IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

ASSESSMENT TOOLS FOR RISKS OF FALL AND POSTURAL INSTABILITY IN OLDER ADULTS: A REVIEW

[1]Reni Maharabam, [2]Jagmeet Kaur

[1]BPT Student, [2] Assistant Professor

Department Of Physiotherapy

RIMT University, Mandi Gobindgarh, Punjab, India

Abstract: Postural instability and the increased risk of falls are major concerns among older adults, often leading to injury, hospitalization and a decline in quality of life. Various assessment tools have been developed to identify individuals at risk and to guide appropriate interventions. Common tools include the Berg Balance Scale (BBS), Timed Up and Go (TUG) test and the Performance-Oriented Mobility Assessment (POMA), all of which are practical and widely validated for clinical use. These assessments help evaluate balance, gait and functional mobility providing valuable insights into an older adult's fall risks. Selecting the appropriate tool is crucial for fall prevention strategies and improving overall outcomes in geriatric care.

IndexTerms **– Falls, Postural instability, Ageing, Outcome assessment**

1. INTRODUCTION

Falls are a major health problem of the elderly. Falling accounts for the majority of injury-related deaths and injury is the sixth leading cause of death among older adults. This number would probably be even higher if cases in which a fall initiated a chain of events culminating in death were taken into account. Falling is also a major cause of morbidity and disability in the elderly. Those who survive falls often have restricted activity, soft tissue injuries or fractures. Multiple potential causes for falls are recognized including neurologic, cardio-vascular and musculoskeletal disorders because disorders of balance and gait are frequently associated with falls in the elderly. Age-related changes in the nervous system may contribute to postural instability, gait disturbance and falling in the elderly. These changes include both visual and vestibular information, in addition to reduced motor power, muscular atrophy, loss of proprioception and vibration sense, extrapyramidal dysfunction and slowed reaction times (Tell GS et al.,1998). Falls are common in old age and frequently result in fall related injury and delayed recovery. This represents a huge burden on the individual and the community. Injuries are the sixth leading cause of death in adults of 65 years of age or above and falls are the leading cause of such injuries. Although many studies have identified risk factors for falls among the elderly in the general population, few have focused on risk factors for fall related injury. Depending on the population under study, between 20% and 60% of the elderly suffer injuries from falls in any one year. Among older adults living at home, almost half of the falls lead to a fall related injury (Bergland et al., 2004). The ability to maintain balance in an erect posture over a relatively narrow base is a unique feature of humans. This feature plays an important role in our day-to-day activities. Therefore, abnormality in postural stability may lead to serious consequences adversely affecting the normal life. The functionally important components of balance are maintenance of posture, postural adjustments in anticipation of and during a self-initiated movement and adjustments in response to an external perturbance (Borah et al., 2007). Because of the multi-sensory complex nature of postural control, it is important to explore whether factors that might negatively impact on postural stability such as physical activity levels, lower limb sensory and motor function. Vestibular and visual function are different in older adults. First, level of physical activity has been negatively associated with onset of neck pain. Lower levels of physical activity may be associated with poorer lower limb function such as reduced strength and flexibility and consequently contribute to a decrease in postural stability in older adults with neck pain (Quek J et al., 2018).

2. METHODOLOGY

Research design – Literature Review.

Duration of study – 6 months

Search strategy and selection criteria – Electronic searches were performed using Google scholar, Medline, PubMed.

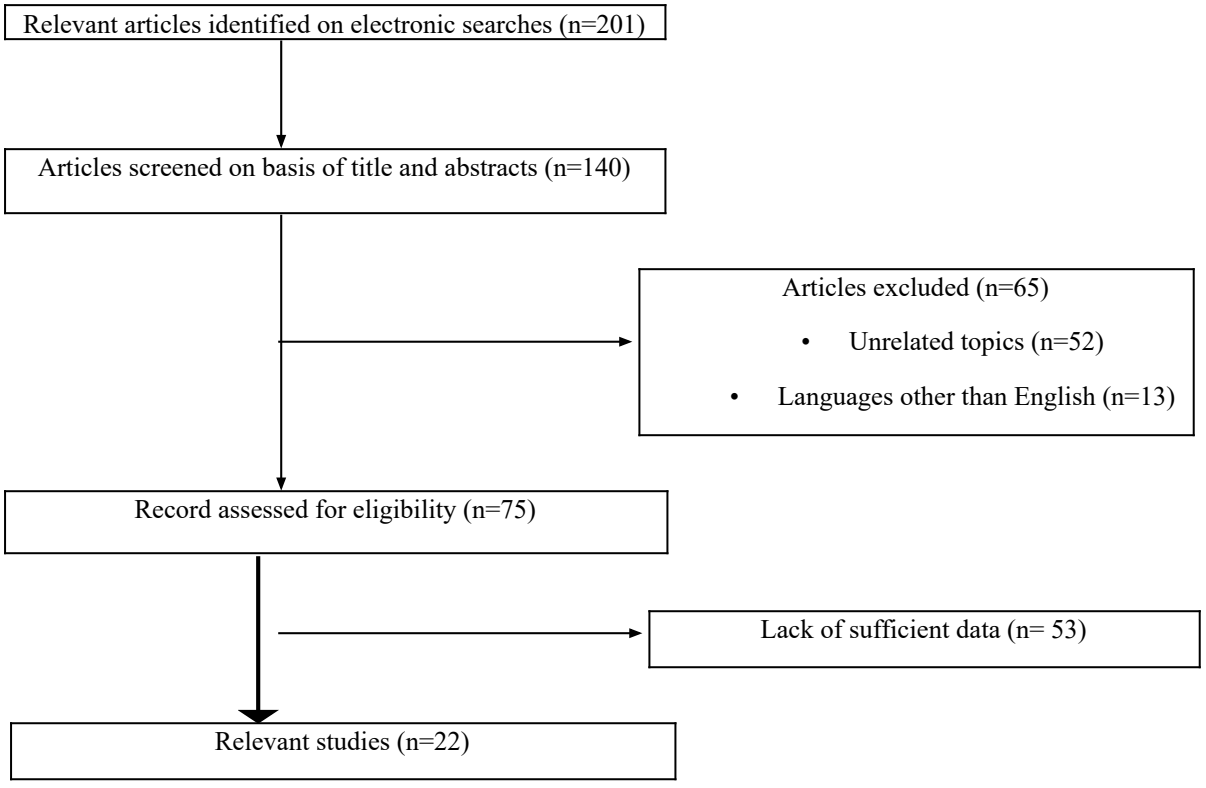
Inclusion criteria –

- Articles on scales for assessment tools for postural instability or risk of fall in older adults.
- Studies done between 1996-2023.
- Studies involving participants aged 60 years and above.
- Articles published in English language only.

Exclusion criteria –

- Studies involving participants below 60 years of age
- Articles published in language other than English language.

OVERVIEW OF METHODOLOGY



3. RESULT:

S. no	Tool	Author	Sample	Domains	Reliability & validity	Validation	Used for
1.	Time up & go test (TUG)	Adson J.A	427 people of age above 65 years in a community	Physical function (stand up, walking, sitting)	ICC = 0.80 r = 0.97	English, Spanish, French, German, Swedish	Assessing elderly individuals who are prone to falling
2.	Functional reach test (FRT)	P. Duncan et al.	217 elderly male veterans aged 70 years and above	Physical function (standing, hand movements)	_____	English, Spanish, French, Swedish, Italian, Portuguese	Identifying elderly subjects at risk of recurrent fall
3.	Fullerton advance scale (FABS)	Hernandez D. et al.	192 older adults of mean age 75 years	Balance	High test – retest reliability (0.96) intra – rater reliability (0.92 – 1.00)	English, Spanish, French, German, Italian, Dutch, Swedish, Norwegian	Predicting which older adults will or will not fall
4.	6 min walk test (6MWT)	Rikli R.E et al	77 subjects, 60- 87 years	Walking	Test – retest reliability (0.88) Validity = 0.71	English, French, Italian, Norwegian, Arabic, Russian	Assessing risk of falls while walking
5.	Dynamic gait test (DGI)	Talia Herman et. al	278 older adults	Gait, balance, walking	Inter – rater (r= 0.96) Test – retest reliability (r = 0.98)	English, Chinese, Korean, Russian, Japanese	Assessing, gait, balance, and risk of fall
6.	Performance oriented mobility assessment (POMA)	B Moulodi et.al	145 older adults aged 65 years and older	Gait	TRR ICC = 0.97 IRR ICC = 0.92 r = 0.39 – 0.90	English, Norwegian, Japanese, French, German	Assessing risk of fall in older adults
7.	Morse falls scale	Marry E Tinetti et. al	89 older adults	Daily activity	_____	English, French, Spanish, German	Identifying patient risk of falling

8.	Downton risk index	U. Olsson Moller et al.	153 people aged 65 years and older	Daily activities	_____	English, Portuguese, Swedish, Arabic, Russian	Predicting risk of fall
9.	Retropulsion test	Jorik N et al.	Older adults with parkinson disease	Standing, walking backward	ICC = 0.95 rSp > 0.80	English, Greek, Turkish, Italian	Evaluating postural instability in Parkinson`s disease
10.	Stratify	Alexendra Papaionnou et al.	620 older adults over the age of 65 years	Mobility, Balance	Inter-rater reliability ICC = 0.78	English, Spanish, French, Chinese	Identifying clinical characteristics of elderly inpatient that predict their chance of falling.
11.	30 second sit to stand test (30 CST)	Peixuan Zheng et al.	Older adults in geriatrics care (65 years and above	Sitting, standing	CI = 0.79 – 0.93	English, Spanish, French, Italian	Testing leg strength and endurance in older adults
12.	Berg balance scale (BBS)	F Sahin et al.	60 older adults of aged 65 years and older	Physical function (sitting, standing, stand on one leg, walking)	Intra reliability ICC= 0.97 Inter reliability ICC =0.98 Validity r=0.67	English, Bengali, Tamil, Telugu, Polish.	Determining the patient's ability to safely balance during a series of task
13.	Balance evaluation system test (BESTest)	Abigail L.L et al.	80 older people with Parkinson disease	Balance, gait	Inter rater ICC =0.91 Test retest=ICC = 0.88 r = 0.95	English, Spanish, French, German	Evaluating the balance impairment
14.	Zur balance scale	Zur et al.	251 older adults over the age of 70 years	Balance, standing	ICC = 0.80 r = 0.34 p< 0.01	English, Spanish, French, German, Italian	Evaluating the visual, somatosensory, & vestibular sensory that form basis postural balance
15.	Sit to stand test (SST)	Anoop T B et al.	51 community dwelling older adults, 65 years and older	Balance, walking, standing	Test retest ICC = 0.96	English, Greek, Chinese, Japanese	Testing leg strength and balance while standing up from sitting

16.	Modified clinical test of sensory interaction and balance (mCTSIB)	Eleftheri A. et al.	100 women over 65 years community dwelled	Balance	ICC = 0.62 (r = -0.652, p < 0.001)	English, Korean, Russian, Chinese	Assessing balance in a population of older adults in the community
17.	Tandem stance test	Franchignoni et al.	45 healthy older adults, mean age of 61 years	Tandem stand barefoot (with eyes open and close)	IRR (EO) ICC = 0.99 (EC) ICC = 0.99 TRR (EO) ICC = 0.90-0.91 (EC) ICC = 0.76 – 0.77	English, Spanish, Arabic, Greek	Assessing balance and mobility
18.	Gait speed	Hee J K et al.	65 older female aged 70 years and above	Walking	Maximal pace ICC (4m) = 0.83 ICC (6m) = 0.90 ICC (10m) = 0.93	English, Korean, Spanish, Japanese	Measuring the functional balance for older adults
19.	Functional gait assessment	Wrisley DM et al	35 older adults aged 60 to 90 years	Walking, balance	ICC = 0.83 – 0.84	English, Swedish, French, Arabic	Assessing the ability to control balance and stability under a variety of conditions.
20.	Static posturography	Jennifer H	Older adults	Standing with eyes open and close	_____	English, Spanish French, arwabic	Assessing passive postural control
21.	Short physical performance battery	Cecilie F. O	Older than 60 years of age	Walking, sitting, standing	r = 0.53 – 0.84 p< 0.01	English, Japanese, Korean, Italian	Assessing balance while doing activity
22.	Activities-specific balance confidence scale (ABC)	Erica M B et al.	Elderly people	Daily activities	test-retest reliability ICC = 0.85	English, Japanese, Korean, Italian	Assessing the balance of subjects while doing activities.

4. DISCUSSION

Assessment of postural instability and risk of falls in older adults is crucial in geriatric healthcare due to the rising incidence of fall-related injuries and the associated economic and social burden. A wide variety of tools are currently available, each designed to evaluate different domains of mobility, balance and physical function. The selection of an appropriate tool depends on clinical context, resource availability and the specific functional impairments being targeted.

Simple, functional tools such as the Timed Up and Go (TUG) and Functional Reach Test (FRT) are highly valued in geriatric care due to their efficiency, minimal resource requirement and strong predictive validity. TUG has been shown to predict all-cause mortality among older adults in community settings, highlighting its utility beyond mere fall prediction (Edson et al., 2022). The FRT similarly provides a quick measure of forward balance reach and is significantly correlated with recurrent falls (Duncan et al., 1992). Performance-based tools like the Fullerton Advanced Balance Scale (FAB) and Berg Balance Scale (BBS) evaluate both static and dynamic components of balance. FAB, for example, can identify subtle changes in balance and mobility that may be missed by more general tests and is particularly effective in predicting fall risk among high-functioning older adults (Hernandez et al., 2019). The Balance Evaluation Systems Test (BESTest) goes further by segmenting balance performance into six distinct systems including biomechanical constraints and postural responses allowing clinicians to target specific deficits. It has been successfully applied in populations with Parkinson's disease to distinguish fallers from non-fallers (Abigail et al., 2011). However, its detailed nature makes it better suited for specialized clinical or rehabilitation settings.

Gait-specific tools such as the Dynamic Gait Index (DGI) and Functional Gait Assessment (FGA) provide dynamic insights into walking stability. The FGA has demonstrated strong predictive ability, with a cut-off score of 22 yielding 100% sensitivity and 72% specificity for falls in older adults (Wrisley et al., 2010). Similarly, the 6-Minute Walk Test (6MWT) evaluates endurance and functional capacity, with performance decreasing predictably with age and physical decline (Rikli et al., 1998). Tests such as the 30-Second Sit-to-Stand (30STS) and Sit-to-Stand (STS) focus on lower extremity strength, which plays a critical role in postural control and the ability to recover from perturbations. These tests are validated for reliability and correlate well with other strength assessments like the pneumatic leg press. Advanced and objective tools such as Static Posturography, Zur Balance Scale (ZBS), and Modified Clinical Test of Sensory Interaction on Balance (mCTSIB) provide detailed information about the contributions of sensory systems (visual, vestibular, somatosensory) to postural control. For example, the mCTSIB evaluates balance under four sensory conditions and has shown moderate to good reliability on the Biodex platform. ZBS is particularly effective at detecting subtle balance impairments in higher-functioning older adults, although both tools require specialized equipment.Finally, subjective assessments like the Activities-Specific Balance Confidence (ABC) Scale provide valuable insights into the psychological aspect of falls, capturing how confident older adults feel about maintaining balance during daily tasks. The ABC scale has shown strong reliability and construct validity, particularly in post-stroke populations (Botner et al., 2005).

5. CONCLUSION

While a single test may not fully capture all aspects of risk of falls or postural instability, a combination of tools can offer a comprehensive evaluation. Examiner should choose assessment tools based on the individual's health status, setting, and intended intervention, always aiming to detect early signs of functional decline and reduce the incidence of preventable falls in older populations. Further studies are required to evaluate the reliability and validity of assessment tools of risk of fall and postural instability in older adults used in common clinical practice. The assessment of postural instability and risk of falls in older adults is a critical area of geriatric healthcare, given the rising global elderly population and the profound individual, social, and economic consequences associated with falls. This review of various assessment tools highlights that no single measure can comprehensively evaluate all the dimensions of balance, gait, mobility, strength, and functional independence. However, a variety of validated and reliable tools are available, each targeting specific aspects of fall risk and postural control.

Simple clinical tests such as the Timed Up and Go (TUG) test, Functional Reach Test (FRT), and 30-Second Sit-to-Stand Test are practical, low-cost, and require minimal equipment, making them particularly suitable for routine screenings in community and clinical settings. These tests offer quick insights into mobility, balance, and functional strength, effectively identifying individuals at elevated risk of falls. Their widespread application in both research and practice underscores their clinical relevance.More comprehensive assessments such as the Fullerton Advanced Balance Scale (FABS), Performance-Oriented Mobility Assessment (POMA), and Dynamic Gait Index (DGI) offer a deeper evaluation of balance and gait adaptability. These tools are especially useful in detecting subtle deficits in higher-functioning older adults or in tailoring rehabilitation programs. The Balance Evaluation Systems Test (BESTest) and Zur Balance Scale (ZBS) further refine balance assessment by isolating specific sensory, motor, and cognitive contributions to postural control, though their complexity and resource requirements may limit use to specialized settings.

The Morse Fall Scale (MFS) and Downton Fall Risk Index (DFRI) stand out as quick screening instruments, effectively identifying older individuals at higher risk based on clinical history, medication use, cognitive impairment, and mobility limitations. While highly sensitive, these tools should ideally be supplemented by physical performance tests to avoid overestimation of fall risk.The Retropulsion Test is particularly vital in populations with Parkinson's disease, offering a focused assessment of postural instability that is a major predictor of falls in this group. Meanwhile, tools like the Six-Minute Walk Test (6MWT) and Gait Speed Test provide functional endurance and mobility measures that not only predict fall risk but are also linked to broader health outcomes, including mortality. Moreover, psychological factors such as fear of falling, captured effectively through self-reported measures like the Activities-Specific Balance Confidence (ABC) Scale, are equally crucial. Fear can independently lead to activity restriction, deconditioning, and subsequent falls, thus necessitating its routine assessment alongside physical measures.

In conclusion, this review affirms that the selection of fall risk and postural instability assessment tools must be individualized based on the target population, clinical objectives and available resources. A multifactorial approach, combining history-taking, performance-based measures and psychological assessments offers the most comprehensive evaluation. Importantly, early identification of at-risk individuals through these tools enables timely intervention, ultimately improving quality of life, maintaining independence and reducing the burden of falls in older adults. Future research should continue refining these tools to enhance sensitivity, specificity, and practicality across diverse clinical populations and settings.

REFERENCES

1. Tell GS, Lefkowitz DS, Diehr P, Elster AD. Relationship between balance and abnormalities in cerebral magnetic resonance imaging in older adults. Archives of Neurology. 1998 Jan 1;55(1):73-9.
2. Bergland A, Wyller TB. Risk factors for serious fall related injury in elderly women living at home. Inj Prev 2004; 10: 308–13.
3. Borah D, Singh U, Wadhwa S, Bhattacharjee M. Postural stability: Effect of age. IJPMR. 2007;18(1):7-10.
4. Quek J, Treleaven J, Clark RA, Brauer SG. An exploratory study examining factors underpinning postural instability in older adults with idiopathic neck pain. Gait & posture. 2018 Feb 1;60:93-8.
5. Edson J. Ascencio1, Gustavo D. Cieza-Gómez, Rodrigo M. Carrillo-Larco, and Pedro J. Ortiz. Timed up and go test predicts mortality in older adults in Peru: a population-based cohort study. BMC Geriatrics. 2022
6. Pamela W. Duncan, Stephanie Studenski, Julie Chandler, Barbara Prescott. Pamela W. Duncan, Stephanie Studenski, Julie Chandler, Barbara Prescott. *Journal of Gerontology,* May 1992; 47(3):M93-M98
7. Danielle Hernandez, MS, Debra J. Rose. Predicting Which Older Adults Will or Will Not Fall Using the Fullerton Advanced Balance Scale. Arch Phys Med Rehabilitation 30 June 2019; Vol89.
8. Rikli RE, Jones CJ. The reliability and validity of a 6-minute walk test as a measure of physical endurance in older adults. Journal of aging and physical activity. 1998 Oct 1;6(4):363-75
9. T. Herman, N.Inbar – Borovsky, Marina Brozgol, N.Giladi and Jeffrey M.H. The dynamic gait index in healthy older adults: The role of stair climbing, fear of falling and gender. Gait posture, 2009 feb; 29(2): 237 -241.
10. Moulodi B, Azad A, Taghizadeh G, Roohi-Azizi M, Mohammadi P. Reliability and validity of Persian version of performance-oriented mobility assessment (POMA) in community-dwelling Iranian older adults: Psychometric properties. Iranian Rehabilitation Journal. 2020 Mar 10;18(1):39-48.
11. Ivana B a, Katarina Z. a, Martina T. a, Jana Z. The risk of falling among older adults in long-term care: screening by the Morse Fall Scale. Kontakt. 2018; 20(2): e111–e119.
12. U. O Moller, J. Kristensson, P. Midlov ,C. Ekdahl & U. Jakobsson. Predictive Validity and Cut-Off Scores in Four Diagnostic Tests for Falls – A Study in Frail Older People at Home. 3rd July 2012; 30(3):189-201.
13. Jorik N, Rianne G, Vivian W,c and Bastiaan R.B. The Retropulsion Test: A Good Evaluation of Postural Instability in Parkinson's Disease. Journal of Parkinson's Disease 5 (2015) 43–47
14. Viveiro LA, Ferreira AF, Pompeu JE. Cross-cultural adaptation, reliability, and validity of the St. Thomas's Falls Risk Assessment Tool in Older Adults (STRATIFY). Fisioterapia em Movimento. 2019 Jul 22; 32: e003227.
15. Zheng P, Huynh TL, Jones CD, Feasel CD, Jeng B, Motl RW. Validity of the 30-Second Sit-to-Stand test as a measure of lower extremity function in persons with multiple sclerosis: Preliminary evidence. Multiple Sclerosis and Related Disorders. 2023 Mar 1;71: 104552.
16. Abigail L. Leddy, Beth E. Crowner, Gammon M. Earhart, Utility of the Mini-BESTest, BESTest, and BESTest Sections for Balance Assessments in Individuals with Parkinson Disease J Neurol Phys Ther. 2011 June; 35(2): 90–97.
17. Oz Zur, Hadas Ben-Rubi Shimron, Lisa Deutsch and Eli Carmeli. Reliability, validity and normal ranges of the Zur Balance Scale for detecting mild postural control differences: introducing the modified, short version mZBS. Jia Han, Shanghai University of Sport, China. 26 May 2023;
18. Anoop T. Balachandran, Andrew D.Vigotsky, Norberto.Q, Lidwine B. Mokkink, Mark A. Belio, Jordan M.G. Validity, reliability, and measurement error of a sit-to-stand power test in older adults: A pre-registered study. Experimental gerontology, March 2021; vol 145: 111202.
19. Eleftheria.A, Xristina Kalivioti, Konstantinos Stolakis, Amalia Koloniari, Panagiotis Megas, Minos Tyllianakis, Elias Panagiotopoulos. Reliability and validity of the mCTSIB dynamic platform test to assess balance in a population of older women living in the community. J Musculoskelet Neuronal Interact 2020; 20(2):185-193.
20. F. Franchignoni, L. Tesio, M.T. Martino and C. Ricupero. Reliability of four simple, quantitative tests of balance and mobility in healthy elderly females. Aging Clin. Exp. Res, 1998; 10: 26 – 31.
21. H.J Kim, I. Park, H. J Lee, O. Lee. The reliability and validity of gait speed with different walking pace and distances against general health, physical function, and chronic disease in aged adults. J Exerc Nutrition Biochem. 2016;20(3):046-050.
22. Wrisley DM, Kumar NA. Functional gait assessment: concurrent, discriminative, and predictive validity in community-dwelling older adults. Physical therapy. 2010 May 1;90(5):761-73.
23. Jennifer H, Edward D.L, Jonathan K, William E.M. Elderly fall risk prediction using posturography. 21st feb, 2017.
24. Cecilie F.O and Astrid B. Reliability of the Norwegian version of the short physical performance battery in older people with and without dementia. BMC Geriatrics (2017) 17:124.
25. Erica M.B, William C M and Janice J. E. Measurement properties of the Activities-specific Balance Confidence Scale among individuals with stroke. Published online; 07 Jul 2009.