

# Effect of Tai Chi Exercise Versus Pilates on Dynamic Balance and Gait in Elderly - A Comparative Study

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## ABSTRACT

**Background:** Elderly people within the society face plenty of physical & medical problems which make them more at risk of deconditioning & confined to their home and a few of them are impaired mobility, falls, impaired cognition, incontinence, etc. Out of this, falls are common & complex geriatric syndrome. Falls and poor bone health are major causes of disability and accidental home deaths in the older population.

**Aim:** To study the effect of Tai chi exercises versus Pilates on dynamic balance and Gait in elderly.

**Methodology:** A comparative study was conducted on 36 elderly subjects. Subjects were selected according to inclusion criteria & exclusion criteria. The pre assessment was taken before intervention & post assessment was taken after intervention by using TUG, Tinetti Balance Assessment Tool and Cadence. Participants were randomly divided into two groups with n=18 in each group. Group A received Tai chi exercise while Group B received Pilates exercise. The treatment was given for 6 weeks, 3 days/week. Statistical analysis was carried out using paired & unpaired t test.

**Results:** Tai chi & Pilates exercise was effective on improving dynamic balance and Gait in elderly. on intergroup comparison using unpaired t test, there was no significant difference between effect of Tai chi & Pilates exercises (TUG p value =0.1739), (Tinetti p value =0.3378), (Cadence p value=0.3433) which implies both exercises were equally effective on improving dynamic balance & gait in elderly.

**Conclusion:** Tai chi & Pilates were equally effective on improving dynamic balance & gait in elderly, except both could not improve walking velocity as gait improves in qualitatively manner.

**Keywords:** Tai chi, Pilates, TUG, Tinetti, Cadence.

## INTRODUCTION

As age progresses, the degree of body sway increases even in simple postural forms, such as an upright posture, causing elderly individuals to sway more than young adults. An important in balance control with regular exercise is a good strategy with which to successfully reduce the incidence of falls in this population. There are several causes of falls in the elderly like muscle weakness, dizziness, hypotension, etc and about 17% of falls in the elderly are because

of loss of balance. It has been found that about 28-35 you look after community dwelling older people above 64years old fall every year and also the falling rates are higher in older women (40% then in older men 28%). Considering the numerous increases in lifetime of the population generally therapeutic interventions directed to the elderly those who provide prevention of falls will eventually result in improvement is quality of life of this a part of the population.<sup>1</sup>

Falls and poor bone health are major causes of disability and accidental home deaths in the older population. Ageing pathology, inactivity, multi morbidities aetiology, with over 200 risk factors identified & it is recommended to identify and assess the leading causes of falls<sup>2</sup>.

Postural stability may also be influenced if there is a tendency to avoid full-weight bearing on the affected limb. As one expects, the risk of falling increases as the number of co-morbidities increase. Physiologic changes of normal aging may increase the risk of falls. For example, with normal aging there is diminished input from the visual, proprioceptive, and vestibular systems, which may result in alterations of balance<sup>3</sup>. Older adults may also have impaired balance recovery due to an age-related decline in the ability to rapidly and efficiently contract the muscles of the lower extremities<sup>4</sup>.

Elderly individuals who have experienced one or more falls may develop fear of falling, which leads to loss of confidence in a person's ability to perform routine tasks, restricted activity, social isolation, functional decline, depression and decreased quality of life.<sup>6</sup> Individuals with fear of falling demonstrated perceived stability limits that are reduced from their actual stability limits and gait changes, including decreased stride length, reduced speed, increased stride width, and increased double support time<sup>7</sup>. There is also an increased risk of falling of older individuals who take four or more medications. The causes of falls in elderly persons are multifactorial and include physiologic changes of aging, frailty, pathologies and environmental and situational factors<sup>8</sup>. Maintaining postural control requires a complex integration of sensory inputs, central processing, motor coordination and musculoskeletal function, which decrease with aging. Management and prevention of falls focus on maintaining mobility and balance, and identifying those at risk of fall for multidisciplinary

assessment and intervention of loss of balance and gait in elderly people.<sup>9</sup>

The movement pattern of martial art is exclusive among other therapeutic interventions for people with balance impairments. The movement is slow but continuous, that the individual learns a way to move most effectively within the postures and forms. Tai chi is 'posture' or 'form oriented' so that the person learns to use his/her visual or kinaesthetic frame of reference throughout the movement. Therefore, the learner's behaviour emerges from a self-organizing of varied subsystems. It is additionally hypothesized that the martial art movement patterns facilitate specific breathing pattern, which successfully trigger the autonomic system a nervous for self-adjustment, i.e. Homeostasis.<sup>10</sup>

Several studies have verified the effect of Pilates exercise in increasing postural balance by increasing or decreasing body sway. Pilates method developed by Joseph Pilates, combines strength and flexibility training and has become increasingly popular, especially in rehabilitation programs. One of the main objectives in Pilates is to strengthen the core muscles, also known as the 'Power house'. This triggers stabilization of the back and pelvic muscles, maintains adequate spinal alignment against Gravity, and provides support for limb movements. Several studies shown that when applied to the elderly, Pilates improves strength, mobility, coordination, balance.<sup>11</sup>

So the present study aim to compare effect of Tai chi exercise & Pilates in improving dynamic balance and gait in older adults, thus identifying alternative therapeutic approach to prevent falls & promoting functional independency.

## **MATERIALS & METHODS**

### **Methodology**

1. **Study Design:** Comparative study
2. **Sample Size:** 36
3. **Study Setting:** Old age Home in & around Jalgoan

4. **Study Duration:** 6 months
5. **Sampling Method:** simple random sampling (odd even method)
6. **Target Population:** Young Middle old Elderly.

#### **Inclusion Criteria:**

1. Subjects who are willing to participate
2. Subjects with young and middle age old people.
3. Balance difficulty because of ageing only.
4. Difficulty in walking
5. Both Gender

#### **Exclusion Criteria:**

1. Any cognitive, hearing impairment & poor vision.
2. Any underlying neurological / vestibular disorders affecting balance and gait.
3. Limb length Discrepancy
4. Severe Musculoskeletal problem e. g (Ankylosing Spondylitis, Severe Osteoporosis.
5. subjects who are not able to perform all exercises

#### ✓ **Appropriate Subject Withdrawal Criteria:**

Participants who were not willing to participate or not able to perform tests included in the study were given complete freedom to withdraw from the study as mentioned in consent form.

#### **Materials**

- Pen
- Patient Evaluation Sheet
- Informed consent
- Measuring tape
- Tinetti balance and Gait Scale
- Chair
- Stopwatch
- Swiss ball
- Exercise Mat

#### **Outcome Measures**

1. Time up & go test Reliability= (ICC)= 0.92,0.99, Validity= r= .75
2. To determine fall risk and measure the progress of balance, sit to stand and walking.

#### **Method**

- Patients wear their regular footwear and can use a waling aid, if needed.
- The patient starts in a seated position
- The patient stands up on therapist's command: walks 3 meters, turns around , walks back to the chair and sits down
- The time stops when the patient is seated.
- Be sure to document the assistive device used.
- The practice trial should be completed before the timed trial.
- Observe the patient's postural stability, gait, stride length and sway.

Gait Parameters- Cadence -Number of steps per minute.

#### **Variables:**

##### **Dependent variables**

1. Age
2. Gender
3. TUG
4. Tinetti Balance Assessment Tool.
5. Cadence

##### **Independent Variables**

1. Tai chi exercise
2. Pilates

#### **STATISTICAL TESTS**

1. Paired 't' test for intragroup comparison
2. Unpaired 't' test for intergroup comparison

#### **PROCEDURE**

- Ethical clearance was obtained from the institutional ethical clearance. Informed consent was obtained from participants who was willing to participate.
- Subjects were screened according to the inclusion and exclusion criteria. Those who meets inclusion criteria & fit for protocol were selected for the study.
- A written consent was obtained from selected participants. The purpose and procedure of the study was explained to participant
- Total 38 subjects were included in the study.
- The subjects were equally divided into two group i.e group A- Tai-chi (n=18),

- group B- Pilates (n=18) using simple random sampling odd even method.
- Subjects were assessed using TUG, Tinetti Balance Assessment Tool.
- Both groups received intervention for 6 weeks, 3 days/week. After completion of intervention post outcome measures were recorded.
- **Group A- Tai chi exercise and Group B- Pilates**
- The pre assessment will be taken before intervention & post assessment will be taken after intervention by using TUG, Tinetti Balance Assessment Tool and Cadence.

- **Tai chi exercise**
- **Commencing form**

Form 1: Commencing form Pre-commencing stance: feet together with both knees unlocked, arms at sides, facing forward.

**Step 1:** with a slight weight-shift to the right, left foot takes a half-step to the left, so that the feet are at shoulder's width apart. Toes point forward and arms hang naturally alongside the body.

**Step 2:** slowly raise both arms up, elbows unlocked, to shoulder level, keeping the palms facing downward

**Transitional movement:** slightly lower both arms while bending legs.

**Repulse monkey** (right side, left side)

Form 2: Repulse Monkey

**Step 1:** from the transitional movement described above, move the right hand downward in a semicircle to shoulder level with the palm facing up. The left arm remains in position, but the left wrist now twists slightly so that the palm faces up. Shift the body weight gradually to the left foot as the arm movements are being executed.

**Step 2:** Now push the right hand forward with the body weight simultaneously shifting to the right side while the left arm lowers in a downward arch, passing the left hip and ending at the shoulder level. Repeat these movements twice on each side.

**Transitional movement:** the Repulse Monkey form finishes up in a ball holding position with hands on the right side.

**Grasp peacock's tail.: Form** Grasp Peacock's Tail This form consists of four parts: 1. Ward-off; 2. Pull back; 3. Press; and 4. Push. **Step 1:** from the above ball-holding position, turn the left

- The subjects will receive intervention for thrice a week for 6 weeks in both groups, Group A and Group B.

- **Group A-Tai chi exercise**

- **Tai chi Warmup exercise**

1. Single hand circle (Rotating shoulder, elbow, wrist)
2. Double hand circle
3. Alternative hand circle
4. Foot circles
5. Round waist
6. Rotate knee

Along with this exercise, continuously breathe in and breathe out



foot away from the midline of the body (towards left side), then turn the upper body 45° to the left. Move the left hand forward arriving at eye level while pressing the right hand down obliquely to the side of the right hip with the palm facing downward. This completes Ward-of

**Step 2:** turn torso slightly to left while moving the right hand forward to almost meet the extended left hand. Then, pull both hands down in a curve past the abdomen, until right hand is extended sideways at shoulder level with the elbow bend upward; the right hand then joins the left hand in front of the chest. This completes Pull back.

**Step 3:** with the weight seated on the (rear) right foot, pull both hands downward to abdomen, then push forward both hands with shoulders relaxed and elbows dropped. This completes press.

**Step 4:** at the end of Press, extend both hands and palms outward and forward. This completes Push.. Repeat all four mini-forms on the right side.

#### Moving hands like moving clouds.

**Step 1:** from the end of Form 3, move both arms (45°) to the left side and simultaneously shift the weight into the left leg. Then, move right hand in an arc past one's face with palm facing the body, while left hand moves downward

**Step 2:** turn torso gradually to the left with the weight shifting onto left leg. Simultaneously, move left hand upward with the palm facing the body, to pass the left shoulder. The right hand twists and starts its swing downward (palm faces the body), following the direction of the left hand. The right leg joins the left leg. Repeat this movement three times.

**Transitional movement:** the Move Hands like Moving Clouds form finishes with a ball-holding position of hands on the right side (near the hip).

#### Fair lady works at shuttles.

**Step 1:** from the end of Form 4, step out (45° to the left) with left foot. Left hand moves upward to block (an opponent) while the right hand and right palm pushes forward and outward. **Step 2:** Now drop the right hand. Step out (45° to the right). Right hand moves upward to block (an opponent) while the left hand pushes forward.

#### Golden cock stands on one leg.

**Step 1:** drop the left and right hands and slowly move one's weight to the left foot. Move the right arm upward and lift the right leg (as if it were on a string). The left arm is simply at the side of the left thigh. **Step 2:** return to a standing position with feet shoulder



width apart, weight evenly balanced. Repeat Steps 1 and 2 on the right foot.

**Brush knees and twist steps.**

**Step 1:** turn torso slowly to the right as right hand circles upward and outward about ear level. Arm is slightly bent and palm faces upward (as if holding a violin). Left hand follows the direction of the right hand.



**Step 2:** turn torso to the left as left foot takes a step in a forward direction. At the same time, left hand pushes forward passing knee, while right hand pushes forward, palm facing away from body. Repeat this for the right knee.

**Closing form.**

**Step 1:** from the end of Form 7, bring left foot forward to place it next to the right foot with knees slightly bent (unlocked). At the same time, move both hands upward to face level (palms facing body), ending with both hands crossed in front of chest. **Step 2:** straighten both legs. Turn wrists forward, so that palms now face downward; lower both hands gradually alongside the body. Look straight ahead.

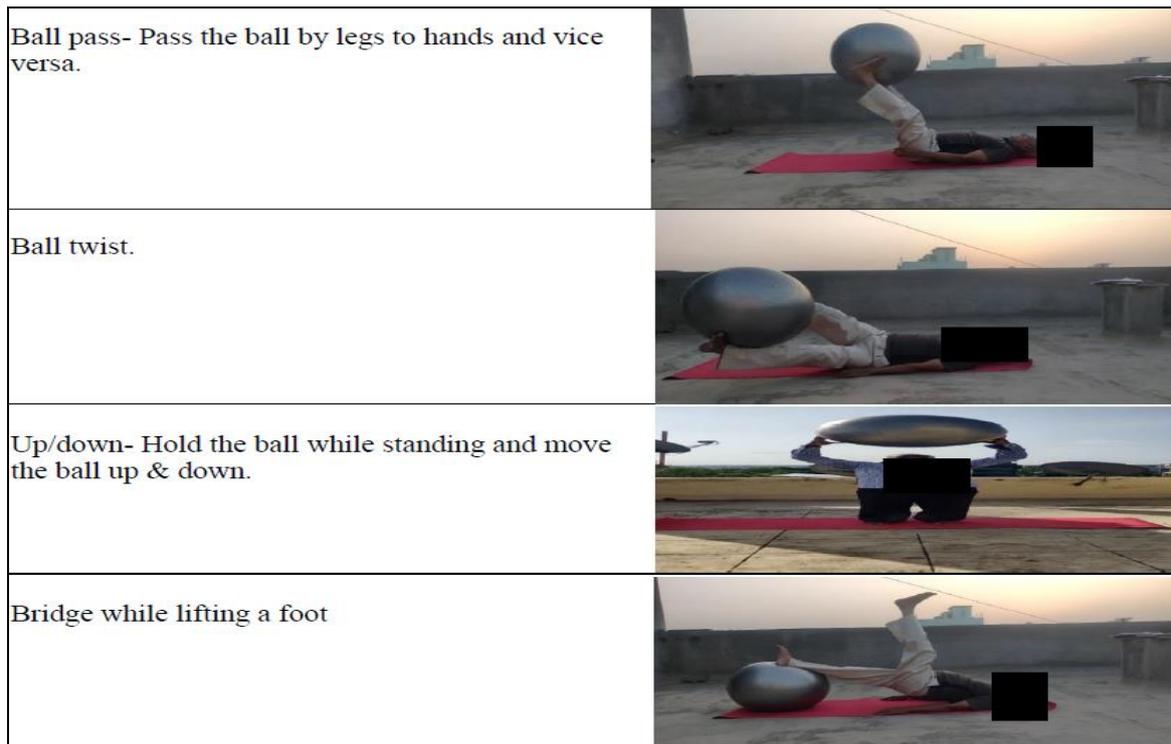


**Tai chi Relaxation exercise**

1. Move your hands in the air, slowly breathe in and out in the direction Up and Down.
2. Lock your both the hands and stretch the hands upwards.
3. Twist your waist to the right side and then left side.

Pilates is done by improving & including variations in exercise week by week

<p>Elevate the ball using upper limbs in supine position.</p>	
<p>Move the ball laterally to the right and left with the heels in supine position.</p>	
<p>Circle using legs in supine position</p>	
<p>Bridge</p>	
<p>Flex elbow against the wall.</p>	
<p>Sit on the ball ,hands straight at the line of shoulders &amp; move your body side to side.</p>	



## RESULT

The entire data of the study was entered and cleaned in MS Excel before it was statistically analyzed in “GraphPad InStat version 3.05”. All the results are shown in tabular as well as graphical format to visualize the statistically significant difference more clearly. The statistical significance of difference of pre-treatment and post-treatment quantitative characteristics in study group (intra-group comparisons) was tested using paired ‘t’ test, after confirming the underlying normality assumption of pre and post-treatment difference of parameters. The statistical significance of difference between Group A & Group B was tested using unpaired ‘t’ test. Total 38 subjects were included in this study. Out of 38, in Group A, there were 12 Male and 6 female, and in Group B there were 9 Male and 9 Female. For within group comparison Group A Pre-treatment TUG, Tinetti, Cadence and Post – treatment TUG, Tinetti, Cadence within

group ‘paired t test’ was used. The results in the present study shows that Tai chi is effective in improving dynamic balance (TUG p value <0.0001) and Gait (Tinetti p value <0.0001), Cadence (p value 0.0063) in older adults.

For within group comparison Group B Pre-treatment TUG, Tinetti, Cadence and Post-treatment TUG, Tinetti, Cadence within group ‘paired t test’ was used. This results in the present study shows that Pilates is effective in improving dynamic balance in TUG (p value <0.0001) and Gait Tinetti (p value <0.0001), Cadence (p value 0.0131) in older adults.

Intergroup comparison between Group A and Group B ‘unpaired t test’ was used. This results in the present study shows that TUG (p value 0.1739) Tinetti (p value 0.3378, Cadence (p value 0.2684). The study shows that Tai chi and Pilates are not statistically significant in improving dynamic balance and gait in elderly.

Table1) Comparison of mean between pre – treatment & post treatment for Time Up and Go test (TUG)in Group A.

TUG	INTERVENTION	TUG mean	t value	p value	significance
TUG	Pre treatment	27.05±11.6	4.818	<0.0001	Extremely significant
	Posttreatment	23.77±10.4			

Values are Mean  $\pm$  Standard deviation. P- values are obtained using paired t- test, after confirming the underlying normality assumption. P-value  $<0.05$  is considered to be statistically significant.



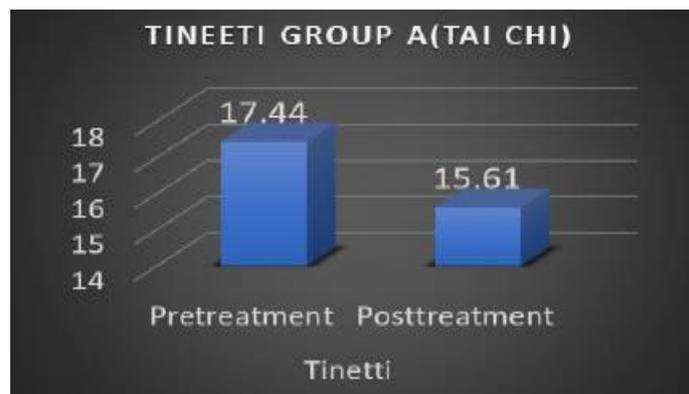
Graph 1) Comparison of mean between pre- treatment & post treatment for TUG in Group A

**Comments (Intra -Group comparison)**

P value is  $<0.0001$ . This implies that TUG score has improved and was extremely significant to improve dynamic balance and gait in elderly in Group A(Tai chi).

Table 2) Comparison of mean between pre-treatment & post treatment for Tinetti Balance Assessment Tool in Group A

Tinetti	Intervention	Tinetti mean	t value	p value	significance
Tinetti	Pre treatment	17.44 $\pm$ 4.42	4.808	$<0.0001$	Extremely significant
	Posttreatment	15.61 $\pm$ 4.38			



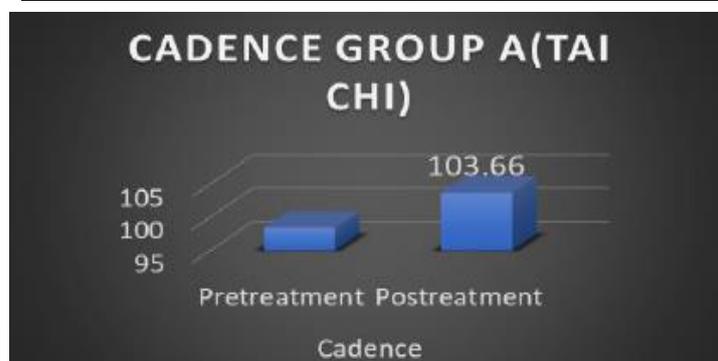
Graph 2) Comparison of mean between pre-treatment & post treatment for Tinetti in Group A

**Comments (Intra-Group comparison):**

P value is  $<0.0001$ . This implies that Tinetti score has improved and was extremely significant to improve dynamic balance and gait in elderly in Group A(Tai chi)

Table 3) Comparison of mean between pre-treatment & post treatment for Cadence in Group A.

Cadence	Intervention	Tinetti mean	t value	p value	significance
Cadence	Pre treatment	99.38 $\pm$ 9.53	2.177	0.0219	significant
	Posttreatment	103.66 $\pm$ 8.41			

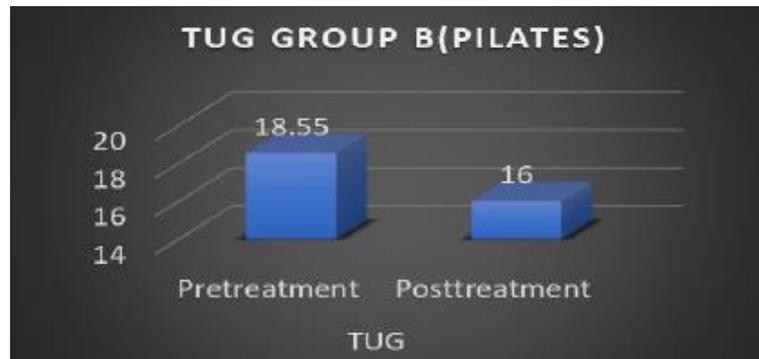


Graph 3) Comparison of mean between pre-treatment & post treatment for Cadence in Group A.

**Comments (Intra-Group comparison):** P value is 0.0063 . This implies that Cadence score has improved and was significant to improve dynamic balance and gait in elderly in Group A(Tai chi).

**Table 4) Comparison of mean between pre-treatment & post treatment for TUG in Group B.**

TUG	INTERVENTION	TUG mean	t value	p value	significance
TUG	Pretreatment	18.55±8.35	7.617	<0.0001	Extremely significant
	Posttreatment	16.7±7.53			

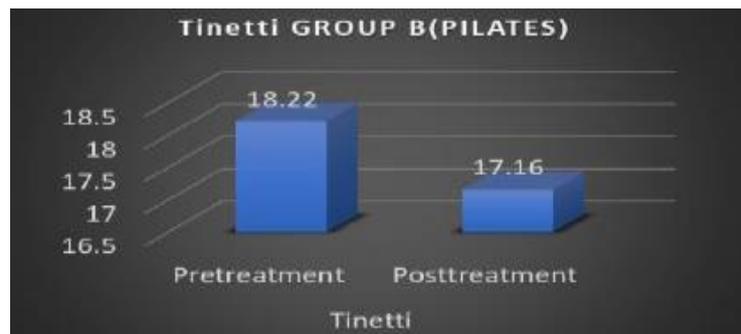


**Graph 4) Comparison of mean between pre-treatment & post treatment for TUG in Group B**

**Comments (Intra – Group comparison):** P value is <0.0001. This implies that Cadence score has improved and was extremely significant to improve dynamic balance and gait in elderly in Group B (Tai chi).

**Table 5) Comparison of mean between pre-treatment & post treatment for Tinetti in Group B**

Tinetti	INTERVENTION	Tinetti mean	t value	p value	significance
Tinetti	Pretreatment	18.22±4.09	2.257	<0.0001	significant
	Posttreatment	17.16±3.73			

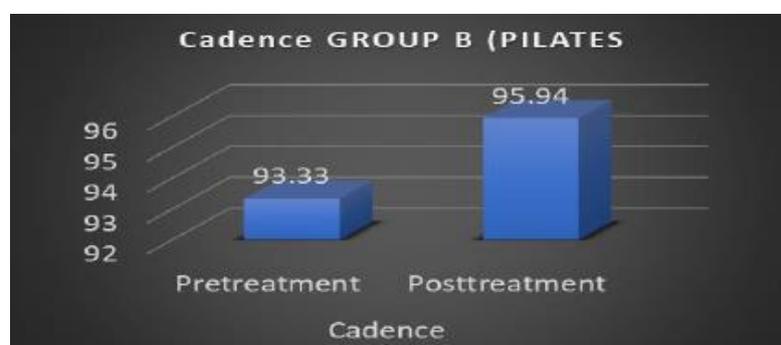


**Graph 5) Comparison of mean between pre-treatment & post treatment for Tinetti in Group B**

**Comments (Intra -Group comparison):** P value is <0. 0001.This implies that Tinetti score has improved and was extremely significant to improve dynamic balance and gait in elderly in Group B(Pilates).

**Table 6) Comparison of mean between pre-treatment & post treatment for Cadence in Group B**

Cadence	INTERVENTION	Cadence mean	t value	p value	significance
Cadence	Pretreatment	93.33±16.7	1.249	0.1144	not significant.
	Posttreatment	95.94±13.1			



**Graph 6) Comparison of mean between pre-treatment & post treatment for Cadence in Group B.**

**Comments (Intra – Group comparison):** P value is 0.1144. This implies that Cadence score has improved and was not significant to improve dynamic balance and gait in elderly in Group B(Pilates).

**Table 7) Comparison of mean between Group A & Group B for TUG group.**

TUG	PRE-POST Mean	TUG mean± SD	t value	p value	Significance
TUG	GROUP A	3.277±2.88	0.9522	0.1739	Not significant
	GROUP B	2.555±1.42			

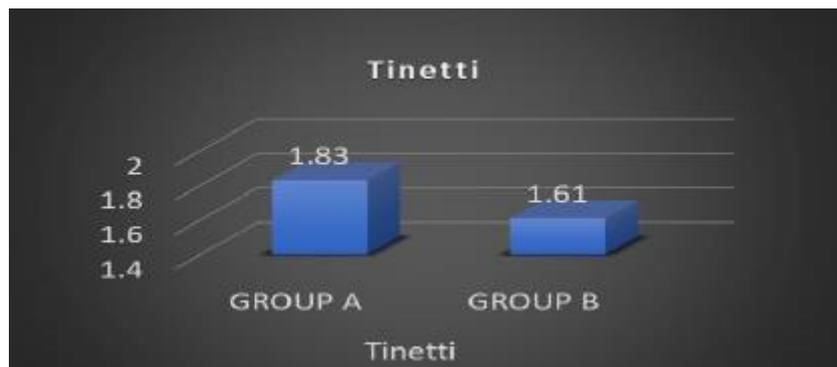


**Graph 7) Comparison of mean between Group A & Group B for TUG.**

**Comments (Inter-Group comparison):** On intergroup comparison using unpaired t test, there is no significant difference between two groups (p value 0.1739) which implies that both groups were equally effective on improving dynamic balance.

**Table 8) Comparison of mean between Group A & Group B for Tinetti group.**

Tinetti	PRE-POST Mean	Tinetti mean	t value	p value	Significance
Tinetti	GROUP A	1.83±1.61	0.4222	0.3378	Not significant
	GROUP B	1.61±1.53			

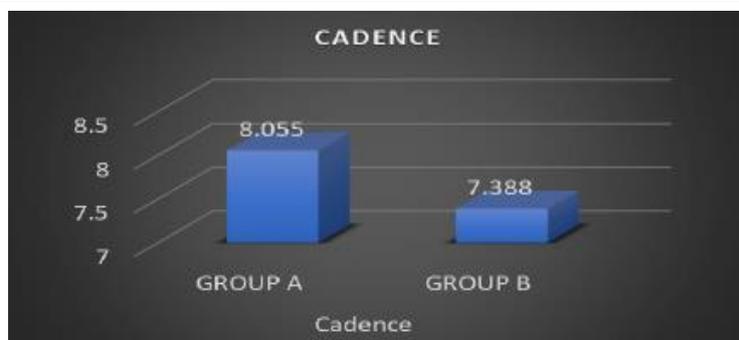


**Graph 8) Comparison of mean between Group A & Group B for Tinetti.**

**Comments (Inter-Group comparison):** On intergroup comparison using unpaired t test, there is no significant difference between two groups (p value 0.3378) which implies that both groups were equally effective on improving dynamic balance.

**Table 9) Comparison of mean between Group A & Group B for Cadence group.**

Cadence	PRE-POST Mean	Tinetti mean	t value	p value	Significance
Cadence	GROUP A	8.055±4.49	0.4069	0.3433	Not significant
	GROUP B	7.388±5.30			



**Comments (Inter – Group comparison):** On intergroup comparison using unpaired t test, there is no significant difference between two groups (p value 0.3433) which implies that both groups were equally effective on improving dynamic balance.

## DISCUSSION

The main objective of the present study was to determine whether Tai chi or Pilates training was better on improving dynamic balance and gait in elderly people. Total 36 subjects, elderly people matched the inclusion criteria were recruited in to this study. They were divided into 2 groups (18 each). Group A consists of 18 subjects for Tai chi training and Group B consists of Pilates training to improve dynamic balance and gait in elderly people. Outcome measures used were TUG (Time Up and Go test), Tinetti Balance Assessment Tool & Cadence.

In Group A-. There were 12 Males and 6 Females and in Group B - 9 Males and 9 Females.

There was no dropout from the study.

### VARIABLE 1- TUG (Time Up and Go test)

#### Group A:

Using paired t test for analysis on data (n=18) the mean of pre-treatment TUG score was  $27.05 \pm 11.6$  and post-treatment was  $23.77 \pm 10.4$ . On comparing score with paired t test, the p value obtained was  $<0.0001$  which implies that it is statistically extremely significant. This means that the TUG score was more improved in post-treatment.

One of the possible causes for the improvement in balance with practicing Tai Chi observed in this study may be explained by the training characteristics that seek to control the displacement of the centre of body mass with postural alignment and range of motion of the joints of the lower body.

As a result of practising Tai chi, due to its diversity of movements there is improvement in proprioceptive mechanisms, coordination, balance & gait stability. Thus, Tai Chi may help reduce the occurrence of falls by improving the ability of postural control, especially in altered somatosensorial situations, including visual and vestibular adverse conditions. One of the reasons that helped in the process of improving balance by practicing Tai Chi is

the positioning of the legs, which need to be flexed, transferring the weight from one limb to the other while performing the exercise.

#### Group B:

Using paired t test for analysis on data (n=18) the mean of pre-treatment TUG score was  $18.55 \pm 8.35$  and post-treatment was  $16.7 \pm 7.53$ . On comparing score with paired t test, the p value obtained was  $<0.0001$ .

Pilates exercises are very useful to improve body balance at advanced ages. When considering the mechanisms resulting in the improvement of body balance after Pilates exercise, strengthening of the trunk and peri pelvic muscles in the sense of the "powerhouse" is certainly an important measure to stabilize posture and gait pattern, with the concomitant effect on maintaining equilibrium, Isabela P. Coriolano Appell 2012) & also trunk stability and strength could enhance old people mobility and functionality, favouring the development of daily physical activities and reducing the risk of falling (Granacher et al., 2013).

### VARIABLE 2- Tinetti Balance Assessment Tool

Group A - Using paired t test for analysis on data (n=18) the mean of pre-treatment Tinetti score was  $17.44 \pm 4.42$  and post-treatment was  $15.61 \pm 4.38$ . On comparing score with paired t test, the p value obtained was  $<0.0001$ .

Tai Chi exercise can significantly increase the knee extensor and flexor muscle strength and bone mineral density among older adults. Chan K, Qin L, Lau M, et al.(2004). Decreased risk and fear of fall (Kessenich, 1998; Province et al., 1995; Taggart, 2001) probably are linked with joint stability and better postural control that also contribute to the mental health benefits. Electromechanical delay is the time lapse between the onset of muscle electrical activation and onset of torque production from muscle contraction, reflecting both electrochemical and mechanical processes of muscle contraction.

Numerous authors have reported increased electromechanical delay in older adults compared with young individuals for muscles of the lower limb, including the hip abductors. Age-dependent increases in electromechanical delay of hip abductor muscles is a likely mechanism underlying increased risk of falls to the side because it contributes to a longer reaction time. Reducing falls to the side is particularly important because this is the direction of fall most likely to result in hip fractures in older adults. Age-related slowing of motor signals would likely impair the nervous system's ability to activate an appropriate muscle contraction in response to balance perturbation. A 20% decrease in electromechanical delay time was observed following Tai Chi intervention in this study. Jason R. Wingert,(2020).

**Group B:** Using paired t test for analysis on data (n=18) the mean of pre-treatment Tinetti score was  $18.22 \pm 4.09$  and post-treatment was  $17.16 \pm 3.73$ . On comparing score with paired t test, the p value obtained was  $<0.0001$ . The improvement of the dynamic balance after the intervention of the Pilates method, which can be justified by the increase of muscle strength, proprioception and gait<sup>26</sup>. Furthermore, it is stated that the training of peripheral, abdominal and spinal muscles influences the improvement of posture and consequently the body balance.<sup>26</sup> Moreover, this technique helps to strengthen the abdominal muscles, which are important for a good posture. The strengthened abdominal muscles reduce anterior pelvic inclination, common in this age group, thus improving gait

### **VARIABLE 3- Cadence**

**Group A--** Using paired t test for analysis on data (n=18) the mean of pre-treatment Cadence score was  $98.38 \pm 9.53$ . and post-treatment was  $95.94 \pm 13.1$ . On comparing score with paired t test, the p value obtained was 0.0063. Muscle strength is increased (Hong, Li, & Robinson, 2000; Lan et al., 1998) through slow, repetitive, and alternating movement of the legs, shifting

the weight from one leg to another in a sequence of movements that, at times, require a single leg stance while maintaining a balanced, upright body position (Liao, 1990; Olson, 1992). Better structural support of the joints is related to less pain and a reduction in anxiety and depression, thus it gives confidence to older adults while walking.

### **Group B:**

Using paired t test for analysis on data (n=18) the mean of pre-treatment Cadence score was  $93.33 \pm 16.7$  and post-treatment was  $95.94 \pm 13.1$ . On comparing score with paired t test, the p value obtained was 0.1144.

Newell, Shead, and Sloane (2012) reported significant improvements in gait speed, step length, and cycle length after 8 weeks of Pilates exercise training in older adults.

Pilates is an exercise method that requires contraction and coordination of multiple muscle groups to achieve better motor recruitment, as well as synchronization of body movements and breathing. Latey P(2002)

## **CONCLUSION**

The study concludes that Tai chi & Pilates was equally effective on improving dynamic balance & gait in elderly. But both exercises could not improve walking velocity as gait improves qualitatively manner.

## **LIMITATIONS**

1. Short term protocol it would be extended up to 12 weeks for lasting effect of both exercises.
2. Follow-up data after cessation of the intervention was not collected. Therefore, the lasting effects after the completion of the Tai Chi and Pilates exercise are unknown.
3. Gender distributions was not equal in both the groups.
4. Future Scope Future study will be undertaken as RCT with control group.
5. Other outcome measure for more accuracy like balance mat, gait rite system can be incorporated.

**Acknowledgement:** None

**Conflict of Interest:** None

**Source of Funding:** None

**Ethical Approval:** Approved

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