

## Review Article

# INTERVENTIONS FOR INCREASING BALANCE & CONFIDENCE IN OLDER ADULTS: A REVIEW

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## ABSTRACT

Elderly is defined as being 65 years of age or older. Geriatrics or geriatric medicine is a specialty that focuses on health care of elderly people. The number of persons above the age of 60 years is fast growing, especially in India. Falls are the leading cause of traumatic brain injury, fractures & the leading cause of emergency department visits by older adults. Low balance confidence is a major health problem among older adults restricting their participation in daily life. Objective of this review is to determine what interventions are most effective in increasing balance & confidence in older adults. The American Geriatrics Society (AGS) published clinical guidelines 2011 that recommended all adults aged 65 years and older be screened for falls. Prevention of the fall can be done by combination of exercise include Strengthening exercise, Balance & co-ordination exercise, Hydrotherapy and allied therapeutics such as tai chi and yoga.

**KEYWORDS:** Geriatric, Balance, co ordination, Fall, Intervention.

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## INTRODUCTION

Elderly is defined as being 65 years of age or older<sup>1</sup>. Geriatrics or geriatric medicine is a specialty that focuses on health care of elderly people. The term geriatrics comes from the Greek word *geron* meaning "old man", and *iatros* meaning "healer".<sup>1</sup>

Elderly can be classified in to three groups:

1. Young old: between 65 and 75 years of age
2. Middle old: between 75 and 85 years of age.
3. Old: older than 85 years.<sup>1</sup>

## DEMOGRAPHY OF AGING

The number of persons above the age of 60 years is fast growing, especially in India. India as the second most populous country in the world has 76.6 million people at or over the age of 60, constituting above 7.7% of total population.<sup>2</sup>

Following factors contributed in demographic changes occurred in last century

- Advances in medicine
- Healthier lifestyles
- Improved access to health care
- A steady decline in death rate from infectious diseases throughout adult life
- Availability of information about health, diseases and treatment through conventional media and the internet.<sup>3</sup>

## EPIDEMIOLOGY OF FALL

Fall can be defined as an event that results in a person's inadvertently coming to rest on ground or lower level with or without loss of consciousness or injury<sup>4</sup>. Falls are the public health epidemic of this decade. More than 30% of people aged 65 years or older and more than 50% of people aged 80 years or older have an

event of fall.<sup>4</sup> The incidence of falls (History of a single fall in the last 6 months) was found to be 14% in 10 states across India.<sup>5</sup> Falls and fractures are more common in females (2:1). Falls due to intrinsic causes and recurrent falls are common in people > 70 years. Falls are the leading cause of traumatic brain injury, fractures. It is the leading cause of emergency department visits by older adults, and the number one cause of hospital admissions due to trauma.<sup>6</sup>

**BALANCE CONTROL**

Balance is a complex automatic integration of several body systems as shown in figure

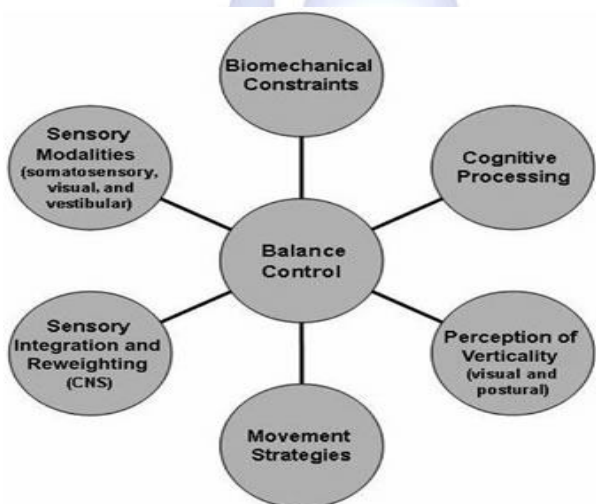


Fig. 1: Important resources required for postural control. CNS= Central Nervious System.

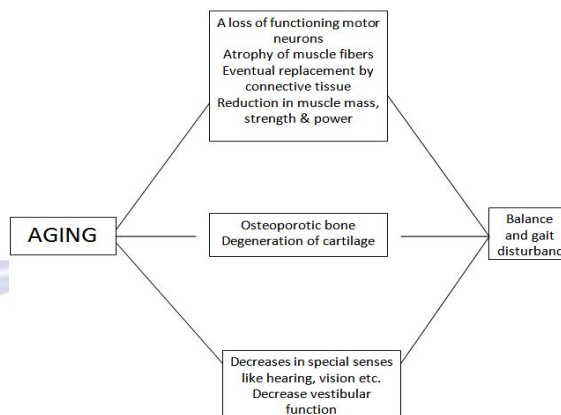
**AGE RELATED CHANGES**

With age and inactivity these unconscious processes may not integrate as well or as quickly, so in order to maintain their balance and avoid falling older people may have to give a greater proportion of their attention to keeping upright with concomitant fatiguing effort

Age-related changes in connective tissue results in further reduction of flexibility, loss of tensile strength in the ligaments, and greater rigidity in the muscles and peripheral support structures of the joints of the lower limb.

Changes in gait pattern may also be associated with balance (Nasher, 1993). Older people tend to step with a wider base, spending increased time in the double leg support phase of walking and minimizing the time spent on one leg. There is, therefore, a decrease in stride length and

trunk rotation, with the result that a more unbalanced or even shuffling gait may develop. Other age-related changes that may affect postural stability include the reduction of reflex speeds, poor co-ordination and vestibular dysfunction (often medication related) may mean there is overlap between the timing of reflexes and the voluntary responses to correct the loss of balance.<sup>7</sup>



**RISK FACTORS AND SCREENING**

The American Geriatrics Society (AGS) published clinical guidelines in 2001, subsequently expanded and revised in 2011, that recommended all adults aged 65 years and older be screened for falls.<sup>8</sup>

The AGS published a 2011 update of the guidelines.<sup>9</sup> The guidelines still specify all older adults be screened annually for falls by a health care provider, but now have expanded to include screening for balance and mobility impairments.<sup>9</sup> The screen consists of (1) asking the older person if they have experienced a fall over the past year (yes or no), (2) asking if they are experiencing difficulty with walking or with their balance (yes or no), and/or (3) observing whether performance of walking and balance is compromised (yes or no) using the Timed Up and Go test or other balance assessment. If one or more of these screens are “positive” the individual should be referred for a comprehensive multifactorial fall-risk assessment

1. Obtain relevant history, physical examination, cognitive, and functional assessment
2. Determine multifactorial falls risk:
  - History of falls
  - Medication review
  - Gait, balance, mobility assessment

- Visual acuity
- Other neurological impairments
- Muscle strength
- Heart rate and rhythm
- Postural hypotension
- Feet and footwear
- Environmental hazards

Several reliable and validated tools are available to assess balance and mobility across the continuum of function

- Berg Balance Scale,<sup>10</sup>
- Performance-Oriented Mobility Assessment <sup>11,12</sup>
- Dynamic Gait Index <sup>13</sup>
- Timed Up and Go <sup>14,15</sup>.

Psychological factors can be more disabling and have a greater impact on function than the fall itself and should therefore be an important consideration in rehabilitation programmes. Assessment should identify fall-related psychological factors that impact on confidence, activity restriction and participation. An appropriate outcome measure should be used such as the Falls Efficacy Scale (FES), FES - International (FES-I) or the Short FES

**FALL MANAGEMENT:**

**EXERCISE DOSE:**

Sherrington's meta-analysis of 44 studies determined the minimum dose of exercise to effectively reduce the risk and rate of falls is 50 hours.<sup>16</sup> The delivery of the dose of exercise was dependent on the trial, with trials achieving the 50 hours over a period of 3 months,<sup>17</sup> 6 months<sup>17,18</sup> or longer.<sup>16</sup>

**MODE OF EXERCISE:**

A recent Cochrane systematic review examining exercise interventions to improve balance among older people reported exercise interventions that included:

- (a) gait, balance, coordination and function training;
- (b) strength training;
- (c) three dimensional training e.g. dance, tai chi; and
- (d) mixed training were beneficial in relation to balance outcomes.

The most effective programmes involved dynamic exercise programmes that ran three times weekly training for three months.<sup>19</sup>

**(a) strength training**

Strength is a key element of fall prevention; however, strength training alone without a balance component is not an effective strategy to prevent falls.<sup>20</sup>

A recent meta-analysis identified the key components of strength training that translate to improved balance and reduced falls risk including: (1) A focus on lower-extremity and postural muscles; (2) Minimal upper-extremity support; (3) Delivered at either a moderate or high intensity to achieve the desired results. A few strength training interventions have resulted in more injuries compared with balance training

- Danilo Sales, Bocalini , April 2010 had concluded that moderate resistance training for 1 hour – 3 times a week in non-consecutive days for 24 weeks improves fitness and suppress the decline in BMD without tacking hormone replacement therapy and reduce fall risk. The exercises include leg press, leg extension, leg curl, shoulder and elbow exercises at 60-70% of 1 RM considered as moderate resistance training.<sup>21</sup>

- M. martin, S.T. James. Jan.2009(national osteoporosis foundation):A systemic review and meta-analysis were undertaken and concluded that high intensity resistance training affect bone mineral density and decline bone loss in post menopausal woman. Which suggest improve bone health & less complication of fall.<sup>22</sup>

Back extension exercise encourage both strength and later mobility

- Stretching to improve flexibility should be part of exercise programme.
- Stretching of whole major upper limb and lower limb muscles group should be carried out.
- It should be carried out following warm period ballistic stertching should be avoided

**(b) Balance and co-ordination exercise**

**• Static activities**

Exercises that challenge the center of mass (eg, reaching while standing) while the feet remain fixed, and exercises that practice a narrow base

of support (eg, tandem series, single-leg stance) have been included in effective interventions.<sup>23,24</sup> For greater challenge, a sensory component can be included (standing on an unstable surface or standing with the eyes closed)

· **Dynamic activities**

Activities that challenge the center of mass while the feet are in motion are dynamic activities. Dynamic activities tend to be functional, and may include reaching, turning in a circle, standing, and stair-stepping.<sup>25,26</sup>

· **Dynamic gait training** can be incorporated into progression of intervention using dance steps, circling, figure eights, directional changes on command, obstacle courses, and dual-task training.<sup>27-28</sup>

**(c) Dual-task training**

Involves doing a primary task (maintaining postural control or walking speed) while performing a secondary task (eg, a cognitive challenge such as counting backwards, or a manual task such as carrying an item).<sup>29</sup>

In a randomized controlled trial on the effects of single-task versus dual-task training on balance performance in older adults, Silsupadol et al found that changing the focus of the dual-task priority instructions from a priority on cognitive to a priority on the physical task resulted in greater improvements of performance<sup>30</sup>

**(d) To prevent the consequences of a long lie**

Up to half of non-injured fallers are unable to get up again<sup>31</sup>. The inability to get up from the floor independently following a fall is associated with subsequent serious fall-related injury and increased mortality<sup>32</sup>. The consequences of a long lie on the floor (> 1 hour) include pressure sores, hypothermia and dehydration and increased risk of admission to hospital with a subsequent fall, or moving into long term care<sup>33</sup>.

There is some evidence that teaching and practicing how to get up from the floor is acceptable to older people and can be successful<sup>34,35</sup>.

**(e) Small Group session for community elders**

A Matter of Balance includes eight two-hour sessions for a small group led by a trained facilitator. This nationally recognized program

was developed at the Roybal Center at Boston University.

During the class, participants learn to:

- View falls as controllable
- Set goals for increasing activity
- Make changes to reduce fall risk at home
- Exercise to increase strength and balance

Participants experienced significant increases in Falls Efficacy, Falls Management, and Falls Control at six weeks, six months, and 12months<sup>36</sup>

**(f) Hydrotherapy**

Hydrotherapy is used to treat rheumatic, orthopedic and neurological disorders. It has been the subject of investigations regarding balance recovery in elderly people. The situation is different with exercises in an aquatic environment, where there is a reduction in joint overload and less risk of falls and lesions. In addition, floating allows individuals to perform exercises and move-ments that cannot be done on the ground.<sup>37,38</sup> Although few studies have reported the effects of hydro-therapy on balance and the reduction of falls, all of them have shown benefits. It includes following plan of care.

Phase I – Aquatic environment adaptation.

Phase II – Stretching. Each stretching exercise was maintained for 30 seconds.

Phase III – Static and dynamic exercises for balance.

**(g) Allied therapeutics:**

· **Tai Chi**

Several research studies assessing Tai Chi as an intervention to improve balance and prevent falls have reported favorable outcomes.<sup>39-40</sup> However, it does appear that to be effective, the minimal dose must be achieved. Interventions that are less than 12 weeks typically are not as effective in improving balance and preventing falls as those of 12 weeks or greater.<sup>41-42</sup>

· **Yoga**

Several authors have shown that including specific asana in an overall yoga program for older adults may improve balance<sup>43</sup> hip ROM<sup>44</sup> and gait speed<sup>45</sup> Yoga programs designed specifically for older adults should include a combination of sitting and standing asana and modifications such as warming up with heel raises and the use of a chair to reduce the fear of falling during the practice.

## CONCLUSION

The research supports the most effective interventions to manage falls risk are those that incorporate exercise. For optimal results, the exercise program needs to be structured, progressed, and must achieve the minimum dose of exercise. Exercise include strength training, Balance and co-ordination exercise, Dual-task training. Hydrotherapy & Allied therapeutics: yoga & tai chi can also have beneficiary effects.

**Conflicts of interest:** None

## REFERENCES

- Landefeld CS, Paimer RM, Johnson MA, Johnson CB. Current geriatric diagnosis and treatment. International edition. McGraw Hill, 2004, 4-6.
- Joshi K, Rajeshkumar and Avasthi A, Morbidity profile and disability among elderly people in Northern India, International Journal of Epidemiology 2003;32:978-987
- White LR, et al. Geriatric epidemiology. Annu Rev Gerontol Geriatr 1986;6:215-311
- Stevens J. Falls among older adults: an overview. <http://www.cdc.gov/Home and Recreational Safety/Falls/adultfalls.html>. Accessed March 24, 2011.
- Johnson S, Sapergia, S, Joe Joseph, Irudaya Rajan, S, Sabu Aliyar, Daliya Sebastian, Sujatha, M, Promoting Healthy Ageing Through Community Development in India: A Study of Kerala, Shastri Applied Research Project, March 2006.
- Centers for Disease Control and Prevention. Injury prevention & control: data & statistics (WISQARSTM). <http://www.cdc.gov/injury/wisqars/index.html>. Accessed May 15, 2011
- Prungham D, Evan JG. Factors associated with falls in the elderly. Age Aging, 1981;10:141-6.
- Prevention of Falls in Older Persons AGS/BGS Clinical Practice Guidelines. <http://www.medcats.com/FALLS/frameset.htm>. Accessed April 19, 2011.
- American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention. Guideline for the prevention of falls in older persons. J Am Geriatr Soc. 2001;49:664-672.
- Berg K. Measuring balance in the elderly: validation of an instrument. Can J Public Health. 1992;83:S7-S11.
- Tinetti ME. Performance-oriented assessment of mobility problems in elderly patients. J Am Geriatr Soc. 1986;34:119-126.
- Faber M, Bosscher R, van Wieringen P. Clinimetric properties of the performance oriented mobility assessment. Phys Ther. 2006;86:944-954.
- Marchetti GF, Whitney SL. Construction and validation of the 4-item dynamic gait index. Phys Ther. 2006;86:1651-1660.
- Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. J Am Geriatr Soc. 1991;39:142-148.
- Shumway-Cook A, Brauer S, Woollacott M. Predicting the probability for falls in community-dwelling older adults using the Timed Up & Go Test. Phys Ther. 2000;80:896-903.
- Sherrington C, Whitney JC, Lord SR, Herbert RD, Cumming RG, Close JC. Effective exercise for the prevention of falls: a systematic review and metaanalysis. J Am Geriatr Soc. 2008;56: 2234-2243.
- Barnett A, Smith B, Lord SR, Williams M, Baumand A. Community-based group exercise improves balance and reduces falls in at-risk older people: a randomised controlled trial. Age Ageing. 2003;32:407-414.
- Buchner D, Cress M, de Lateur B, et al. The effect of strength and endurance training on gait, balance, fall risk, and health services use in community-living older adults. J Gerontol A Biol Sci Med Sci. 1997;52:M218-224.
- Gillespie LD, Robertson MC, Gillespie WJ, et al. Interventions for preventing falls in older people living in the community. Cochrane Database Syst Rev. 2009 CD007146.
- Orr R, Raymond J, Fiatarone Singh M. Efficacy of progressive resistance training on balance performance in older adults: a systematic review of randomized controlled trials. Sports Med. 2008;38(4):317-34.
- Danilo Sales Bocalini, Andrey Jorge Serra, and Leonardo dos Santos: Moderate Resistive Training Maintains Bone Mineral Density and Improves Functional Fitness in Postmenopausal Women: Journal of Aging Research Volume 2010, Article ID 760818.
- S. Karinkanta & A. Heinonen & H. Sievänen & K. Uusi-Rasi & M. Fogelholm & P. Kannus Maintenance of exercise-induced benefits in physical functioning and bone among elderly women Osteoporos Int (2009) 20:665–674.
- Lin MR, Wolf SL, Hwang HF, Gong SY, Chen CY. A randomized, controlled trial of fall prevention programs and quality of life in older fallers. J Am Geriatr Soc. 2007;55:499-506.
- Liu-Ambrose T, Donaldson MG, Ahamed Y, et al. Otago home-based strength and balance retraining improves executive functioning in older fallers: a randomized controlled trial. J Am Geriatr Soc. 2008;56:1821-1830.
- Mansfield A, Peters AL, Liu BA, Maki BE. Effect of a perturbation-based balance training program on compensatory stepping and grasping reactions in older adults: a randomized controlled trial. Phys Ther. 2010;90:476-491.
- Rugelj D. The effect of functional balance training in frail nursing home residents. Arch Gerontol Geriatr. 2010;50:192-197.

27. Campbell AJ, Robertson MC. Otago Exercise Programme to Prevent Falls In Older People: A home-based, individually tailored strength and balance retraining program. Otago; 2003.
28. Skelton D, Dinan S, Campbell M, Rutherford O. Tailored group exercise (Falls Management Exercise—FaME) reduces falls in community-dwelling older frequent fallers (an RCT). *Age Ageing*. 2005;34:636-639.
29. Silsupadol P, Siu KC, Shumway-Cook A, Woollacott MH. Training of balance under single- and dual-task conditions in older adults with balance impairment. *Phys Ther*. 2006;86:269-281.
30. Silsupadol P, Lugade V, Shumway-Cook A, et al. Training-related changes in dual-task walking performance of elderly persons with balance impairment: a double-blind, randomized controlled trial. *Gait Posture*. 2009;29:634-639.
31. Tinetti ME, Liu WL, Claus EB. Predictors and prognosis of inability to get up after falls among elderly persons. *Journal of the American Medical Association* 1993; 269:65-70.
32. Bergland A, Wyller FB. Risk factors for serious fall-related injury in elderly women living at home. *Injury Prevention* 2004; 10:308-31.
33. Bergland A, Laake K. Concurrent and predictive validity of "getting up from lying on the floor". *Aging Clinical and Experimental Research* 2005; 17:181-185.
34. Hofmeyer MR, Alexander NB, Nyquist LV, Medell JL, Koreishi A. Floor-Rise Strategy Training in Older Adults. *Journal of the American Geriatrics Society* 2002; 50(10):1702-1706.
35. Reece AC, Simpson JM. Preparing older people to cope after a fall. *Physiotherapy* 1996; 82:227-235.
36. Healy, T. C., Peng, C., Haynes, P., McMahon, E., Botler, J. & Gross, L. The Feasibility and Effectiveness of Translating A Matter of Balance into a Volunteer Lay Leader Model. *Journal of Applied Gerontology*. (2008) 27 (1): 34-51.
37. Booth CE. Water exercise and its effects on balance and gait to reduce the risk 14. of falling in older adults. *Activities, Adaptation Aging*. 2004;28(4):45-57.
38. Simmons V, Hansen PD. Effectiveness of water exercise on postural mobility in the well elderly: an experimental study on balance enhancement. *J Gerontol*. 1996;51A(5):M233-8.
39. Li F, Harmer P, Fisher KJ, et al. Tai Chi and fall reductions in older adults: a randomized controlled trial. *J Gerontol A Biol Sci Med Sci*. 2005;60:187-194.
40. Liu H, Frank A. Tai chi as a balance improvement exercise for older adults: a systematic review. *J Geriatr Phys Ther*. 2010;33:103-109.
41. Logghe IH, Verhagen AP, Rademaker AC, et al. The effects of Tai Chi on fall prevention, fear of falling and balance in older people: a meta-analysis. *Prev Med*. 2010;51:222-227.
42. Logghe IH, Zeeuwe PE, Verhagen AP, et al. Lack of effect of Tai Chi Chuan in preventing falls in elderly people living at home: a randomized clinical trial. *J Am Geriatr Soc*. 2009;57:70-75.
43. Zettergren K, Moriarty E, Zabel A (2006) The Effectiveness of therapeutic yoga on community dwelling older adults with and without balance deficits. *J Neuro PT* 29: 216.
44. Zettergren K, Viverito J, Lubeski J (2011) Effects of a yoga program on postural control, mobility, and gait speed in community living older adults: A pilot study. *J Geriatr Phys Ther* 34: 88-94.
45. Brown KD, Koziol JA, Lotz M (2008) A yoga based exercise program to reduce the risk of falls in seniors: A pilot and feasibility study. *J Alt Comp Med* 14: 454-457.

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