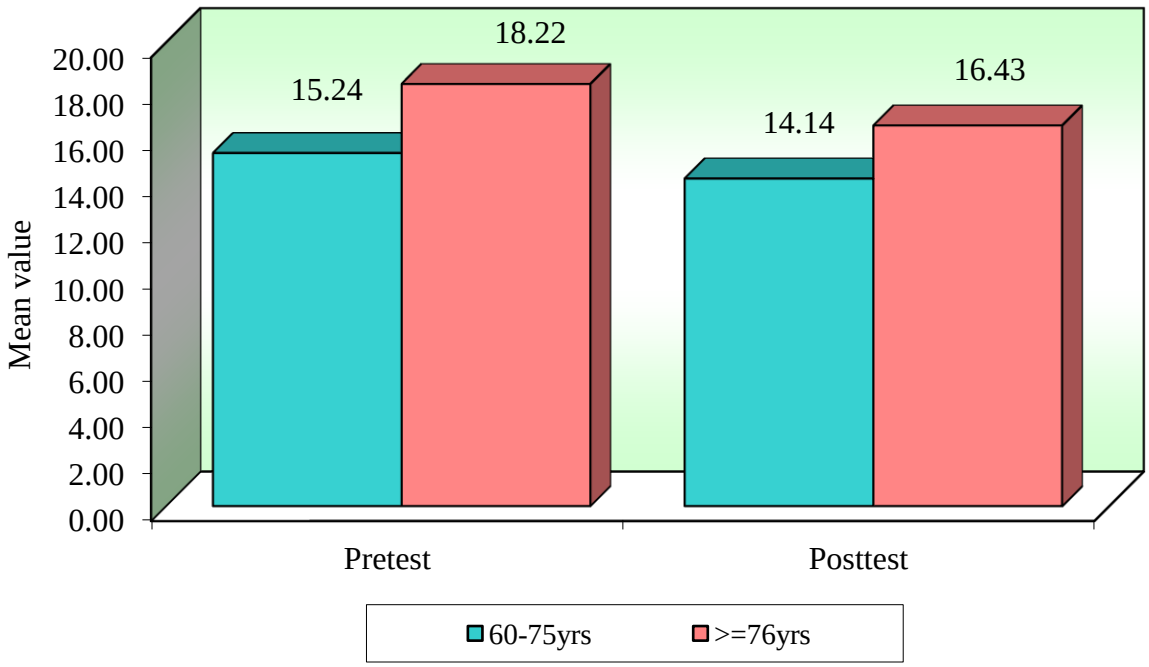
Table 1: Distribution of geriatric population by age and sex

Age groups	Male	%	Female	%	Total	%
60-75yrs	2	12.50	14	87.50	16	53.33
>=76yrs	6	42.86	8	57.14	14	46.67
Chi-square= 3.5129 P = 0.0612						
Total	8	26.67	22	73.33	30	100.00
Mean age	76.38		73.59		74.33	
SD age	12.15		10.28		10.67	

Table 2: Comparison of age groups with respect to pre and post Tendo - Achilles stretch scores by t test

Variable	Age groups	Mean	SD	t-value	P-value
Pretest	60-75yrs	15.24	2.71	-1.2986	0.2047
	>=76yrs	18.22	8.73		
	Total	16.63	6.35	-1.0329	0.3105
Post test	60-75yrs	14.14	2.37		
	>=76yrs	16.43	8.49		
	Total	15.21	6.04	-1.1806	0.2477
Changes	60-75yrs	1.37	1.07		
	>=76yrs	1.82	1.05		
	Total	1.58	1.07		

Figure 1: Comparison of age groups with respect to pre and post Tendo - Achilles stretch scores



DISCUSSION

The purpose of this study was to evaluate the immediate effects of Tendo – Achilles stretch on balance in geriatric population. The results showed that there was improvement in balance of the subjects after the Tendo – Achilles stretch on geriatric population. The participants in the study included more female then males which included 14 female and 8 males.

In a study it was said that as age advance the body undergoes various changes from which balance has been often said to be impaired among geriatric population which happens to be one of the major concerns that makes them prone to falls and secondary complications of falls which can lead to high rates of morbidity and mortality.(1,2) Impairment in balance can be caused due to injury and diseases that can affect the three stages of information processing which include (1) sensory system, (2) motor system and (3) higher – level CNS processors.[2] Another study conducted by Patricia A. Hagemen et al to identify age related changes in the postural control system in order to understand the risks for falls in older adults and also to determine whether age and gender played a significant role. This study suggested that gender was not significant in any of the outcome measures, however age was significant in all of the outcome measures, where older adults demonstrated larger areas of sway regardless of condition (eyes open, eyes closed off and with visual feedback) also, older adults had longer movement times, longer path lengths, and shorter distances of functional reach when compared with younger adults. [19] In this study it was proved that stretching of the Tendo – Achilles helped to improve balance in the. A study by Gladys L. Onambeleet. al. on calf muscle tendon properties and postural balance in old age was conducted to evaluate whether aging deteriorates the muscle tendon characteristics which in turn could be associated with variance in postural balance performance especially in more demanding postural tasks. Through this study it was evident that postural stability declined in old age related to deterioration in ankle plantar flexor strength, muscle activation and tendon mechanical properties. However, these deteriorations were associated with postural tasks that were more challenging. Present finding in this study showed

that by stretching the Tendo- Achilles there was improvement of balance in the target population. [12]

In addition another important finding of this study showed that there was increased speed in completion of the TUG test post Tendo – Achilles stretching. According to various studies it was proven that using TUG as an outcome measure is shown to be a sensitive and specific indictor for identifying community - dwelling adults who are at risk of falls.[15]

LIMITATION

In the present study we used TUG as the test for balance; hence there could be a subjective error during the data collection. Instead better equipment like the force plate of the balance master could have been used to check balance improvement.

FUTURE SCOPE

In the present study both male and female subjects were taken, in future this study can be performed using homogenous groups. Also TUG test was used to check balance; in future the balance master can be used as this can avoid subjective errors. Also this study can be performed on older individuals having neurological deficits like Parkinson, etc., since in this study healthy subjects were taken.

CONCLUSION

Results of the study concluded that the stretching as an intervention was effective in improving the balance of the target population.

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