Featured Falls Research – February

Effects of Twelve Weeks of Square Stepping Exercises on Physical and Cognitive Function and Plasma Content of SMP30: A Randomised Control Trial

Franco-García JM, Pérez-Gómez J, Castillo-Paredes A, Redondo PC, Rojo-Ramos J, Mayordomo-Pinilla N, Villafaina S, Gómez-Álvaro MC, Melo-Alonso M, Carlos-Vivas J. Geriatrics (Basel). 2025 Feb 7;10(1):22.

DOI: 10.3390/geriatrics10010022 **PMID:** 39997521 **PMCID**: PMC11855813

Abstract

Background: Ageing and sedentary lifestyles affect physical and cognitive function and markers of frailty, increasing the risk of falls in older adults and affecting their quality of life. The aim of this study was to evaluate the effects of a Square Step Exercise programme on physical and cognitive function and plasma SMP30 levels for the prevention of falls in older adults.

Methods: A randomised controlled trial was designed with 44 participants assigned to an experimental group (SSE group) and a control group. The SSE group performed SSE sessions twice a week for three months, with a follow-up in the fourth month. The assessments of physical function included tests such as the Four-Square Step Test, Brisk Walking and its dual-task variant, Time Up and Go and its imagined and dual-task variants, 30 s Sit-to-Stand and its dual-task and imagined variants and a 6 min walking test. Questionnaires were also used to assess the risk and fear of falling. Resting EEG activity was also recorded to assess electrocortical brain activity. SMP30 levels were measured by Western blotting.

Results: The SSE group showed significant improvements compared to the control group in the Four-Square Step Test ($p < 0.001$), Brisk Walking ($p < 0.05$) and reduction in the fear of falling ($p < 0.001$) after the training programme, but these adaptations were not maintained one month after the programme ended ($p < 0.05$). No significant changes were observed in the remaining variables of physical function, cognitive function, fall risk questionnaire, EEG activity or plasma levels of SMP30 compared to the control group ($p > 0.05$).

Conclusions: The SSE programme showed efficacy in improving balance, gait speed and reducing fear of falling in older adults but did not show improvement over the control group in other areas of physical or cognitive function or plasma SMP30 levels for fall prevention.

Keywords: ageing; electroencephalography; executive cognitive function; physical fitness; quality of life.

Non-Immersive Virtual Reality Exercise Can Increase Exercise in Older Adults Living in the Community and in Long-Term Care: A Randomized Controlled Trial

Sheehy L, Bharadwaj L, Nissen KA, Estey JL. Clin Interv Aging. 2025 Feb 5:20:109-124.

DOI: 10.2147/CIA.S498272 **PMID:** 39931102 **PMCID**: PMC11807768

Abstract

Purpose: To assess the impact of an 8-week non-immersive virtual reality exercise program for older adults on 1) balance, physical function, community integration and quality of life; 2) falls, emergency room visits, hospital and long-term care admissions; 3) quantity of exercise performed; and 4) acceptance of non-immersive virtual reality.

Patients and methods: This prospective, assessor-blinded, randomized controlled trial was carried out on two separate samples of older adults: those living in their own homes ("home-based") and those living in long-term care ("facility-based"). Participants were randomized to non-immersive virtual reality or usual activity. Non-immersive virtual reality consisted of 20-30 minutes of customized, gamified exercises for balance, stepping, strengthening, and aerobic conditioning, performed 3-5x/week for 8 weeks. Outcomes were measured before the intervention, immediately after, and 1 month later. Physical testing and questionnaires addressed objective 1). Counts for objectives 2) and 3) were reported by the participants and retrieved from the non-immersive virtual reality platform. Logbooks and a short interview addressed objective 4).

Results: Recruitment was substantially impacted by the COVID-19 pandemic. The facility-based sample had 31 participants; the home-based sample had 16. There were no statistically-significant benefits to non-immersive virtual reality in either sample for objective 1), although the facility-based non-immersive virtual reality group showed a clinically-significant improvement in functional walking. Effect sizes were small (≤ 0.16). No falls occurred during non-immersive virtual reality exercise. The facility-based non-immersive virtual reality group did an average of 14.1 sessions (average 20.1 minutes/session) and the home-based non-immersive virtual reality group did an average of 17.2 sessions (22.6 minutes/session). Participants enjoyed the non-immersive virtual reality, found it challenging and motivating and felt that it improved balance and walking. Most were interested to continue beyond the study.

Conclusion: Non-immersive virtual reality for home-based and facility-based older adults is safe, enjoyable and feasible and may increase users' weekly levels of physical activity leading to clinical benefits for functional walking in facility-based users.

Trial registration: ClinicalTrials.gov (NCT04083885; registered 2019-09-06).

Keywords: exergaming; healthy aging; older adults.

Falls Research – February

Caregiver beliefs about older adult falls from a nationally representative U.S. sample 2022

Collette B, Dobash D, Harris S. J Safety Res. 2025 Feb;92:306-316.

DOI: 10.1016/j.jsr.2024.11.025 **PMID:** 39986852

Abstract

Introduction: Falls represent a prevalent cause of injury, disability, and mortality in the United States among older adults (ages 65+). Falls are not an inherent part of aging and adopting evidence-based fall prevention strategies can reduce fall risk. Caregivers are well-positioned to increase awareness and uptake of fall prevention strategies among older adults but may not be aware of all effective strategies. The objective of this study was to assess caregivers' beliefs and awareness related to older adult falls and evidence-based prevention strategies.

Methods: Questions about falls were included in the SummerStyles survey, part of the 2022 suite of Porter Novelli ConsumerStyles surveys. Questions covered demographic and health characteristics of respondents, caregiver status, and knowledge of evidence-based fall prevention strategies. We compared demographic, health, and fall prevention knowledge by caregiver status and age.

Results: Caregivers were more likely to be women, 65+, and report low income and fair/poor health compared to non-caregivers. Most (88.8%) caregivers did not believe older adult falls are inevitable. Most caregivers (94.0%) reported knowing at least one evidence-based fall prevention strategy, but many also identified strategies with limited evidence, such as being more careful (75.1%), as effective. Few caregivers recognized interventions like Tai Chi (13.4%) and medication management (23.3%) as effective. However, caregivers often recognized the importance of making homes safer (84.8%) and strength or balance exercises (76.4%).

Conclusions: Our findings highlight the need for expanded education aimed at caregivers to raise awareness about fall risks and all evidence-based fall prevention strategies.

Practical applications: Public health efforts can benefit from effectively educating and empowering older adults and their caregivers to play a proactive role in fall prevention and aging without injury. Results can facilitate targeted education and support of caregivers and creation of caregiver-driven programs to address fall risk and prevention.

Keywords: Caregiver-driven Fall Prevention; Evidence-based Fall Prevention; Fall Prevention; Injury Prevention; Older Adult Fall Prevention.

Effects of Unpredictable Perturbation Training on a Split-Belt Treadmill on Physical Performance in Older Adults: A Randomized Controlled Trial

Han KS, Ko MH. Geriatrics (Basel). 2025 Feb 7;10(1):23.

DOI: 10.3390/geriatrics10010023 **PMID:** 39997522 **PMCID**: PMC11855342

Abstract

Background/Objectives: This clinical trial aimed to determine whether perturbation-based gait training (PBGT) on a split-belt treadmill enhances balance and muscle strength in older adults, comparing its effectiveness with walking-only training on a treadmill.

Methods: This single-center, prospective, single-blind (assessor), randomized controlled trial included 24 older adults from the Rehabilitation Center of Jeonbuk National University Hospital. Participants were equally divided into the PBGT and control groups. Both groups underwent 12 training sessions, three times a week for 4 weeks, for a total of 43 min per session. The outcomes, including the Five Times Sit-to-Stand Test (FTSST), Falls Efficacy Scale International, timed up-and-go (TUG) test, functional reach test, and lower-extremity manual muscle test scores, were measured at three time points: pre-training, post-training, and four weeks after training.

Results: While there were no significant differences between the two groups, the PBGT group demonstrated significant improvements in its FTSST and TUG values.

Conclusions: Unpredictable perturbation training on a split-belt treadmill can be safely performed by older adults and may serve as an alternative exercise method to enhance physical performance and balance ability for fall prevention.

Keywords: balance; falls; rehabilitation; treadmill; unpredictable perturbation.

Preventing Falls in Older Adults after Upper Limb Fractures: A Scoping Review

Lobo BS, Amaral Alfonsi M, Lima CA, Felipe SGB, Kristensen MT, Beaupre LA, Sherrington C, Bruder AM, Perracini MR. Phys Ther. 2025 Feb 21:pzaf020.

DOI: 10.1093/ptj/pzaf020 **PMID:** 39982430

Abstract

Objectives: The objective was to identify and describe fall prevention strategies in upper limb fracture rehabilitation for older people using recent fall prevention guidelines as a standard.

Methods: A systematic search was conducted in 9 electronic databases (PUBMED/MEDLINE, EBSCOhost, Cochrane Library, Lilacs, SPORTDiscus, CINAHL, Web of Science, AgeLine, and SciELO), grey literature, and in bibliographic and citation searching of selected articles between May and December 2022 and updated between February and March 2024. Two independent reviewers screened citations for inclusion. Data extraction was performed by 1 reviewer and verified by a second reviewer. A frequency of strategies and content analysis syntheses were conducted.

Results: A broad search strategy was used, initially identifying 25,945 articles and including 6 randomized clinical trials. The grey literature search identified 18 records. Five studies included forearm fractures, 1 upper limb fracture, and no study exclusively rehabilitation after humerus fractures. None of the studies provided comprehensive multifactorial fall risk assessments to guide tailored interventions. Assessments mainly focused on gait and balance. Exercise was the most offered intervention alone or in combination with education. Exercise programs were aligned with recommendations to include progressive balance and functional exercises overall. However, the frequency of 3 or more times weekly was less frequently offered. The grey literature showed a lack of fall prevention-specific information after upper limb fractures and mostly called attention to fall prevention after hip fractures.

Conclusion: Upper limb fracture rehabilitation in older adults, considered at high risk of falling, did not include comprehensive and tailored multifactorial fall assessment and intervention. Unequivocally, exercise programs were overall aligned with recent recommendations and were the most frequent intervention. There is a crucial gap for humerus fractures. This study can help align the treatment of upper limb fractures with updated fall prevention recommendations and impact future research, guiding and influencing implementation in clinical practice.

Impact: There is an urgent need to implement comprehensive and tailored multifactorial fall assessments and interventions in rehabilitation programs for older adults recovering from upper limb fractures. Guidelines should direct this work to enhance clinical practice.

Keywords: aging; falls; fragility fracture; secondary prevention; upper limb.

Development and Implementation of Strong Foundations, a Digitally Delivered Fall Prevention Program: Usability and Feasibility Pilot Exercise Cohort Study

Moran R, Wing D, Davey H, Barkai H, Nichols J. JMIR Form Res. 2025 Feb 28;9:e67406.

DOI: 10.2196/67406 **PMID:** 40019778

Abstract

Background: Falls remain a major public health problem and a significant cause of preventable injury. Maintaining strength and balance by staying active can prevent falls in older adults, and public health advocates support referral to community exercise programs. Given the growth in use and acceptance of technological interfaces, there remains an interest in understanding the role of a synchronous exercise program designed to improve strength, postural alignment, and balance specifically designed to be delivered in a digital environment with respect to usability and feasibility.

Objective: This study aims to design and implement a synchronously delivered digital fall prevention program to adults aged 60 years and older, to understand the usability, feasibility, and attendance.

Methods: The "Strong Foundations" program, a 12-week, live, digitally delivered fall-prevention exercise program was informed from different existing in-person exercises and piloted to older adults who were considered a low fall risk by scores of 4 or less from the Centers for Disease Control and Prevention's (CDC's) Stopping Elderly Accidents and Deaths Initiative (STEADI) Staying Independent questionnaire. The System Usability Scale (SUS) measured usability and feasibility at the completion of this program, and digital measures of age-related function (timed up and go [TUG] and 30-second chair stand [30 CS]) were collected pre- and postintervention. Data were collected in 2021.

Results: A total of 39 older adults were recruited and 38 completed the 12-week program with an average age of 72 years. The average SUS was 80.6, with an 85% attendance rate and an 8.5 (out of 10) self-reported satisfaction score. Digitally collected TUG and 30 CS statistically improved pre- and postintervention by 9% and 24%, respectively; by week 12, 64% (23/36) of participants improved in the timed up and go and 91% (32/35) improved the chair stands.

Conclusions: There was excellent usability and acceptability for Strong Foundations, a novel fall-prevention program designed to be delivered digitally and promising improvement of objective measures of fall risk.

Keywords: Strong Foundations; digital health; digital technology; exercise; fall prevention; fall risk; feasibility; geriatrics; mobile phone; older adults; public health; system usability scale; usability; user acceptance.

Recreational older ballet dancers fall less with more effective reactive balance control than non-dancers after a slip during gait

Simpkins C, Yang F. Exp Brain Res. 2025 Feb 24;243(3):75.

DOI: 10.1007/s00221-025-07021-y **PMID:** 39992460

Abstract

Recent work revealed that recreational ballet practice reduces older adults' fall risk after a standing-slip perturbation. However, whether such ballet practice can lead to decreased falls and better reactive motor control after a gait-slip among older adults remains unclear. This study investigated whether ballet reduces older adults' gait-slip falls and the possible neuromuscular and biomechanical mechanisms responsible for fall risk reduction. Protected by a safety harness, 15 older recreational ballet dancers and 21 age- and sex-matched non-dancers experienced a single unexpected slip while walking on a treadmill. The slip acceleration, duration, and displacement were standardized at 8 m/s^2, 0.2 s, and 16 cm, respectively. Motion and electromyography data were collected during the gait-slip trial. The outcomes included slip-faller rate as the primary outcome and the following secondary ones: dynamic gait stability, slipping foot displacement, recovery stepping performance, trunk movement, and recovery leg muscle electromyography latency (rectus femoris, biceps femoris, medial gastrocnemius, and tibialis anterior). The results revealed that fewer dancers fell after the gait-slip ($p = 0.029$). Dancers displayed better stability at recovery foot touchdown ($p = 0.012$), a longer ($p = 0.002$) and faster ($p = 0.009$) step, shorter slipping foot displacement ($p = 0.031$), less backward trunk velocity at touchdown ($p = 0.011$), and shorter latencies for all four muscles ($p \leq 0.038$). The results suggest that older dancers are more resilient to an unexpected gait-slip and display better reactive balance control responding to the slip perturbation, which could be related to their more effective recovery stepping, better trunk movement control, and faster leg muscle activations.

Keywords: Dance; Dynamic gait stability; Falls; Muscle activity; Slip.

Use of a Technology-Based Fall Prevention Program With Visual Feedback in the Setting of Early Geriatric Rehabilitation: Controlled and Nonrandomized Study

Steinmetz C, Stenzel C, Sylvester M, Glage D, Linke A, Sadlonova M, von Arnim CAF, Schnieder M, Valentová M, Heinemann S. JMIR Form Res. 2025 Feb 11;9:e66692.

DOI: 10.2196/66692 **PMID:** 39935036 **PMCID**: PMC11835598

Abstract

Background: The Otago program (OP) is evidence-based and focuses on fall prevention in older people. The feasibility and usability of a short-term digital program modeled after the principles of the OP in the setting of early geriatric rehabilitation (EGR) are unclear.

Objective: This study investigated the feasibility and usability of an additional technology-based fall prevention program (FPP) in the setting of EGR.

Methods: We performed a feasibility study in the setting of EGR. A sample of 30 patients (mobility at least by walker; mini-mental status test score >17) was recruited between March and June 2024 and compared with a retrospective cohort (n=30, former EGR patients). All patients in the intervention group (IG) received a supervised, OP-modified FPP thrice/week for 20 minutes using a technology-based platform called "Pixformance." The device is a digital trainer and enables real-time corrections. The primary end point was the feasibility (given when 80% of the IG participated in 6 trainings within 2 weeks). Secondary outcomes were usability (patients' and facilitators' perspective; ≥75%), risk of falls (Berg Balance Scale), mobility (Timed Up and Go Test), functional independence (Functional Independence Measure), and activities of daily living (Barthel Index). Several further exploratory end points were analyzed including anxiety and depression (Four-Item Patient Health Questionnaire; PH-Q4). Data were accessed at entry to EGR and after 2 weeks prior to discharge. To analyze the pre-posttest results, the dependent Student t test and the Wilcoxon test were applied. A mixed ANOVA with repeated measurements was used for statistical analyses of time-, group-, and interaction-related changes.

Results: A cohort of 60 patients (mean 80.2, SD 6.1 y; 58% females, 35/60) was analyzed. The main indication for EGR was stroke (9/60, 15%). Patients were recruited into a prospective IG (n=30) and a retrospective control group (n=30). Of the 30 patients in the prospective IG, 11 patients (37%) completed 6 training sessions within 2 weeks. Reasons why participants did not complete 6 training sessions were diagnostic appointments (33%), pain/discomfort (33%), or fatigue (17%). EGR patients rated FPP usability at 84% and facilitators at 65% out of 100%. Pre-posttest analysis of the standard assessments showed a significant interaction in Berg Balance Scale (<.01). In both groups, a significant improvement over time was found in the Timed Up and Go Test (<.01), Barthel Index (<.01), and Functional Independence Measure (<.01). Likewise, in the IG, the PH-Q4 score (.02) improved.

Conclusions: While the technology-based FPP in the EGR setting was generally well-accepted by patients, with high usability ratings, its feasibility was limited. Only 37% of participants completed the required additional training sessions. Further studies should test the technology-based FPP as an integrated part of the EGR complex therapy concept. Our findings suggest potential benefits of incorporating technology-based FPPs in EGR, but further refinement is needed to enhance participation and feasibility.

Keywords: aging; digital activity; digital exercise intervention; digital intervention; early geriatric rehabilitation; elder; fall prevention; fall prevention program; feasibility; functional capacity; gerontology; new technology; older adult; physical exercise; technology-based.

A multiple correspondence analysis of the fear of falling, sociodemographic, physical and mental health factors in older adults

Tabacchi G, Navarra GA, Scardina A, Thomas E, D'Amico A, Gene-Morales J, Colado JC, Palma A, Bellafiore M. Sci Rep. 2025 Feb 21;15(1):6341.

DOI: 10.1038/s41598-025-89702-w **PMID:** 39984517 **PMCID**: PMC11845738

Abstract

Fear of falling (FoF) is a disabling condition due to different factors. The present study assessed potential FoF predictors, among sociodemographic, physical, and mental health domains, and explored their structural patterns. This cross-sectional study is part of the Physical Activity Promotion & Domestic Accidents Prevention (PAP & DAP) project, and was targeted to a sample of 229 independent older people (M 14.0%, F 86.0%) aged over 60 (mean 70.5 ± 5.96), both normal and overweight (median BMI 25.8 kg/m^2, Interquartile Range 5.24). Standardized tools were used to assess the variables: the Short Falls Efficacy Scale International for the FoF; an information questionnaire for the socio-demographic variables, the presence of diseases, and previous falls; the International Physical Activity Questionnaire for the PA level; the Senior Fitness Test for physical fitness data; the Short Form 12 questionnaire for variables in the mental domain; and the Psychological Well-Being Scale 24 for the psychological well-being. Correlation/regression analyses were used to explore relationships between FoF and the considered variables. A Multiple Correspondence Analysis (MCA) was conducted to show graphical patterns projected into space dimensions. A percentage of 59.0 of the sample showed moderate/high concern of falling. The multiple regression model showed the following variables being significant predictors ($p < 0.05$) of the FoF: BMI (coeff 0.44, SE 0.104), musculoskeletal disease (1.55, 0.681), upper body strength (0.33, 0.117), mobility and balance (0.76, 0.320), perceived physical health (- 0.21, 0.047), and self-acceptance (- 0.52, 0.190). MCA evidenced two dimensions: the first one explained 41.8% of the variance and was described mostly by FoF (square residuals 0.721), gender (0.670), leg strength (0.617), perceived mental health (0.591), musculoskeletal diseases (0.572), and PA level (0.556); the second dimension (12.3% of the variance), was characterized mainly by perceived physical health (0.350), life objectives (0.346), education (0.301), upper body strength (0.278), and living in family/alone (0.260). The pattern elicited by MCA was characterized by older subjects with moderate/high FoF having low education or no occupation, being overweight and inactive, suffering from different diseases, having low physical fitness, and declaring low perceived physical and mental health. These results suggest that interventions aimed at reducing FoF should be addressed to this specific profile of older people.

Keywords: Fear of falling; Mental health; Older; Physical health; Sociodemographic.

Building Strong Foundations: Nonrandomized Interventional Study of a Novel, Digitally Delivered Fall Prevention Program for Older Adults

Wing D, Nichols JF, Barkai HS, Culbert O, Moreno D, Higgins M, O'Brien A, Perez M, Davey H, Moran R. JMIR Aging. 2025 Feb 26;8:e68957.

DOI: 10.2196/68957 **PMID:** 40009847

Abstract

Background: Injuries from falls are a major concern among older adults. Targeted exercise has been shown to improve fall risk, and recommendations for identifying and referring older adults for exercise-based interventions exist. However, even when very inexpensive or free, many do not use available fall prevention programs, citing barriers related to convenience and safety. These issues are even greater among older adults residing in rural areas where facilities are less abundant. These realities highlight the need for different approaches to reducing falls in novel ways that increase reach and are safe and effective. Web-based delivery of exercise interventions offers some exciting and enticing prospects.

Objective: Our objective was to assess the efficacy of the Strong Foundations exercise program to change markers of physical function, posture, balance, strength, and fall risk.

Methods: Strong Foundations is a once weekly (60 minutes), 12-week iterative program with 3 core components: postural alignment and control, balance and mobility, and muscular strength and power. We used a quasi-experimental design to determine changes in physical function specific to balance, postural control, and muscular strength among older adults at low or moderate risk of falling.

Results: A total of 55 low-risk and 37 moderate-risk participants were recruited. Participants significantly improved on the 30-second Chair Stand (mean change of 1, SD 3.3 repetitions; P=.006) and Timed Up and Go (mean change of 0.2, SD 0.7 seconds; P=.004), with the moderate-risk group generally improving to a greater degree than the low-risk group. Additionally, Short Physical Performance Battery performance improved significantly in the moderate-risk category (P=.02). The majority of postural measures showed statistically significant improvement for both groups (P<.05). Measures of "relaxed" posture showed improvements between 6% and 27%. When an "as tall as possible" posture was adopted, improvements were ~36%.

Conclusions: In this 12-week, iterative, web-based program, we found older adults experienced improvement not only in measures used in clinical contexts, such as the 30-second Chair Stand and Timed Up and Go, but also contextualized gains by providing deeper phenotypical measurement related to posture, strength, and balance. Further, many of the physical improvements were attenuated by baseline fall risk level, with those with the highest level of risk having the greater gains, and, thus, the most benefit from such interventions.

Keywords: Zoom; balance; digital intervention; exercise; fall prevention; older adults; posture; strength.

Relationship between typical fall patterns and fall-related fractures in older Japanese adults

Yamada M, Terao Y, Kojima I, Tanaka S, Saegusa H, Nanbu M, Soma S, Matsumoto H, Saito M, Okawa K, Haga N, Arai H. Proc Jpn Acad Ser B Phys Biol Sci. 2025;101(2):98-106.

DOI: 10.2183/pjab.101.004 **PMID:** 39924178

Abstract

This study explored the relationship between fall patterns and fall-related fractures in older adults. A cross-sectional survey was conducted among community-dwelling older adults in Maibara City, Japan, focusing on falls over the past three years. Among the 1,695 reported falls, 176 fractures occurred in 120 individuals. Backward or straight-down and sideways falls were more likely to result in fractures compared to forward falls, with odds ratios (95% confidence interval) of 3.23 (2.08-5.02) and 3.68 (2.35-5.76), respectively. Falls triggered by slipping or loss of balance had higher fracture rates than those triggered by tripping. Specific fall patterns were associated with particular fractures, such as forearm and patella fractures from forward falls, spine fractures from backward or straight-down falls, and hip fractures from sideways falls. We conclude that the fracture risk varies significantly based on fall patterns, providing insights for enhancing fall prevention strategies.

Keywords: community-dwelling; fall pattern; fall-related fracture; older adults.

Effect of a home-based physical rehabilitation program via virtual reality on the functional outcomes of frail older adults: a quasi-experimental study

Mohamed Zein El-AbdeenMohamed D, Noshy Abd El-Aziz Mohamed H, Hassan Abd Elhameed S. Sci Rep. 2025 Feb 4;15(1):4180.

DOI: 10.1038/s41598-025-88225-8 **PMID:** 39905167 **PMCID**: PMC11794556

Abstract

Given the rapid aging of the population in Egypt, efforts to slow down or prevent frailty. Virtual reality technology constitutes a promising rehabilitation strategy, but its effect on frailty in older adults remains inconclusive. A non-equivalent control pre, post, and follow-up test design was used with a sample of 70 prefrail or frail older adults. In 3 urbans affiliated to Dakahlia governorate, tools of data collection; Mini-Cog, Structured Interview Schedule, Survey of Health, Aging and Retirement in Europe of the Frailty Indicator (FI), Short Physical Performance Battery, and Falls Efficacy Scale. For each group, a significant improvement in frailty, physical performance, and falls from each measurement period to immediately after ($p < 0.001$), and within the 30-days study period while those in the control group were relatively stable over time and sometime worsen. The baseline characteristics and assessment results were similar between groups. We observed significant improvements in the intervention group in terms of frailty criteria, standing balance, gait speed, chair stand, and fear of fall. No improvements were observed in the control group, we anticipate a decrease in frailty index, and increase in standing balance, reinforcing the proven benefits of the exercise in this vulnerable population.

Keywords: Effect; Frail older adults; Functional outcomes; Home-based; Physical rehabilitation; Virtual reality.

Home-based strength and balance exercises for fall prevention among older individuals of advanced age: a randomized controlled single-blind study

Zhou J, Liu B, Xu JF, Wang FB, Ye H, Duan JP, Cui XW. Ann Med. 2025 Dec;57(1):2459818. Epub 2025 Feb 7.

DOI: 10.1080/07853890.2025.2459818 **PMID:** 39918027 **PMCID**: PMC11809163

Abstract

Objectives: This research was to explore the effectiveness, safety, and adherence of home-based strength and balance exercises for fall prevention among the self-reliant individuals of advanced age and analyzed the beneficial components.

Methods: This randomized controlled single-blind study included 124 individuals aged 80 years and over(mean age 84.4±3.2 years). The test group (n=63) performed strength and balance exercises facilitated by sports video training (≥ 3 sessions a week, ≥ 30 minutes per session), while the control group (n=61) maintained their daily routines. We conducted a comprehensive geriatric assessment (self-care ability, muscle strength, mobility, cognition, and psychological status) at baseline and 12 months later and dynamic posture mapping for balance and gait.

Results: The test group had a decreased risk of falls compared to the control group (25.4%vs.44.3%, respectively; RR = 0.747; 95% CI: 0.551-0.975; p = 0.027). There was no statistically significant difference in the fall rate between the two groups (0.48 falls per person-year vs. 0.67 falls per person-year, respectively; IRR: 0.708; 95% CI: 0.394-1.275; p = 0.251). The composite equilibrium score (SOTcom) for vestibular and integrated balance on the Sensory Organization Test (SOT) increased in the test group, while SOTcom decreased in the control group. In the test group, there was a significant improvement in the indexes pertaining to response time, movement speed, directional control, and endpoint offset in some directions. Adherence was better in the test group, with 54.0% exercised ≥ 3 times per week and 28.6% exercised 1-2 times per week on average.

Conclusion: Home-based strength and balance exercises improved balance and reduced the risk of falls among the individuals of advanced age. The video-guided, remotely monitored regimen demonstrated effectiveness, safety, and compliance, although scope for improvement remains.

Keywords: Accidental falls; aged 80 years and over; exercise; fall prevention.

Association of lower-limb strength with different fall histories or prospective falls in community-dwelling older people: a systematic review and meta-analysis

Zhu RT, Zuo JJ, Li KJ, Lam FMH, Wong AYL, Yang L, Bai X, Wong MS, Kwok T, Zheng YP, Ma CZ. BMC Geriatr. 2025 Feb 6;25(1):83.

DOI: 10.1186/s12877-025-05685-3 **PMID:** 39915768 **PMCID**: PMC11800621

Abstract

Background: Fall is a major health threat to older people. The lower-limb power and rate of torque or force development (RTD or RFD) are prominently affected by aging and are crucial for maintaining postural balance. However, there have been inconsistent findings regarding the association of such aspects of lower-limb strength with falls among community-dwelling older adults. Comprehensive synthesis and appraisal are needed to examine what deficits in lower-limb rapid force generation could identify the fallers (i.e., those with a fall history or prospective falls).

Methods: This systematic review searched six databases, including PubMed, Web of Science, EMBASE, Scopus, CINAHL, and Cochrane CENTRAL. Meta-analysis was conducted to aggregate standardized mean differences (SMD) or odds ratios (OR). The quality of evidence regarding each strength parameter's ability to identify fallers was assessed using the GRADE approach.

Results: Twenty observational studies with 8,231 community-dwelling older adults were included (mean age: 73.5 years; male to female ratio: approximately 6:1). Moderate quality of evidence showed that the lower average leg-press power (SMD & 95% CI: -0.17 [-0.23, -0.12]; OR & 95% CI: 0.84 [0.79, 0.89]) and lower peak sit-to-stand power (Cohen's d = 0.41) could predict prospective falls in older adults, especially the injurious/recurrent falls. Low quality of evidence showed that the lower peak sit-to-stand power could also discern fall history (SMD & 95% CI: -0.58 [-0.96, -0.20]). Conversely, low to very low quality of evidence showed that the RTD of a single muscle group could not predict prospective falls and was generally unable to identify fall history in older adults. DISCUSSIONS AND CONCLUSION: The decline of entire lower-limb power appears a good indicator of prospective falls in community-dwelling older adults. Tests of entire lower-limb power required the cumulative and coordinated contractions of more leg muscles, possibly explaining why they could identify the fallers whereas the RTD or power of a single muscle group could not. Future studies are warranted to determine cut-point values of the entire lower-limb power measurements in fall-risk assessment and explore rapid force generation of a single muscle group in predicting the injurious falls among older adults.

Trial registration: Registration No.: CRD42021237091.

Keywords: Balance; Community-dwelling older adults; Fall history; Fall incidence; Fallers; Falls; Muscle strength/power; Rate of force development (RFD); Rate of torque development (RTD); Risk factors.