

# Yoga in Physical Therapy Reducing Fall Risk in Older Adults

## Clinical Question

Are the holistic benefits of low impact yoga more effective in preventing falls in the older adult population (65 years and over) than traditional strength and endurance training programs in the rehabilitation process?

**Keywords:** Holistic; Endurance; Traditional; Physical therapy; Consequences; Stiffening; Vitamin D; Yoga

## Introduction

A prominent health issue in the older adult population (65 years and older) frequently addressed by the field of Physical Therapy is the risk of falls, and the secondary consequences of falls. Falls are a \$30 billion a year industry within the United States alone [1]. It is projected that falls will cost our country \$43.8 billion a year by 2020 [2]. Aging can lead to changes in the vestibular system and the visual system, a decrease in muscle mass and bone density, increase in postural sway, as well as stiffening of soft tissues within the body [3]. These physiological changes can make an individual more predisposed to falling and susceptible to more serious injuries as a result of a fall. These age-related physiological changes can be more pronounced in an individual who is not physically active and therefore, becomes deconditioned at a faster pace.

Approximately 30 to 40% of community dwelling adults over the age of 65 will experience at least one fall a year [2]. Exercise, and more specifically physical therapy interventions have been suggested to reduce fall risks more successfully in comparison to other interventions like: vitamin D supplementation [1,2], environmental interventions [1,2], surgery [1], and behavioral counseling [2]. Many groups propose exercise guidelines for the older adult population (American College of Sports Medicine, Health and Human Services, and National Institute on Aging). A synthesis of the published guidelines from these organizations put an emphasis on endurance exercises, strength training, stretching or flexibility, and balance training [4]. These types of exercise would be beneficial for the older adult population in reducing the incidence of falls if utilized in a preventive fashion. However, patients who avoid physical activity are less likely to exhibit compliance with such a varied exercise program. Thus, the goal is finding a type of exercise that is appropriate for a deconditioned, aging population that addresses the appropriate physical systems to decrease an individual's risk of falling.

Yoga has been utilized for centuries as a practice promoting physical and mental wellbeing. Yoga includes a variety of physical poses and breathing techniques combined into a practice that can be personalized for the individual. The ability to modify the yoga poses and practice for the individual in a therapeutic manner may allow yoga to be a beneficial intervention. Low impact forms of yoga, such as Hatha or Iyengar [5] may be more effective than

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traditional strength, endurance, and balance training regimens in preventing falls in older adults. In a study conducted by Gardner, Robertson, and Campbell, traditional physical therapy that focused on targeting the quadriceps and ankle strength was unable to reduce the number of falls or fall related injuries in older adults [6]. Less intense forms of Hatha yoga including Iyengar yoga have been studied biomechanically to ensure they do not stress the individual's body. From a biomechanics standpoint, the yoga poses with the largest impact on standing and ambulation challenged hip extensors, knee extensors, and plantar flexors. Yoga has been utilized for centuries as a practice promoting physical and mental well-being [5]. Yoga includes a variety of poses and breathing techniques that can be personalized for the individual. The ability to modify the yoga flow for the individual allows yoga to be utilized in a therapeutic manner to benefit an individual. Less intense forms of yoga such as Hatha or Iyengar have been studied biomechanically to ensure they do not stress the individual's body. Biomechanically, the yoga poses with the largest impact on standing and ambulation challenged hip extensors, knee extensors, and ankle plantar-flexors [7].

As an individual ages, they may lose control of their postural sway. Yoga can be utilized to help develop more awareness and control over where the center of mass is in relation to the body [8]. Falls can occur when an individual's center of mass extends outside the area of the base of support, so utilizing yoga could be beneficial in teaching an individual how to better maintain the center of mass within the supportive base.

Yoga can assist in improving proprioception. Proprioception training can decrease falls by improving coordination and dynamic balance. It can also help by improving the control of postural sway through improving postural stability. Individuals can challenge their proprioception by altering their base of support, visual support and dynamic status through variation of yoga poses. Yoga challenges both unconscious and conscious proprioception [9-

11]. Yoga practices also progress from poses with eyes open to closing the eyes, reducing the reliance of the participant on visual cues [9,12].

Some adult living facilities have started implementing yoga programs oftentimes referred to as Silver yoga. The use of these programs have helped to improve the weight and respiratory rate of participants. Yoga also has data supporting improvements in flexibility, power and endurance with static and dynamic activities [13]. Researchers have proposed other health benefits in doing yoga that could be beneficial to deconditioned patients who are at risk for falling.

## Methods

Each of the articles that were chosen were from either EBSCO Host, Google Scholar, or the BYU Library databases. The following are key phrases that were first searched within the chosen databases: “yoga and physical therapy”, “yoga as therapy”, “yoga as an intervention”, “therapeutic effects of yoga”, “preventing falls in older adults”, and “exercise and fall risk for older adults”. In order to specify the search criteria from the previous searches, the following, more precise, key phrases were used: “yoga in older adults”, “yoga based physical therapy”, “yoga and balance in older adults”, “yoga and older adults”, “yoga versus traditional exercise”, and “yoga and rehabilitation.” By making the search terms more specific, more relevant and appropriate articles that would answer the PICO question were found. To further narrow the results of the searches, only articles that were in full text, peer reviewed, and from scholarly databases were utilized by the group.

## Results

Interventions researched were successful in diminishing the risk of falls in older adults. The search yielded two level one meta-analyses examining the effectiveness of the most commonly prescribed interventions on fall risk in the older adult population. One meta-analysis compared exercise, vitamin D supplementation, environmental interventions, surgery, education, and multi factorial interventions [1]. The other meta-analysis compared multifactorial treatments, single treatments, education or behavioral counseling, home modifications, and exercise or physical therapy interventions [2]. Both meta-analyses suggested the most successful intervention when compared to other prescribed interventions was exercise or physical therapy.

From an extensive search to find the best research to address the PICO question, articles that specifically discussed yoga interventions that would apply to the older generation were examined. Not all of the articles included participants over 65, but all of the evidence found could be reasonably applied to those over 65 years of age. The levels of evidence used spanned the entire spectrum of evidence level one to five, but most of the articles qualified as level two or three evidence. Two additional articles were level one evidence and contributed to the research by referring to yoga improving depression [14], blood pressure [14], strength [15], and flexibility [15]. Six of the articles were level two evidence and explained improvements in flexibility [16-18], strength [7,14], and balance [8,13,14,20]. Three articles, which were level three evidence, contributed information about yoga improving strength [10], BMI [13], weight [13], and blood

pressure [19]. The level four articles [20], also contributed to the research by showing flexibility as an improvement from yoga. Three articles ranked as level five evidence were included to support research showing refinement in balance [4,5,20], strengthening [5], and walking [20] when utilizing a yoga program.

## Discussion

Yoga has been found effective in improving balance [4,7,11,15-18,20,21] strength [5,18,20], and flexibility [14,16-20] as well as to help with blood pressure regulation [13,14], weight control [15,19], and BMI [13,15]. These factors contribute to falls in older adults, so exercise that can target these factors it may reduce the risk of falling in older adults. Two separate meta-analyses suggest that exercise or physical therapy is the most successful intervention diminishing fall risk in the older adult population with little adverse reaction [1,2]. Both meta-analyses used balance training and functional training among strengthening [1,2]. Researchers even suggested that the more intense the exercise regimen with higher rates of adherence to the program led to larger reductions in fall risk [2]. Additional research suggests that exercise when in combination with appropriate patient education may decrease fall efficacy or fear of falling [22]. Individuals in this exercise and education program gained more confidence in their skills to avoid falls. Emphasizing the importance of patient education in conjunction with any physical therapy program.

While there are many different types of yoga, all which have a purpose, Iyengar and Hatha have been deemed as low impact [5]. Because both are considered less intense forms of yoga when compared to astanga and vinyasa, Iyengar and Hatha are specifically more beneficial to the older adult population showing gains in both balance control as well as flexibility [14,16,19,21]. Iyengar and Hatha yoga are both appropriate forms of yoga for those beginning yoga practice. Chen and Tseng [19] found that over a period of four weeks under a Hatha yoga intervention three times a week, participants, all over the age of 60, presented a decrease in BMI, weight, and overall blood pressure. Indicating a positive correlation between adding the practice of yoga into one's exercise regimen and health benefits. Another study of interest concluded that Iyengar yoga for a period of 12 weeks helps reduce the risk of falling in older adults more so than the control group who received a fall prevention booklet only [16]. This suggests that Iyengar yoga may be appropriate as a follow-up to physical therapy interventions to help prevent falls. Results, moreover, support the use of yoga in community-dwelling older adults to help improve postural control, mobility, and walking [16], however, while yoga does provide some gains in strength [10], it does not yield gains as large as other interventions. Further studies correlate the practice of yoga with strength gains. A study performed by Ying-Wang and colleagues provided evidence supporting the use of diverse yoga poses to target different muscle groups (hip extensors, knee extensors, and ankle plantar-flexors) to effectively address balance and ambulatory deficits as well as help strengthen the particular muscle group each pose targets [7]. Greendale et al. [18] addressed specific poses that were most beneficial in yoga asanas, also known as sequences, for patients susceptible to falls [18]. Two series were incorporated into this program. Both asanas included: Chair, Wall Plank, Tree, Warrior II, Side Stretch, Chair Twist, Bridge, and Abdominal Cultivation.

The first series also consisted of: Warrior I, Downward Facing Dog, and Cobra. In addition to the shared poses, the second series also utilized: Crescent, One-Legged Balance, and Recumbent Leg Stretch. All poses were modified with additional support if required by the individual participant. Chair pose strengthens the hips, abdominals and spinal muscles while promoting chest stretching and increased shoulder range of motion. Wall Plank was done in standing to lessen the upper extremity load while strengthening the entire body and improving proprioception. Tree pose challenged both the vestibular and proprioceptive systems involved with balance. Warrior II and I strengthen and stretch the lower extremities. Downward Facing Dog and Side Stretch stretched the hamstring musculature while challenging balance of the participant. Cobra improved range of motion of the spine in extension, specifically lessening the lumbar lordosis which can negatively impact posture. Bridging improved range of motion and strength of hip extensors, back extensors, and abdominal musculature. Crescent and One-Legged Balance challenged balance. One-Legged Balance was progressed through partial weight-bearing using a block, partial weight-bearing through a chair, and lifting the lower extremity unsupported. Recumbent Leg Stretch was performed to stretch the hamstrings in a stable position. Another study by Yu et al. [23] compared the physical demands and muscular activation of two Hatha yoga poses, the Tree and One-Legged Balance, on the lower extremities of healthy seniors [23]. Each of the poses were performed at either an introductory, intermediate, or advanced level two times a week for thirty-two weeks. The results showed that within three planes of motion, the level of difficulty for both poses increased, along with activating more muscle groups. This showed that as the poses progressively increased in difficulty more muscle groups are activated, allowing for better balance among older adults [23]. Static and dynamic balance among the older population is a concern due to the fear of falling. In a study by Silver and Mokha, both static and dynamic balance was measured over a six week yoga training program [24]. After six weeks, the group that received that yoga intervention showed significant increases in both static and dynamic balance. The intervention group was also able to maintain a medial lateral balance through the six weeks, whereas the control group fluctuated [24]. Practicing yoga can help to address balance deficits. It is important to use yoga as an intervention after physical therapy to help maintain and improve both static and dynamic balance among older adults after the cessation of skilled physical therapy. This will help to decrease fear of falling among this population.

As individuals age overall health declines with a marked decrease in strength and flexibility, increasing risk of falls. With a risk of falls, fear of falling arises and deterioration in the overall quality of life is observed. A study performed by Saravankumar found improvements in balance and a marked decrease in the fear of falling with the participants following the yoga intervention provided over a 14 week period [11]. Wood yard reports that yoga can shift the response of the nervous system causing an increase in serotonin levels, which is directly linked to happiness and inversely affecting monamine oxidase (MAO), the enzyme that breaks down serotonin [14]. High levels of MAO are correlated with depression. A fear of falling is also associated with depression due to the fact that an increase in fear inhibits the individual

from enjoying life to its fullest. Additionally, a study performed using Ashtanga-based yoga program determined a substantial increase in the somatosensory and vestibular systems for visually impaired individuals improving postural control, stability, and flexibility [14,17]. Ashtanga-based yoga program is a specific form of modified yoga that involves focus on balance and strength emphasizing abdominals, spinal musculature, hip adduction, hip abduction, and ankle flexibility with dorsiflexion [17]. Jeter et al. [17] discovered with the increases in postural control, stability, and flexibility, participants exhibited a decline in the likelihood of falling. In addition to the physical benefits of yoga, there has been evidence to suggest that yoga is also beneficial to mental health problems like depression, anxiety, stress, and insomnia [14].

There are other types of alternative exercise therapies that are used to help reduce falls in older adults. One of the more popular alternatives besides yoga is tai chi. The data comparing yoga to tai chi is mixed in results, however, both alternatives improve walking speed, balance, postural sway, and dynamic posturography in older adults similarly to traditional balance training [3]. Yoga is gaining in popularity in the United States, which may contribute to higher rates of compliance and long-term higher success rates with patients at risk for falls.

## Conclusion

The research would suggest that yoga could be effective as a preventive measure against falls in the older adult population. Exercise is the best preventative measure that is currently prescribed by the Physical Therapy field and general medical field to prevent older adults from falling. As a type of exercise, yoga is suggested to be a successful preventative to falls. The evidence does not suggest yoga eliciting any detrimental effects in the older adult population. When compared to traditional balance training and other alternative treatments such as tai chi, yoga offers similar or better outcomes. All of the texts hypothesize that these improved outcomes may be a result of higher rates of compliance to the yogic exercise programs, but has little data of compliance rates beyond the time of the clinical trial. Future research would need to be completed examining the use of yoga with physical therapy intervention to decrease falls with a large number of participants. Additionally, future research would need to further examine the qualifications for teaching yoga as a Physical Therapist and what kind of criteria would be required or educating yoga instructors about the intricacies of fall prevention with discharged patients. While there is certainly a lot of research yet to correlate the addition of yoga to traditional Physical Therapy practices with fall prevention in the older adult population, the current evidence is promising.

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