

## Featured Falls Research – May

### **Interventions for preventing falls in older people in hospitals**

McLennan C, Dyer SM, Kwok WS, Suen J, Marin TS, Haley M, Murray GR, Sutcliffe K, Kneale D, Sherrington C, Cameron ID. Cochrane Database Syst Rev. 2026 May 5;5(5):CD016065.

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PMID: 42084046

### **Abstract**

**Rationale:** Falls in hospitals are common events that cause considerable morbidity and mortality for older people. This is an update of the hospital components of a review of interventions in hospitals and care facilities first published in 2010 and updated in 2012 and 2018.

**Objectives:** To evaluate the benefits and harms of interventions designed to reduce the incidence of falls in older people in hospitals, including inpatient rehabilitation facilities.

**Search methods:** We searched CENTRAL, MEDLINE, Embase, CINAHL, and trial registers to 28 October 2025.

**Eligibility criteria:** Randomised controlled trials of any interventions for preventing falls in older people (aged 65 years and over) in hospitals, excluding trials where falls were recorded as adverse events of the intervention and those recruiting participants post-stroke or living with Parkinson's disease.

**Outcomes:** Critical outcomes were rate of falls (number of falls per unit time) and risk of falling (number of fallers). Important outcomes were risk of fracture, adverse events, and economic outcomes.

**Risk of bias:** We evaluated risk of bias in the included trials against nine items (seven in the Cochrane RoB 1 tool, plus method of ascertaining falls and baseline imbalance).

**Synthesis methods:** Two review authors independently performed study selection, risk of bias assessment, and data extraction. We calculated rate ratios (RaR) for rate of falls and risk ratios (RRs) for risk of falling and risk of fracture, with 95% confidence intervals (CIs). We adjusted for clustering if not undertaken by the trial authors. We pooled results where appropriate using the generic inverse variance method in RevMan. We conducted subgroup analyses according to intervention type, cognitive status, setting, and informed by an intervention component analysis. Where pooling was precluded by the nature of the data, we presented trial data in tables for illustrative purposes. We recategorised one trial considered as multifactorial in 2018 to multicomponent education for consistency within the group of trials considered as multifactorial. We used GRADE to assess the certainty of evidence for each outcome for the main comparisons. GRADE ratings of risk of bias were based on sensitivity analyses excluding trials at high risk.

**Included studies:** We included 32 new trials (35,235 participants) in this update, for a total of 55 trials (104,474 participants; mean age 79 years; 45% women). The majority of trials were at high risk of bias in one or more domains, mostly due to lack of blinding, which is not typically feasible for hospital fall prevention interventions. With few exceptions, the certainty of

evidence for the critical outcomes of falls for individual interventions was rated as low or very low. We have reported outcomes for the main comparisons here. The outcomes of risk of fracture and economic outcomes were generally poorly reported and, where reported, the evidence was of very low certainty; we have not reported these data here. We only reported the outcome of adverse events when the certainty of evidence was stronger than very low.

**Synthesis of results:** Exercise. The effect of exercise on the rate of in-hospital falls is uncertain (RaR 0.62, 95% CI 0.28 to 1.36;  $I^2 = 0\%$ ; 3 trials, 317 participants; very low-certainty evidence). Exercise may have little or no effect on the risk of falling in hospital settings overall (RR 0.73, 95% CI 0.36 to 1.46;  $I^2 = 27\%$ ; 6 trials, 668 participants; plus 1 trial, N = 12,863, adjusted odds ratio 0.8, 95% CI 0.5 to 1.1; P = 0.52; low-certainty evidence). Medication optimisation. We are uncertain of the effect of medication optimisation as a single intervention on the rate of falls (RaR 1.71, 95% CI 0.95 to 3.07;  $I^2 = 0\%$ ; 3 trials, 2093 participants; very low-certainty evidence) and risk of falling (RR 0.94, 95% CI 0.46 to 1.90;  $I^2 = 39\%$ ; 4 trials, 2255 participants; very low-certainty evidence). Medication optimisation may have no effect on adverse events overall (data not pooled, 3 trials; low-certainty evidence). Service model change (aspect of social environment category). Service model change (a change in a model of care or organisational system targeted at falls reduction) probably reduces the rate of falls in acute settings (RaR 0.45, 95% CI 0.27 to 0.74;  $I^2 = 0\%$ ; 6 trials, 10,825 participants; moderate-certainty evidence). However, the effect of service model change on risk of falling is uncertain (RR 0.93, 95% CI 0.25 to 3.46;  $I^2 = 70\%$ ; 3 trials, 5534 participants; very low-certainty evidence). Education (aspect of social environment category). Tailored education (patient, staff or multicomponent) probably reduces the rate of falls (RaR 0.73, 95% CI 0.56 to 0.94;  $I^2 = 0\%$ ; 3 trials, 4868 participants; moderate-certainty evidence) and risk of falling (RR 0.61, 95% CI 0.40 to 0.92;  $I^2 = 45\%$ ; 5 trials, 5035 participants; plus 1 trial, N = 3121 admissions, adjusted odds ratio 0.55, 95% CI 0.38 to 0.81; P = 0.003; moderate-certainty evidence). Multifactorial interventions. Multifactorial interventions, where two or more categories of interventions are given based on a fall risk assessment, probably reduce the rate of falls (RaR 0.87, 95% CI 0.69 to 1.08;  $I^2 = 40\%$ ; 5 trials, 42,256 participants; moderate-certainty evidence) and risk of falling (RR 0.82, 95% CI 0.63 to 1.07;  $I^2 = 0\%$ ; 5 trials, 41,141 participants; moderate-certainty evidence), but the CIs include the possibility of no effect or a slight increase in falls. Any intervention. Categorisation of intervention type was often not distinct. Overall, pooled data from all trials of any intervention to prevent falls had an uncertain impact on the rate of falls (RaR 0.85, 95% CI 0.71 to 1.02;  $I^2 = 51\%$ ; 27 trials, 72,016 participants; very low-certainty evidence), but suggested that there may be a reduced risk of falling (RR 0.83, 95% CI 0.73 to 0.94;  $I^2 = 0\%$ ; 35 trials, 56,452 participants; low-certainty evidence). A subgroup analysis found that trials of interventions that include integration with the local setting, tailoring approaches to the needs and abilities of patients, and engaging patients and/or their family or carers may reduce the rate of falls (RaR 0.68, 95% CI 0.55 to 0.84;  $I^2 = 23\%$ ; 12 trials, 18,183 participants; low-certainty evidence), but the effect of trials that did not undertake these approaches on rate of falls is uncertain (RaR 1.04, 95% CI 0.84 to 1.30;  $I^2 = 39\%$ ; 15 trials, 53,833 participants; very low-certainty evidence; test for subgroup differences P = 0.006).

**Authors' conclusions:** Tailored education (staff, patient/family and multicomponent) probably reduces the rate of falls and the risk of falling. Service model change in acute hospitals probably reduces the rate of falls, but its effect on risk of falling is uncertain. Multifactorial interventions probably reduce the rate of falls and risk of falling, but the CIs include the possibility of no effect or a slight increase in falls. The effect of exercise on the rate of falls is uncertain. Exercise may have little or no effect on the risk of falling in hospital settings overall. The effect of medication optimisation as a single intervention on the rate and risk of falls is uncertain. Across all intervention types, fall prevention approaches that include features of integration with the local

setting, tailoring approaches to the needs and abilities of patients, and engaging patients and/or their family or carers may reduce the rate of falls in older people in hospitals more effectively than those that do not include these elements. Interventions with these features include social environment change and education interventions plus an effective multifactorial trial. Fall prevention in hospitals is very difficult. Despite the large number of trials included in this review, the conclusions for many intervention types are uncertain.

## Falls Research – May

### **Effectiveness of Virtual Reality-Based Simulation Using the Nintendo Wii Balance Board for Assessing the Risk of Falls in Young and Older Adults**

Ahmad MA, Gouveia ÉR, Bermúdez I Badia S. Games Health J. 2026 May 7:2161783X261445327.

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PMID: 42099133

#### **Abstract**

**Introduction:** Falls severely affect older adults and are emerging as a global health and financial burden for public health care systems. Multiple studies have validated the use of virtual reality (VR) to prevent falls and reduce the risk of falls among older adults with cognitive deficits. Therefore, we evaluated the effectiveness of VR-based cable car simulation (CCS) using a Nintendo Wii Balance Board (WBB) to assess balance and profile individuals based on fall risk and age, and validated using the Biodex Balance System. Center of pressure (COP) displacement and mean velocity (MV) metrics obtained from the WBB were used for balance assessment.

**Methods:** A total of 23 young participants (10 females; M = 29.9, SD = 5.0) were recruited from the Agência Regional para o Desenvolvimento da Investigação, Tecnologia e Inovação, and 25 older participants (19 females; M = 71.2, SD = 7.8) were recruited from a local senior gymnasium in Funchal, Portugal. All participants took part in a repeated-measures study design. Results indicated that young adults exhibited greater COP displacement than older adults in the anterior-posterior (AP) direction.

**Results:** Significant differences were found in COP displacement between the groups, confirming age-related variations in balance performance. However, no significant differences were observed in MV. Discriminant analysis models were employed using COP displacement and MV to classify participants by age and fall risk. The best classification performance was achieved for the CCS at 77%, with average turns at 80%, average speeds at 86%, and 83% for the combined features using stepwise regression.

**Discussion:** The selected features included the COP displacement for speeds and turning angles in both AP and medial-lateral (M-L) directions, as well as the mean values of speeds and turns for both AP and M-L. The system can accurately differentiate balance patterns across age groups and risk categories, indicating a reliable and ecologically valid assessment method.

**Keywords:** balance assessment; ecological validity; machine learning; physical fitness; posturography; virtual reality.

## Balance impairment as a central correlate of falls, short sleep, and physical health in community-dwelling adults

Alhasan H, Alsayed M, Alotibi J, Alharbi R, Alharbi S, Alshareef S, Redah S, Babtain A, Aljabri A, Alalwani F, Hawsawi F, Fadil A, Alayat MS, Awali A, Alshehri MA. BMC Public Health. 2026 May 29.

DOI: [10.1186/s12889-026-28003-x](https://doi.org/10.1186/s12889-026-28003-x)

PMID: 42216061

### Abstract

**Background:** Falls are a leading cause of disability in older adults and often co-occur with sleep disturbance, balance impairment, concern about falling and reduced health-related quality of life. However, these domains are usually studied separately. This exploratory cross-sectional analysis assessed the interrelationships among sleep quality and duration, concern about falling, clinical balance and functional performance, and health-related quality of life in community-dwelling adults aged  $\geq 45$  years using seven prespecified binary outcomes: falls, high concern about falling, balance impairment, short sleep duration, poor physical health-related quality of life, current smoking, and weak grip strength.

**Methods:** A community-based cross-sectional study was conducted among adults aged  $\geq 45$  years ( $N=52$ ; mean age  $61.10 \pm 12.55$  years). Trained physiotherapists collected sociodemographic and clinical data, medications, morbidities, smoking, and administered standardized measures: grip strength, 30-s Sit-to-Stand (STS), Timed Up & Go (TUG), Berg Balance Scale (BBS), Falls Efficacy Scale-International (FES-I), SF-12 Physical and Mental, Pittsburgh Sleep Quality Index (PSQI), sleep duration, and the International Physical Activity Questionnaire (IPAQ). Seven prespecified binary outcomes were modelled using logistic regression adjusted for age and sex.

**Results:** Falls were common (46.2%), as were BBS impairment (36.5%), weak grip strength (73.1%), short sleep (63.5%), and poor sleep quality (86.5%). Current smoking was reported by 26.9% of participants. Fallers were more often  $\geq 65$  years, smokers, and on  $\geq 5$  medications, and showed worse STS, BBS, SF-12 Physical/Mental, and FES (all  $p \leq .041$ ). Falls were strongly associated with age ( $\rho = .58$ ), smoking ( $\rho = .71$ ), BBS impairment ( $\rho = .66$ ), and higher FES concern ( $\rho = .60$ ) (all  $p < .001$ ). In logistic regression models adjusted for age and sex, BBS impairment predicted falls (OR=5.88, 95% CI 1.06-6.67,  $p = .043$ ) and high FES concern (OR=1.68, 95% CI 1.40-3.28,  $p = .004$ ). Short sleep duration strongly associated with BBS impairment (OR=4.71, 95% CI 2.82-6.02,  $p = .008$ ), having  $\geq 1$  fall was associated with current smoking (OR=2.86, 95% CI 1.02-3.74,  $p = .048$ ) and high FES concern was linked to poorer SF-12 Physical status (OR=0.18, 95% CI 0.05-0.74,  $p = .017$ ).

**Conclusion:** In this cohort, balance impairment, fall concern, short sleep and lower physical health-related quality of life were observed to cluster. BBS was identified as a key independent correlate of both falls and concern about falling, while short sleep duration was strongly associated with balance impairment, and concern about falling independently predicted lower SF-12 physical scores. Given these results, multidimensional assessment including balance testing, concern-about-falling assessment, sleep and health-related quality of life screening is supported, and confirmation in larger longitudinal cohorts is required.

**Keywords:** Balance; Fall risk; Falls; Older adults; Saudi Arabia; Sleep.

## Comparative Analysis of Muscle Strength, Dynamic Stability, Balance, Sit-to-Stand Capacity, Fear of Falling, and Fall History in Older Adults With Distinct Frailty Phenotypes

Almeida JR, Castro PMMA, Santos CS, Assis IP, Montenegro LCC, Ribeiro AJF, Resende RA, Ocarino JM. J Geriatr Phys Ther. 2026 May 15.

DOI: [10.1519/JPT.0000000000000499](https://doi.org/10.1519/JPT.0000000000000499)

PMID: 42138269

### Abstract

**Background and purpose:** In this study, we aimed to compare muscle strength, dynamic postural stability, balance, sit-to-stand capacity, fear of falling, and fall history among robust, prefrail, and frail older adults.

**Methods:** This cross-sectional study included 159 community-dwelling older adults classified by frailty phenotypes. Muscle strength was assessed with a hand-held dynamometer. Dynamic postural stability during gait was measured with the Functional Gait Assessment. Static balance was assessed via the Single-Leg Stance test and the Modified Clinical Test of Sensory Interaction and Balance. Reactive balance response was assessed via the forward compensatory stepping correction task. Sit-to-stand capacity was measured using the Five-Time Sit-to-Stand test. Fear of falling was assessed with the Falls Efficacy Scale-International, and the history of falls in the past year was self-reported. Analysis of covariance was used for continuous outcomes (muscle strength, sit-to-stand performance, dynamic postural stability, static balance, and fear of falling), and binomial and ordinal logistic regression were used for categorical and ordinal outcomes (history of falls and reactive balance response).

**Results:** Compared with robust individuals, frail older adults had lower trunk and lower limb strength, static balance, dynamic stability, and sit-to-stand capacity (all P values <.05); greater fear of falling; worse reactive balance; and higher fall history. Prefrail adults also showed declines in lower limb strength, static balance, dynamic stability, sit-to-stand capacity, and reactive balance response (all P values <.05).

**Conclusions:** Physical and functional declines in frail and prefrail older adults highlight the need to include these parameters in their assessment.

**Keywords:** balance; falls; frailty phenotypes; functional gait assessment; muscle strength.

## Role of Thai Boxing Dance Program on Fall Prevention and Physical Performance in Community-Dwelling Older Adults at Risk: A Randomized Controlled Study

Areedomwong P, Mahikul W, Khunthason S, Boonyaratana Y, Buttagat V. Phys Ther. 2026 May 18:pzag054.

DOI: [10.1093/ptj/pzag054](https://doi.org/10.1093/ptj/pzag054)

PMID: 42149989

### Abstract

**Importance:** Falls among older adults are a major public health concern, but evidence on Thai boxing dance interventions for prevention remains inconclusive.

**Objective:** This study aimed to evaluate the effectiveness of a 6-month Thai boxing dance (TBD) program in reducing fall incidence and improving physical performance, fear of falling, and cognitive function among community-dwelling older adults at risk of falling.

**Design:** This study was a 3-arm parallel-group, assessor-blinded randomized controlled trial.

**Setting:** The study was conducted at 3 primary health care centers in Chiang Rai, Thailand.

**Participants:** Among the 123 participants enrolled, 115 older adults aged  $\geq 60$  years were identified as being at risk of falling and completed the study.

**Interventions:** Participants were randomly allocated to 1 of 3 groups: Thai boxing dance (TBD), conventional balance exercise (CBE), or a control group (CG). All groups participated in biweekly sessions over a 24-week period.

**Main outcomes and measures:** Falls were monitored over a 180-day period, whereas physical performance, fear of falling, and cognitive function were assessed at baseline and at the 6-month intervention period.

**Results:** Of the 123 participants, 115 completed the trial. Incident rates of falls in the TBD and CBE group (0.18 and 0.17 per person-month, respectively) were lower than the rate of 0.62 in the CG. The TBD group showed a 76% reduction in fall rate compared to CG. TBD also led to significantly greater improvements in physical performance, including postural sway, gait parameters, and lower-limb strength, compared with the CG after the 6-month intervention. The CBE group showed greater improvements in gait parameters only. No significant between-group differences were observed in fear of falling or cognitive function.

**Conclusions and relevance:** A 6-month TBD and CBE program reduced falls. TBD improved physical performance more broadly, whereas CBE yielded targeted gait improvements in community-dwelling older adults at risk of falling.

**Keywords:** Thai boxing dance program; exercise; fall incidence; physical performance; postural control.

# Prediction of inpatient falls and key predictors using machine learning applied to electronic health records: a retrospective cohort study in a tertiary hospital in Türkiye

Baris VK, Hudaverdi B. BMJ Open. 2026 May 12;16(5):e113384.

DOI: [10.1136/bmjopen-2025-113384](https://doi.org/10.1136/bmjopen-2025-113384)

PMID: 42129985

## Abstract

**Objective:** Traditional fall risk tools are often inaccurate and burdensome. This study aims to develop a predictive model for inpatient falls and identify the most influential variables using machine learning applied to electronic health record data.

**Design:** A retrospective cohort study.

**Setting:** A large tertiary university hospital in Türkiye.

**Participants:** Adult patients ( $\geq 18$  years) hospitalised in a university hospital between January 2017 and June 2023.

**Primary outcome measures:** Occurrence of inpatient falls recorded in incident reporting systems.

**Results:** A total of 518 fallers were identified and compared with 3121 non-fallers. Fallers were significantly older (median 68.5 vs 64 years,  $p < 0.001$ ), had longer hospital stays (16 vs 12 days,  $p < 0.001$ ) and higher comorbidity burden ( $p < 0.001$ ). They were also more likely to receive high fall-risk medications (86% vs 76%,  $p < 0.001$ ) and had a higher prevalence of mental disorders (26.3% vs 17.2%,  $p < 0.001$ ). The random forest quantile classifier demonstrated the highest discrimination (area under the curve (AUC) 0.821, 95% CI 0.781 to 0.861), with balanced sensitivity (0.799, 95% CI 0.734 to 0.867) and specificity (0.722, 95% CI 0.691 to 0.755). Pairwise comparisons using DeLong's test showed significantly higher AUC compared with several models (adjusted  $p = 0.001$ ), while differences with eXtreme Gradient Boosting were not significant ( $p = 0.240$ ). Key predictors included comorbidity burden, age, number of fall-risk-increasing medications and laboratory variables such as eosinophil and basophil counts, blood urea nitrogen, sodium and red blood cell count.

**Conclusion:** Machine learning models using electronic health data can predict inpatient falls and reveal key risk factors. The random forest quantile classifier offers a promising approach for improving fall risk prediction in imbalanced clinical datasets.

**Keywords:** Machine Learning; Nurses; Quality in health care; Safety.

## Usage of the Tablet-Based "Keep On Keep Up" Digital Program and Resulting Changes in Physical Capacity and Real-World Walking in Community-Dwelling Older Adults: Process Evaluation

Böttinger MJ, Stefanakis M, Eckert T, Jansen CP, Litz E, Bredenbrock A, Mellone S, Radeck L, Schubert AL, Fleiner T, Steib S, Stanmore E, Todd C, Bauer JM, Becker C, Gordt-Oesterwind K. JMIR Form Res. 2026 May 13;10:e80372.

DOI: [10.2196/80372](https://doi.org/10.2196/80372)

PMID: 42126985

### Abstract

**Background:** "Keep On Keep Up" (KOKU) is a tablet-based digital program based on the well-validated Otago and Fitness and Mobility Exercise programs for older adults to decrease the risk of falling.

**Objective:** This substudy involved a process evaluation in order to analyze the usage patterns of the KOKU digital program, specifically training frequency, volume, and intensity among older adults over a 3-month self-managed training period. Pre-post changes in physical capacity and real-world walking were examined.

**Methods:** This study is a nested cohort study within the three-armed randomized controlled SMART-AGE trial conducted in Germany (German Clinical Trials Register ID: DRKS00034316). Participants aged 67 years or older with basic digital literacy were included. KOKU provided guided but unsupervised progressive strength and balance training for 3 months. The data on training adherence, engagement, and progression were collected. Instrumented assessments included the Timed Up and Go Test, the 30-Second Chair Rise Test, and real-world walking monitoring using wearable sensors.

**Results:** A total of 113 participants (n=63, 56% female; mean age 74.02, SD 5.36 y) were included in the analysis. During the 3-month period, participants used KOKU for 24 (SD 15) days, that is, 2 to 3 times per week. Over the entire study period, no falls or other adverse events were reported due to KOKU usage. The number of exercises performed per participant ranged from 2 to 213, with a median value of 70. The instrumented Timed Up and Go Test results revealed a prolonged total duration (d=0.26; P=.009). In the instrumented 30-Second Chair Rise Test, improvements were observed in the number of completed repetitions (d=0.21; P=.04) and frequency of repetitions (d=0.23; P=.03). This was mainly due to a reduction in inactive time (d=-0.60; P<.001). Real-world walking parameters remained unchanged, except for a slower walking speed during walking bouts of less than 30 seconds (d=0.49; P<.001). All changes did not meet the criteria for minimally important differences.

**Conclusions:** KOKU is a novel digital intervention for older adults, promoting balance and strength exercises. Physical capacity improvements were small. However, the use of instrumented assessments provided further insights into participants' capacity and mobility that would not have been identifiable with conventional assessments. Future improvements to the program should focus on incorporating more challenging exercises for individuals with varying levels of physical capacity.

**Keywords:** aged; digital intervention; exercise therapy; mobile apps; physical capacity; real-world walking; treatment adherence and compliance.

## Falls prevention in hospitalised older adults with cognitive impairment: strategies and ethical implications

Charville PJ, Loughrey N, Chalk F, Hill B. Nurs Stand. 2026 May 6;41(5):55-61.

DOI: [10.7748/ns.2026.e12607](https://doi.org/10.7748/ns.2026.e12607)

PMID: 41948994

### Abstract

Falls are the most commonly reported patient safety incident in hospitals in the UK, and a major cause of patient harm. Older adults with cognitive impairment, such as dementia or delirium, are at particular risk of falls in acute settings due, for example, to attempting to mobilise without support, inability to communicate their needs or misjudging danger. Nurses have a central role in falls prevention, balancing patient safety with preserving individuals' dignity and autonomy to ensure that practice is consistent, compassionate and ethically sound. This article explores strategies for reducing the risk of falls in older adults with cognitive impairment in acute settings. The authors discuss patient safety interventions, including the use of enhanced observation and technological devices such as pressure-sensitive mats and bed-exit alarms, and consider the ethical implications of using such interventions. The authors also discuss the importance of multidisciplinary assessment and rehabilitation, as well as education for staff, patients and families, in effective falls prevention practice.

**Keywords:** cognitive impairment; dementia; ethical issues; ethical practice; falls; gerontology; mental capacity; multidisciplinary teams; older people; patient assessment; teamwork.

## Diabetes-Related Balance Impairment in the Aging Population: A Combined NHANES and Mendelian Randomization Study

Cheng K, Fakorede S, Lateef OM, Fakorede OS, Wang D, Liu X, Wang D. Gerontology. 2026 May 20:1-21.

DOI: [10.1159/000552601](https://doi.org/10.1159/000552601)

PMID: 42160236

### Abstract

**Introduction:** Diabetes mellitus contributes to motor control impairments that can compromise balance and increase fall risk, particularly in older adults. Given that both the prevalence of aging and diabetes is increasing globally, understanding this relationship is vital for targeted fall prevention. This study examined the association between diabetes status and balance performance in older adults and assessed potential causal relationships using Mendelian randomization.

**Methods:** We analyzed 1,218 adults aged 60+ years from the 2021-2023 National Health and Nutrition Examination Survey (NHANES). Participants were classified as nondiabetic (n = 248), prediabetic (n = 690), or diabetic (n = 280) on the basis of fasting glucose and HbA1c. Balance was evaluated via the modified Romberg test. Associations were examined via ordinal logistic regression, and causality was assessed via Mendelian randomization with diabetes-related genetic instruments.

**Results:** In fully adjusted models, diabetes was strongly associated with impaired balance ( $\beta = -0.88$ ; 95% CI: -1.33 to -0.44;  $p < 0.001$ ). Prediabetes also demonstrated a significant association with balance impairment ( $\beta = -0.53$ ; 95% CI: -0.85 to -0.22;  $p < 0.001$ ). Mendelian randomization provided evidence that genetically predicted diabetes was associated with increased fall risk (OR = 4.75; 95% CI: 1.48-15.24;  $p = 0.009$ ).

**Conclusions:** Observational analyses link diabetes and prediabetes to poorer balance performance, and genetic evidence supports an association between diabetes liability and increased fall risk.

## Preferences of older Australians for fall prevention exercise program features: a discrete choice experiment

Chye A, Lung T, Delbaere K, van Schooten KS, Taylor M, Ambrens M, Howard K, Angell B. BMC Geriatr. 2026 May 21.

DOI: [10.1186/s12877-026-07602-8](https://doi.org/10.1186/s12877-026-07602-8)

PMID: 42163166

### Abstract

**Background:** Falls are a major cause of injury, disability and health service use among older Australians. While exercise-based interventions can reduce falls, participation remains low. Understanding preferences for program features may inform design and implementation of fall prevention exercise programs to maximise uptake, adherence and impact.

**Methods:** An online discrete choice experiment was conducted with 383 community-dwelling Australians aged  $\geq 60$  years, independent in daily activities and not currently enrolled in a fall prevention program. Participants completed choice tasks with varying levels of six program attributes: cost per class, delivery mode, class size, personalisation, program duration and access to professional support. Data was analysed using mixed multinomial logit and latent class models to estimate preferences, willingness to pay and preference heterogeneity. Policy simulations estimated predicted uptake under alternative service configurations.

**Results:** Participants generally preferred lower-cost, individual programs of short duration (1-3 months) delivered in-person at home with on-demand professional support. There was no significant preference for personalisation. Latent class analysis identified three subclasses: "opt-out" (19%), "cost-sensitive" (37%) and "support-oriented" (44%). Policy simulations showed high uptake in the support-oriented class and low uptake in the opt-out class regardless of configuration and greater responsiveness to cost reductions among the cost-sensitive class.

**Conclusions:** Preferences for fall prevention program features at point of uptake vary across identifiable older Australian subclasses. Offering flexible configurations, including low-cost options for cost-sensitive participants and enhanced features for those willing to pay, may improve program uptake and long-term sustainability. These findings provide actionable evidence to inform program design and policy decisions for scalable fall prevention initiatives.

**Keywords:** Discrete choice experiment; Exercise; Fall prevention; Implementation science; Preferences.

## Modifiable risk factors for falls in community-dwelling older adults

Cotton K, Jin Y, Verghese J. Gerontologist. 2026 May 4:gnag086.

DOI: [10.1093/geront/gnag086](https://doi.org/10.1093/geront/gnag086)

PMID: 42082404

### Abstract

**Background and objectives:** Nearly 30% of U.S. adults aged 65 and older fall each year, and falls are the leading cause of injury and injury-related deaths in this population. Our objective was to identify potentially modifiable risk factors for falls, which will be important in determining the most effective targets for interventions and help refine fall prevention guidelines.

**Research design and methods:** Our sample included 3,111 community-dwelling older adults (65 years and older, 57% women) without dementia from the Health and Retirement Study (2010 wave) who reported falls at baseline and two years later. We examined the association between reported falls at follow-up and fifteen potentially modifiable medical and lifestyle risk factors using logistic regression models, overall and stratified by sex. We calculated the adjusted odds ratio (aOR) and Population Attributable Fraction (PAF) for each risk factor.

**Results:** Falls were reported in 1,027 participants (33%) at follow-up. In females, previous fall history (aOR 2.95), heart conditions (aOR 1.38) and pain (aOR 1.40) predicted incident falls and together accounted for 42% of the PAF for falls. In males, previous fall history (aOR 4.74), poor balance (aOR 1.64), poor hearing (aOR 1.83), and physical inactivity (aOR 1.42) predicted incident falls and together accounted for 52% of the PAF for falls.

**Discussion and implications:** Several potentially modifiable risk factors were associated with incident falls in older adults and differed by sex. These results are a key initial step in identifying older adults with the highest fall-risk and who may most benefit from targeted interventions.

**Keywords:** Health and Retirement Study; falls; population attributable fraction; risk factors.

## Optimal Reactive Balance Training Characteristics Poststroke: Secondary Analysis of a Clinical Trial

Faria JO, Danells CJ, Inness EL, Mansfield A. *Physiother Res Int*. 2026 Jul;31(3):e70231.

DOI: [10.1002/pri.70231](https://doi.org/10.1002/pri.70231)

PMID: 42130167

### Abstract

**Background and purpose:** Reactive balance training (RBT) has shown promise for enhancing reactive balance control and reducing falls poststroke. However, the optimal training parameters (e.g., intensity, duration) are unknown. This secondary analysis examined dose-response relationships between specific reactive balance training characteristics and improvements in reactive balance control and fall rates poststroke.

**Methods:** 30 people with chronic stroke (mean age:  $66.6 \pm 8.8$  years; time after stroke:  $3.3 \pm 2.3$  years) completed up to 12 one-hour reactive balance training sessions, twice per week. Training included experiencing losses of balance due to internal or external perturbations while performing voluntary tasks. The tasks were of four types: stable, quasi-mobile, mobile, and unpredictable, each with choice of three difficulty levels (normal, increased, or reduced). Multiple linear regression (reactive balance outcome) and negative binomial regression (fall rates) were used to model associations between training characteristics (total number of perturbations, task difficulty, perceived challenge, and success rate) and post-training fall rates and changes in the reactive balance control sub-score of the mini-Balance Evaluation Systems Test (mini-BESTest).

**Results:** A higher number of perturbations were significantly associated with better post-intervention reactive balance scores on the mini-BEST ( $p = 0.010$ ). There were no significant associations with any other training characteristics and post-intervention mini-BEST Scores. For fall incidence rates, there were no significant associations with any training characteristic (all  $p > 0.05$ ).

**Discussion:** Greater exposure to RBT was associated with improvements in reactive balance control among individuals with chronic stroke. Participants who completed a higher number of perturbations within the standardized 12-session protocol showed greater improvements in reactive balance control, consistent with a dose-response association. These results indicate that training volume-reflected in the number of perturbations experienced-may be an important factor to consider when refining RBT protocols.

**Keywords:** accidental falls; neurological physiotherapy; postural balance; rehabilitation; stroke.

# Machine Learning and Deep Learning Models for Predicting Future Falls in Community-Dwelling Older Adults: Systematic Review and Meta-Analysis of Longitudinal Evidence

Gao Y, Xu D, Li X, Wang J, Wang L, Wu B, Zhao H, Qiu X, Zhu W. J Med Internet Res. 2026 May 14;28:e84844.

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PMID: 42133917

## Abstract

**Background:** Machine learning (ML) and deep learning (DL) show promise for fall risk prediction, but prior reviews focused mainly on real-time fall detection, in-hospital falls, or conventional statistical models. The performance of ML-DL-based models for predicting future falls in community-dwelling older adults remains unclear.

**Objective:** This study aimed to review ML-DL studies for predicting future falls among community-dwelling older adults and meta-analyze discrimination where feasible.

**Methods:** Six databases were searched from inception to September 23, 2024, with updates on August 31, 2025, and February 28, 2026. We included longitudinal studies developing or validating ML-DL models to predict future falls in community-dwelling adults aged  $\geq 60$  years and excluded real-time detection, simulated or no fall, and inpatient studies. Risk of bias was assessed using the Prediction Model Risk of Bias Assessment Tool (PROBAST). Areas under the curve (AUCs) were meta-analyzed using Hartung-Knapp-Sidik-Jonkman random-effects models with 95% CIs. Heterogeneity, 95% prediction intervals (PIs), sensitivity analyses, and subgroup analyses were conducted.

**Results:** After screening 10,253 records, 28 (0.3%) studies were included; 18 (64.3%) focused on general older adults. Prediction horizons ranged from 3 months to 7 years, and fall incidence ranged from 1.6% to 46.6%. Twenty-three (82.1%) studies applied ML, and 5 (17.9%) studies used DL. Input modalities included text ( $n=18$ , 64.3%), sensor ( $n=5$ , 17.9%), image ( $n=1$ , 3.6%), and multimodal data ( $n=4$ , 14.3%). Common predictors included age, sex, fall history, depression, and basic daily activities. Only one model underwent external validation. Calibration reporting was sparse. All models were rated at high risk of bias. Ten models were meta-analyzed, yielding a pooled AUC of 0.79 (95% CI 0.69-0.87) with extreme heterogeneity ( $\tau^2=0.64$ ;  $\tau=0.80$ ;  $I^2=99.8\%$ ;  $Q=4128.99$ ). The confidence-distribution bootstrap PI was 0.20 to 0.99, indicating substantial uncertainty in expected performance across new populations. Subgroup analyses indicated moderation by sample size and population type, with higher discrimination in specific populations than in general samples; however, the specific population subgroup included only 2 studies. Although all participants were community dwelling, some cohorts were recruited through clinically enriched pathways rather than general community sampling.

**Conclusions:** ML-DL models show potential for identifying community-dwelling older adults at elevated future fall risk; however, wide PIs, limited external validation, and high risk of bias suggest real-world performance may be optimistic. The pooled AUC should be interpreted as a summary of reported discrimination under study-specific conditions, predominantly from internally validated, high-risk-of-bias models, rather than as a robust estimate of transportable real-world performance. This review extends prior reviews by focusing on community-dwelling settings and by integrating PROBAST, Hartung-Knapp-Sidik-Jonkman meta-analysis, PIs, and modality-specific synthesis to evaluate both discrimination and uncertainty. Findings support the use of

ML-DL models for proactive fall prevention while emphasizing the need for validation and context-specific implementation.

**Keywords:** community-dwelling older adults; falls; machine learning; meta-analysis; risk prediction; systematic review.

## Sleep Pattern Clusters, Physical Function and Fall Risk: Geriatric Syndromes among Older Ambulatory Women

Garduno AC, Viswanath V, Smarr B, McEvoy L, Xiao Q, Full K, Gallo L, Parada H, Crandall C, Cauley J, Tinker LF, LaCroix AZ. *J Gerontol A Biol Sci Med Sci*. 2026 May 11:glag115.

DOI: [10.1093/gerona/glag115](https://doi.org/10.1093/gerona/glag115)

PMID: 42116597

### Abstract

**Background:** Poor sleep is a suspected risk factor for lower physical functioning and frequent falling at older ages. We evaluated the relationship of multiple sleep and rest-activity rhythm (RAR) metrics with fall risk and physical functioning.

**Methods:** Older women (N = 4,543) wore hip-worn accelerometers, recording their falls daily for 13 months following accelerometry. Uniform manifold approximation projection identified sleep-circadian clusters; K-Means clustering further distinguished healthy and unhealthy sleep patterns. After cross-validation, we examined associations between sleep clusters and fall risk using adjusted, negative binomial models. Linear regression models estimated associations of sleep clusters with Short Physical Performance Battery (SPPB) score and its sub-scores. We evaluated whether SPPB status modified associations of sleep and RAR with fall risk.

**Results:** Five sleep clusters were identified including C1 ("sleep disturbed", n = 1051), C2 ("healthy", n = 1043), C3 ("mild RAR, active", n = 1446), C4 ("earlier sleepers, n = 105), and C5 ("shorter, mildly disrupted, later sleeper", n = 898). Unhealthy sleep clusters C1 and C4 were associated with a higher fall risk compared to healthy cluster C2 after adjustment (C4, IRR: 1.76 (95%CI : 1.15-2.69)). These same clusters were also associated with lower balance scores (score: 0-4) after adjustment (C1, beta: -0.11 (95% CI:-0.21 to -0.01); C4, beta: -0.30 (95%CI: -0.55 to -0.05)).

**Conclusions:** Older women with unhealthier sleep-RAR patterns are more at risk for falling, which may be partially explained by the role of sleep on balance and physical functioning.

**Keywords:** Physical functioning; aging; circadian rhythm.

# Effects of Multisensory Integration Training on Postural Stability Characteristics and Fall Risk in Older Adults: Systematic Review and Meta-Analysis

Guo C, Yin L, Chen P, Zhan J, Yu Z, Tan TC, Wei Y, Gong Y, Xu M, Le VM, Wang L. JMIR Aging. 2026 May 7;9:e80345.

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PMID: 42096607

## Abstract

**Background:** The risk of falls escalates with advancing age, a consequence of the concomitant degeneration of multiple physiological systems, altered sensory processing capabilities, and reduced postural control. Multisensory integration (MSI) training has been demonstrated to enhance the brain's processing of multisensory information. However, existing studies show considerable variability in intervention duration and training modalities, limiting comparability across studies and contributing to inconsistent findings.

**Objective:** This study aimed to systematically evaluate the effectiveness of MSI training on postural stability and fall risk in healthy older adults and provide an evidence base for clinical practice.

**Methods:** Databases including PubMed, Embase, and Cochrane Library were searched by PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The methodological quality of the included randomized controlled trials was assessed using the Cochrane risk of bias tool, and publication bias was evaluated through funnel plots. Meta-analyses using R packages quantified effects via standardized mean differences (SMDs) and 95% CIs, with fixed or random effects models selected based on heterogeneity ( $I^2$ ). Subgroup analyses explored age, intervention duration, and type.

**Results:** A total of 14 randomized controlled trials were included in the meta-analysis. Results showed that MSI training significantly reduced center of pressure displacement in the anterior-to-posterior displacement (SMD -1.64, 95% CI -2.78 to -0.49,  $P < .001$ ) and center of pressure displacement in the medio-to-lateral displacement (SMD -1.37, 95% CI -2.68 to -0.07,  $P < .001$ ). In terms of postural stability, MSI training significantly improved Berg Balance Scale scores (SMD 3.42, 95% CI 2.41 to 4.44,  $P = .006$ ). In terms of fall risk, MSI training significantly reduced the time to complete the timed up and go test, and intervention type significantly moderated this effect (SMD -1.43, 95% CI -2.36 to -0.50,  $P < .001$ ). Additionally, MSI training reduced the risk of falls (SMD -1.27, 95% CI -2.03 to -0.52,  $P < .001$ ).

**Conclusions:** In conclusion, MSI training is an effective intervention for enhancing static and dynamic postural control and reducing fall risk in healthy older adults, suggesting a beneficial effect on postural stability and fall-related outcomes.

**Keywords:** fall risk; meta-analysis; multisensory integration training; older adults; postural stability.

## Exploring influencing factors on fall prevention intentions among nursing assistants: a qualitative study

Huang Y, Zhang W, Wang S. Front Public Health. 2026 Apr 22;14:1823811.

DOI: [10.3389/fpubh.2026.1823811](https://doi.org/10.3389/fpubh.2026.1823811)

PMID: 42100507

### Abstract

**Objective:** Guided by the Theory of Planned Behavior (TPB), this study explored key factors influencing fall prevention intentions among nursing assistants in Chinese tertiary hospitals.

**Methods:** A qualitative descriptive study was conducted. Twenty nursing assistants from a tertiary hospital in China were recruited via purposive sampling. Semi-structured interviews were analyzed using thematic analysis, with reporting guided by the COREQ checklist.

**Results:** Three core themes consistent with the TPB emerged: (1) Ambivalent behavioral attitudes, characterized by a disconnect between valuing fall prevention and assuming responsibility, and conditional proactivity; (2) Conflicted subjective norms, including situational compromises among institutional, family, and peer expectations, and a punitive feedback culture; (3) Limited perceived behavioral control, challenges in complex situations and structural resource constraints (time, equipment, support).

**Conclusion:** Nursing assistants' fall prevention intentions are shaped jointly by ambivalent attitudes, conflicting norms, and limited control. Multi-level interventions empowering nursing assistants, fostering a constructive organizational culture, and optimizing resources are needed to enhance their intentions and translate policy into consistent bedside practice.

**Keywords:** falls; nurse management; nursing assistants; patient safety; qualitative study; risk management.

# Association of depressive symptoms, gait and dynamic balance with risk of falling in older adults discharged from the emergency department after a fall: a prospective observational study

Kastler F, Himmelmann L, Speckmann EM, Hackbarth M, Schmidt NM, Zieschang T, Stuckenschneider T. BMC Geriatr. 2026 May 21;26(1):726.

DOI: [10.1186/s12877-026-07670-w](https://doi.org/10.1186/s12877-026-07670-w)

PMID: 42168903

## Abstract

**Background:** Depressive symptoms are an established fall-risk factor in older adults, potentially mediated by gait and dynamic balance impairments. However, this relationship remains unexamined in older individuals discharged from the emergency department (ED) following a fall - a group at particularly high risk for recurrent falls. Therefore, this study examined whether depressive symptoms predict 12-month prospective fall risk in this population, and whether gait and dynamic balance impairments act as mediators.

**Methods:** This prospective sub-study analysed participants from the SeFalled study aged  $\geq 60$  years who had recently been discharged from the ED following a fall. Data were collected through home visits, gait analyses, and monthly follow-up interviews. Depressive symptoms were assessed using the Depression in Old Age Scale. Gait speed, stride length, swing and double support time were combined into a single gait performance factor using principal component analysis, while dynamic balance was quantified by mediolateral and anteroposterior margin of stability. Ordinal logistic regression analysis investigated the association between depressive symptoms and fall risk, while causal mediation analysis examined gait and dynamic balance as mediators.

**Results:** In a sample of 143 participants, depressive symptoms (OR 3.74, 95% CI 1.35-10.37,  $p = 0.011$ ) and higher mediolateral margin of stability (OR 1.36, 95% CI 1.07-1.73,  $p = 0.011$ ) independently predicted higher prospective fall risk, whereas gait performance was negatively associated with fall risk (OR 0.47, 95% CI 0.28-0.80,  $p = 0.005$ ). Neither gait nor dynamic balance impairments significantly mediated the association between depressive symptoms and falls.

**Conclusions:** Depressive symptoms, alongside gait and dynamic balance impairments, represent modifiable indicators of future fall risk following ED presentation after a fall. Integrating mood and mobility assessments into post-ED falls prevention strategies could help mitigate fall risk in this high-risk population.

**Trial registration:** Prospectively registered on 4 November 2021 in the Deutsches Register für Klinische Studien, (DRKS00025949; Date of registration in DRKS: 2021-11 - 04).

**Keywords:** Aged; Falls prevention; Gait analysis; Margin of stability; Mediation analysis; Principal component analysis; Prospective falls; Sensor-based.

## Reducing unwarranted variation in medication reviews following a fall: a closed-loop audit in primary care

Khan H. Br J Gen Pract. 2026 May 14;76(suppl 1):bjgp26X745449.

DOI: [10.3399/bjgp26X745449](https://doi.org/10.3399/bjgp26X745449)

PMID: 42134925

### Abstract

**Background:** Falls in adults  $\geq 65$  are common, costly and preventable. Around one-third fall each year and 5-10% sustain serious injury; hip fractures carry 20-30% one-year mortality and falls cost the NHS  $\sim$ £2.3bn annually. Polypharmacy and high-risk drugs (e.g. benzodiazepines, anticholinergics, antihypertensives) increase risk. NICE CG161/NG5 and NHS England guidance recommend timely, structured post-fall medication reviews, yet local data suggested unwarranted variation in documentation and follow-up.

**Aim:** To increase guideline-concordant documentation of medication reviews within 4 weeks after a fall to 100%.

**Method:** Retrospective closed-loop audit in a UK GP surgery.

**Inclusion:** patients  $\geq 65$  with a recorded fall. Cycle 1 (Apr-Jun 2024, n=63) established baseline; interventions comprised clinician education on NICE guidance, SystemOne prompts, and weekly MDT fall reviews; Cycle 2 (Jan-Mar 2025, n=70) re-audited performance against a 100% standard. Data were obtained from routine clinical records.

**Primary outcome:** documented review within 4 weeks; secondary: evidence of deprescribing/medication optimisation.

**Results:** Documentation improved from 22% (14/63) at baseline to 94% (66/70) post-intervention. Reviews led to more appropriate deprescribing and optimisation, particularly of benzodiazepines, anticholinergics and antihypertensives, with qualitative MDT feedback indicating better continuity and timelier follow-up. These changes align with evidence that structured reviews reduce fall-related harm.

**Conclusion:** Simple, scalable system changes, education, prompts and routine MDT oversight markedly reduced unwarranted variation and embedded safer prescribing after falls. The model is feasible for wider rollout across primary care; planned next steps include extending to care homes, sharing SystemOne prompt templates regionally, and annual re-audit to sustain gains.

## From Near Falls to Compensated Loss of Balance: A Concept Analysis in Older People

Labrague LJ, Nguyen A, Ha D, Visbal-Dionaldo L. Int J Older People Nurs. 2026 Jul;21(4):e70087.

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PMID: 42216299

### Abstract

**Introduction:** Near falls, defined as recoverable postural instability, are increasingly recognised as important experiences that can provide insight into balance and mobility in older people, yet they are often underreported and inconsistently documented. Unlike falls, which have been clearly defined and extensively investigated, the conceptual definition of near falls remains inconsistent. This concept analysis aimed to clarify the phenomenon traditionally described as 'near falls' and to establish a more precise conceptual definition in older people.

**Methods:** This is a concept analysis using the framework by Walker and Avant. A comprehensive literature search of four databases was conducted in Medline, PubMed, Scopus and CINAHL. Data extraction and synthesis were guided by the eight-step framework of Walker and Avant.

**Results:** A total of 23 articles were included in the analysis. Antecedents included intrinsic and extrinsic factors. Defining attributes of near falls comprised transient loss of balance, activation of compensatory mechanisms (e.g., rapid stepping, trunk or limb adjustments) and successful prevention of a fall. Consequences involved increased fall risk, changes in physical functions and psychological impacts.

**Conclusions:** Based on findings, the concept was refined and reconceptualised as 'Compensated Loss of Balance' (CLB), a more precise term emphasising recoverable postural instability through successful corrective responses.

**Implications for practice:** Integrating CLB into clinical screening, research frameworks and fall prevention guidelines may enhance early detection of postural instability and promote more standardised approaches to fall risk assessment and prevention.

**Keywords:** compensated loss of balance; fall; fall prevention; mobility; near fall; older people.

# Falls prevention for older adults in outdoor public spaces: an interdisciplinary Delphi consensus on risks, actions, and barriers

Langeard A, Torterotot M, Le Roux M, Wollesen B. BMC Public Health. 2026 May 2.

DOI: [10.1186/s12889-026-27548-1](https://doi.org/10.1186/s12889-026-27548-1)

PMID: 42069576

## Abstract

**Background:** Falls are the leading cause of accidental injury among older adults, 30% of community-dwelling adults aged 65 and over fall each year, with nearly half occurring outdoors. These falls are complex, understudied, and insufficiently addressed in current age-friendly cities or walkability frameworks. This study aimed to build interdisciplinary consensus on risks, preventive actions, and barriers to fall prevention in outdoor public spaces through a Delphi process.

**Methods:** A three-phase Delphi study was conducted with 64 participants in round 1, 60 in round 2, and 49 in round 3, including four expert groups: older adults who had fallen outdoors, health and research professionals, urban planners, and decision-makers (local and regional policy-makers, elected officials, and public-space managers involved in urban planning). Phase one collected open responses on risks, preventive actions (modification of physical layout, public-space management, and behavior-related factors), and barriers to these actions. Responses were synthesized using AI-assisted analysis with systematic human validation. In phases two and three, the relevance of 124 propositions were rated on a 10-point Likert scale. Consensus was defined as  $\geq 70\%$  of ratings  $\geq 7/10$  and interquartile range  $\leq 2.5$ .

**Results:** Consensus was reached for key intrinsic factors such as gait and balance impairments, visual and vestibular deficits, cognitive decline, and polypharmacy, as well as for environmental factors including irregular or inappropriate surfaces, obstacles, or signage, and crowding. Highly relevant preventive actions included integrating fall prevention into street and sidewalk design, training urban planning professionals, awareness campaigns, systematic maintenance, safer crossings, participatory co-design public-space adaptations and urban design features involving older adults and local stakeholders, and improved data monitoring through surveillance, mapping, and sharing of fall-related and environmental risk information. Main barriers were insufficient budgets, high costs, limited integration of fall prevention into planning priorities, and lack of evaluation of the impact of implemented actions.

**Conclusions:** Outdoor fall prevention is a transversal challenge requiring integration of public health and urban planning. This Delphi highlights actionable priorities to embed fall prevention in local and national strategies, in particular in rapidly aging regions.

**Keywords:** Delphi; Falls in outdoor public spaces; Older adults; Prevention; Urban planning.

## Effects of a postural balance apparatus-assisted combined exercise program on fall-related physical fitness and blood vessel elasticity among older women

Lee J, Moon Y, So WY, Kim K. *Medicine (Baltimore)*. 2026 May 15;105(20):e48802.

DOI: [10.1097/MD.00000000000048802](https://doi.org/10.1097/MD.00000000000048802)

PMID: 42152327

### Abstract

**Background:** In this study, we evaluated the effects of a combined exercise program incorporating a postural balance apparatus on the fall-related physical fitness and blood vessel elasticity of older women.

**Methods:** The participants were 36 women aged 65 years or older who did not engage in regular exercise. They were randomly divided into an exercise group (n = 18) and a control group (n = 18). The exercise group underwent a combined exercise program for 12 weeks (60 minutes a day for 5 days a week), whereas the control group engaged in no physical activity or exercise during the 12 weeks. The combined exercise program consisted of aerobic exercise (such as step-ups and the short foot exercise), resistance exercises (such as heel raises, semi-squats, and weight-bearing closed-chain exercises), and joint mobility exercises (such as step-ups with pelvic floor muscle engagement, lower body stretching, and back stretching) to be performed on a postural balance apparatus, which provided an inclined and elastic surface to facilitate ankle dorsiflexion, joint mobility, and proprioceptive stimulation. The exercises were performed at a moderate intensity, maintaining a perceived exertion rating between 11 and 14, for 12 weeks. The outcome variables were measured through experimental procedures. The collected data were analyzed using means, standard deviations, and 2-way repeated measures analysis of variance.

**Results:** We found a significant improvement in the range of motion for left ankle dorsiflexion in the lying and seated positions, as well as right ankle dorsiflexion in the lying, seated, and prone positions, in the exercise group compared to the control group ( $P < .05$ ). Furthermore, the atherosclerosis left brachial-ankle pulse wave velocity, atherosclerosis right brachial-ankle pulse wave velocity, diastolic blood pressure, and heart rate significantly decreased in the exercise group compared to the control group ( $P < .05$ ).

**Conclusions:** These results confirmed that the 12-week apparatus-assisted combined exercise program, unlike conventional programs, effectively improves ankle dorsiflexion, vascular elasticity, and cardiovascular health in older women.

**Keywords:** blood vessel elasticity; combined exercise; older women; postural balance apparatus.

## Supervised and Self-Directed Technology-Based Dual-Task Exercise Training Program for Older Adults With a History of Falls: Mixed Methods Feasibility Study

Mathur P, Stathi A, Goodyear VA, Krauss T, Thomas H, Cooper A, Kinghorn P, Miller C, Ives N, Chechlacz M, Wilson D, Magill L, Chiou SY. JMIR Aging. 2026 May 18;9:e87577.

DOI: [10.2196/87577](https://doi.org/10.2196/87577)

PMID: 42150160

### Abstract

**Background:** Older adults who have fallen are at an increased risk of future falls. Training cognitive and physical functions simultaneously, known as dual-task (DT) training, has been shown to improve mobility and reduce fall risks. With appropriate digital tools, such as smartphones and mobile apps, it is possible to deliver DT training in unsupervised, home-based settings, thereby increasing accessibility beyond the clinical environment.

**Objective:** This study aimed to evaluate the feasibility and acceptability of a technology-based DT training program delivered through a blended model of supervised and self-directed sessions for older adults with a history of falls. Perspectives of health care professionals working in fall-prevention services were also explored.

**Methods:** A single-arm, nonrandomized feasibility study was conducted with 45 community-dwelling adults aged 65 years or older with a history of falls. Participants were recruited through primary care practices, secondary care fall-prevention services, and community outreach. The 24-week DT program, which integrated balance and strength exercises with cognitive training using a mobile app, was delivered in two phases: (1) for 12 weeks, weekly 50-minute physiotherapist-led group classes in the community, and 2 additional 50-minute self-directed sessions at home, and (2) for 12 weeks, 3 weekly 50-minute self-directed sessions at home. Feasibility and acceptability were assessed through recruitment and retention rates, adherence, app usage, and self-reported satisfaction. Qualitative data were obtained from focus groups with 28 participants who completed the program and 16 health care professionals. Quantitative data were analyzed descriptively, and qualitative data were analyzed thematically.

**Results:** We recruited 45 of the target 50 participants, with most participants (n=41) recruited through community pathways; 4 were recruited via National Health Service (NHS) pathways. Adherence was 64%, with higher adherence during phase 1 (81%) than phase 2 (50%). App usage was high (95%), and self-reported program satisfaction was moderate to high. Retention at 24 weeks was 76%, and no adverse events occurred. The qualitative findings supported the program's feasibility and acceptability, emphasizing social connection and tailored exercises as key to adherence—especially in home-based sessions. Health care professionals identified community organizations and referral pathways as the most practical routes for implementation.

**Conclusions:** A blended, technology-based DT training program is both feasible and acceptable for older adults at risk of falling and can be effectively delivered beyond clinical settings. Community-based recruitment outperformed NHS pathways, highlighting the value of community engagement. These findings support the feasibility and acceptability of a full-scale trial, with targeted refinements to recruitment, support structures, and delivery to maximize scalability and impact.

**Keywords:** aging; cognition; dual-task; exercise; falls prevention; older adults; technology.

## **Nonselective beta-blocker eye drops and the risk of fall-related injuries: a Danish nationwide new user, active comparator propensity score matched cohort study**

Obling ML, Ryg J, Lund LC, Viberg B, Reilev M, Henriksen DP, Pedersen SA. Age Ageing. 2026 Apr 4;55(4):afag093.

DOI: [10.1093/ageing/afag093](https://doi.org/10.1093/ageing/afag093)

PMID: 41980196

### **Abstract**

**Background and aim:** Falls in older adults are a major health concern. Risk factors include medications, but uncertainty remains about potential fall risk-increasing drugs (FRIDs). This nationwide cohort study examined whether non-selective beta-blocker eye drops (timolol) increase the risk of fall-related injuries compared to topical prostaglandin analogue (TPA) eye drops.

**Methods:** Using registry data from all Danish residents, we included individuals aged  $\geq 65$  years who initiated timolol ( $n = 52\,019$ ) or TPA ( $n = 72\,885$ ) between 1996 and 2023. Propensity score matching was applied to balance baseline characteristics. The primary outcome covered hospital-treated fall-related injuries while the secondary outcome was fall-related fractures specifically.

**Results:** No statistically significant differences were observed in the risk of fall-related injuries or fall-related fractures for timolol vs. TPA users at 14, 90 or 365 days of follow-up, before or after propensity score matching. Predefined subgroup analyses showed an increased risk of fall-related injuries among individuals aged  $\geq 80$  years [incidence rate ratio (IRR) 1.23, 95% CI 1.01-1.50] and among users of  $\geq 3$  FRIDs (IRR 1.20, 95% CI 1.01-1.44).

**Conclusion:** Our findings suggest that timolol eye drops are not associated with a significantly increased risk of fall-related injuries in the overall population of older adults. However, a marginally significant increased risk of fall-related injuries was seen among the oldest individuals and those concurrently using multiple FRIDs. These findings underscore the importance of considering a patient-centred approach when prescribing medications that could be potentially harmful.

**Keywords:** FRIDs; beta-blocker eye drops; fall-related injuries; high-dimensional propensity score; older people; timolol.

## Exercise Interventions for Improving Balance, Strength, and Functional Capacity in Older Adults: A Randomized Controlled Trial

Özdiñçler AR, Yiğit Ş, Utku Umut G, Ülker Ekşi B, Güney İ. J Aging Phys Act. 2026 May 29:1-9.

DOI: [10.1123/japa.2025-0400](https://doi.org/10.1123/japa.2025-0400)

PMID: 42219157

### Abstract

Age-related declines in strength and balance increase fall risk in nursing home residents. This study compared the effects of the modified Otago Exercise Program and the Large-Amplitude Functional Exercise Program (LAFEP) on fall risk, balance, functional capacity, and lower-extremity strength. In this randomized controlled trial, 70 participants (aged  $\geq 65$ ) residing in nursing homes were randomly assigned to the modified Otago Exercise Program ( $n = 35$ ) or the LAFEP ( $n = 35$ ). Both groups received supervised group exercise three times weekly for 12 weeks. Primary outcomes were the functional reach test and the timed up-and-go test. Secondary outcomes included the Performanz Balance System, the 6-min walk test, and the five times sit-to-stand test. Both interventions led to significant within-group improvements ( $p < .05$ ). However, the LAFEP group demonstrated significantly greater improvements in dynamic balance, specifically in the functional reach test ( $p = .03$ ). Improvements in functional mobility outcomes, including the timed up-and-go ( $p = .67$ ) and the five times sit-to-stand tests ( $p = .17$ ), were also more pronounced in the LAFEP group; however, these between-group differences did not reach statistical significance. Both the modified Otago Exercise Program and the LAFEP were effective in enhancing balance and functional outcomes for older adults in residential care. The LAFEP, however, yielded superior gains specifically in dynamic balance. The findings suggest that the LAFEP, adapted from neurorehabilitation principles, may be a viable and potentially more effective alternative to conventional fall prevention exercise programs for this population.

**Keywords:** Large-Amplitude Functional Exercise Program; fall risk; modified Otago Exercise Program.

## **Fear of falling in older adults: The role of fear of dependency and tiredness as key determinants**

Pires PM, Carvalho J, Pires T, Pires C, Ribeiro O. Geriatr Nurs. 2026 May 21;71:104088.

DOI: [10.1093/ageing/afag093](https://doi.org/10.1093/ageing/afag093)

PMID: 42167083

### **Abstract**

**Objective:** This study explored factors associated with FoF in community-dwelling older adults, with a particular focus on the role of fear of dependency and tiredness as potential determinants, building on the Multifactorial Causation Model of Falls and Fear of Falling proposed by Hadjistavropoulos et al.

**METHODS:** A cross-sectional study of 509 adults aged  $\geq 65$  evaluated sociodemographic, clinical, and psychological factors. Simple and multiple linear regressions were used to identify FoF-related factors.

**Results:** FoF was significantly higher in women and increased with age. Other significant predictors included greater fear of dependency, poorer visual acuity, lower levels of physical activity, greater number of falls in the previous year, higher anxiety, tiredness, and lower mobility/balance (TUG) - which showed the strongest association with FoF ( $p < 0.05$ ). The multiple regression model explained 47.3% of the variance in FoF.

**Conclusion:** Fear of dependency and tiredness were significant predictors of FoF and may represent additional determinants of FoF in community-dwelling older adults.

**Keywords:** Comprehensive geriatric assessment; Fall prevention; Fear of dependency; Fear of falling; Older adults; Tiredness.

## Wuqinxi exercise for mind and balance: Enhancing cognition, fall prevention, and quality of life in older adults with mild cognitive impairment

Wen Q, Chen S, Zhou H, Liu Y, Li J, Białas M, Wilczyńska D. PLoS One. 2026 May 6;21(5):e0346490.

DOI: [10.1371/journal.pone.0346490](https://doi.org/10.1371/journal.pone.0346490)

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### Abstract

**Background:** The risk of falls is a global public health issue, with over 38 million disability-adjusted life years lost annually due to falls. However, older adults with mild cognitive impairment (MCI) are more likely to fall and suffer more severe injuries compared to cognitively normal older adults, which also has an impact on their quality of life.

**Methods:** This study was a randomized, controlled trial with two parallel groups, allocated in a 1:1 ratio using a concealed allocation mechanism and assessor blinding. 53 participants were randomly assigned to the 12-week Wuqinxi exercise group or the 12-week stretching exercise group. Overall cognitive function, risk of falls, and quality of life were assessed at baseline and at post. Independent t-tests and non-parametric tests were used to compare the outcome variables between the two groups.

**Results:** There were no significant differences in baseline demographic characteristics or assessment indicators between Wuqinxi exercise group and stretching exercise group ( $P > 0.05$ ), indicating comparability between the groups. After 12 weeks of intervention, the Wuqinxi exercise group showed significant improvements in primary outcome measures, including cognitive function and risk of falls ( $P < 0.001$ ). In the SF-12 quality of life, Wuqinxi exercise group showed statistically significant improvements in six dimensions ( $P < 0.05$ ), including general Health (GH), physical Function (PF), role Physical (RP), body Pain (BP), role Emotional (RE), and mental Health (MH). In two dimensions insignificant vitality (VT,  $P = 0.649$ ) and social function (SF,  $P = 0.089$ ). The median and interquartile range after intervention were also overall better in the Wuqinxi exercise group. In addition, the Mini-Mental State Examination (MMSE) was significantly negatively correlated with Timed Up and Go Test (TUG) ( $r = -0.52$ ,  $p < 0.01$ ) and significantly positively correlated with Modified Falls Efficacy Scale (MFES) ( $r = 0.463$ ,  $p < 0.05$ ). The improvement in quality of life in the BP and SF dimensions was significantly positively correlated with the increase Montreal Cognitive Assessment (MoCA) and MMSE respectively (BP-MoCA:  $r = 0.406$ ,  $p < 0.05$ ; SF-MMSE:  $r = 0.399$ ,  $p < 0.05$ ).

**Conclusion:** The Wuqinxi exercise is a feasible and acceptable intervention for improving cognitive function, preventing falls, and enhancing quality of life in older adults with MCI. Our study's findings emphasize the importance of Wuqinxi exercise in older adults' health management and confirm the feasibility of a large-scale randomized controlled trial.