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**Research**

# A study on effects of balance training exercises as compared to yoga in prevention of fall in elderly people

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## Abstract

**Background:** Due to ageing population worldwide, the burden of disability is increasing. It is therefore important to develop interventions that improve healthy ageing, reduce disability onset and enhance life quality. Physical exercises can promote healthy ageing and help maintain independance, yet many older adults are inactive. Yoga is a form of physical activity that aims to improve health and may be particularly suitable for older adults. So purpose of this study to analyse the effect of balance training exercises as compared to yoga in prevention of fall in elderly people.

**Study Design:** Pre and Post test Experimental design.

**Methodology:** 60 subjects were recruited from age 60 years or above.Subjects were divided into 2 groups-Group A(Physical Exercises) and Group B(Yoga).30 Subjects in group A attended 4 weeks session for practicing Exercise(each session runs 20 mins). Also in Group B with 30 subjects attended 4 weeks session and completed within 30mins.

**Result and Conclusion:** The subjects in group B (yoga) showed significantly better results in comparison with group A(Physical Exercises) by using Tinetti balance and gait assessment scale with p value 3.8.

**Keywords:** Yoga, Balance training exercises, Elderly, fear of falling, Tinetti scale.

## INTRODUCTION

Ageing refers to “Biological process of growing older in a deleterious sense”. Falls are a major health problem among older adults due to ageing. It occurs one in three people of aged 65 or more living in the community at least once a year. This proportion increases to one in two for those over 80years.[1,2,3]
Worldwide , adults aged over 70 years particularly females have significantly higher falls and related mortality than younger people.[4] The severity of fall related complications also increases with age .[2,3] Balance is a state of

"Equillibrium characterized by cancellation of all forces by equal opposing forces". A study conducted by Chaitali Shah concluded that ,three mechanisms responsible for maintaining balance-Ocular Mechanism in which visual cues are constantly used to correct minor deviation from fixed point; Vestibular Mechanism Involved with rotatory movements of head and neck and eolith organ is involved with acceleration and deceleration; Proprioceptive Mechanism in which Position sense is important for maintaining balance. Sensory information from proprioceptors in the central spine and major weight bearing joints may be impaired with ageing and arthritis.[9].

A study conducted by O' Loughlin JL, Robittaile Y, found that the primary sequelae of falls include falls related injuries, such as fractures and head injuries, and post-fall anxiety .[5,6]This leads to loss of independence through disability and fear of falling . The reduction in mobility and independence are often serious enough to result in admission to hospital or a nursing home or even premature death.[7,8] .severel risk factors such as intrinsic factor (host factor) & extrinsic factor (environmental factor). Intrinsic factor include poor balance, weakness, foot problems, visual impairment, cognitive impairment. Extrinsic factor include poor lighting, slippery surface, obstacles, no safety equipments, loose carpets polypharmacy.

A study conducted by Rossat et al. found that the number of falls per patient increased with age, female sex, institutionalization, polypharmacy, the use of walking aids, muscle weakness and increased fear of falling. Research have shown that reducing number of prescription medication ,improve strength, improve gait and balance reduces falls(13). Zettergren et al. evaluated the effect of therapeutic yoga on postural control, mobility, rising from floor, and gait speed in community living older adults(10).

Age and lack of physical activity may both be responsible for poor balance control. The risk of developing problems in one or more of the sensory, motor or adaptive brain components of balance increases with age as the body is exposed to degenerative or infectious disease, or the effect of injuries accumulated over life time.

Poor balance has repeatedly shown to be a risk factor for fall in elderly. Balance has 3 basic dimensions-maintenance of position, stabilization for voluntary movements, & reaction to external disturbances. Most injurious falls occur during performance of routine daily activities such as walking, transferring, stopping, bending, reaching.

The elderly are among those at greater risk for disequilibrium. Although the relationship between the muscle weakness in old age and equilibrium maintenance would be seem to be closely related. Further investigation in to the use of yoga as general exercise and physical exercises and for possible use for prevention of falling is needed. Now days more people are performing yoga in their daily life. So I am conducting this study to compare the effect of yoga and balance training exercises in elderly people for fall prevention.

Many people are practicing yoga and exercises regularly, which results in improved postural stability. It also accommodates both physical limitations and fears in elderly people.[9,10] Although researchers found improved postural control & gait speed, some limitations were noted, including small sample size and short intervention duration. On literature review we have come across studies on interventions to prevent falls in older adults, but yoga as an intervention is not compared with exercises. To identify the effectiveness of yoga in preventing such falls as compared to exercises study is being conducted –Effect of balance training exercises as compared to yoga in prevention of fall in elderly people.

**Objectives**

1. To analyse the effect of balance training exercises on Tinetti balance scale and gait assessment scale in elderly people.
2. To analyse the effect of yoga on Tinetti balance and gait assessment scale in elderly people.
3. To compare the effect of balance training exercises and yoga on Tinetti balance and gait assessment scale in elderly people.

**Study Design**

Research Design: Pre test and post test Experimental Design.
Study Duration**:** 4 weeks
Study Population: The patients came to Physiotherapy Department after consideration of inclusion and exclusion criteria.
Sample Size: 60 subjects were evaluated for the study.

**Selection Criteria**

**Inclusion Criteria**

1) Age 60 years or above, include both sexes.
2) Ability to maintain upright standing independently with feet bare for 90 seconds, without device.
3) Intact lower extremity sensation &Visual acuity should be intact.

**Exclusion Criteria**

1) Subjects with history of impairment of hip, thigh, & knees
2) Recent fracture or any injury, Inflammatory conditions to lower limb
3) Sensory deficits, Hyper mobility to ankle and knee joint
4) Rheumatoid arthritis, Any neurological problem, Amputation or severe pain in lower limb

**Instruments**

Hard chair without armrest, Paper, pen, pencil, chock**,** Stop watch or hand watch**,** Yoga mat.

## METHODOLOGY

Approval for the study was obtained from the Protocol committee and the Institutional Ethical Committee and from Maharashtra University of Health Sciences (MUHS), Nashik. The purpose and procedure of the study was explained to all subjects in detail and were also informed about the risks in the language they understood. They were made aware about the right to terminate the participation at any time during the procedure. Those who agreed to participate were asked to sign a written consent form in the language they understood .Those who fulfilled the inclusion & exclusion criteria were included in the study. 60 patients who continued 4 weeks balance training, Exercises & yoga came for regular follow up formed the study group.

Prospective participants were taken from elderly people coming to Physiotherapy Department. Subjects were evaluated as per the case record form. Before the beginning of the study Demographic data like Name, age, sex, Height were noted. All subjects signed an informed consent prior to participating in the study. All the subjects were evaluated by Tinetti balance and gait assessment scale before and after the intervention (1$^{st}$& 30$^{th}$ day) , the subject were positioned comfortably and assessed throughly about their condition. The subjects were then divided Randomized by in to 2 group as group A and group B using odd and even method.

**GROUP A**: Consisted of odd numbers of 30 subjects treated with following exercises once times a day for 4 weeks& completed within 20 mins.

- Single leg standing with 30secs holding time, 5 repetitions for each side.
- Tandem standing with 30secs holding time, 5 repetitions.
- Functional reach outs in standing, 5 repetition.

**1)Single leg standing 2)Tandom standing 3)Functional reachouts in standing**

**GROUP B**: Consist of even number of 30 subjects treated with following Yoga once time a day for 4 weeks & completed within 30 mins.

**1]Tadasana (Mountain pose)**

Step 1$^{st}$- Stand erect, and place legs slightly apart, with hands hanging alongside the body.
Step 2$^{nd}$ - look slightly forward or upward.

Step 3rd - Now breath in and stretch shoulders, arms and chest upwards. Raise heels, making sure the body weight is on the toes.
Step 4th- Feel the stretch in body from feet to head. Hold the pose for 30secs, then exhale and return to initial position-5 repetition for 30 secs hold.

**2]Vrikshasana (Tree pose)**
Step 1st - Stand erect and drop arms to side of body.
Step 2nd - Slightly bend right knee and then place right foot high up on left thigh or left leg (modification) and placed sole firm, and left leg absolutely in erect position.
Step 3rd - Now inhale, and gently raise arms near the chest and bring them together in"Namaste Mudra".
Step 4th - hold gaze straight forward to maintain balance.
Step 5th - Gently comebackto original position with exhale and repeat with left leg-2 repition on each side for 30- secs hold.

**3] Utkatasana (Chair Pose)**
Step 1st - Big toes touching each other and heels kept little apart.
Step 2nd - Take deep breath in and lift arms over the head ( in palms joint together , or parallel to each other ).
Step 3rd - Then slowly exhales and bend the knees , make thighs parallel to ground and hold the pose .
Step 4th - Keep gaze straight forward .
Step 5th - Gently comeback to original position with inhalation-5 repetitions' for 30 secs hold.

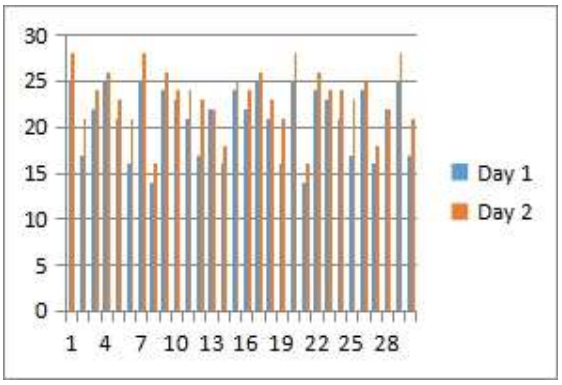
**1) Starting position** **2)Tadasana** **3) Vrikshasana** **4)Utkatasana**

After 4 weeks both the groups were again evaluated on Tinetti scale.

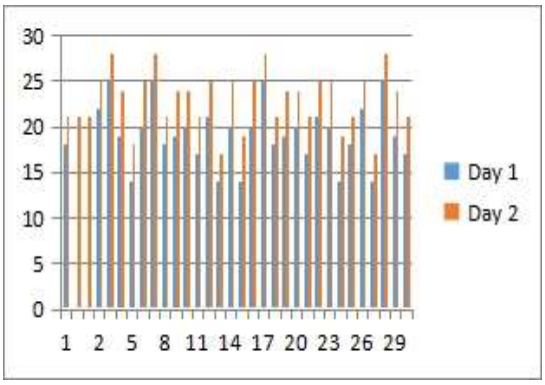
**Outcome Measures**
**Tinetti Test =** Balance were measured on 1st day & on30th day by Tinetti test using following scale :-Tinetti Balance scale & Gait Assessment scale- Three point ordinal scale , ranging from 0-2."0"= Scoring indicates highest level of impairment. "2"= individuals independence. Total Balance score = 16, Total gait score = 12, Total test score = 28
**Interpretation:** Low fall risk =25-28, Medium fall risk=19-24, High fall risk =<19

**Data Analysis: Data was analysed using SPSS 20.0 software.**
Balance response and gait improvement of geriatric individuals in group A group B before and after 4 weeks was analysed using paired t- test. Balance response and gait improvement of geriatric individuals in group A group B before and after 4 weeks was analysed using unpaired t- test.

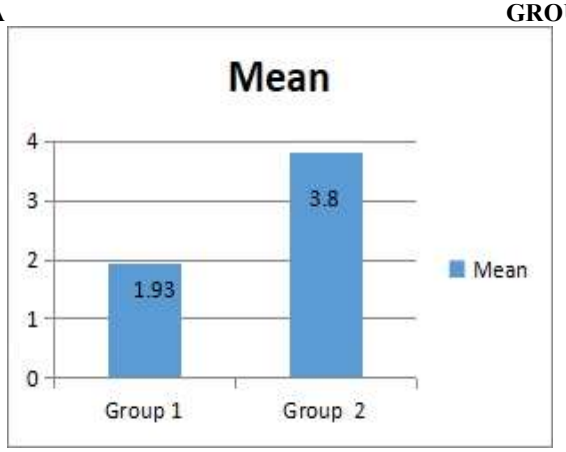
## RESULT




**GROUP A**




**GROUP B**




| | GROUP-A | GROUP-B |
|---|---|---|
| Mean | 1.93 | 3.8 |

| Tabulated value | Calculated value |
|---|---|
| 1.7010 | 4.70 |

Paired t – test were used to assess change scores on the Tinetti balance scale. The Mannwhitney U Analysis was used to assess change scores on the fall Tinetti balance & gait assessment scale. The group B showed a statistically significant increase on the Tinetti Balance scale (p=3.8). The group- A showed no significant change. There was no statistically significant change on the Tinetti balance & gait assessment scale for group- A.

## DISCUSSION

The purpose of the study is to analyse the effect of physical exercises and yoga in elderly people. The data was analyzed by using t- test. The result of the study support the use of 4 weeks yoga and physical exercises program as an intervention to improve postural control, mobility, ambulation in elderly people.

Study done by Gerome C Gauchard et al(2003) who concluded that the effectiveness of proprioceptive training for improving motor function ; a systematic review. It have the best impact on balance regulation and precision. Besides even if bioenergetics activity improves postural control in simple tasks, more difficult postural tasks show that this type of activity does not develop neurosensorial. Proprioceptive input threshold as well probably an account of higher contribution of visual afferent. Proprioception increased with these balance training intervention**.** Study of Kurt Murer et al (2007) who conclude twice weekly lower extremity strengthening training of 12 weeks duration in hostel dwelling elderly and lower extremity physical function when Yoga are added. The Tinetti balance score and the chair stand test of physical performance assessment improved significantly. Specific muscles which will help body to maintain balance will be trained.

Study done by Kathleen K. Kelley et al,(2014) who conclude 12 week yoga classes in community dwelling older adults and observed that improve mobility, postural stability and gait speed.Quasi- experimental design study with pre test and post test. Carried out for 12 week , 60 minute biweekly kripalu yoga class. Test was used to evaluvate scores for Mini Best test. Tree pose encourage active work of gastrocnemius muscle and the heel and toe raises, the participants performed directly strengthened the gastrocnemius, soleus muscle and

well as anterior tibialis muscle. The anterior tibialis is important for foot clearance in gait, contributing to reduced fall risk. Chair pose increase strength of quadriceps, which are crucial in promoting full knee extension between terminal stance and preswing contribute to normal step length. This poses promote ankle stabilization muscle activation and intrinsic foot muscle activation, thus leading to improved postural stability and gait speed . Thus postural control, mobility, and gait speed test score improved significantly.

Gun Jahansson and Gun – Britt Jarnlo(2009) concluded that 70- years old women improved their performance significantly when doing yoga like as Tadasana, vrikshasana, utkatasana and were able to walk faster after a 5 week training period. Mountain pose improved participants confidence in standing because it promote even weight distribution through both feet. This pose also improved pelvic stabilization and postural control because it recquire co-activation of hip flexors and extensors. Tree pose improved gastrocnemius, hamstring and anterior tibialis muscle strength as well as unilateral stance and thus improved postural control. Chair pose increased strength of quadriceps muscle of the participating people.

Finally, we found the age group of 65 yrs and above improve their performance significantly on one leg and were able to walk faster after 30 days programme. Those subjects who had lowest before training showed the most pronounced improvement. Subjects in the training group reported filling much comfortable after training and expressed a desire to continue the yoga. Subject in the training group B (yoga) give better improve balance and gait than group A(physical exercises) giving in age group of 65 yrs and above.

## CONCLUSION

It is concluded from our study that the practice of yoga for 4 weeks is effective in elderly people to improve fall prevention and functional balance. It also improve strength, flexibility, balance have been thoroughly studied. This study showed statistically significant change with relatively short intervention program of yoga.

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