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शोध भूमि

शिक्षा एवं शिक्षण शास्त्र विषय की पूर्व समीक्षित शोध पत्रिका

The Effect of Yoga Based Intervention on Proprioception and Balance in Older Adults : A Review Study

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Abstract

Age-related deterioration in the musculoskeletal, visual, vestibular, and proprioceptive systems substantially affects postural stability and elevates the risk of falls among older adults. Reductions in joint position sense, neuromuscular coordination, muscular strength, and sensory integration collectively impair balance performance and functional mobility, thereby compromising independence and overall quality of life. Given the multifactorial mechanisms underlying balance regulation, comprehensive and integrative interventions such as yoga have gained attention as promising non-pharmacological approaches. Accordingly, the present review critically examines and synthesizes current evidence regarding the impact of yoga-based interventions on proprioception and balance among individuals aged 60 years and above. A comprehensive literature search was conducted in PubMed, ScienceDirect, and Google Scholar for studies published between 2015 and 2025 using predefined keywords and eligibility criteria. Following screening and removal of duplicates, 13 studies were included for qualitative synthesis. The selected studies comprised randomized controlled trials, experimental, quasi-experimental, comparative, and observational designs. The findings consistently showed significant increases in lower extremity strength, joint proprioceptive accuracy, gait parameters, static and dynamic balance, and fear of falling. The Berg Balance Scale, Tinetti Performance-Oriented Mobility Assessment, and Timed Up and Go Test were often used outcome measures. Incorporating physical postures, controlled breathing, and mindful awareness

seems to improve postural stability, center-of-mass control, sensorimotor integration, and psychological confidence.

Keywords: Yoga therapy; Proprioception; Postural balance; Older adults; Fall prevention.

Introduction:

As individuals grow older, noticeable changes occur in both their physical and psychological health. With advancing age, the gradual decline in physical capacity and functional reserve can significantly affect stability, walking speed, muscular strength, and the overall ability to maintain balance. These age-related changes often influence the independence and daily functioning of older adults (De Carvalho, et al., 2017; Yang, et al., 2018). Furthermore, the ageing process is accompanied by progressive deterioration in several bodily systems, including the musculoskeletal, sensory, and neurological systems. Such physiological changes can adversely affect the overall quality of life of older adults by impairing balance, restricting safe mobility, and increasing the risk of falls. Consequently, maintaining functional stability and mobility becomes a major concern in the ageing population (Berg, 1989).

Over the past five decades, India the world's second most populous country has experienced a significant demographic shift, largely driven by a substantial increase in the population aged 60 years and above (Government of India, 2011). Projections suggest that the proportion of India's population aged 60 years and above is expected to rise from 7.5% in 2010 to approximately 11.1% by 2025 (Raja & Balaji, 2024). India's elderly population is anticipated to reach about 158.7 million by 2025 (United Nations, 2008). Older adults are more vulnerable to falls and related injuries due to age-associated changes in multiple physiological systems, which often lead to a decline in balance function (Viljanen et al., 2009). Balance refers to the capacity to maintain postural stability by controlling body position, thereby ensuring a stable base of support during both static positions and dynamic movements (Saravanakumar et al., 2014). Impairment in balance can reduce independence in performing activities of daily living and limit mobility, while also increasing the risk of falls during changes in body position (Lee & Scudds, 2003).

A technical definition of balance is the ability to control the body's centre of mass (CoM) within the base of support or a changing base of support while upright and performing activities (Berg & Kairy, 2002). Maintaining balance depends on the coordinated functioning of several systems, including the neuromuscular, proprioceptive, vestibular, and visual systems. Balance in older adults requires particular attention due to its crucial role in maintaining functional mobility and ensuring safety in daily activities. Research has indicated that impaired balance is a significant factor contributing to the increased risk of falls among the elderly population (Berg, 1989). Approximately one in three adults aged 65 years and above experiences a fall each year (Tromp et al., 2001).

Proprioception is a crucial component of voluntary motor control, since it provides an updated schema of the body and its loss can substantially affect motor behaviors (Carranza et al., 2025). Proprioception, defined as limb and joint awareness is particularly important for upright function as it is normally the body's first line of

defense against falls. Unfortunately, proprioception decreases with certain neurological pathologies and may decrease with age (Olson et al., 2024). The term proprioception was first introduced by Sherrington (1906), to describe the process of receiving and analyzing information concerning body position through continuous feedback to the central nervous system from receptors in the joints (Sherrington, 1906).

The benefits of yoga for the elderly are wide-ranging. Regular yoga practice has been associated with improvements in energy levels, muscle tone, flexibility, fine motor coordination, postural alignment, and cardiovascular fitness. Furthermore, yoga can enhance attention, concentration, emotional regulation, and relaxation (Donahoe-Fillmore & Grant, 2019). Importantly, yoga with its slow and mindful movements targets multiple non-fall risk factors—such as reduced strength, flexibility, poor mobility, and diminished proprioception—making it especially suitable for improving balance and confidence in older adults (Karthi & Sharad, 2021).

Search Strategy

This review carried out a thorough search of the literature to explore the relationship between Yoga practice and its effects on Proprioception and balance in older adults. Well-established databases such as PubMed, ScienceDirect, and Google Scholar were searched to identify studies published between 2015 and 2025.

The search used combinations of keywords such as “Yoga” AND “Older adults,” “Yoga” AND “Proprioception,” “Yoga” AND “Balance”. This search identified 673 studies from PubMed and 55 from Science Direct and 382 from Google Scholar.

Only English-language journal articles that examined Yoga practice as an independent intervention were included in this review. Studies that combined Yoga practice with other practices as well as review articles, conference abstracts, editorials, studies without accessible abstracts, and non-English publications, were excluded.

Search Outcome

This review initially identified a substantial number of studies across the selected databases. After removing duplicates and applying the inclusion and exclusion criteria, 13 studies were selected for detailed analysis.

These included a mix of study designs: Six-randomised controlled trials, three experimental trials, two quasi-experimental one comparative study, and one Observational study.

All the included studies focused on older adults aged 60 years and above, with outcome measures primarily related to proprioception and balance.

The final synthesis evaluated the effectiveness of Yoga practice in improving proprioception and balance in older adults, thereby emphasizing its potential role as a complementary therapeutic intervention in this population.

Yoga: Principles and Practices

Yoga is a holistic psycho-somatic and spiritual discipline that aims to establish harmony among the mind, body, and spirit, ultimately guiding individual consciousness toward union with universal consciousness (Ali et al., 2012). Rooted in ancient Indian philosophical traditions, yoga integrates philosophical principles with practical techniques designed to promote holistic well-being. These practices include physical postures (asanas), controlled breathing (pranayama), and meditation, which together

help cultivate focused awareness while enhancing both physical and psychological health (Verma et al., 2023). Yoga integrates physical postures, regulated breathing techniques, and focused mental awareness to provide a holistic approach to improving overall well-being. This practice contributes to physical fitness, mental clarity, emotional stability, and spiritual development (Tiwari et al., 2023).

In India, several forms of yoga are widely practiced, including Hatha Yoga, Raja Yoga, Jnana Yoga, Integral Yoga, Karma Yoga, Bhakti Yoga, Mantra Yoga, Kundalini Yoga, Sahaja Yoga, and Laya Yoga, among others. Among these, Hatha Yoga primarily involves the practice of asanas (physical postures), pranayama (breathing techniques), and kriyas, which include purification methods such as breathing cleansing techniques and the shatkarmas, a group of six purification practices (Tandon & Tripathi, 2011). Around 900 BC, the ancient sage Patanjali systematized the philosophy of yoga and introduced the eightfold path known as Ashtanga Yoga. Integral Yoga combines various elements such as Hatha Yoga, meditation, and pranayama. In the Indian subcontinent, Integral Yoga is also referred to as the “Yoga of Transformation” (Ali et al., 2012).

Age-related changes in sensory systems

Effects of visual changes on balance:

The visual system plays an essential role in maintaining balance and supporting spatial orientation (Kahiel et al., 2021). It provides essential information regarding the position and movement of the body in relation to the surrounding environment. However, when visual input becomes impaired, it can contribute to balance disturbances and increase the likelihood of falls, particularly among older adults. Age-related visual changes that may influence balance include reduced depth perception, narrowing of the visual field, decreased visual acuity, lower sensitivity to light, and difficulties in visual tracking (O’Connell et al., 2017). As a result of these changes, older adults may become increasingly difficult to accurately perceive the distance between themselves and surrounding objects (Grant et al., 2020). This impaired depth perception can lead to misjudgment of steps, curbs, or uneven surfaces, thereby increasing the likelihood of tripping and falling.

Visual acuity, which refers to the clarity or sharpness of vision, also tends to decline with advancing age. Reduced visual clarity can make it more difficult to detect obstacles, curbs, or potential hazards in the environment, which may further contribute to balance difficulties (Wang et al., 2024). Moreover, some older adults develop increased sensitivity to bright light or glare, which can interfere with clear vision in certain environments, which may negatively influence balance and stability. In addition, impaired visual tracking resulting from age-related visual changes or certain neurological conditions can also affect balance, particularly during activities that require coordinated head or eye movements (Srulijes et al., 2015).

The effect of the vestibular system on balance:

The vestibular system plays an essential role in maintaining balance and spatial orientation. It is a complex sensory system located within the inner ear that detects head movements and changes in head position relative to gravity. The information generated by this system is crucial for coordinating body movements and stabilizing vision during head motion (Shou et al., 2003). Anatomically, the vestibular system mainly consists of

three fluid-filled semicircular canals horizontal, anterior, and posterior along with the otolith organs and the vestibular nerve pathway, which connects the brainstem to the cerebellum. When the head moves in any direction, the fluid within these canals shifts, stimulating specialized hair cells that send signals to the brain regarding the direction and speed of head movement (Shou et al., 2003).

Functionally, the vestibular system functions in close coordination with the visual system to maintain stable vision during head movements. It enables the eyes to remain focused on a target while the head is moving, thereby ensuring clear and stable vision. Additionally, the vestibular system continuously provides the brain with information regarding the body's position and movement in space. This integrated sensory input plays a crucial role in many everyday activities, including maintaining upright posture, walking, running, and performing more complex movements such as dancing and various sports (Wang et al., 2024)

The effect of proprioception on balance:

Humans have the ability to sense their body position, movement, and orientation in space, a capability known as proprioception. This system relies on specialized receptors located in the muscles, tendons, and joints, which continuously send information to the brain about the body's internal state. Such afferent feedback allows the brain to maintain body awareness and regulate movements even without relying on visual input.

However, proprioceptive function progressively decline with advancing age, which can significantly affect balance. With ageing, both the number and sensitivity of proprioceptive receptors in muscles, tendons, and joints gradually diminish, leading to reduced accuracy in detecting joint position and muscle length becomes less precise, which may impair the brain's ability to coordinate movements accurately (Boisgontier et al., 2016; Wang et al., 2024).

In addition to peripheral changes, ageing also affects the central nervous system (CNS), which is responsible for processing and integrating proprioceptive information. These neural alterations can slow the transmission of sensory signals, thereby reducing the speed and accuracy of motor responses required for maintaining balance. Furthermore, age-related declines in muscle mass and strength may lead to reduced joint stability and control. Weakened muscles may be less capable of providing adequate support during weight-bearing activities, which can contribute to balance difficulties (Pahor et al., 2009). Reduced proprioceptive ability can increase the likelihood of falls, as it may lead to difficulties in gait, decreased joint stability, and slower reaction times.

Review of literature:

In order to determine if a 16-week therapeutic yoga program with psychosocial support improved balance in adult cancer survivors, Miller et al, (2025) performed a secondary analysis. Sway measurements were used to evaluate twenty-nine people both with and without their eyes open. Balance did not significantly improve following the intervention, according to group analysis. Respondent analysis, however, revealed that some people made significant progress. The study found that although group-level results were not significant, therapeutic yoga may help some cancer survivors, which calls for more investigation (Miller et al., 2025).

The benefits of an 8-week yoga intervention on muscle strength, proprioception, pain, fear of falling, and quality of life in individuals with diabetic neuropathy were investigated in a randomized controlled experiment by Faridi Dastjerdi et al, (2024). Thirty individuals were divided into two groups at random: yoga (n = 15) and control (n = 15). Three times a week, the yoga group engaged in 60 minutes of practice. In comparison to the control group, the flexor and extensor muscle strength, proprioception error, pain intensity, fear of falling, and quality of life were significantly improved ($p < .001$) (Dastjerdi et al., 2024).

A study was conducted to examine the influence of yoga exercises on balance and flexibility among the male geriatric population. The study included 30 elderly men aged between 60 and 65 years from Anbagam Old Age Home, Chidambaram, Tamil Nadu. The participants were equally divided into an experimental group and a control group, each consisting of 15 subjects. The experimental group practiced selected yoga exercises for 12 weeks, six days per week, while the control group continued their normal daily activities. Balance was assessed using the Four Stage Balance Test and flexibility was measured through the Sit and Reach Test before and after the intervention. Statistical analysis was performed using the t-test and ANCOVA with a significance level of 0.05. The results showed significant improvement in balance and flexibility in the experimental group compared to the control group (Raja & Balaji., 2024).

A study was conducted to examine the effect of yoga therapy on fear of falling and balance among elderly individuals aged 60 years and above. The study was designed as an open-label randomized controlled trial including 62 participants, who were randomly divided into an intervention group and a control group with 31 participants in each. Both groups received standard medical treatment, while the intervention group additionally participated in structured yoga therapy sessions. Fear of falling was assessed using the Falls Efficacy Scale (FES) and balance was measured using the Berg Balance Scale (BBS) at baseline and after 12 weeks. Data were analyzed using Student's t-test and Mann-Whitney U test with a significance level of $p < 0.05$. The study aimed to determine whether yoga therapy could reduce fear of falling and improve balance and quality of life among elderly individuals (Kashyap et al., 2023).

A study was carried out to investigate the impact of a yoga-based intervention on balance, body composition, and social indices among elderly individuals aged 65 years and above. The research involved 500 participants (234 men and 266 women) residing in senior homes or community centres. Participants were divided into an experimental group (262) and a control group (238). The experimental group engaged in a yoga-based intervention for 30 minutes daily over a period of four weeks, while the control group continued with their regular daily activities. Balance was evaluated using the Tinetti Balance Assessment Tool, body composition was assessed with the InBody 230 bioimpedance analyser, and quality of life was measured using the SF-36 Health Survey. The findings indicated significant improvements in static, dynamic, and overall balance scores among participants in the experimental group compared to those in the control group (Krejci et al., 2022)

In a study research examined how Hatha Yoga and certain balance exercises affected older persons residing in nursing homes' ability to balance and their fear of falling. 26 senior participants, ages 78 to 82, were split into two groups for the study: one for Hatha Yoga and the other for balance exercises. The duration of the intervention was three months. The Performance-Oriented Mobility Assessment (POMA) tool was used to test balance, and the Falls Efficacy Scale-International (FES-I) was used to gauge fear of falling. The participants who practiced Hatha Yoga exhibited notable improvements in their gait and balance as well as a decrease in their fear of falling (Fronso et al., 2021).

In this study, Kartha and Sharad (2021) examined the effectiveness of a yoga-based exercise therapy program on balance, mobility, and gait speed among institutionalized older adults. The study included 30 male participants aged 65–80 years who were divided into an experimental group and a control group. The experimental group performed yoga practices including asanas and pranayama along with conventional exercises for four weeks, while the control group continued only conventional exercises. Balance, mobility, and gait speed were assessed using the Berg Balance Scale, Timed Up and Go Test, and gait speed measurement. The results showed significant improvement in balance, mobility, and gait speed in the yoga group (Kartha & Sharad., 2021).

The benefits of a 12-week Yoga Meditation (YoMed) program on proprioception and balance in people with mild to severe Parkinson's disease were studied by Cherup et al, (2020). Thirty-three individuals were split into two groups at random: YoMed and a conventional proprioceptive training (PRO) group. Sessions lasted 45 minutes and were held twice a week. The Tinetti Balance Assessment ($p = .01$) and joint kinesthesia during knee flexion ($p = .05$) revealed substantial between-group improvements that favored YoMed. Dynamic balance metrics (DMA and TIME) showed notable gains for both groups (Cherup et al., 2020).

In another study, Patel and his friends (2019) examined the effect of yoga on balance among the geriatric population. The study included 40 healthy older adults aged 60–75 years who were randomly divided into an experimental group and a control group. The experimental group performed yogasanas for four weeks, five times per week, while the control group received no intervention. Balance was assessed using the Modified Clinical Test of Sensory Interaction in Balance (CTSIB-M) and the Timed Up and Go Test. The results showed significant improvement in balance among participants who practiced yoga (Patel et al., 2019).

Bucht and Donath (2019) conducted a randomized controlled trial to evaluate the effects of sauna yoga on flexibility, strength, and balance in healthy older adults. The study included 23 participants aged between 60 and 80 years, who were randomly assigned to either an intervention group or a control group. Participants in the intervention group practiced yoga in a sauna environment maintained at approximately 50 °C for a duration of eight weeks. Flexibility was assessed using the chair sit-and-reach test along with additional physical fitness measures. The findings revealed a significant improvement in flexibility, along with modest improvements in strength and balance among participants in the sauna yoga group (Bucht & Donath., 2019)

In another study Wooten and his colleagues (2018) investigated the impact of yoga meditation (YoMed) on proprioception and balance in older persons who have fallen in a randomized controlled research. Over the course of six weeks, with sessions held three times a week, sixteen participants were randomized to either the YoMed or the proprioceptive training groups. Leg power, proprioception, balance, and gait were measured both before and after the intervention. The YoMed group exhibited a notable improvement in dynamic balance scores, although the majority of factors did not achieve statistical significance, according to the results. According to the study, yoga meditation may be a useful clinical intervention for enhancing older persons' proprioception and balance (Wooten et al., 2018)

Research conducted a pilot intervention study to examine the effects of Hatha yoga on balance and fall risk among rural older adults. The study included 38 participants aged 60 years and above who participated in 16 yoga sessions over a period of eight weeks. Participants were divided into two groups: one group practiced home-based yoga exercises combined with relaxation techniques, while the other group performed relaxation exercises only. Balance and gait were evaluated using the Berg Balance Scale, Functional Gait Assessment, and Dynamic Gait Index. The findings indicated a significant decrease in self-reported falls along with notable improvements in balance, gait performance, and standing reach following the intervention (Hamrick et al., 2017)

In this study research examined the impact of yoga on older individuals balance and fear of falling in a randomized controlled experiment. 40 individuals, ages 60 to 74, were randomly assigned to one of two groups for the study: the intervention group or the control group. For eight weeks, the intervention group engaged in twice-weekly Hatha yoga classes, while the control group did not receive any intervention. The Berg Balance Scale (BBS) was used to test balance, while the Modified Falls Efficacy Scale (MFES) was used to quantify fear of falling. Comparing the yoga group to the control group, the results revealed a significant increase in balance and a decrease in fear of falling (Nick et al., 2016).

Discussion

The current evaluation looked at how yoga-based therapies affected older adults proprioception and balance. Yoga practice generally has positive impacts on balance performance, gait characteristics, proprioceptive function, and fear of falling, according to a synthesis of 13 studies, including randomized controlled and experimental designs. Standardized balance tests such the Berg Balance Scale, Tinetti Balance Assessment Tool, and Timed Up and Go Test consistently showed improvements.

Impaired postural control is largely caused by age-related declines in the vestibular, proprioceptive, musculoskeletal, and visual systems. According to the reviewed research, yoga's integrated physical postures, breathing exercises, and mindful awareness may be able to offset these alterations. Yoga improves control of the center of mass by increasing lower limb strength, flexibility, joint stability, and sensory-motor integration. Reductions in the fear of falling also point to psychological advantages that promote functional independence.

However, definite results are restricted by small sample sizes, poor long-term follow-up, and heterogeneity in study design. All things considered, yoga seems to be a safe, practical, and economical supplemental intervention for enhancing older individuals' proprioception and balance.

Conclusion

This review indicates that yoga-based therapies improve older individuals' proprioception and balance. Evidence from the included research shows improvements in joint position sensing, muscle strength, gait performance, static and dynamic balance, and a decrease in fear of falling. Yoga improves neuromuscular coordination and sensory integration by combining physical postures, breathing exercises, and mental awareness. Yoga seems to be a safe, practical, and helpful supplemental strategy for lowering fall risk and fostering functional independence, despite methodological flaws.

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