

ASSOCIATION BETWEEN PHYSICAL ACTIVITY, FEAR OF FALL AND BALANCE DEFICITS IN COMMUNITY DWELLING OLDER INDIVIDUALS

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ABSTRACT

Background: Fall is a major health concern among community-dwelling elderly people. Age-related decline in balance impairs postural control, increasing fall risk. Fear of fall (FOF) further limits activity participation, leading to reduced physical activity. Although physical activity improves balance and reduces falls, low activity and FOF may act synergistically. Limited evidence exists regarding the combined association of physical activity, fear of fall, and balance deficits in older adults

Aim: To find the association between physical activity level, fear of fall, and balance deficits among community dwelling older individuals

Methodology: Based on eligibility criteria one hundred and fifteen older adults aged ≥ 60 were included in the study. Informed consent was obtained from all participants. Physical activity, fear of fall and balance was evaluated using the International Physical Activity Questionnaire, Falls Efficacy Scale–International and Berg Balance Scale.

Result: Pearson correlation analysis revealed statistically significance between all three variables. Physical activity shows moderate positive correlation with balance and moderate negative correlation with fear of fall. Balance also showed a strong negative association with fear of fall.

Conclusion: This study found an association between physical activity, balance, and fear of fall in community-dwelling older adults. Lower physical activity is linked to reduced balance and increased fear of fall. Increasing daily physical activity are important to reduce fall risk and maintain independence.

KEYWORDS: Physical activity, fear of fall, balance, older adults, fall risk, good health and well-being

INTRODUCTION

Fall is one of the most prevalent issues associated with aging, which affects 28% to 35% of people over 65 annually ^[1]. The World Health Organization (WHO) define event in which person unintentionally lands on the floor or ground as fall ^[2]. Falls affect 30% of adults over 65 in the United States, 13.7% in Japan, 26.4% in China, and 53% in India ^[3]. Additionally, studies have indicated that female are more likely than men to experience falls ^[4].

Balance is defined as the capacity to keep the body's center of mass within the base of support in order to guarantee stability and orientation ^[5]. Ageing is an main causes of balance impairment, which also affects postural control and increases the risk of falls and death in older people ^[6].

Fear of fall (FOF) is defined as concern about fall that may cause an individual to avoid of activities that they are capable of performing and it is prevalent in older adults ^[7]. Fear of Fall has an influence on person's self-perception of their ability to balance, which can prevent them from engaging in daily activities and physical exercise ^[8].

Physical activity is defined as any skeletal muscle movement of body that requires the use of energy ^[9]. 60% of the population do not get the required amount of physical activity to obtain health benefits, physical activity means movement during their free time or while performing their work or domestic activities. (WHO). 6 to 10% of health-related issues globally are caused by physical inactivity ^[10]. Inadequate physical activity prevalence in Tamil Nadu was 40.6% in rural areas and 63.3% in urban areas. Back pain, vision and hearing issues, low BMI, obesity, poor sociodemographic status, depressive symptoms, diabetes, hypertension, and sleep issues are the factors that increase physical inactivity ^[11].

Factors which could affect balance in older individuals, include age-related sensory system changes like visual, vestibular, and somatosensory systems, musculoskeletal, joint mobility, bone density and cognitive factors ^[12]. Balance reduces after aging and leads to postural instability and it has been proven that physical activity improves postural control among the older people and decreases the fall rate ^[13]. Improved balance measures among older and healthy adults show the benefits of free-living physical activity in preventing falls ^[6].

Fear of falling was also found to be predicted by a number of factors, including living alone, environmental dangers, anxiety, depression, female gender, less education, chronic illness, poor subjective health status, functional impairments, and a history of falls. Among these fear of fall was significantly influenced by depression and poor subjective health status

^[14] .Fear of fall can cause older adults to engage in less physical activity and it will increase the risk of falls in older adults ^[15] .Low physical activity and fear of falling both showed positive synergism ^[16] .Sedentary lifestyle may put older adults at risk of fear of fall and by increasing their physical activity is likely a promising way to reduce fear of fall^[17] .Physical activity promotes health well-being in the elderly population and simultaneously addresses the greater fall risk in older women contributing to gender equality in geriatric health outcomes .From these findings older people experience fear of falling and balance deficits are more likely to have reduced physical activity, which further impairs mobility and increases fall risk, limited evidences exists on the combined association of PA, FOF, and balance deficits among community-dwelling older individuals .It has been reported that individuals with absence of balance deficits had fear of fall based on FOF questionnaire . In similar line we assume older individuals with Fear of Fall and Balance deficits objectively measured is likely to maintain better level of Physical activity.

AIM :

To find the association between physical activity level, fear of falling, and balance deficits among community dwelling older individuals

OBJECTIVES :

To find the

- 1 . Level of physical activity
- 2 . Presence of fear of fall
- 3 . Presence of balance deficits
- 4 . Association between level of physical activity, fear of fall and balance deficits in older individuals.

METHODOLOGY

This observational study was conducted at the Outpatient Department of Physiotherapy, old age homes and community-dwelling elderly people. This study is approved by Institutional Ethics Committee for Student's Projects with ref.no **CSP-III/25/NOV/29/469**. The CTRI registration has been done with register no: **CTRI / 2026 /01 / 102114**.

Sample size:

According to Shuang wu et al, 2023, total of 115 participants were included in the study. The required sample size was calculated using $n = [(Z_{\alpha} + Z_{\beta})/C]^2 + 3$ (confidence interval = 1.96, power = 0.80 and effect size = 0.26)

INCLUSION CRITERIA:

- Older individuals age ≥ 60 years
- Both genders
- Balance score less than 45 in Berg Balance Scale
- Fear of Fall score more than 25 in Fall Efficacy Scale

EXCLUSION CRITERIA:

- Musculoskeletal and Neurological problems.
- Recent surgery.
- Vestibular problems
- Sensory problems

Procedure:

One hundred and fifty older adults are evaluated for eligibility were one hundred and fifteen are recruited based on the inclusion and exclusion criteria. Study's procedures was explained and signed informed consent was obtained from each individual. Participants were assessed for balance with Berg Balance Scale, Fear of Fall with Fall Efficacy Scale and International physical activity questionnaire is used to check physical activity level. Later the association between physical activity, fear of fall and balance deficits was determined.

RESULTS

TABLE 1: Demographic data

Variables	Mean $\pm$ SD
Age	67.04 $\pm$ 5.43
Fear of Fall	22.39 $\pm$ 6.87
Physical Activity	1845.11 $\pm$ 2004.23
Balance	48.94 $\pm$ 7.38

Table 1: Demonstrates the mean and standard deviation values of age, fear of fall, physical activity and balance.

TABLE 2: Pearson correlation between Physical activity, Fear of fall and Balance

Variables	BBS	FES	IPAQ
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BBS	1.000	-0.659	0.428
FES	-0.659	1.000	-0.311
IPAQ	0.428	-0.311	1.000

IPAQ – International Physical Activity Questionnaire, **BBS** – Berg Balance Scale, **FES** – Fall Efficacy Scale

Table 2 demonstrates the correlation between all three variables

1. IPAQ vs FES – I shows moderate negative correlation
2. IPAQ vs BBS shows moderate positive correlation
3. FES-I vs BBS shows strong negative correlation

DISCUSSION

This study examines the association between physical activity levels, fear of fall (FOF), and balance deficits among community-dwelling older individuals. Most of the participants in this study has shown increased level of fear of fall, reduced balance scores and reduced physical activity. Previous studies , Tsai et al .,2024 has said that physical activity is reduced when fear of fall is more and McMullan et al 2018 has said that balance is reduced when physical activity decreased .Analysis of IPAQ scores across age groups showed that physical activity levels were highest in the 60–64 year group and began to decline from the 65–69 year group, with a further marked reduction in individuals aged 70–74 years.”

Impact of Physical Activity on Balance:

According to NHS guidelines., the older adults should maintain moderate to vigorous amount of physical activity level at least 150 min per week, which essential for maintaining the musculoskeletal and neurological integrity for stability. In older adults aged above 65 physical activity will effectively improve balance and reduce the number of falls ^[17]. Daily 15 minutes of moderate to vigorous physical activity can improve balance in older adults ^[19]. From this study mean Berg Balance Scale score was highest in individuals aged 60–64 years (53.7). A decline in balance performance was observed from the 65–69 age group (47.9), with further gradual reductions in older age group. Positive correlation between balance (BBS) and physical activity (IPAQ) ($r = 0.428$, $p < 0.05$) indicates older adults who maintained moderate to high levels of physical activity exhibited high balance scores compared to older adults who has low physical activity.

Impact of Physical Activity on Fear of Fall:

Fear of fall acts as an psychological barrier leading older individuals to avoid their daily physical activity ^[11]. The mean FES score increased progressively with age individuals aged 60–64 years had the lowest FES scores, while scores began to increase from the 65–69-year age group, indicating increasing fear of falling with advancing age. From the findings of this study negative correlation was identified between fear of falling (FES-I) and physical activity (IPAQ) ($r = -0.311$, $p < 0.05$). Low physical activity in older adults over the age of 70 was strongly associated with an increased fear of fall. This confirms that higher fear of fall is connected with lower levels of physical activity.

Balance and Fear of Fall:

Fear of fall can be present even in individuals without balance deficits, which impacts quality of life ^[8]. From the findings of this study, there is a strongest correlation observed in our data was the negative relationship between balance (BBS) and fear of falling (FES-I) ($r = -0.659$, $p < 0.05$). This indicates analysis of balance performance and fear of falling showed that adults with lower BBS scores demonstrated higher FES scores, indicating that reduced balance ability is associated with increased fear of falling.

Clinical implications:

Sedentary lifestyles are potential risk factors of fall increasing their physical activity levels serves as a protective strategy. Physiotherapy-based interventions should prioritize early identification and focus on improving physical activity levels to improve balance and reduce fear of fall to reduce fall risk. The findings reinforce that physical activity interventions must be designed to overcome psychological barriers like fear with exercise.

CONCLUSION

This study concludes that there is an association between physical activity level, fear of fall, and balance in community-dwelling older adults. Low physical activity is a primary contributor to both reduced balance and increased psychological concern of fear of fall. This combination collectively contributes to a higher overall risk of falls in the elderly population. As early identification of these risks is essential. Physiotherapy-based interventions should not focus on physical exercise alone; they must be multidimensional, addressing both the functional balance deficits and the psychological barriers created by the fear of fall to effectively reduce fall risk and maintain independence.

ACKNOWLEDGEMENT: Nil

FUNDING SOURCES: There is no funding received for the study.

ETHICAL APPROVAL: This study was approved by the Institutional Ethics Committee.

CONFLICT OF INTEREST: We declare there is no conflict of interest attached to the study.

CONTRIBUTIONS OF AUTHORS: All authors have contributed equally in this study.

REFERENCES

1. Xing L, Bao Y, Wang B, Shi M, Wei Y, Huang X, et al. Falls caused by balance disorders in the elderly with multiple systems involved: Pathogenic mechanisms and treatment strategies. *Front Neurol*. 2023 Feb 23;14:1128092. doi:10.3389/fneur.2023.1128092
2. Weltgesundheitsorganisation. WHO global report on falls prevention in older age. Geneva: WHO; 2008. (Ageing and life course, family and community health).
3. Dsouza S, Rajashekar B, Dsouza H, Kumar K. Falls in Indian older adults: a barrier to active ageing. Vol. 9. 2014;9(1).
4. Johansson J, Nordström A, Nordström P. Greater Fall Risk in Elderly Women Than in Men Is Associated With Increased Gait Variability During Multitasking. *J Am Med Dir Assoc*. 2016 Jun;17(6):535–40. doi:10.1016/j.jamda.2016.02.009
5. Shumway-Cook A, Woollacott MH, Rachwani J, Santamaria V. Motor control: translating research into clinical practice. Sixth edition. Philadelphia: Wolters Kluwer; 2023.
6. McMullan II, McDonough SM, Tully MA, Cupples M, Casson K, Bunting BP. The association between balance and free-living physical activity in an older community-dwelling adult population: a systematic review and meta-analysis. *BMC Public Health*. 2018 Dec;18(1):431. doi:10.1186/s12889-018-5265-4
7. Hoang OTT, Jullamate P, Piphatvanitcha N, Rosenberg E. Factors related to fear of falling among community-dwelling older adults. *J Clin Nurs*. 2017 Jan;26(1–2):68–76. doi:10.1111/jocn.13337
8. Sumanth Thatamsetty S, Ramachandran S. Presence of Fear of Fall in the Absence of Balance Deficits and its Impact on Quality of Life in Elderly Population. *Int J Sci Res IJSR*. 2025 May 26;1425–8. doi:10.21275/MR25521234700
9. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Rep*. 1985;100(2):126–31. PubMed PMID: 3920711; PubMed Central PMCID: PMC1424733.
10. Chan YY, Sooryanarayana R, Mohamad Kasim N, Lim KK, Cheong SM, Kee CC, et al. Prevalence and correlates of physical inactivity among older adults in Malaysia: Findings from the National Health and Morbidity Survey (NHMS) 2015. *Arch Gerontol Geriatr*. 2019 Mar;81:74–83. doi:10.1016/j.archger.2018.11.012
11. Pengpid S, Peltzer K. Prevalence and associated factors of physical inactivity among middle-aged and older adults in India: results of a national cross-sectional community survey. *BMJ Open*. 2022 Aug;12(8):e058156. doi:10.1136/bmjopen-2021-058156.
12. Wang J, Li Y, Yang GY, Jin K. Age-Related Dysfunction in Balance: A Comprehensive Review of Causes, Consequences, and Interventions. *Aging Dis*. 2025;16(2):714. doi:10.14336/AD.2024.0124-1
13. Živković D, Karaleić S, Anđelković I, Aksović N. THE EFFECTS OF PHYSICAL ACTIVITY ON THE BALANCE OF THE ELDERLY. *Facta Univ Ser Phys Educ Sport*. 2019 Jan 25;16(2):761. doi:10.22190/FUPES190114002Z
14. Izadi-Avanji FS, Safa A, Abedzadeh-Kalahroudi M, Shaterian N. Fear of falling and its related factors in older adults following a fall in Kashan, Iran (2023-2024). *BMC Geriatr*. 2024 Nov 20;24(1):965. doi:10.1186/s12877-024-05560-7 PubMed PMID: 39567872; PubMed Central PMCID: PMC11577670.
15. Rezaeipandari H, Koochakinejad N, Chahmatki F, Taheri Tanjani P, Shaker M, Dehghani Tafti A. The Relationship Between Fear of Falling and Physical Activity among Older Adults. *Elder Health J*. 2023 Jul 1. doi:10.18502/ehj.v9i1.13107
16. Tsai YJ, Sun WJ, Yang YC, Wei MY. Association of fear of falling and low physical activity with fall risk among older Taiwanese community-dwellers. *BMC Public Health*. 2024 Nov 6;24(1):3066. doi:10.1186/s12889-024-20467-z PubMed PMID: 39508228; PubMed Central PMCID: PMC11539577.
17. Wu S, Li G, Shi B, Ge H, He Q. The association between physical activity and fear of falling among community-dwelling older women in China: the mediating role of physical fitness. *Front Public Health*. 2023 Aug 14;11:1241668. doi:10.3389/fpubh.2023.1241668
18. Papalia GF, Papalia R, Diaz Balzani LA, Torre G, Zampogna B, Vasta S, et al. The Effects of Physical Exercise on Balance and Prevention of Falls in Older People: A Systematic Review and Meta-Analysis. *J Clin Med*. 2020 Aug 11;9(8):2595. doi:10.3390/jcm9082595
19. Li YY, Hsueh MC, Park JH, Lai TF, Hung YC, Liao Y. The Association between a Minimum Amount of Physical Activity and Subsequent Muscle Strength and Balance in Older Adults: A Prospective Study. *Behav Sci*. 2023 Apr 6;13(4):316. doi:10.3390/bs13040316