



## **EFFECT OF 4 WEEK YOGA PROGRAM ON RETRO-WALKING VELOCITY AND KINESIOPHOBIA IN ELDERLY AGED 60-80 YEARS: A PILOT STUDY**

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Yoga, Kinesiophobia, Retro- walking velocity, TAMPA Scale.

### **ABSTRACT**

**Purpose-** The purpose of this study was to assess the effect of 4 week yoga program on retro-walking velocity and kinesiophobia in elderly aged 60-80 years.

**Method-** A convenient sampling of 46 participants, aged 60-75 years was obtained. The participants perform one hour thirty minute yoga session, led by registered yoga centre everyday for 4 weeks. The retro-walking velocity was used to test functional mobility and TAMPA scale was used to analyze kinesiophobia before and at the end of 4 week.

**Result-** There was a statistically significant difference between pre and post yoga program for kinesiophobia ( $p < 0.0001$ ) and retro-walking velocity ( $p < 0.0001$ ).

**Conclusion-** Yoga may be a beneficial form of exercise in elderly for improving functional mobility and reducing kinesiophobia.

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### **INTRODUCTION**

Ageing is a natural process associated with many structural and functional changes (Choudhary A *et al*, 2019). It also affects physical status, cognitive behaviour, perceived sensation, thinking process and social activities (Choudhary A *et al*, 2019). The elderly population in India is estimated to increase from 71 million (2001) to 179 million (2031) (Mooventhan A *et al*, 2017). Studies have documented that with increase in age, the level of physical activity is decreasing (Choudhary A *et al*, 2019). Regular physical activity can alleviate many health problems; yet many older adults are inactive (Choudhary A *et al*, 2019). It is widely documented that regular physical activity in elderly can help delaying and preventing a wide range of health problems including cardiovascular diseases, stroke, diabetes and some types of cancer (Choudhary A *et al*, 2019). The ageing process involves physiological, functional, and biochemical changes that reduces one's ability to perform daily activities (Mooventhan A *et al*, 2017). Impaired mobility often leads to disability involving activities of daily living (ADL's) reduce quality of life (QOL) and increased mortality (Groessler EJ *et al*, 2018). One third of people aged 65 years and older experience a fall each year (Nick N *et al*, 2015). The number of fall and severity of injury increases with age (Nick N *et al*, 2015).

Fear of Fall (FOF) exists among 30% of older adults who have never experienced a fall and the rate is doubled in older adults who had at least one fall (Nick N *et al*, 2015).

FOF is linked to reduced participation in daily activities, lower quality of life, depression, decreased social activities and physical weakness (Nick N *et al*, 2015). Slowing of movement with ageing appears to be a universal biological phenomenon and reflect the integrated performance of numerous organ systems. The assessment of gait speed has been described as sixth vital sign with potential to serve as a core indicator of health and function in ageing and disease (Peel NM *et al*, 2012). The decline in walking velocity that comes with ageing appear to differ with direction and is more pronounced in backward walking (BW) than forward walking (FW) (Johansson H *et al*, 2017). Global cognitive function was associated with backward walking only, perhaps due to it being more challenging (Johansson H *et al*, 2017). Being able to take steps backward is crucial when performing activities of daily living (ADL) such as backing up to a chair or moving away from refrigerator door when closing it (Johansson H *et al*, 2017). Backward walking is more sensitive at identifying age-related changes in balance and mobility as compared with forward walking (Carter V *et al*, 2019). Backward walking is a clinical measure of mobility in the older population (Maritz CA *et al*, 2017). Researchers have asserted that the joint motions of FW, especially at the hip and ankle, are similar to the time reversal counterpart of BW (Lee M *et al*, 2013). While the main FW propulsion is generated by the ankle

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planter flexors and the principal BW propulsion is provided by the hip and knee extensors (Lee M *et al*, 2013).

Kinesiophobia or “fear of movement” was defined as a state where an individual experience excessive, irrational and debilitating fear of physical movement and activity as a result of a feeling of susceptibility to painful injury or reinjury (Nor Aziza Ishak *et al*, 2017). When pain is perceived as threatening, pain catastrophising occurs, which may develop pain related fear and anxiety, in turn leads to an avoidance behaviour (Nor Aziza Ishak *et al*, 2017). Avoidance behaviour is a state where an individual withdraws from performing activities such as leisure, work and socializing, which is associated with high level of pain, which may aggravate the painful experience (Nor Aziza Ishak *et al*, 2017). Subsequently, avoidance behaviour as an adaptation to pain would develop disuse, disability and depression (Nor Aziza Ishak *et al*, 2017). There is clear evidence that exercises that challenges balance is considered to be most effective in preventing falls in older people (Youkhana S *et al*, 2016). Yoga is an ancient Vedic science and a way of life which is being increasingly applied in the field of therapeutics (Donahoe-Fillmore B *et al*, 2019). It includes the practice of moral observances (yama), self-disciples (niyama), specific posture (asana), regulated breathing (pranayama), sensory withdrawal (pratyahara), concentration (dharana), meditation (dhyana) and self-realization (samadhi) (Donahoe-Fillmore B *et al*, 2019). Increasing number of elderly population is practicing yoga in recent years and these yogic practices are also reported to promote healthy ageing (Donahoe-Fillmore B *et al*, 2019). A 2012 systematic review with meta-analysis provided preliminary evidence of improvement in strength, aerobic fitness and self-rated health among older people after regular yoga practice (Youkhana S *et al*, 2016). A growing body of research suggested that yoga is readily accepted by older adult and may improve health in this population (Nick N *et al*, 2015). Previous studies have evaluated effect of yoga on balance and FOF (Nick N *et al*, 2015) but there is lack of researches on yoga that focuses on mobility and fear of movement. Thus, the purpose of this study was to evaluate effect of yoga practice on walking velocity and kinesiophobia (Donahoe-Fillmore B *et al*, 2019).

**MATERIALS AND METHODOLOGY**

A pilot study using convenient sampling technique was conducted in elderly population performing yoga for the first time. Participants with pre-existing vestibular impairment, neurological condition, psychological illness, using walking aids and subjects undergoing any other exercise program were excluded from this study. A written informed consent was taken and purpose of the study was explained to each participant. Participants were requested to perform yoga session of one and a half hour daily for 4 weeks. Yoga session consisted of various asanas in standing, supine, prone, sitting and pranayama along with shuddhi kriya.

Retro-walking velocity and kinesiophobia was evaluated pre yoga session. Subjects were asked to walk a 10-m path and the time taken to complete the path was recorded. Walking velocity was calculated using the following formula:

$$\text{Speed (m/s)} = \frac{\text{Distance per meter}}{\text{Time per second}}$$

and Kinesiophobia was assessed using TAMPA Scale (TSK-11) (Peeyoosha Gurudut *et al*, 2020). Revaluation was done for retro-walking velocity and kinesiophobia at the end of 4 weeks of yoga program. Data was collected and statistically analysed by paired t-test.

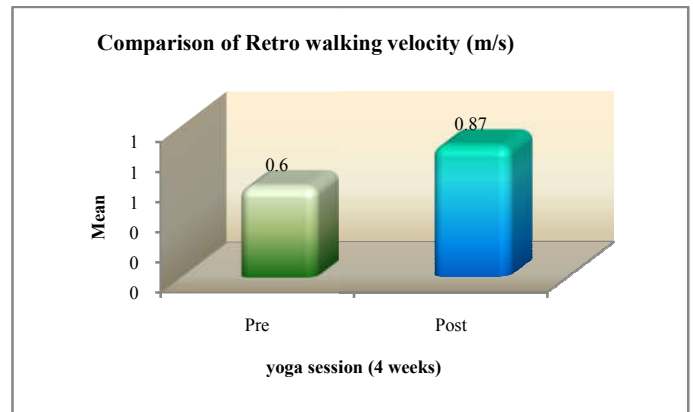
**Data analysis and Results**

**Table 1** Table shows distribution of participants according to age

Age-Group (years)	No. of participants	Percentage (%)
60 – 64	31	67.39
65 – 69	13	28.26
70 – 74	1	2.17
> 75	1	2.17
Total	46	100.00
Mean ± SD	63.28 ± 3.52	
Range	60 – 75	

**Table 2** Comparison of mean value of retro-walking velocity pre and post yoga program

Retro walking velocity (m/s)	Mean	SD
Pre	0.6	0.18
Post	0.87	0.05
t (46) = 5.2158, p value = 0.0001 (significant)		



**Graph 2** Comparison of mean value of retro-walking velocity pre and post yoga program

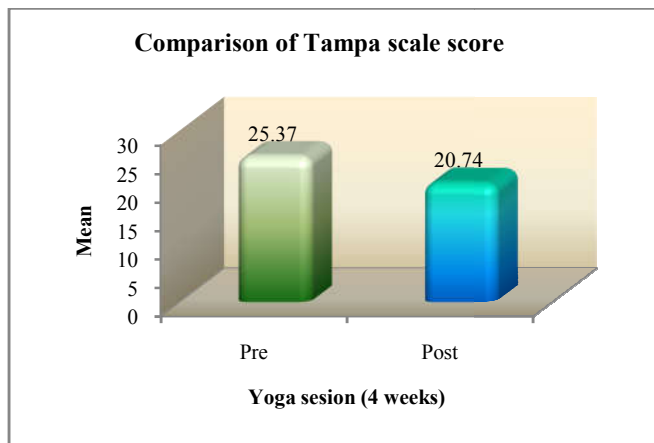
Mean of pre Yoga session Retro - walking velocity (0.60±0.18).

Mean of post Yoga session (4 weeks) Retro - walking velocity (0.87±0.05).

Results obtained (Table 2, Graph 2) suggests that mean retro-walking velocity in participants improved significantly after Yoga practice for 4-weeks (p = 0.0001).

**Table 3** Comparison of mean value of Tampa scale scores pre and post yoga program

Tampa scale score	Mean	SD
Pre	25.37	9.07
Post	20.74	7.79
t (46) = 5.6573, p value = 0.0001 (significant)		



Graph 3 Comparison of mean value of Tampa scale scores pre and post yoga program

Mean of TAMPA scale score pre Yoga session -  $25.37 \pm 9.07$   
 Mean of TAMPA scale score post Yoga session -  $20.74 \pm 7.79$   
 It was observed (Table 3, Graph 3) that pre TAMPA scale score decreased significantly post 4 weeks of Yoga session ( $p=0.0001$ ).

Table 4 All questions in TAMPA scale were assessed for the effect of 4 week yoga session.

Question wise pre and post yoga program Tampa scale scores:

TAMPA Scale Questions	Pre – mean	Post-mean	p Value
1	2.15	1.65	0.0001
2	2.28	1.65	0.0001
3	2.00	1.63	0.0022
4	1.85	1.61	0.0050
5	2.02	1.67	0.0219
6	2.61	2.13	0.0028
7	2.46	1.93	0.0005
8	2.35	2.15	0.1725
9	2.61	2.15	0.0009
10	2.28	1.87	0.0032
11	2.89	2.24	0.0010
TOTAL	25.37	20.74	0.0001

The above table (Table 4) shows question wise scoring of Tampa scale. All the p-Value were found to be significant ( $p < 0.05$ ) except for question no. 8 which was non-significant with p-value of 0.1725 which was  $>0.05$ .

This states that 4 weeks of yoga session has significantly decreased the fear of movement (kinesiophobia) of participants. Also Yoga proved to improve confidence in individuals to perform ADL’s independently and to overcome the avoidance behaviour.

**DISCUSSION**

A Pilot study was carried out on 46 participants to assess effect of 4 weeks yoga program on retro-walking velocity and kinesiophobia in elderly. Result of present study has shown significant difference between pre (mean- 0.6) and post (mean- 0.87) retro-walking velocity. Walking velocity is used as screening test to measure mobility impairment in elderly and also indicate level of functional mobility. It is feasible to perform, simple to administer and require no special equipment’s also easy to record. It mirrors the status of multiple domains and it has also been proposed that decline in physiological function may be better explained by the accumulation of defects in multiple domains rather than by a single specific impairment (M.Montero-odasso *et al*, 2004). Although backward walking has been utilized in other clinical

population this is the first study that has used retro-walking as an outcome measure to assess functional mobility in elderly population performing yoga. Backward walking was more sensitive measure at identifying age related changes in mobility and balance compared with forward walking and it is also a clinical measure of mobility in elderly. During backward walking because of lack of visual clue; Individual requires greater reliance on neuromuscular control, protective reflex, sensory-motor, proprioception and vestibular functions (Maritz CA *et al*, 2017) and it has been known from previous researches that these sensory systems often deteriorate with ageing. To minimize the fear of fall shorter stride length and slower walking velocity were some adaptations made by elderly. Reduced retro-walking velocity is also associated with lower extremity muscle weakness, hip flexion contracture and generalized deconditioning all of which are common with ageing. In backward walking toes contact the ground first and heel is lift off the ground at the end. The foot impact on the ground in early stance is sustained by co-activation of several limb muscle: flexors and extensors at the hip, knee, ankle in forward walking, whereas the same events is accompanied by activity in knee extensors and plantar flexors in BW. Thus, knee flexors are reciprocally activated with knee extensors in BW gait. Researchers have suggested a greater level of energy expenditure and oxygen consumption in BW than in FW. Also it has been known that in kinetic analysis of backward walking, compressive forces of patella-femoral joints are lower as compared to forward walking (Lee M. *et al*, 2013).

Furthermore in backward walking range of motions of all joints were smaller than in FW. Ankle was the main propulsion and shock absorption joint during BW (Lee M. *et al*, 2013).

In current study, different yoga poses were used with emphasis on Pavanamuktasana, balancing asana (Tadasana, Vrukshasana) and Pranayama. Pavanamuktasana are breath-coordinated movement that are safe, rhythmic and stretch repetitive, this helps mobilize the joints (Narjes Nick. *Et al*, 2016) and strengthen periarticular muscles (quadriceps and hamstrings) by increasing proteoglycan content, reduce the synovial fluid pressure which prevent cartilage degeneration (Isha Bhonde *et al*, 2020). Many researchers have proven that yoga practice might prevent synovial fluid deterioration by strengthening and stretching different parts of body, massaging and bringing fresh blood to internal structure of joints (muscle and ligaments) (Isha Bhonde *et al*, 2020). Also, it helps to open up the large joint, maintain body balance and release muscular tension. Yoga requires the stretching of major muscle groups to improve physical strength and mobility .It also improves walking velocity as it increases extension of hip, step length and decreases anterior pelvic tilt (Nick N *et al*, 2015).

Practicing yoga causes stimulation of autonomic nervous system which acts by modulating sympathovagal balance to maintain homeostasis, reduce psychological factors such as stress, mood disturbance, and depression and enhance self-esteem (Isha Bhonde *et al*, 2020).It also improves body’s flexibility, mobility, power and joint plays therefore play an important role in preventing falls (Nick N *et al*, 2015).In current study yoga involves seated, standing, supine as well as prone postures all targeting major muscle groups. Regardless of types of yoga, all yoga posture require the participants to hold and move between a series of stationary positions that use

isometric contraction and relaxation of different muscle groups to create specific body alignment (Neha P *et al*, 2015). It mainly works on increasing body awareness and proprioception, which will lead to improvement of balance in older adult (Peel NM *et al*, 2012).

In the present study, comparing pre mean (0.6±0.18) and post mean (0.87±0.05) of kinesiophobia, statistically significance (p=0.0001) was found. This shows decrease in fear of movement among participants after attending yoga classes. Arlene A, Schmid. *et al* (2010) observed similar finding that yoga may be a promising intervention to improve balance among elderly. It has been scientifically proved that an adequate level of physical activity is necessary for human body system to function in an optimum way. According to a study by oken *et al*, (Patel NK *et al*, 2012) yoga group had improvements in physical measures such as timed one leg standing and forward flexibility as well as quality of life measure related to sense of well-being, energy, and fatigue, compared to aerobic exercise group. Our results concur with previous findings in the literature where researchers have found similar improvements in balance, mobility and flexibility measures following yoga intervention in various pathological conditions. With the increase popularity of yoga and larger number of older adults adopting alternate mode of physical activities, this finding has significant clinical implications (Neha P *et al*, 2015).

## CONCLUSION

This study revealed that yoga can improve physical functioning in elderly and decrease kinesiophobia, which is associated with mobility limitation in older adult. The findings obtained have important clinical implications and many advantages over various forms of therapies. Yoga requires less equipment and can be adapted for individual with lower level of functioning and disability (Choudhary A *et al*, 2019). Also it serves as an alternate form of physical activity in people who are not able to perform stretching and strengthening exercise using free weights and resistance bands (Neha P *et al*, 2015). Furthermore, yoga being physically active, easy and feasible exercise it can help in emotional and physical betterment and ultimately functional wellbeing in the elderly group (Choudhary A *et al*, 2019).

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