

Featured Falls Research – July

Exergaming Interventions for Preventing Falls and Injurious Falls in Older People: Systematic Review and Meta-Analysis of Randomized Controlled Trials

Eost-Telling C, McGarrigle L, Shi C, Money A, Yang Y, Lazo Green K, Ahmed S, Christie R, Aminu A, Delbaere K, de Bruin ED, Stanmore E, Todd C. JMIR Aging. 2026 Jul 31;9:e89807.

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PMID: 42536979

Abstract

Background: Exergames, which combine physical exercise with interactive gameplay, are increasingly being incorporated into fall prevention programs for older adults. Gamified elements, such as real-time feedback and progress tracking, may enhance motivation, engagement, and adherence. Although several systematic reviews have examined the effects of exergaming on balance and physical function, fewer have focused specifically on clinically meaningful outcomes, such as falls and injurious falls, or on indicators that may influence real-world adoption of exergames.

Objective: This study aimed to evaluate the effectiveness of exergaming interventions for preventing falls and injurious falls in people aged ≥ 60 years and to synthesize evidence on implementation-related outcomes, including adherence, acceptability, concerns about falling, quality of life, adverse events, and cost-effectiveness.

Methods: MEDLINE, Embase, CINAHL Plus, PsycINFO, and the Cochrane Central Register of Controlled Trials (CENTRAL) were searched from inception to February 2025 for randomized controlled trials evaluating exergaming interventions in older adult populations across all settings. Outcomes included fall rate, number of fallers and injurious falls, and implementation-related secondary outcomes. Risk of bias was assessed using RoB 2.0, and certainty of evidence was assessed using Grading of Recommendations Assessment, Development, and Evaluation (GRADE). Data were synthesized narratively and, where appropriate, pooled using meta-analysis.

Results: Nine studies (N=1385) met the inclusion criteria. Comparator-specific analyses suggested that exergaming may reduce fall rates compared with active intervention comparators, although the magnitude and certainty of effect varied, and substantial heterogeneity was present across analyses. Moderate-certainty evidence also suggested that exergames reduced the number of older adults experiencing one or more falls at 12-month follow-up compared with usual care (risk ratio 0.75, 95% CI 0.61-0.92). Evidence for injurious falls, quality of life, concerns about falling, adherence, acceptability, and cost-effectiveness was limited or inconsistent. When pooled across all control groups, exergaming interventions were associated with a lower overall fall rate than comparator interventions (incidence rate ratio 0.53, 95% CI 0.41-0.68), although substantial heterogeneity was present ($I^2=76\%$).

Conclusions: Low- to moderate-certainty evidence suggests that exergames may reduce fall rates, particularly in comparisons with active intervention control groups, and may reduce the number of fallers compared with usual care. These findings indicate that exergaming may offer a useful adjunct to established fall prevention strategies for older adults, particularly where sustained engagement

with conventional exercise is challenging. However, substantial heterogeneity, modest sample sizes, and limited long-term follow-up reduce confidence in these estimates, and more rigorous, large-scale trials are needed before routine implementation can be recommended. This review extends previous exergaming syntheses by focusing on clinically meaningful outcomes, including falls and injurious falls, while also considering implementation-related factors relevant to real-world uptake.

Keywords: accidental falls; active video gaming; aging; exercise; exergames; fall prevention; physical activity; video games; virtual reality.

Effectiveness of Self-Administered Dual-Task Training in Improving Balance and Reducing Falls Among Older Adults: A Multicenter Randomized Control Trial

Khan MJ, Fong KNK, Wong TW, Tsang WW, Chan WC, Chen C, Winsor SJ. J Phys Act Health. 2026 Jul 25:1-16.

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Abstract

Background: Dual-task training helps improve balance and reduce falls among older adults, but self-administration of such training has yet to be explored. This study investigates the effectiveness of self-administered dual-task (sDT) compared with single-task training for improving balance and reducing falls.

Methods: Participants were 216 community-dwelling adults aged 65 years or over who had experienced at least 1 fall in the previous 6 months. Participants were assigned randomly to the sDT (n = 99) or self-administered single-task training (n = 117) group. Both groups completed 36 training sessions over 12 weeks, including 6 supervised workshops. The primary outcome was frequency of falls, while secondary outcomes included dynamic balance, dual-tasking ability, fear of falls, general health, global cognition, and quality of life. Assessment timelines included baseline, 12 weeks postintervention, and 6-month follow-up.

Results: The number of falls decreased in both groups. Compared with the self-administered single-task training group, the sDT group had a significantly lower fall rate (incidence rate ratio: 0.47; 95% CI, 0.34-0.64; $P < .001$). Immediate between-group effects showed that the sDT group had improved general health and global cognition. Immediate and long-term within-group effects in the sDT group included improved dynamic balance, standard Time Up and Go, and global cognition. No adverse events were recorded.

Conclusion: Twelve weeks of sDT intervention was found to be safe and effective for reducing falls among at-risk participants. Future studies should evaluate the effects of sDT interventions, including a usual care control group.

Keywords: accidental fall; community-dwelling; elderly; motor–cognitive; postural control.

Comparing the effects of different exercises on falls in older adults: A network meta-analysis of randomized controlled trials

Zhou L, Huang H, Wang C, Wang L, Wang C, Yang R, Lv L, Huang S, Xu J, Yang Y, Tao Y, Zhao S, Xie T, Zhang J. *Int J Nurs Stud.* 2026 Jul 22;183:105648.

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Abstract

Background: Falls are a common geriatric syndrome in older adults and are associated with functional decline, disability, hospitalization, and increased mortality. Exercise has been shown to improve fall-related outcomes, but the comparative effectiveness across different exercise modalities remains to be clarified.

Objective: This study aimed to assess the comparative effectiveness of different exercise interventions on the number of fallers, recurrent fallers, fall-related injuries, and fall-related fractures in older adults.

Design: Network meta-analysis of randomized controlled trials.

Methods: Systematic searches were conducted in five databases, including PubMed, Web of Science, Embase, the Cochrane Library, and CINAHL Plus with Full Text, from database inception to October 21, 2025, and were updated to April 18, 2026. Risk of bias was assessed using the Cochrane Risk of Bias tool 2.0 for randomized controlled trials. A frequentist network meta-analysis was performed using Stata 17 and R 4.2.1. Heterogeneity was assessed using τ^2 , Q statistics, and I^2 , and interventions were ranked according to the surface under the cumulative ranking curve.

Results: A total of 45 randomized controlled trials involving 16,240 older adults were included, evaluating five types of exercise interventions. Compared with usual care, multicomponent exercise (OR = 0.78, 95% CI: 0.67 to 0.91) and mind-body exercise (OR = 0.62, 95% CI: 0.46 to 0.85) were associated with fewer fallers among older adults ($Q = 89.27$, $P < 0.05$, $I^2 = 55.2\%$, $\tau^2 = 0.08$), while mind-body exercise (OR = 0.57, 95% CI: 0.38 to 0.85) was also associated with fewer recurrent fallers ($Q = 32.95$, $P = 0.02$, $I^2 = 45.4\%$, $\tau^2 = 0.06$). In addition, mind-body exercise (OR = 0.68, 95% CI: 0.47 to 0.99) and balance training (OR = 0.76, 95% CI: 0.61 to 0.96) may reduce the risk of fall-related injuries ($Q = 4.03$, $P = 0.67$, $I^2 = 0\%$, $\tau^2 = 0$). No statistically significant differences were observed between exercise interventions and usual care for fall-related fractures. Sensitivity analyses indicated that the results were stable.

Conclusion: Multicomponent exercise, mind-body exercise, and balance training may reduce fall-related outcomes in older adults and may inform clinical decision-making regarding exercise interventions. However, these findings should be interpreted with caution because the certainty of evidence ranged from moderate to very low across outcomes. Further high-quality randomized controlled trials are needed to confirm these findings.

Keywords: Exercise; Falls; Network meta-analysis; Older adults.

Falls Research – July

Association between depressive symptoms and balance disorders in older adults living in 12 high Andean communities

Alanya-Pineda MT, Bravo-Alcántara IA, Alcantara-Diaz AL, Salazar-Talla L, Urrunaga-Pastor D, Runzer-Colmenares FM, Parodi JF. PLoS One. 2026 Jul 8;21(7):e0353158.

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Abstract

Background: The prevalence of depressive symptoms and balance disorders may be higher in high-altitude Andean regions due to chronic hypoxia, neurochemical alterations, and limited access to health services. Since both conditions can coexist and contribute to functional decline and falls, their association is relevant. We aimed to estimate the association between depressive symptoms and balance disorders in older adults living in 12 high Andean communities.

Methods: We carried out a secondary analysis of data from a cross-sectional analytical study in older adults residing in 12 Peruvian high Andean communities during the period 2013-2020. The exposure variable was depressive symptoms (defined as a score greater than or equal to two on the five-item geriatric depression scale), while the outcome variable was balance disorders (defined by a functional reach test less than or equal to 20.32 cm). We constructed generalized linear models from Poisson family with link log and robust variances. We estimated crude (cPR) and adjusted (aPR) prevalence ratios with their respective 95% confidence intervals (95%CI).

Results: We analyzed 417 older adults; 61.1% (n = 255) were women, with a mean age of 73.2 ± 6.9 years. Additionally, 52.8% (n = 220) presented depressive symptoms, while 48.9% (n = 204) presented balance disorders. In the adjusted regression model, depressive symptoms were associated with a higher prevalence of balance disorders in older adults (aPR = 1.66; 95%CI: 1.28-2.15; $p < 0.001$).

Conclusions: Depressive symptoms were associated with a higher prevalence of balance disorders in older adults residing in the 12 high Andean communities. Future epidemiological studies with a larger sample size are needed to evaluate depressive symptoms and balance disorders to develop early screening programs in older adults to improve their quality of life and access to primary health care.

A Multidomain Longitudinal Analysis of Frailty, Functional Limitation, Balance and Falls in Older Adults

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Abstract

Background/Objectives: Falls are a major threat to healthy ageing and the preservation of independence, yet the risk of falls in older adults commonly arises from multiple interacting domains rather than a single factor. This longitudinal analysis assessed whether frailty, functional limitation, and balance performance were associated with future falls among older adults. **Methods:** This longitudinal analysis assessed older adults aged 65 years and older over a three-year follow-up interval, using baseline data collected in 2015 and follow-up falls data collected in 2018. Baseline health, functional, and physical performance measures were evaluated in relation to self-reported falls at follow-up. Candidate predictors comprised sociodemographic, health, functional, and physical performance variables. Univariable logistic regression, adjusted screening models, and a final complete-case multivariable logistic regression model were used. **Results:** The eligible analytic sample comprised 1932 participants, of whom 480 (24.8%) reported falls at follow-up. In adjusted analyses, greater frailty index, greater ADL limitation, female sex, shorter full-tandem balance time, depressive symptoms, and greater self-rated mobility severity were associated with higher odds of future falls. However, only frailty index, ADL limitation, full-tandem balance time, and female sex were retained in the final multivariable model. In the final multivariable model of 1451 participants, frailty index per 0.1-unit increase (OR 1.26, 95% CI 1.07-1.48), ADL limitation score per 1-point increase (OR 1.30, 95% CI 1.16-1.45), female sex (OR 1.62, 95% CI 1.17-2.25) and longer full-tandem balance time per 10 s increase (OR 0.89, 95% CI 0.82-0.96) remained associated with falls. The final model showed modest discrimination and acceptable apparent calibration. **Conclusions:** Higher frailty, greater ADL limitation, poorer tandem balance and female sex were associated with subsequent falls. These results reinforce the value of a multidomain approach to fall-risk assessment.

Keywords: activities of daily living; balance; falls; frailty; longitudinal study; older adults.

Comparison of hip abduction range of motion and strength and ankle dorsiflexion in older adults with and without a history of falls

Al-Sayyid Salman ZAAN, Roshani S. BMC Geriatr. 2026 Jul 6.

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PMID: 42410524

Abstract

Background and purpose: Falls are among the most serious complications of aging, leading to disability, reduced quality of life, and even mortality. "Evidence suggests that weakness in proximal muscles (such as the hip abductors) and distal muscles (such as the ankle dorsiflexors) may contribute to impaired balance and increased fall risk in older adults." However, few studies have simultaneously compared both the range of motion and strength of these two muscle groups in older adults with and without a history of falls. The aim of the present study was to compare hip abduction and ankle dorsiflexion range of motion and strength between older adults with and without a history of falls.

Methods: This cross-sectional comparative study included 60 community-dwelling older adults (30 with and 30 without a history of falls within the past 6 months). Range of motion was measured using a universal goniometer, and isometric muscle strength was assessed using a handheld dynamometer. Data were analyzed using the independent samples t-test at a significance level of $p < 0.05$.

Results: No significant difference was observed between the two groups in hip abduction range of motion ($p = 0.188$). However, the group without a history of falls demonstrated greater hip abduction strength ($p < 0.001$), ankle dorsiflexion range of motion ($p < 0.001$), and ankle dorsiflexor strength ($p < 0.001$).

Conclusion: Concurrent weakness in the hip abductors and ankle dorsiflexors may be associated with an increased risk of falls in older adults. Combined assessment of muscle strength and range of motion in these regions may assist in identifying older adults with characteristics associated with fall history.

Keywords: Ankle dorsiflexion; Falls; Hip abductor strength; Older adults; Postural stability; Range of motion.

Effects of dynamic neuromuscular stabilization on balance, gait, and quality of life in older adults: a randomized controlled trial

Babagoltabar-Samakoush H, Aminikhah B. Sci Rep. 2026 Jul 8.

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Abstract

Age-related declines in neuromuscular and sensory systems substantially increase fall risk and impair independence in older adults. Exercise interventions improve balance and gait; however, the maintenance of these training-induced gains over time remains uncertain, as most benefits may diminish within months after training ceases. This study determined whether an 8-week Dynamic Neuromuscular Stabilization (DNS) programme produces post-intervention and short-term follow-up improvements in balance, gait speed, fear of falling, and health-related quality of life in community-dwelling older adults. In this assessor-blinded randomised controlled trial, 44 older adults aged 60-75 years were randomly allocated to either supervised DNS (totaling 24 sessions: three sessions per week for 8 weeks, 40-50 min per session) or a usual-activity control group. Outcomes were measured at baseline, immediately post-intervention, and at 2-month follow-up using validated clinical instruments. Thirty-nine participants completed the trial (DNS group, $n = 19$; control group, $n = 20$). Mixed-design ANOVA showed significant group $\times$ time interactions for all outcomes (all $P < 0.001$). At post-test, the DNS group exhibited large effect-size improvements compared with controls: static balance errors decreased by 58-74% (Cohen's $d = 2-2.65$), dynamic balance scores increased by 36% ($d = 2.05$), gait speed increased by 28% ($d = 1.54$), fear of falling decreased by 42% ($d = 1.92$), and physical and mental health-related quality of life (HRQOL) components improved substantially ($d = 2.20-2.28$). At 2-month follow-up, these improvements were largely maintained without significant deterioration within the follow-up period ($P > 0.05$). The control group exhibited no meaningful changes. An 8-week DNS intervention yields robust, clinically meaningful, and sustained short-term improvements across multiple domains related to fall risk in older adults. These short-term retained adaptations position DNS as an effective neurophysiologically based approach for fall prevention within the observed follow-up period. Trial registration: RTC, prospectively registered in the Clinical Trial Registry (UMIN000055127) on 29/12/2024.

Characterization of physical health variables across fall risk appraisal groups: a cross-sectional study

Banarjee C, Lafontant K, Suarez JR, Lopez J, Wang Z, Leinbach C, Xie R, Thiamwong L. BMC Geriatr. 2026 Jul 18.

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Abstract

Background: Fall risk appraisal (FRA) integrates perceived fall risk (levels of fear of falling) and physiological fall risk (static balance). Established literature has defined cut-offs for four groups (congruent, incongruent, irrational, and rational), but characterization of these groups is limited to separate studies evaluating physical activity, body composition, and fall history. This study aims to characterize physical health measures in a large sample of older adults and evaluate differences between each maladaptive group (congruent, incongruent, irrational) and the adaptive (rational) group.

Methods: The sample included 381 low-income older adults (age = 74.3 ± 7.1 years; 87.7% female) from diverse backgrounds. Age, body mass index (BMI), physical activity measured through accelerometry, dynamic balance measured through the Timed Up and Go test, lower limb power measured through the 30-second chair stand test, and handgrip strength were compared across groups distinguished by perceived and physiological fall risk.

Results: The characterization of a large and diverse sample of low-income older adults revealed a majority with maladaptive FRA. Those in the congruent group presented with greater age, BMI, and decreased physical activity, dynamic balance, lower limb power, and handgrip strength. However, those with physiological deficits but low perceived fall risk (incongruent) outperformed in physical health measures than those without physiological deficits and high fear of falling (irrational). Older adults with greater fear of falling and better static balance (congruent) show worse physical health than older adults with less fear of falling and worse static balance.

Conclusions: This study examines the physical health of a large group of community-dwelling older adults based on differences in fear of falling and static balance. The results reveal the greater significance of fear of falling in affecting physical health than the presence of physiological balance deficits. It further validates that FRA differentiates older adults with differences in physiological physical health and reveals the significance of applying fall risk appraisal to practice and providing tailored recommendations that decrease fall risk. Additionally, it strengthens the argument for tailored interventions to address perceived fall risk alongside physiological exercise and physical activity.

Trial registration: This study used data collected from a clinical trial registered on ClinicalTrials.gov on March 21, 2023 ([NCT05778604](https://clinicaltrials.gov/ct2/show/study/NCT05778604)).

Keywords: Dynamic balance; Fear of falling; Physical activity; Physical function; Static balance.

Foot deformities and alterations associated with increased fall risk in older adults

Castillo-Montesinos A, Brognara L, Zamboni AD, Mafla-España A, Cauli O. J Tissue Viability. 2026 Jul 21;35(4):101035.

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PMID: 42480449

Abstract

Background: Foot alterations have been identified in the literature as a significant risk factor for falls in older adults. However, the contribution of specific types of alterations, such as digital deformities and skin alterations, has not been studied in detail. These findings highlight the importance of improving understanding of podiatric factors that contribute to fall risk.

Objective: This study aimed to identify which podiatric alterations, such as hyperkeratosis, corns, reduced plantar fat pad, onychomycosis, heel xerosis, and digital deformities, including hallux valgus (HAV), claw toes, supraductus toes, infraductus toes, hammer toes, and quintus varus, are most predictive of fall risk in older adults, both with and without diabetes mellitus.

Materials and methods: An analytical, cross-sectional, retrospective study was conducted on 85 individuals over 60 years of age. Foot deformities and dermatological alterations were recorded, and fall risk was assessed using the Tinetti balance and gait scale. Statistical analyses included bivariate tests and binary logistic regression to identify predictors of fall risk.

Results: The mean age of participants was 71 years; 66% were women, and 46% had type 2 diabetes mellitus. Overall, 66% of participants had a moderate-to-high risk of falling, and a significant association was observed between fall risk and the presence of diabetes ($p = 0.048$). Logistic regression analysis revealed that reduced plantar fat pad ($p = 0.007$) and heel xerosis ($p = 0.038$) were significantly associated with fall risk, irrespective of the presence of diabetes.

Conclusion: Podiatric alterations, particularly reduced plantar fat pad and heel xerosis, are strong predictors of fall risk in older adults, irrespective of the presence of diabetes. Foot health assessment should be considered a core component of multidisciplinary fall prevention programmes, reinforcing the crucial role of podiatrists in geriatric care to reduce fall risk.

Daily fall risk assessment for older adults using a balance sensor with machine learning

Chen J, Ma X, Zou KH, Tian Y, Zhang Q, Sheng B, Lou VWQ, Xi N. Front Public Health. 2026 Jun 24;14:1827730.

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PMID: 42422682

Abstract

Introduction: Fall-risk assessment is important for preventing falls in older adults, but many conventional balance tests are time-consuming and difficult to use frequently in daily practice. This study aimed to evaluate a rapid 30-s quiet-standing assessment using a balance sensor combined with machine learning for fall-history classification and fall-risk assessment.

Methods: A total of 394 older adults (mean age 71.56 ± 6.69 years) participated, including 91 individuals in a laboratory cohort, 291 in an independent hospital cohort, and 12 in a 10-day home-based feasibility study. The balance sensor captured plantar pressure-distribution images during quiet standing. From these recordings, center-of-pressure (CoP) trajectories and model-derived center-of-gravity (CoG) descriptors were obtained. Spatial, stability, frequency, temporal, and statistical features were extracted, and multiple machine-learning models were evaluated. Model development in the laboratory cohort used nested stratified cross-validation, and the final pipeline was externally validated in the hospital cohort.

Results: In the laboratory cohort, the highest area under the receiver operating characteristic curve (AUC) was 0.71, achieved by the random forest model under the eyes-open condition. Under the eyes-closed condition, the highest AUC was 0.68. In the independent hospital cohort, external validation of the final laboratory-developed model yielded an AUC of 0.68 and an accuracy of 72.0%, which was numerically higher than those of the conventional functional assessments evaluated in this study. The home-based component supported the feasibility of repeated short-duration balance measurement outside the laboratory.

Discussion: These findings suggest that a brief sensor-based standing assessment combined with machine learning may provide a practical approach for fall-history classification and fall-risk assessment in older adults. However, the main analyses were based on retrospective fall history or documented clinical fall risk rather than prospectively observed future falls. Larger prospective and multi-center studies are needed to determine predictive validity and broader clinical utility.

Keywords: balance sensor; center of gravity; center of pressure; fall assessment; machine learning; older adults.

Dose-response relationships of sensorimotor-based interventions on balance performance in older adults: A systematic review and meta-regression analysis

Chen S, Chen P, Huang L, Guo W, Zhong Y. PLoS One. 2026 Jul 23;21(7):e0354522.

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PMID: 42490619

Abstract

Falls are a severe public health challenge for older adults. Although sensorimotor-based interventions can remodel balance, their quantitative dose-response trajectories remain unknown, often leading to blindly accumulated doses. We aimed to identify optimal intervention strategies by deconstructing these non-linear dynamics. A comprehensive search of five databases up to February 2026 identified relevant randomized controlled trials (RCTs). We constructed a random-effects model using the standardized mean difference (Hedges' g). Restricted cubic spline (RCS) and meta-regression models explored the non-linear dynamics of total intervention dose and the moderating effects of age. We included 24 studies comprising 1,110 participants. Sensorimotor-based interventions significantly improved dynamic balance (Timed Up and Go Test [TUGT]: $g = -0.89$, $Q = 78.19$; low-certainty evidence), static balance (Berg Balance Scale [BBS]: $g = 0.94$, $Q = 21.14$; high-certainty evidence), and neuromuscular control, including Center of Pressure with eyes open (COP-EO: $g = -0.66$, $Q = 8.19$; low-certainty evidence) and Center of Pressure with eyes closed (COP-EC: $g = -0.34$, $Q = 3.54$; moderate-certainty evidence). The RCS model suggested significant non-linear dose dependency for dynamic balance (P non-linearity = 0.004), indicating a potential relative attenuation of effect sizes near a cumulative dose of 1000 minutes. Conversely, static balance showed no significant dose association. Increasing age significantly attenuated dynamic balance benefits ($p = 0.047$) but did not negatively affect static stability. The adaptive trajectories of dynamic and static balance responding to sensorimotor interventions diverge fundamentally. Based on these non-linear dose-response fluctuations and age-related characteristics, continuous time accumulation may not guarantee proportional linear returns. Optimizing fall prevention requires shifting toward precise interventions that consider dose-efficiency and age stratification rather than a "more is better" approach. Systematic Review Registration: INPLASY202630061.

Comparative Effectiveness of Unstable Versus Stable Resistance Training on Lower Limb Strength, Mobility, and Fear of Falling in Older Adults: A Systematic Review and Meta-analysis of Randomized Controlled Trials

Doan HN, Chang MC. Am J Phys Med Rehabil. 2026 Aug 1;105(8):722-731.

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PMID: 42468010

Abstract

Objective: This meta-analysis compares the effectiveness of unstable resistance training (URT) with stable resistance training (SRT) on lower limb strength, mobility, and fear of falling in older adults.

Design: PubMed, Embase, Web of Science, Scopus, and the Cochrane Library were searched through July 9, 2025, for randomized controlled trials (RCTs) comparing URT with SRT in older adults. Outcomes included lower limb strength (maximal isometric leg extension strength, Five-Times Sit-to-Stand test), mobility (Timed Up and Go test, gait speed), and fear of falling (Falls Efficacy Scale-International test). Data were pooled separately for short-term (10 to 12 wk) and long-term (24 wk) interventions.

Results: Seven RCTs reported in 8 articles were included; 6 contributed to outcome-specific meta-analyses, and 1 was analyzed descriptively. After short-term training, URT showed no significant improvements over SRT in lower limb strength and mobility outcomes; for the Five-Times Sit-to-Stand test, SRT demonstrated a nonsignificant trend toward better performance than URT. URT significantly reduced fear of falling after short-term training and significantly improved Timed Up and Go performance following long-term training compared with SRT.

Conclusions: URT may provide more benefits over SRT in reducing fear of falling in older adults, with greater functional gains after long-term training.

Keywords: Fear of falling; Lower limb strength; Mobility; Older adults; Resistance training; Unstable surface.

Effects of Whole-Body Vibration Training on Fall-Related Physical Capacities in Older Adults: A Systematic Review

Dong M, Choi Y, Li N, Li F, Shi P, Zhang J. J Am Med Dir Assoc. 2026 Jul 2;27(8):106315.

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PMID: 42391776

Abstract

Objectives: The objective of the study is to synthesize current evidence on the effects of whole-body vibration training (WBVT) on lower limb muscle strength, balance performance, and physical function in older adults and to evaluate its potential role in fall prevention.

Design: Systematic review of randomized controlled trials and quasi-experimental studies examining WBVT as an exercise intervention in older adults.

Setting and participants: Studies involving community-dwelling, institutionalized, or clinical populations of adults aged ≥ 60 years were included, with no restriction on geographical setting.

Methods: Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 guidelines, PubMed, MEDLINE, Web of Science, Embase, Scopus, and the Cochrane Library were searched from inception to May 2025. Eligible studies reported at least 1 outcome related to lower limb strength, balance, or functional performance. Two reviewers independently screened studies, extracted data, and assessed methodological quality using the RoB 2 and PEDro (Physiotherapy Evidence Database) scales. Due to substantial heterogeneity in WBVT protocols, outcome measures, and reporting, a meta-analysis was not performed; findings were synthesized narratively.

Results: Thirty-six studies met the inclusion criteria. Approximately two-thirds of studies reported significant improvements in lower limb muscle strength after WBVT, with the most consistent effects observed in knee extensor strength. For balance and functional outcomes (eg, Timed Up and Go, Chair Rise tests), about half of the studies demonstrated significant benefits, particularly among frail or mobility-limited older adults, whereas others reported no superiority over active comparators. Most studies were of moderate methodological quality, with common limitations including inadequate allocation concealment and lack of blinding. Adverse events were infrequently reported and generally mild and transient, with no serious WBVT-related events identified. No included study was specifically powered to assess fall incidence as a primary outcome.

Conclusions and implications: WBVT appears to be a feasible and generally safe intervention for improving fall-related physical capacities in older adults, particularly muscle strength. However, evidence for balance and functional improvements remains inconsistent, and its effectiveness in reducing fall incidence is still unclear due to the lack of adequately powered trials and long-term follow-up. From a practical perspective, WBVT may be considered as a complementary exercise modality, especially for frail or mobility-limited populations. From a research perspective, future studies should adopt standardized WBVT protocols, improve methodological rigor, and prioritize fall incidence as a primary outcome to better inform clinical and public health practice.

Keywords: Older adults; balance; fall risk; muscle strength; physical function; whole-body vibration training.

Evidence map of Tai Chi interventions for older adults

Fogaça LZ, Schweitzer MC, Ferreira A, Feitosa ADC, Pratt M, Schlechta Portella CF, Ghelman R, Ramos LR. Front Public Health. 2026 Jul 2;14:1820294.

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PMID: 42465647

Abstract

The population aged 60 and over is growing rapidly worldwide, reflecting rising life expectancy and health challenges. Tai Chi is a Chinese mind-body practice and has been recommended for older adults. Evidence maps organize and synthesize information about evidence in a specific field or topic, highlighting consensus and knowledge gaps. This evidence map aims to identify the effects of Tai Chi on health outcomes in older adults. This map used The Campbell Collaboration's methodology. The search was conducted in five databases: PubMed, Embase, CINAHL, Scopus, and Web of Science. The Brazilian Academic Consortium for Integrative Health data of Traditional Chinese Medicine mind-body practices was utilized to manually include studies. The AMSTAR 2 was used to assess quality assessment, and the Tableau was used to graphically present the results. Based on 7.862 systematic reviews, we included 118 of Tai Chi for older adults. The quality assessment was 36 high, 07 moderate, 42 low, and 33 critically low. Each of the 238 effects was classified: 171 as positive, 47 as potentially positive, 13 no effects, and 07 as inconclusive. High-quality evidence that positive effects were related to balance, depression, anxiety, cognitive performance, risk of fall, quality of life, well-being, sleep quality, and Parkinson's disease. Inconclusive or no effect was related to concentration, agility, muscle mass, HDL cholesterol, stroke, hypertension, and coronary heart disease. The most widely used Tai Chi style was the Yang style, for two to three times per week, with each session lasting 30 to 60 min for 12 to 24 weeks. Most interventions targeted community-dwelling older adults with a mean age of 69.5 years; among these, 42 reviews reported a female majority. Based on 56 associations, Tai Chi has been applied in different areas of older adult health. The effect of tai chi may depend on the style, frequency, time, and duration. Despite all results, the evidence suggests methodological rigor, homogeneous populations with larger samples. The Tai Chi effectiveness evidence map will serve to inform decision-making on healthcare for older adults, considering the Decade of Healthy Ageing 2021-2030 and the Global Strategy for Traditional, Complementary, and Integrative Medicine 2025-2034.

Keywords: Tai Chi; complementary therapies; evidence map; older adults; public health.

Identifying sub-health symptom clusters among urban older adults: exploring associations with Tai Chi exercise and risk of falling

Hao T, Yuan J, He Y. Front Public Health. 2026 Jun 29;14:1827783.

DOI: [10.3389/fpubh.2026.1827783](https://doi.org/10.3389/fpubh.2026.1827783)

PMID: 42445911

Abstract

Background: Sub-health status in urban older adults is multidimensional and heterogeneous, potentially influencing fall risk. This study identifies sub-health symptom clusters and explores how Tai Chi's benefits vary across these groups.

Methods: From December 2025 to February 2026, 612 sub-healthy older adults in Beijing were analyzed. Latent Profile Analysis (LPA) identified symptom patterns. Differences in demographics and fall risk indicators (fall rate and ABC scale) were compared across clusters. Stratified analysis assessed the association between Tai Chi exercise and fall risk within each cluster.

Results: Three clusters were identified: Low Physical-Psychological (C1, 21.6%), Balanced Average (C2, 43.9%), and Cognitive-Social Advantage (C3, 34.5%). Significant demographic gradients existed across groups (all $p < 0.001$). Fall risk also showed a significant gradient: C1 had the highest fall rate (67.4%) and lowest ABC score (56.8 ± 9.6), while C3 had the lowest fall rate (7.6%) and highest ABC score (88.9 ± 6.5). Stratified analysis revealed that Tai Chi practitioners across all clusters had significantly lower fall rates and higher ABC scores than non-practitioners. Notably, C1 showed the greatest benefits, with the largest mean difference in ABC scores (14.6 points) and the most pronounced disparity in fall rates (12.2% vs. 92.3%).

Conclusion: Sub-health status in urban older adults exhibits significant heterogeneity, with gradient differences in fall risk and Tai Chi benefits. Older adults in the Low Physical-Psychological group face the highest risk but derive the most significant gains from Tai Chi. Community health management should integrate sub-health profiling to develop personalized interventions. Prioritizing Tai Chi for health-impaired individuals can ensure precise resource allocation and maximize fall prevention outcomes.

Keywords: Tai Chi; fall risk; latent profile analysis; older adults; precision prevention; sub-health.

Effects of game-based virtual reality balance training on postural stability and mobility in community-dwelling older adults: an exploratory randomized controlled trial

Huang CJ, Chen HC, Oknina L, Huang SW, Lin LF. BMC Geriatr. 2026 Jul 3.

DOI: [10.1186/s12877-026-07914-9](https://doi.org/10.1186/s12877-026-07914-9)

PMID: 42393561

Abstract

Background: Falls are a major contributor to reduced independence in older adults and are associated with both physical decline and impaired cognitive-motor integration. Emerging evidence suggests that game-based virtual reality (VR) training may enhance engagement and balance performance; however, its application in community-based settings remains limited.

Objective: To examine the effects of an individualized, game-based VR balance training program on postural stability, functional mobility, and fall-related concern in community-dwelling older adults.

Methods: In this exploratory randomized controlled trial, 40 participants aged ≥ 65 years were assigned to either a VR-based balance training group or a control group receiving unsupervised home-based exercise guidance. The intervention group completed an 8-week supervised VR training program using the Biodex Balance System (2 sessions per week for 8 weeks). The control group received exercise videos and health education without direct supervision or formal adherence monitoring; however, participants received brief weekly telephone reminders to encourage engagement. Primary outcomes included postural sway indices measured by the Biodex Balance System under single- and dual-task conditions. Secondary outcomes included the Timed Up and Go (TUG) test, Single-Leg Stance (SLS), and Falls Efficacy Scale-International (FES-I). Data were analyzed using generalized estimating equations, with group $\times$ time interaction effects reported.

Results: All participants completed baseline and post-intervention assessments. Compared with the control group, the intervention group demonstrated statistically significant group $\times$ time interactions for multiple sway indices under single-task conditions and selected measures under dual-task conditions ($p < 0.05$), indicating differences in change over time between groups. Statistically significant interactions were also observed for functional mobility (TUG) and SLS performance ($p < 0.05$). FES-I scores increased in both groups, with a statistically significant group $\times$ time interaction observed, indicating an increase in self-reported concern about falling. This finding should be interpreted cautiously. Sensitivity analyses showed generally consistent results, although potential sex-related effects were observed and should be interpreted as exploratory. No adverse events were reported.

Conclusions: An 8-week game-based VR balance training program was associated with changes in postural stability and functional mobility in community-dwelling older adults. Changes in fall-related concern were also observed. These findings support the feasibility of a supervised, technology-assisted training approach, although confirmation in larger trials is needed.

Trial registration: ClinicalTrials.gov Identifier [NCT05779189](https://clinicaltrials.gov/ct2/show/study/NCT05779189).

Keywords: Balance training; Biodex Balance System; Community-dwelling; Dual-task; Game-based rehabilitation; Older adults; Pilot randomized controlled trial; Postural control; Virtual reality.

Fall Risk and Fear of Falling Among Older Adults in Cardiac Rehabilitation: ARTICULATING RISK FACTORS, PREVALENCE, PATIENT CHARACTERISTICS, AND OUTCOMES

Kibbey MM, Gathright EC, Goldstein CM, DeAngelis J, Breault C, Buckley ML, Pierce JF, Wu WC. J Cardiopulm Rehabil Prev. 2026 Jul 7.

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PMID: 42400937

Abstract

Purpose: Fall risk is associated with restricted exercise and increased morbidity and mortality. Outcomes of patients with high fall risk in cardiac rehabilitation (CR) are not well documented. This study describes the prevalence of high fall risk in CR, associated patient characteristics, CR engagement, and outcomes.

Methods: Electronic records were examined from CR patients aged ≥ 65 years. An 11-variable checklist identified high (≥ 2 risk factors) versus low fall risk. Groups were compared on demographic, medical, and psychosocial variables, CR sessions completed, and pre-post-CR functional capacity change per maximum effort exercise tolerance test (metabolic equivalent of task) or 6-Minute Walk Test distance.

Results: The CR falls incident rate among 384 patients (70% male, mean age 74.2 ± 6.5) was 0.137/1000 visits. One quarter was identified as "high fall risk." Ten percent reported fear of falling. The most common risk factors included visual difficulty (41%), balance disturbance (24%), and gait disturbance (23%). Patients with high fall risk were older (78.03 ± 6.78 , $P < .001$), reported lower physical and mental health-related quality of life ($P \leq .001$), and attended slightly fewer CR sessions (23.80 ± 11.04 vs 26.47 ± 9.91 ; $P = .18$). There were no significant differences between groups in functional capacity (metabolic equivalent of task: $P = .193$; 6-Minute Walk Test: $P = .141$).

Conclusions: Though patients with high fall risk share characteristics with known associations to lower CR referral (eg, older age and comorbidities), they are as likely to benefit from CR participation as patients with lower risk when supported by tailored exercise prescriptions and safety modifications.

Keywords: accidental falls; aging; anxiety; exercise; fear of falling.

A pilot trial investigating feasibility and preliminary efficacy of a task-specific step training regimen to improve balance recovery among community-dwelling older adults

Lee Y, Alexander NB, Franck CT, Castleberry J, Madigan ML. PLoS One. 2026 Jul 31;21(7):e0354677.

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PMID: 42536665

Abstract

While a growing number of studies have shown positive effects of perturbation-based balance training on balance recovery after tripping, this training has employed specialized equipment that may pose a barrier for wider adoption. To address this, the purpose of this pilot trial was to evaluate the feasibility and preliminary efficacy of a novel, low-resource (i.e., not requiring specialized equipment) version of perturbation-based balance training referred to here as task-specific step training. Thirty community-dwelling older adults (mean (SD) age: 71.8 (4.4) years) were recruited and allocated to either step training (n = 10), traditional treadmill perturbation-based balance training (n = 10), or a control group involving no training (n = 10). Participants were then exposed to two overground laboratory-induced trips while walking on a walkway. Results showed the step training group exhibited an initial recovery step that was 9.0% body height longer ($p < 0.001$) and 0.25 m/s faster ($p = 0.011$) than the control group. The step training group also exhibited a 4.8% body height longer recovery step, and a fall rate that was 39% lower ($p = 0.037$) when compared to the treadmill training group after lab-induced trips. While promising, these results should be interpreted with caution given the modest sample size and a potential bias between groups with respect to safety harness usage during laboratory-induced trips. A future trial with adequate statistical power to better evaluate efficacy and effectiveness of this step training on real-world trip and fall risk appears warranted. The study was registered on clinicaltrials.gov ([NCT05734443](https://clinicaltrials.gov/ct2/show/study/NCT05734443)).

Vestibular perception, balance impairment, and fall risk in community-dwelling older adults

Li Y, Hadi Z, Smith RM, Seemungal BM, Ellmers TJ. Age Ageing. 2026 Jul 2;55(7):afag216.

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PMID: 42525828

Abstract

Background: Vestibular complaints are common in older adults and are linked to imbalance and falls. Some older adults show impaired vestibular perception despite preserved peripheral-reflex ['vestibular agnosia (VA)']. Yet it remains unclear if VA is independently linked to imbalance and falls in otherwise healthy older adults. We therefore investigated the prevalence of VA in community-dwelling older adults, and examined its association to balance and prospective falls.

Methods: Vestibular perceptual thresholds were measured during yaw-plane rotational chair testing. Postural sway and instrumented Timed-Up-and-Go were assessed using wearable sensors, and falls were recorded prospectively over six-months. VA was identified using K-means clustering. Multivariable regressions examined associations between perceptual thresholds and balance outcomes; logistic and negative binomial regressions evaluated associations with prospective falls.

Results: Among 166 participants (75.4 years; 81.9% female), 18.7% were classified as having VA. These individuals had worse cognition and somatosensation, and higher anxiety. Elevated (i.e. worse) vestibular perceptual thresholds were independently associated with greater sway velocity when standing on foam with eyes-open (adjusted $\beta = 0.002$, $P = .03$). Associations with other balance outcomes were attenuated after adjustment. Vestibular perceptual thresholds were not associated with prospective falls (odds of ≥ 1 fall: adjusted OR = 0.99, $P = .65$; fall counts: adjusted IRR = 1.02, $P = .35$).

Conclusions: Approximately one-fifth of healthy older adults exhibit VA. While elevated perceptual thresholds are independently associated with poorer balance, they did not predict falls. Further research is needed to determine whether vestibular perceptual testing provides additional information beyond standard balance assessments for fall-risk prediction in community-dwelling healthy older adults.

Keywords: fall risk; older people; postural sway; vestibular agnosia; vestibular perceptual thresholds; vestibulo-ocular reflex.

Development of a concern about falling scale for older adults living in long-term care settings

Lim ML, Miles L, Ellmers TJ, van Schooten KS, Dawson R, Wesson J, Hewitt J, Ambrens M, Poulos CJ, Parker D, Nelson K, Perry L, Hardy RC, Delbaere K. Age Ageing. 2026 Jul 2;55(7):afag171.

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PMID: 42462203

Abstract

Background: Over half of older adults in long-term care (LTC) experience concern about falling (CaF), yet existing CaF measurement tools do not adequately capture concerns related to daily activities specific to LTC, limiting their usefulness for assessment and management. This study aimed to: (i) develop a co-designed LTC-specific scale by working directly with older residents, adapting relevant Iconographical Falls Efficacy Scale (IconFES) items and adding newly identified activities reflecting their daily lives and CaF (IconFES-LTC), and (ii) identify gaps in current CaF management practices in LTC.

Methods: Semi-structured interviews were conducted with 15 LTC residents (aged 60+ years) to identify daily activities associated with CaF and with 10 LTC staff members to explore resident experiences, barriers and facilitators to implementing a CaF scale, and gaps in current CaF management. Interviews were analysed using reflexive thematic analysis to identify patterns across resident and staff perspectives. The draft IconFES-LTC was pilot-tested with nine residents and further refined.

Results: The final IconFES-LTC comprises 20 items, including seven adapted from the original IconFES. Items reflect common activities of daily living, undertaken within and outside the facility. Interviews further identified key practice gaps, including the absence of a suitable CaF measure, low participation in exercise programmes, limited falls prevention knowledge and a lack of evidence-based programmes addressing CaF in LTC.

Conclusion: Co-designed with LTC residents and staff, the IconFES-LTC offers a context-specific approach to assessing CaF in LTC settings and may inform targeted fall-prevention strategies, with further psychometric validation required in larger, more diverse populations.

Keywords: accidental falls; assessment tool; fear of falling; nursing home; older people; qualitative research; residential aged care.

Associations of different exercise modalities with balance performance and cortical hemodynamic responses in older adults with mild cognitive impairment

Liu H, Zhang X, Han Y, Han Y. J Front Physiol. 2026 Jul 8;17:1870532.

DOI: [10.3389/fphys.2026.1870532](https://doi.org/10.3389/fphys.2026.1870532)

PMID: 42488614

Abstract

Objective: To compare balance performance and task-related cortical hemodynamic responses among older adults with mild cognitive impairment (MCI) who habitually engaged in different exercise modalities, and to provide preliminary evidence for future balance-oriented intervention studies and fall-risk prevention strategies.

Methods: This cross-sectional observational study included 57 older adults with MCI, classified into Tai Chi, brisk walking, and non-exercise control groups according to habitual exercise patterns, with 19 participants in each group. Static balance was assessed during quiet standing, and dynamic balance was evaluated using the Timed Up and Go (TUG) test and the Tinetti Performance-Oriented Mobility Assessment (POMA). Functional near-infrared spectroscopy was used to record oxygenated hemoglobin (HbO) concentrations in predefined regions of interest during quiet standing and TUG tasks.

Results: Compared with the control group, both the Tai Chi and brisk walking groups showed significantly lower postural sway during quiet standing and higher POMA scores during dynamic balance assessment ($p < 0.05$). The Tai Chi group also showed significantly shorter TUG completion time than the control group ($p < 0.05$) and demonstrated more pronounced advantages across static balance outcomes than the brisk walking group ($p < 0.05$). Cortical HbO results showed that the Tai Chi group had significantly higher HbO concentrations in the left primary somatosensory cortex during quiet standing and in the right dorsolateral prefrontal cortex during walking compared with the control group ($p < 0.05$), whereas no significant differences were observed between the brisk walking and control groups.

Conclusion: Different habitual exercise modalities were associated with better balance control in older adults with MCI, with Tai Chi showing more pronounced favorable associations than brisk walking. Habitual Tai Chi practice may be linked to better postural regulation and task-related cortical hemodynamic responses, supporting its potential relevance for future balance-oriented intervention studies and fall-risk prevention strategies in older adults with MCI.

Keywords: balance performance; cortical hemodynamic responses; exercise; fNIRS; mild cognitive impairment.

Age-Related Differences in Postural Balance Among Adults Aged 50-80 Years: An Observational Study

Luna-Corrales GA, Rangel-Piñeros MC, Cardozo-Guzmán C, Tolosa-Guzman I, Trillos-Chacón MC, Torres-Narváez MR. J Funct Morphol Kinesiol. 2026 Jul 18;11(3):277.

DOI: [10.3390/jfmk11030277](https://doi.org/10.3390/jfmk11030277)

PMID: 42496416

Abstract

Global ageing has increased the population of people aged over 60 years, especially in low- and middle-income countries. **Objective:** To evaluate the postural control of adults aged 50-80 years and its relationship with age. **Methodology:** We conducted a cross-sectional observational study in Bogotá and nearby municipalities with 211 participants aged 50 to 80 years. We used the Balance Evaluation Systems Test (BESTest) to measure balance and excluded individuals with mobility-related conditions. We used statistical tests to analyse data from the three age groups. **Results:** Significant differences in postural control were found between age groups; a progressive decline in balance was shown, especially in those over 70 years old. More women than men participated in the study; performance on tasks such as standing on one leg and mobility-related activities decreased with age. **Conclusions:** Balance performance was lower in older age groups, suggesting an age-related decline in postural control. The findings suggest that postural balance performance is lower in older age groups, especially after 70 years of age. These results support the importance of early preventive exercise programmes aimed at maintaining balance and reducing fall risk.

Keywords: adult; cross-sectional study; postural balance; public health.

Examining Falls Rates Across Health Care Settings for Older Adults in Canada: Implications for Population-Level Estimates of Risk

Mofina A, Thiyagarajan JA, Finne-Soveri H, Aaltonen M, Cesari M, Declercq A, Fries BE, Geffen L, Kim H, Lum T, Millar N, Szczerbińska KE, van Hout HP, Heckman G, Honvo G, Morris JN, Foebel A, Hirdes JP. J Am Med Dir Assoc. 2026 Jul 24;27(9):106359.

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PMID: 42497575

Abstract

Objectives: Falls remain a significant public health concern given both the person-level and system-level effects of experiencing a fall, namely decreased function, decreased intrinsic capacity, social isolation, and increased health care utilization. The World Health Organization has prioritized falls as a health outcome indicator in evaluating the impact of policy, strategy, and programming. The objective was to establish cross-sectoral fall rates across health care sectors in Canada and identify key risk factors as candidate risk adjustment variables for a falls quality indicator.

Design: A retrospective, cross-sectional study.

Setting and participants: Seven hundred thousand two hundred four Canadian health care recipients, across multiple health care sectors, aged 60 years and older, were included.

Methods: This study analyzed data from interRAI assessments. Frequencies and χ^2 analyses were used in descriptive analysis. Multivariable logistic regression analyses were used to establish key fall risk adjusters for a quality indicator. The independent variables considered in development included measures, such as function, cognition, health instability, balance impairment, and demographic variables. This model was then applied to a cohort with no serious mobility impairment. Mobility impairment included being completely dependent with ambulation, using a wheelchair or a scooter, or being bedbound.

Results: A higher prevalence of falls was observed in community settings. Regression analysis showed a protective effect of those receiving care in a designated care facility (odds ratio range across facilities with mandated assessments, 0.36-0.55). Those with balance impairment, bladder incontinence, health instability, cognitive impairment, and activities of daily living impairment were more likely to fall. Similar trends were observed in the subgroup with no mobility impairment.

Conclusions and implications: These findings provide a national cross-sectoral landscape of falls in settings not generally considered in population surveys. The rates of falls are highly variable across settings, and key fall risk factors identified in this study provide a foundation for risk adjustment in global comparisons of falls in older adults.

Keywords: Falls; interRAI; intrinsic capacity.

Relationship Between Odds of Reporting a Fall in the Past Year and Health Literacy Among Community-Dwelling Older Adults in Japan: A Preliminary Cross-Sectional Study

Murayama A, Hirukawa K, Shinohara T. Int J Environ Res Public Health. 2026 Jul 5;23(7):875.

DOI: [10.3390/ijerph23070875](https://doi.org/10.3390/ijerph23070875)

PMID: 42512179

Abstract

Background/objectives: Research on falls among community-dwelling older adults has revealed limited knowledge regarding health literacy. This study aimed to evaluate health literacy in community-dwelling older adults in Japan and to clarify its relationship with the odds of reporting a fall in the past year.

Methods: A preliminary cross-sectional study was conducted from January 2024 to May 2025, involving 218 community-dwelling older adults. The study collected data on age, sex, presence of multiple diseases, use of the long-term care insurance system, the Brief-Balance Evaluation Systems Test (Brief-BESTest), the Rapid Dementia Screening Test (RDST), the Communicative and Critical Health Literacy (CCHL) scale, and fall reports in the past year.

Results: After excluding four participants, 214 participants (age, 76.9 ± 6.4 years; 61 men and 153 women) were included in the analysis. Of these, 43 (20.1%) participants had reported a fall. A binary logistic regression analysis was performed, adjusting for confounding factors (age, RDST score, and Brief-BESTest score). The reporting of a fall in the past year (falls/non-falls) was used as the dependent variable, and the CCHL score as the independent variable. The results showed that the CCHL score was associated with the reporting of a fall (odds ratio, 0.61; 95% confidence interval, 0.40–0.93).

Conclusions: These findings suggest that higher CCHL scores, reflecting better communicative and critical health literacy, are associated with lower odds of reporting a fall. However, because of the cross-sectional design of this study, no causal relationship can be inferred. Future longitudinal studies with larger sample sizes are needed to clarify the temporal relationship between health literacy and falls, examine whether this association is causal, and investigate whether the relationship is linear or whether clinically meaningful threshold effects exist.

Keywords: community-dwelling older adults; falls; health literacy.

Using a co-design approach to develop aquatic reactive balance training for fall prevention

Ogonowska-Slodownik A, Faria JO, Thavarajah S, Pacholczyk K, Blain B, Wiener M, Walker J, Mansfield A, Chan Carusone S. PLoS One. 2026 Jul 15;21(7):e0345435.

DOI: [10.1371/journal.pone.0345435](https://doi.org/10.1371/journal.pone.0345435)

PMID: 42455809

Abstract

Background: Falls are a major health concern among older adults, leading to injury, reduced independence, and increased healthcare cost. Reactive balance training can reduce fall risk, but barriers such as fear, joint discomfort, and harness burden limit its use - barriers that training in aquatic environment may help overcome.

Objective: To design an aquatic reactive balance training (AquaReBal) program for older adults, integrating end-user perspectives to enhance safety, accessibility, and engagement.

Methods: Using a participatory design approach grounded in Participatory Action Research principles, we engaged three older adult partners, physiotherapists, and researchers in iterative phases including literature review, stakeholder consultations, practical pool sessions, and feedback meetings. Data collected through online meetings, surveys, field notes, and observations were reviewed using an inductive qualitative content analysis approach to inform iterative refinement of the intervention, following the Guidance for Reporting Involvement of Patients and the Public 2 framework.

Results: Three older adult partners and a multidisciplinary team co-designed the AquaReBal protocol through two participatory design sessions, one practical pool session, and two internal team sessions. Key recommendations from partners included using a vest instead of a hip belt for perturbations, addressing pool depth visibility, and creating an introductory package with practical information for participants. Partners emphasized safety, instructor support, and social engagement as critical for adherence and satisfaction.

Conclusion: The co-design process enabled the development of an AquaReBal protocol tailored to older adults' needs and preferences, providing initial insights relevant to future feasibility and implementation.

Clinical effectiveness of a digitally delivered balance program for older adults: a nonrandomized controlled trial

Phillips F, Yadav S, Sweet CC, Foster Kirk RN, Hong M, Mink S, Krauss J. J Comp Eff Res. 2026 Jul 21:e260070.

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PMID: 42478779

Abstract

Aim: To evaluate the clinical effectiveness of a digitally delivered balance program relative to an attention-control comparison group in older adults at risk for falls. **Materials & methods:** This nonrandomized controlled trial recruited adults aged 65 years and older with moderate-to-high fall risk. Participants were assigned to a digital balance program (exercise therapy, education and health coaching) or an attention-control group (education materials). Outcomes were assessed via self-report surveys at baseline and 3 months. Analyses including all assigned participants evaluated changes in fall rate, fall severity, physical function and medical care utilization. **Results:** A total of 687 participants were included in the analysis (intervention: n = 344; attention-control: n = 343). The mean age was 68.8 years, and 74.1% of participants were female. In the primary analysis, adjusting for baseline factors, the intervention group demonstrated a 37% lower fall rate compared with the attention-control group at 3 months (IRR: 0.63, 95% CI: 0.48-0.82, $p < 0.001$). The intervention group also demonstrated significant improvement in physical functioning ($\beta = 6.86$, 95% CI: 3.80-9.92, $p < 0.001$) and lower odds of emergency department visits (OR: 0.43, 95% CI: 0.24-0.76, $p = 0.004$). Intervention participants engaged in an average of 25.2 exercise therapy sessions over the 12-week period. **Conclusion:** Findings suggest that participation in the digital balance program was associated with reductions in self-reported fall rates, improvements in self-reported physical function, and lower odds of emergency department utilization. High engagement levels further indicate that digitally delivered programs offer a viable option for improving health outcomes in this population. **Trial Registration:** Clinicaltrials.gov [NCT06868680](https://clinicaltrials.gov/ct2/show/study/NCT06868680) retrospectively registered 6 March 2025.

Keywords: digital health; exercise therapy; fall prevention; healthcare utilization; older adults; telerehabilitation.

Effects of Cognitive Behavioral Therapy on Fall Prevention for Older Adults: A Meta-Analysis

Saragih ID, Suarilah I, Ko HK, Wangi K, Lee BO. Worldviews Evid Based Nurs. 2026 Aug;23(4):e70161.

DOI: [10.1111/wvn.70161](https://doi.org/10.1111/wvn.70161)

PMID: 42427163

Abstract

Background: Falls among older adults are a major public health issue and the leading cause of injury-related deaths. They affect older adults' physical, social, and psychological well-being. Although CBT-based interventions show promise for fall prevention, they have not yet been specifically applied to this population.

Aims: To evaluate and synthesize the effects of cognitive behavioral therapy (CBT) on older adults' fear of falling, perceived consequences of falls, physical performance, and balance: **METHODS:** A systematic search of Academic Search Complete, CINAHL Plus with Full Text, Cochrane Library, Embase, Medline, PubMed, and Web of Science was performed, from database inception to March 8, 2025, to find randomized trials applying CBT to prevent falls among older adults. The Cochrane risk-of-bias tool for randomized trials was used to assess the risk of bias of the studies included. A random-effects DerSimonian-Laird model with a 95% confidence interval was used to estimate the pooled standardized mean differences (SMDs) of outcomes.

Result: Seventeen studies were included in the final analysis. CBT in combination with exercise was found to reduce fear of falling (pooled SMD = -0.25; 95% CI = -0.41 to -0.09; $I^2 = 22.22\%$) and improve balance (pooled SMD = 0.79; 95% CI = 0.56-1.01; $I^2 = 0.00\%$; $p < 0.001$) in older adults. The findings of this study can guide future research on developing CBT-based interventions to maximize the benefits of this modality for preventing falls among older adults. This study suggests that CBT in combination with exercise is effective for preventing falls among older adults. CBT also appears to benefit older adults by reducing their fear of falling and improving balance. The intervention duration should be considered to achieve a meaningful effect on fall prevention for this population.

Keywords: cognitive behavioral therapy; falls; meta-analysis; older adults.

Fall history does not affect predictive control of dynamic balance during unilateral load carriage in older adults

Serafim LM, Moraes R. Hum Mov Sci. 2026 Jul 7;109:103507.

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PMID: 42413170

Abstract

We investigated the effects of progressive unilateral hand load carriage on the predictive control of dynamic balance during walking in older adults with and without a recent history of falls. Thirty-one community-dwelling older adults (15 fallers, 16 non-fallers) walked at their preferred speed under six randomized conditions: no load and carrying unilateral dumbbell loads corresponding to 2-10% of body mass. Whole-body kinematics and bilateral gluteus medius electromyography were recorded. Mediolateral margin of stability (MoS) was computed using the extrapolated center of mass, both with and without inclusion of the carried load in the center of mass (COM) calculation, to probe predictive control mechanisms. When the carried load was excluded from the calculation, MoS gradually increased on the ipsilateral side and decreased on the contralateral side as the load increased. In contrast, when the load was included, MoS remained stable across all conditions. This stability was maintained through systematic, load-dependent postural adjustments, including contralateral tilt of the head and thorax and increased abduction of the contralateral shoulder. At higher load levels, these changes were accompanied by increased activation of the contralateral gluteus medius. Load carriage did not affect spatiotemporal walking parameters but reduced the shoulder range of motion differently between fallers and non-fallers. Overall, these findings indicate that predictive control of dynamic balance was preserved despite increasing unilateral loads and was unaffected by fall history. MoS maintenance was accompanied by systematic adjustments in upper-body orientation rather than by changes in lower-limb gait characteristics.

Keywords: Falls; Load transportation; Margin of stability; Older people; Postural control.

Fall prevention in older adults: A primary care-based narrative review

Sheikh AAA. J Family Med Prim Care. 2026 Apr;15(4):1524-1526.

DOI: [10.4103/jfmpc.jfmpc_2220_25](https://doi.org/10.4103/jfmpc.jfmpc_2220_25)

PMID: 42453214

Abstract

Falls are a major cause of morbidity, disability, and mortality among older adults and represent one of the most common preventable geriatric syndromes encountered in primary care. With ageing populations worldwide, fall-related injuries impose a growing burden on individuals, families, and healthcare systems. To review evidence-based strategies for fall prevention in older adults, with emphasis on risk assessment, multifactorial interventions, and the role of primary care physicians. This narrative review integrates evidence from international clinical guidelines and peer-reviewed literature on fall risk assessment and prevention in older adults, focusing on interventions applicable in routine primary care settings. Falls in older adults are multifactorial, resulting from interactions between intrinsic factors, such as frailty, balance impairment, chronic disease, and polypharmacy, as well as extrinsic environmental hazards. Effective prevention strategies include routine fall risk screening, medication review, strength and balance training, vision assessment, home safety modification, and patient education. Primary care-led multifactorial interventions have demonstrated significant reductions in fall incidence and fall-related injuries. Falls among older adults are largely preventable. Integrating systematic fall risk assessment and evidence-based preventive strategies into routine primary care practice can substantially improve patient safety, preserve functional independence, and enhance quality of life.

Keywords: Fall prevention; falls; geriatrics; older adults; primary care; risk assessment.

Advances in Research on the Association between Age-Related Hearing Loss and Risk of Falls and Fractures

Shen H, Shen D, Song H. Noise Health. 2026 May-Jun 01;28(132):527-534.

DOI: [10.4103/nah.nah_263_25](https://doi.org/10.4103/nah.nah_263_25)

PMID: 42446318

Abstract

With the rapid aging of the global population, age-related hearing loss and fall-related fractures have become major public health problems that are seriously affecting the quality of life and health expectations of older adults. Traditionally, fall risk has been attributed to factors such as muscle weakness and vision loss. However, in recent years, increasing evidence has suggested that age-related hearing loss is an independent and significant risk factor for falls and related fractures. The aim of this study is to systematically review the epidemiological evidence supporting the association; explore the multiple underlying mechanisms of action, including cognitive load, sensory integration and psychosocial factors; and evaluate the potential value of interventions, such as hearing rehabilitation, in reducing risk of falls and fractures.

Keywords: accidental falls; aged; bone; fractures; hearing loss; postural balance.

A Novel Multisegmental Individual-Based Exercise Approach for Postural Dysfunction and Balance Impairment in Older Adults: Randomized Controlled Trial

Shoukat F, Ur Rehman SS. JMIR Aging. 2026 Jul 9;9:e78426.

DOI: [10.2196/78426](https://doi.org/10.2196/78426)

PMID: 42424561

Abstract

Background: Age-related decline in mobility and balance substantially increases the risk of falls in older adults. Evidence-based exercise programs are recommended, but their effectiveness requires further evaluation.

Objective: The study aimed to find out the effectiveness of multisegmental individual-based exercise program (MIBEX) approach for postural dysfunction and balance impairment in older adults.

Methods: A 2-arm, single-blinded randomized controlled trial was conducted with 113 community-dwelling adults aged 65 years or older (exercise group, n=56; control group, n=57). Participants in the intervention arm received MIBEX, while the control group received postural education via video. Outcomes included the Timed Up and Go test, tragus-to-wall test, Mini-Balance Evaluation Systems Test, and postural sway, measured at baseline and 3 postintervention time points. Between-group comparisons were analyzed using the Mann-Whitney U test with effect sizes (r) and 95% CIs.

Results: Significant between-group differences were observed across all outcomes ($P < .01$). The exercise group showed improvements in the Timed Up and Go test (median reduction from 15, IQR 13-19 to 10, IQR 8-12 s) compared with controls (15, IQR 13-18 to 12, IQR 10-14 s), with a large effect size ($r = 0.65$, 95% CI 0.45-0.80). Tragus-to-wall test performance improved markedly in the intervention group (median increase from 41, IQR 36-47 to 49, IQR 44-54 cm) versus controls (40, IQR 35-46 to 37, IQR 31-43 cm; $r = 0.52$, 95% CI 0.30-0.70). Mini-Balance Evaluation Systems Test scores declined in controls but improved in the intervention group ($r = 0.48$, 95% CI 0.25-0.66). Postural sway demonstrated moderate improvement ($r = 0.40$, 95% CI 0.18-0.58).

Conclusions: These findings indicate that the MIBEX produced significantly greater improvements in mobility, balance, and postural stability compared with usual care, highlighting its potential as an effective intervention for older adults.

Keywords: balance; exercise; old age; physical function; posture.

Neural Correlates of Balance in People With Parkinson's Disease, Older, and Younger Adults: An fNIRS Study

Tait P, Vitorio R, Graham L, Watermeyer T, Walker R, McDonald C, Mancini M, Stuart S, Morris R. Neurorehabil Neural Repair. 2026 Jul 12:15459683261454945.

DOI: [10.1177/15459683261454945](https://doi.org/10.1177/15459683261454945)

PMID: 42438050

Abstract

Background: Postural instability is one of the most debilitating symptoms of Parkinson's disease (PD). Moreover, older adults (OA) often show issues with postural control leading to increased fall-risk. However, the current understanding of the neural underpinnings of standing postural control remains limited. This study aims to investigate cortical control of postural control in OA, younger adults (YA), and people with PD (PwPD), using functional near-infrared spectroscopy (fNIRS).

Methods: A total of four 2-minute standing conditions were performed. Postural control and cortical activity were recorded in 80 PwPD, 33 OA, and 38 YA. A wireless fNIRS system recorded changes in relative oxygenated haemoglobin (ΔHbO_2) across cortical regions including the prefrontal cortex (PFC), supplementary motor area (SMA), primary motor cortex (M1), primary somatosensory cortex (S1), and primary visual cortex (V1). Six wearable sensors provided sway outcome measures (area, jerkiness velocity, root mean square, and frequency).

Results: Sway outcomes were greater across several conditions in PwPD. Significant group effects were found with increased ΔHbO_2 in the PFC in PD compared to OA. Moreover, YA had increased ΔHbO_2 in the S1 compared to OA and PD.

Conclusions: PwPD showed greater PFC recruitment, indicating reliance on executive-attentional resources for balance. In contrast, YA engaged somatosensory regions more strongly, suggesting that ageing may affect the integration of sensory information for postural control. Findings support interventions that (a) reduce executive load during balance in PD and (b) bolster somatosensory integration in ageing.

Keywords: Parkinson's disease; balance impairment; fNIRS; neural correlates; older adults; postural control; postural stability; postural sway; wearable sensors.

Effects of the Otago Exercise Program on Physical Function Performance Related to Falls in the Elderly: A Meta-Analysis of Randomized Controlled Trials

Tang Y, Shi J, Meng Z, Zhang Y. Healthcare (Basel). 2026 Jul 20;14(14):2187.

DOI: [10.3390/healthcare14142187](https://doi.org/10.3390/healthcare14142187)

PMID: 42512704

Abstract

Background/Objectives: This meta-analysis primarily aimed to evaluate the effects of the Otago Exercise Program (OEP) on physical function performance related to the risk of falls in the elderly. **Methods:** A literature search was conducted in PubMed, Embase, Cochrane Library, and Web of Science for studies on OEP interventions related to falls in older adults. Eligible studies were randomized controlled trials that reported at least one physical function outcome related to fall risk, including the Timed Up and Go test (TUG), Berg Balance Scale (BBS), Short Physical Performance Battery (SPPB), 30-Second Sit-to-Stand Test (30s-SST), Falls Efficacy Scale-International (FES-I), or 6-Minute Walk Test (6MWT). Subsequently, a risk of bias assessment, as well as data extraction and synthesis, was performed. **Results:** Data were synthesized from a total of 13 studies, involving 1278 participants from OEP ($n = 660$) and control ($n = 618$) trials. The results suggested that OEP was associated with improvements in TUG (WMD = -1.47 ; 95%CI: $-2.44, -0.51$), BBS score (WMD = 4.43 ; 95%CI: $2.50, 6.36$), SPPB scores (WMD = 0.76 ; 95%CI: $0.43, 1.09$), 30s-SST (WMD = 2.68 ; 95%CI: $0.86, 4.49$), FES-I score (WMD = -1.74 ; 95%CI: $-3.15, -0.33$). However, no significant effect was observed for the 6MWT. Subgroup analysis suggested that group-based OEP appeared to provide greater improvements in TUG, BBS scores, and 30s-SST, whereas home-based OEP did not show significant effects. In addition, interventions lasting ≥ 4 months were associated with greater improvements for TUG, BBS scores, and the 30s-SST. Older adults aged ≥ 75 showed significant improvements in TUG and 30s-SST. However, substantial heterogeneity was observed across several outcomes, and evidence for SPPB, FES-I, and 6MWT was based on a limited number of studies. **Conclusions:** OEP may improve physical function performance related to fall risk in older adults, such as the TUG, BBS, SPPB, 30s-SST, and FES-I, while no significant effect was observed for the 6MWT. Importantly, the findings support improvements in physical function performance rather than a direct reduction in actual fall incidence. These findings should be interpreted cautiously due to substantial heterogeneity and the limited number of trials for some outcomes. A group-based OEP lasting at least 4 months may provide greater benefits for improving physical function related to fall risk, particularly among adults aged ≥ 75 years.

Keywords: fall; meta-analyses; otago exercise program; physical function.

The effects of a falls prevention app (SAFE app) on community-dwelling adults' fall risk category: Single-blinded randomized control pilot trial

Vad DB, Rone-Adams S, Nieves J, Nof L, Cohen L, Palisetti A. PM R. 2026 Jul 28.

DOI: [10.1002/pmrj.70174](https://doi.org/10.1002/pmrj.70174)

PMID: 42517264

Abstract

Background: In the United States, falls are the leading cause of adult fatal and nonfatal injuries with fall death rates rising after age 65 years. Despite this risk, many community-dwelling older adults do not participate in falls prevention activities.

Objective: To evaluate if a 12-week app-based home exercise program reduces fall risk measures while increasing adherence rates.

Design: Single-blinded randomized controlled design.

Setting: Outpatient physical therapy setting.

Participants: Community-dwelling adults aged 65 years and older (N = 54).

Intervention: Group A received an app-based 7-minute daily home exercise program with five educational pamphlets. Group B received five educational pamphlets delivered via the same app as Group A.

Main outcome measure: Stopping Elderly Accidents, Deaths, and Injuries Tool Kit fall risk performance assessment measured by the 30-second Chair Stand, Timed Up and Go (TUG), and 3-Stage Balance Test, before and 12 weeks after intervention.

Methods: Participants were tested on the TUG, 30-second chair stand, and three-stage balance at the initial visit and 3 months later. Participants in both groups completed Feasibility of Intervention outcome measure after 12 weeks. Adherence measures were collected for both groups via the app. Unadjusted comparisons of outcomes between groups were summarized descriptively using mean differences at baseline and follow-up. Adjusted between-group treatment effects at follow-up were evaluated using analysis of covariance models with treatment group as the independent variable and baseline outcome values and age included as covariates.

Results: After adjustment for baseline values, the intervention group (Group A) demonstrated significantly better results at 12 weeks across multiple fall-risk outcomes, including reduced TUG time, increased 30-second chair stand, and improved balance scores. Compared with the control group, Group A showed significantly greater postintervention improvements in TUG (-2.03 s, $p < .001$), chair stand performance (2.79 repetitions; $p < .001$), and balance (2.02 points; $p = .003$).

Conclusion: This home exercise program has been shown to effectively decrease fall risk in community-dwelling adults 65 years and older. This program had an adherence rate to the exercises of 89%.

Effects of square-step exercise on fear of falling in older patients with ischemic stroke: a cluster randomized controlled trial

Xu X, Liu Y, Xu W, Lu J. BMC Geriatr. 2026 Jul 21.

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PMID: 42481969

Abstract

Objective: To investigate the effects of square-step exercise on fall fear, balance ability, activities of daily living, and fall risk in older patients with ischemic stroke.

Methods: Sixty-two older ischemic stroke patients hospitalized in the Department of Neurology from January to September 2024 were enrolled. The subjects who met the inclusion criteria were divided into two groups according to the unit ($n_1 = n_2 = 31$). The control group received routine care, while the intervention group, in addition to routine care, underwent square-step exercise training. The scores of Short Falls Efficacy Scale-International, Berg Balance Scale, Modified Barthel Index, and Morse Fall Scale in older patients with ischemic stroke were assessed and analyzed before and after the intervention.

Results: After a 12-week intervention, the intervention group demonstrated superior improvements in fall efficacy (SFES-I score), balance ability (BBS score), and fall risk (MFS score) compared with the control group ($P < 0.05$). Regarding activities of daily living (MBI score), both groups showed improvement compared to baseline after the intervention; however, the difference between the intervention and control groups was not statistically significant ($P = 0.250$).

Conclusion: Square-step exercise enhances fall efficacy levels and alleviates fear of falling in older ischemic stroke patients. It also demonstrates efficacy in improving balance ability and reducing fall risk.

Trial registration: ChiCTR2600127548, Date:02/07/2026. (Retrospectively registered).

Keywords: Fall efficacy; Fear of falling; Ischemic stroke; Square-stepping exercise.

Associations of Polypharmacy, Diuretics and Antipsychotics with Injurious Falls: A Population-Based Cohort Study

Yosef T, Pasco JA, Tembo MC, Anderson KB, Williams LJ, Holloway-Kew KL. Drugs Aging. 2026 Jul 23.

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PMID: 42489786

Abstract

Objective: Population ageing increases multimorbidity, which in turn contributes to polypharmacy, elevating fall risk through drug interactions and adverse effects on cognition or balance. Although polypharmacy is recognised as a risk factor, specific fall-risk-increasing drugs (FRIDs) may pose greater hazards. This study aimed to examine the associations of polypharmacy, diuretic and antipsychotic use with injurious falls among older adults.

Methods: Data from 952 participants (590 men and 362 women) aged ≥ 65 years in the Geelong Osteoporosis Study were linked with the Victorian Emergency Minimum Dataset. The outcome variable was time to first fall-related emergency presentation or injurious falls, with polypharmacy, diuretics and antipsychotics as exposure variables. The associations were examined using competing risk regression, with results presented as adjusted subdistribution hazard ratios (aSHR) and 95% confidence intervals. The population attributable fraction (PAF) was calculated to assess the population-level burden of polypharmacy, diuretics and antipsychotics on injurious falls. PAF indicates the proportion of cases in a population attributable to a specific risk factor.

Results: The median time to the first injurious fall was 8.0 years (IQR: 4.0-12.2). The overall incidence rate of injurious falls was 19.3 per 1000 person-years (95% CI: 16.9-22.0). Polypharmacy (aSHR = 2.62, 95% CI: 1.23-5.59), diuretic use (aSHR = 2.98, 95% CI: 1.81-4.92) and antipsychotic use (aSHR = 2.23, 95% CI: 1.23-4.07) increased the risk of injurious falls, with PAF of 17.1%, 23.0% and 4.6%, respectively.

Conclusions: Polypharmacy, diuretic and antipsychotic use were associated with an increased risk of injurious falls, with diuretics accounting for the greatest population-level burden. These findings highlight the potential importance of routine medication review in identifying medications that may contribute to injurious falls among older adults. However, given the observational nature of this study, interventional studies are needed to determine whether medication review and deprescribing strategies can effectively reduce injurious falls and improve safety outcomes.