Featured Falls Research – January

The Effects of Yoga on Fall-Related Physical Functions for Older Women: A Systematic Review of Randomized Controlled Trials

Huang TC, Li C, Hsieh CY. Healthcare (Basel). 2025 Jan 9;13(2):124.

DOI: 10.3390/healthcare13020124 **PMID:** 39857151 **PMCID:** PMC11764746

Abstract

Introduction: The evidence showed that the risk of falls was higher in women, and yoga was considered an effective rehabilitation method for preventing falls. However, there had been no previous attempts to synthesize the evidence specifically for the use of yoga in preventing falls among older women.

Objectives: This systematic review aimed to strengthen the existing body of evidence by focusing exclusively on the impact of yoga in improving fall-related physical functions among older women.

Methods: A systematic review was conducted following the PRISMA guidelines. The protocol was developed in advance of the study and registered on PROSPERO (Registration number: CRD42024506550).

Results: The effects of yoga on balance, gait, and lower-limb strength were inconsistent. It showed that yoga programs designed to prevent falls in older women might not demonstrate the same effectiveness as those identified in previous systematic reviews for the general older adult population.

Conclusions: This systematic review is the first to exclusively explore the impact of yoga on fall-related physical functions in older women. However, this review did not directly observe a definitive effect of yoga on fall prevention in older women. Future studies should delve deeper into identifying appropriate yoga postures and determining the optimal dose required to enhance physical function and prevent falls.

Keywords: balance; gait; lower-limb strength; multicomponent exercise.

Fall rates in bifocal, trifocal, and progressive addition lens glasses wearers

Lord SR, Ivers R, Cameron ID, Lee BB, Haran M. Optom Vis Sci. 2025 Jan 30.

DOI: 10.1097/OPX.0000000000002218 **PMID:** 39882858

Abstract

Purpose: There is evidence that wearing multifocal glasses increases the risk of falls in older people, especially when walking on stairs and in unfamiliar settings. However, it is not clear whether all types of multifocal glasses are equally associated with falls. This study comprised a secondary analysis of data from the VISIBLE randomized controlled trial to determine whether fall rates differ among older bifocal, trifocal, and progressive addition lens glasses wearers.

Methods: Two hundred eighty-one regular wearers of multifocal glasses (mean age, 80.3 years; standard deviation, 6.8 years) who were at increased risk of falls and used multifocal glasses three or more times per week participated in the study. Participants were classified into three groups: bifocal (n = 170), trifocal (n = 33), and progressive addition lens glasses wearers (n = 78). Participants underwent assessments of vision, sensorimotor function and balance (assessed with the Physiological Profile Assessment), Timed Up and Go performance, and activity levels and were then followed up for falls for 13 months.

Results: Two hundred sixty-eight participants (95.4%) were followed up for falls for 6+ months over the following 13 months: 51 bifocal glasses wearers (31.5%) suffered multiple falls compared with 15 trifocal glasses wearers (46.9%) and 33 progressive addition lens glasses wearers (44.6%) (p=0.071). When adjusting for established fall risk factors, participants wearing progressive addition lens glasses had over twice the odds of suffering multiple falls compared with bifocal glasses wearers (odds ratio, 2.23; 95% confidence interval, 1.08 to 4.58).

Conclusions: These findings suggest that progressive addition lens glasses increase the risk of falls more than bifocal glasses possibly due to visual distortions and reduced awareness of blurred distant objects in the lower visual field. Education of the risks posed by progressive addition lens glasses and training in optimal glasses use may help protect older people from falls.

The effect of brief, repetitive balance training on balance and fall risk in older people with stroke: A randomized controlled trial

Medina-Rincón A, Pérez LM, Bagur-Calafat C, Barrios-Franquesa AM, Barbosa MA, Doménech-García V, Bellosta-López P, Buesa-Estéllez A, Girabent-Farrés M. Clin Rehabil. 2025 Jan 15:2692155241312067.

DOI: 10.1177/02692155241312067 **PMID:** 39814534

Abstract

Objective: To evaluate the effect of integrating a specific balance-training program focused on static balance to the conventional rehabilitation program on dynamic balance, risk of falls, and activities of daily living (ADLs) in older adults post-stroke.

Design: A single-blinded randomized controlled trial.

Setting: Institutional Intermediate Care Hospital.

Subjects: Post-stroke older adults in a subacute phase without cognitive impairment, aged 65 years and older, exhibiting trunk control in a seated position for 30 seconds without supporting the arms.

Intervention: The control group underwent the usual treatment, consisting of 60-minute physiotherapy sessions, 5 days per week, for 30 days. The experimental group integrated into the usual treatment 15 minutes of the balance-training program (45 min + 15 min).

Main measures: Balance impairment (Mini-BESTest and Berg Balance Scale (BBS), risk of falls (BBS), and independence for ADLs (Barthel Index)) were assessed at baseline, 15 and 30 days after the start of interventions.

Results: Seventy-one post-stroke patients (77.7 ± 9.0 years, 49.2% women) were randomized into the experimental (n = 35) or control (n = 36) groups. The experimental group showed improved dynamic balance at day 15 (Mini-BESTest: 2.90 [1.05-4.77], p = 0.003; BBS: 4.31 [1.41-7.23], p = 0.004) and day 30 (Mini-BESTest: 6.06 [2.85-9.27], p < 0.001; BBS: 8.24 [2.96-13.53], p = 0.003), as well as greater independence levels (11 [2.75-19.23], p = 0.010) compared to the control group. The control group showed higher risk of falls on day 15 (p = 0.035) and day 30 (p = 0.003) than the experimental group.

Conclusions: A simple, easily reproducible approach designed by and for the older adult to rehabilitate post-stroke impairments effectively improved balance, functional gait, risk of falls, and ADLs.

Keywords: Stroke; balance; fall risk; older adults; rehabilitation.

Is frailty associated with increased concerns about falling and activity restriction in community-dwelling older adults? A systematic review

Nicklen B, Delbaere K, Ellmers TJ. J Frailty Aging. 2025 Feb;14(1):100002.

DOI: 10.1016/j.tjfa.2024.100002 **PMID:** 39855888

Abstract

Purpose: Concerns about falling (CaF) are common in older adults. They are associated with increased risk of falls, activity restriction, social isolation, and physical deconditioning. This systematic review assessed if frailty is a risk factor for CaF.

Methods: Searches of cross-sectional and prospective studies exploring associations between frailty and CaF were conducted across five databases (Medline, CINAHL, Embase, Psychinfo and Scopus). The Risk of Bias in Non-randomised Studies of Exposure (ROBINS-E) was used to determine risk of bias.

Results: The search identified 2492 articles, 12 were included for data extraction: 8 cross-sectional and 4 prospective studies. Participants' mean ages across the different studies ranged from 67.5 - 81.7 years. All adjusted analyses reported a significant association between increasing frailty and CaF, except for one cross-sectional paper. Significant adjusted Odd Ratios (ORs) ranged from 1.79 (CI = 1.18-2.71) to 144.78 (CI = 13.86 - 1512.60) for cross-sectional studies, and from 1.33 (CI = 1.04-1.69) to 12.4 (CI = 7.6-20.1) for prospective studies. Three studies (one cross-sectional and two prospective) explored the association between frailty and concern-related activity restriction: A significant association was reported in two prospective studies (adjusted OR = 1.58 (CI=1.09-2.30) and adjusted RRR = 3.91 (2.61-5.85)), but not the cross-sectional study (adjusted OR = 1.31 (CI=0.62-2.78)).

Conclusion: This review identifies strong associations between increasing frailty and both CaF and associated activity restriction. This expands previous work describing the opposite association (that CaF can lead to frailty), suggesting a bi-directional relationship. Clinicians working with pre-frail and frail older adults should consider screening for CaF.

Prospero: CRD42023371899.

Keywords: Activity avoidance; Anxiety; Falls; Fear of falling; Older adults.

Falls Research – January

Effects of a video-supported Cawthorne-Cooksey exercise program in older adults with balance deficits and dizziness: A preliminary randomised pilot study

Athanasiadou O, Lytras D, Iakovidis P, Kasimis K, Koutras G, Apostolou T. Australas J Ageing. 2025 Mar;44(1):e13408.

DOI: 10.1111/ajag.13408 **PMID:** 39869600

Abstract

Objectives: To determine the safety and efficacy of a video-supported Cawthorne-Cooksey exercise program (CCEP) in improving balance, dizziness and decreasing fear of falling in older adults with balance deficits and dizziness.

Methods: Thirty-two older adults were divided into two groups (intervention and control). The intervention group followed a video-supported CCEP group, while the control group received written instructions to maintain their usual activity and counselling on fall prevention. Balance was assessed using the Berg Balance Scale (BBS), fear of falling with the Fall Efficacy Scale International (FES-I), and dizziness impact on daily life with the Dizziness Handicap Inventory (DHI) at baseline, the 4th week and at the 1-month follow-up. Analysis of variance with repeated measures was applied, and the level of significance was set at $p < .05$.

Results: Statistically significant differences were found between groups at the 4th week, with the CCEP group showing significant improvement in all outcome measures (BBS, FES-I, DHI scores) ($p < .05$). These differences remained statistically significant at the 1-month follow-up ($p < .05$). No adverse effects were detected.

Conclusion: A 4-week video-supported CCEP is safe and effective in improving balance, dizziness impact on daily life and fear of falling in older adults with age-related dizziness and imbalance.

Keywords: accidental falls; dizziness; exercise; physical therapy modalities; postural balance.

A Comparative Study of Risk Factors for Falls in Total Hip and Knee Arthroplasty Patients and Community-Dwelling Older Adults

Chen SK, Voaklander D, Jhangri GS, Jones CA. Musculoskeletal Care. 2025 Mar;23(1):e70055.

DOI: 10.1002/msc.70055 **PMID:** 39841325 **PMCID:** PMC11771673

Abstract

Objectives: Falls in older adults are a public health concern, yet little is known about falls in adults with hip or knee total joint arthroplasty (TJA) who may be at a higher risk than the general population. The study objectives were to compare the number of fallers and fear of falling in TJA patients to age and sex matched community controls, and determine whether the type of risk factors for falls reported in TJA differed from the community group.

Methods: A cross sectional comparative study was conducted with patients waiting or recovering from TJA and age and sex matched comparison group of older adults residing in the community. Reported falls and risk factors for falling were compared to age and sex matched controls from the community. Fear of falling was measured using the Activities-specific Balance Confidence (ABC) Scale. Logistic regression was used to determine risk factors associated with falls in TJA and community participants.

Results: Of the 198 TJA participants, 29% (n = 57) reported falls within the past 12 months compared to 24% (n = 24) of 100 participants in the control group (p = 0.36). Of those who fell, 25 (44%) were recurrent fallers in the TJA cohort compared with 6 (25%) in the community cohort. Eleven participants reported falls after TJA surgery. Fear of falling was greater in the TJA group (ABC score, mean ± SD: 67.1 ± 24.4) than in the community group (88.1 ± 14.9) ($p < 0.001$).

Conclusion: Although the number of participants who reported falls was comparable in both groups, the TJA group had more recurrent falls, different risk factors for falls, and more fear of falling. Fall prevention programs should be embedded in pre-operative programs for patients undergoing surgery for TJA.

Keywords: accidental falls; falls; fear of falling; older adults; total joint arthroplasty.

Effects of different types of Tai Chi intervention on motor function in older adults: a systematic review

Fan X, Soh KG, Mun CY, Soh KL. Aging Clin Exp Res. 2025 Jan 22;37(1):32.

DOI: 10.1007/s40520-024-02894-5 **PMID:** 39841325 **PMCID:** PMC11754367

Abstract

Background: Tai Chi (TC) is widely acknowledged for its positive impact on improving motor function in older adults. Nevertheless, limited research has directly compared the effects of different TC styles on older adults with functional impairments.

Objective: This study aimed to assess the impact of different TC styles on motor function in older adults with functional impairments.

Method: We searched five databases-PubMed, Scopus, Chinese National Knowledge Infrastructure (CNKI), Web of Science, and Wiley Online Library-including studies published up to September 2024. The selection of literature adhered to PRISMA guidelines, with quality assessment independently carried out by two researchers.

Results: Fourteen studies met the inclusion criteria for this review. The analysis revealed that TC interventions for functionally impaired older adults primarily employed Yang-style, Sun-style, Chen-style, and simplified-style TC. The populations studied included individuals with mild cognitive impairment (MCI), nonspecific low back pain (NS-LBP), preclinical disabilities, chronic diseases, poor balance, osteoarthritis (OA), Parkinson's disease (PD), sarcopenia, and those at risk of falls. The findings indicated that motor function in functionally impaired older adults were closely linked to balance, gait, mobility, strength, and fall rates. Among the various TC styles, Yang-style was the most frequently utilised intervention.

Conclusion: This review examined four types of TC interventions and found strong evidence supporting the effectiveness of Yang-style TC in improving motor function in older adults with functional impairments. Additionally, five assessment methods-Single-Leg Stance (SL), Six-Minute Walk Test (6MWT), Timed Up and Go Test (TUGT), Chair Stand Test (CST), and Fall Efficacy Scale (FES)-were identified as suitable for evaluating this population. Based on the findings, it is recommended that individuals with functional impairments engage in Yang-style 24-movement TC, with an intervention duration of 12 weeks, practicing two to five times a week for 60 min each session.

Keywords: Balance; Gait; Motor function; Older adults; Tai Chi.

Plantar sensation associates with gait instability in older adults

Franz JR, Shelton AD, Takahashi KZ, Allen JL. J Neuroeng Rehabil. 2025 Jan 23;22(1):11.

DOI: 10.1186/s12984-025-01555-6 **PMID:** 39849593 **PMCID:** PMC11756194

Abstract

Background: Advanced age brings a loss of plantar sensation, represented, for example, as higher sensation thresholds in standardized testing. This is thought to contribute to an increased risk of falls among older adults - an intuitive premise that has yet to be fully investigated, especially in the context of walking balance. The purpose of this study was to quantify the association between plantar sensation and the instability elicited by a suite of walking balance perturbations that differ in direction and context in a cohort of n = 28 older adults (73.0 ± 5.9 yrs).

Methods: We measured plantar sensation using Semmes-Weinstein monofilaments and quantified margins of stability (MoS) and whole-body angular momentum (WBAM) during habitual walking and in response to optical flow perturbations, lateral waist-pull perturbations, and treadmill-induced slips.

Results: Our two major results were that higher monofilament thresholds (i.e., worse plantar sensation) in older adults associated with: (1) larger anterior-posterior (AP) and mediolateral (ML) MoS and increased transverse plane WBAM ($p \leq 0.031$) during habitual walking, and (2) larger decreases in MoS_{AP}, MoS_{ML} and larger increases in transverse plane WBAM in response to lateral waist pull perturbations ($p \leq 0.018$). We found no associations between plantar sensation and responses to other perturbation contexts.

Conclusions: We conclude that there is an association between worse plantar sensation and gait instability, both during habitual unperturbed walking and in response to some perturbation contexts. These results should build confidence that interventions designed to improve plantar sensation for older adults, possibly through insoles or footwear modifications, could be critical for reducing gait-related falls in at-risk populations.

Keywords: Angular momentum; Balance; Falls; Margin of stability; Monofilaments.

Concurrent Validity and Reliability of In-Person and Supervised Remote STEADI Fall Risk Assessment in Community-Dwelling Older Adults

Jasper A, Karim R, Vitente AC, Rafael CM, Tayag E, Uy SJM, Baloy RK, Lazaro R. J Geriatr Phys Ther. 2025 Jan 27.

DOI: 10.1519/JPT.0000000000000446 **PMID:** 39868692

Abstract

Background and purpose: Physical therapists play a vital role in preventing and managing falls in older adults. With advancements in digital health and technology, community fall prevention programs need to adopt valid and reliable telehealth-based assessments. The purpose of this study was to evaluate the validity and reliability of the telehealth-based timed up and go (TUG) test, 30-second chair stand test (30s-CST), and four-stage (4-stage) balance test as functional components of the Stopping Elderly Accidents, Deaths, and Injuries (STEADI) fall risk assessment.

Methods: This cross-sectional study was conducted using a convenience sample of community-dwelling older adults. The TUG, 30s-CST, and 4-stage balance test were administered in random order in 1 session in the participant's own environment. Performance was scored concurrently by an in-person and synchronous telehealth rater. The video recordings of the performances were scored by an asynchronous telehealth rater on days 1 and 30 for inter- and intra-rater reliability. Additionally, participants performed the TUG test twice, using the distance measured by the participant and the distance measured by the in-person rater. To establish the validity of telehealth-based STEADI fall risk assessments, the Intraclass Correlation Coefficient (ICC), Pearson correlation coefficient, and 95% limits of agreement were derived. Inter- and intra-rater reliability were established by calculating ICC using a 2-way mixed model. Bland-Altman plots were created for nonsignificant proportional bias tests.

Results and discussion: Thirty community-dwelling older adults participated. Based on the STEADI algorithm, 13 participants were classified as having a moderate fall risk. A comparison of in-person and synchronous telehealth ratings showed excellent ICCs (0.97-0.99) and relationships (r = 0.94-0.98). Bland-Altman plots were created for all tests except for the 30s-CST (t = -2.168, P = .04). All tests had good to excellent inter-rater reliability (ICC = 0.84-1.00) and intra-rater reliability (0.77-1.00). No adverse events were reported.

Conclusion: This study suggests that telehealth-administered functional tests in the STEADI fall risk assessment are valid and reliable when technology, environment, camera view, and angle are optimally managed.

Effects of Remote Exercise on Physical Function in Pre-Frail Older Adults: A Randomized Controlled Trial

Lee K. Med Sci Monit. 2025 Jan 28;31:e947105.

DOI: 10.12659/MSM.947105 **PMID:** 39871464 **PMCID**: PMC11786508

Abstract

BACKGROUND Remote exercise have emerged as a promising solution to overcome barriers to physical activity participation in pre-frail older adults, such as limited mobility and accessibility issues. Pre-frail older adults often face barriers to physical activity due to limited mobility and accessibility, underscoring the need for remote exercise alternatives. This study aimed to evaluate and compare the efficacy of remote versus in-person exercise in improving physical function in pre-frail older adults.

MATERIAL AND METHODS Ninety pre-frail older adults aged 65 years and above were recruited, and randomly assigned to 3 groups: the remote exercise group (REG, n=30), the in-person exercise group (IPEG, n=30), and the control group (CG, n=30). The REG and IPEG groups underwent identical exercise, including balance, strength, and gait training, conducted twice weekly for 8 weeks. The REG received live, real-time instructions via video conferencing, while the IPEG participated in identical sessions conducted at a local facility. Outcome measures included assessments of balance, lower-limb strength, gait ability, and fall efficacy.

RESULTS Both the REG and IPEG groups demonstrated significant improvements in balance, gait ability, lower-limb strength, and fall efficacy compared to the CG ($P<0.05$). No significant differences were found between the REG and IPEG groups across all outcome measures, indicating that remote exercise were as effective as in-person sessions.

CONCLUSIONS Remote exercise effectively enhanced balance, strength, gait, and fall efficacy in pre-frail older adults, providing a viable alternative to traditional in-person programs and addressing healthcare disparities.

Effect of Body-Weight-Based Resistance Training on Balance Ability and Fear of Falling in Community-Dwelling Older Japanese Women

Liu Z, Sawada S, Deng P, Naito H, Machida S. Sports (Basel). 2025 Jan 7;13(1):8.

DOI: 10.3390/sports13010008 **PMID:** 39852604 **PMCID**: PMC11769491

Abstract

Background: This study aimed to investigate the effects of a 12-week body-weight-based resistance training program on balance ability and fear of falling in community-dwelling older women.

Methods: Twenty-three older women were assigned to either an intervention group that performed the low-load resistance training with slow movement using the body weight (LRT group; n = 12) or a control group (CON group; n = 11). The LRT group participated in the exercise session twice weekly for 12 weeks, while the CON group maintained their daily routine. The 30 s chair stand test (CS-30) was applied to measure lower-extremity muscle strength, balance ability was evaluated using one-leg standing tests with eyes open (OLST-O) and closed (OLST-C), and fear of falling among all participants was assessed using the Falls Efficacy Scale International (FES-I) before (pre) and after (post) the intervention. A two-way analysis of variance with repeated measures [group (LRT and CON) × time (pre and post)] was carried out to evaluate the intervention effects.

Results: Significant interactions were observed in the CS-30 ($F = 9.503$, $p < 0.01$, $\eta p2 = 0.312$), OLST-O ($F = 5.211$, $p < 0.05$, $\eta p2 = 0.199$), and OLST-C ($F = 5.257$, $p < 0.05$, $\eta p2 = 0.200$), though significant simple main effects from pre to post were observed only in the LRT group. The CS-30 scores (pre: 19.8 ± 3.8 times, post: 25.5 ± 5.6 times; $p < 0.001$), OLST-O time (pre: 78.8 ± 35.8 s, post: 96.2 ± 29.9 s; $p < 0.01$), and OLST-C time (pre: 10.2 ± 5.9 s, post: 17.4 ± 12.2 s; $p < 0.01$) were improved before and after the intervention. However, a significant interaction was not observed in FES-I ($F = 1.335$, $p = 0.261$, $\eta p2 = 0.06$).

Conclusions: The 12-week body-weight-based resistance training program enhanced lower-extremity muscle strength and balance ability but did not lessen the fear of falling in community-dwelling older women. The study findings offer relevant information for fall prevention in older adults.

Keywords: concern about falling; fall prevention; low-load resistance training; physical function; static balance.

Sensory reweighting for balance in people living with Parkinson's Disease: Postural adaptation, muscle co-contraction, and perceptual delays

McDonnell P, Rodger M, Teixeira LA, Mitchell G, Doumas M. Gait Posture. 2025 Jan 14;117:342-348.

DOI: 10.1016/j.gaitpost.2025.01.012 **PMID:** 39847875

Abstract

Background: Postural instability is common in people with Parkinson's Disease (PwPD), increasing their risk of injurious falls. Evidence suggests a sensory reweighting deficit in PwPD, along with compensatory muscle co-contraction in response to postural challenges. During balance tasks requiring sensory reweighting, older adults exhibit elevated postural sway and muscle co-contraction, as well as longer perceptual delays, compared to young adults. Such responses may be exacerbated in PwPD, with implications for fall risk.

Research question: The aim of this study was to assess postural sway, muscle co-contraction, and perceptual delays in PwPD and healthy age-matched controls during a sensory reweighting balance task.

Methods: Eleven PwPD and 16 control participants completed a sensory reweighting protocol: standing without vision on a fixed platform (2-min), which then undergoes a period of body sway-referencing (3-min) before returning to its fixed position (2.5-min). Anteroposterior (AP) path length, co-contraction index (CCI), and perceptual delay were analysed across task phases.

Results: PwPD showed a longer delay in perceiving when the body sway-referenced platform returned to a fixed position. This perceptual delay in PwPD (43.40-s) was over double that observed in control participants (21.25-s). AP path length and co-contraction aftereffects were longer in control participants than PwPD.

Significance: Where conditions require it, PwPD can effectively adjust their reliance on proprioceptive information for postural control. However, the significant delay shown by PwPD in perceiving changes to sensory conditions could be detrimental during everyday sensory transitions, potentially increasing fall risk.

Keywords: Balance; Health; Muscle co-contraction; Parkinson’s disease; Postural control; Proprioception; Sensory reweighting.

In a visual inverted pendulum balancing task avoiding impending falls gets harder as we age

Park HE, Bakshi A, Lackner JR, DiZio P. Exp Brain Res. 2025 Jan 16;243(2):44.

DOI: 10.1007/s00221-025-06997-x **PMID:** PMC11735510 **PMCID**: PMC11735510

Abstract

Younger adults (YA) and older adults (OA) used a joystick to stabilize an unstable visual inverted pendulum (VIP) with a fundamental frequency (.27 Hz) of half that of bipedal human sway. Their task was to keep the VIP upright and to avoid ± 60° "fall" boundaries. Both age groups were tested with joystick gains and delays simulating age-related muscle strength and reflex slowing, respectively. In previous VIP and analogous self-balancing tasks, we observed a mixture of discrete corrective commands toward the balance point and destabilizing commands toward an impending fall. We hypothesized that (1) OA would fall more than YA, (2) traditional whole-trial stability and variability measures would differ across age groups and VIP conditions, and (3) different dynamics of corrective and destabilizing commands would discriminate falling from recovery. Results: (i) Traditional whole-trial performance metrics of fall incidence and the variance of position and velocity were worse in OA than YA and worse with longer delays and excessive joystick gains; (ii) OA made fewer corrective and more destabilizing commands than YA only when falling was imminent; (iii) when falls were imminent, a logistic model fit the percentage of inactive, corrective, and destabilizing commands as a function of time left to fall; and (iv) OA were like YA in switching between inaction and action, but exhibited less frequent and less prompt corrective commands than destabilizing commands relative to YA. We discuss whether such a decision-like process may also operate in a bipedal stance.

Keywords: Age-related Differences; Balancing; Falling; Risk of Falling; Serial Decision; Visual Inverted Pendulum (VIP).

The Effect of Frailty on Balance, Fear of Falling, and Dual-Task Performance in Individuals with Type 2 DM

Sertel M, Tütün Yümin E, Bilgin M, Hekimoğlu HB, Özyün S, Körlük FN. Life (Basel). 2024 Dec 30;15(1):25.

DOI: 10.3390/life15010025 **PMID:** 39859965 **PMCID**: PMC11766893

Abstract

The aim of this study was to compare balance, fear of falling, and dual-task performance in frail, pre-frail, and non-frail individuals with type 2 DM. The study included 110 voluntary individuals diagnosed with type 2 DM. Individuals with type 2 DM were divided into three groups according to the FRAIL Scale: frail (n = 26), pre-frail (n = 52), and non-frail (n = 32). The FRAIL Scale evaluated individuals' frailty levels, Timed Up and Go Test evaluated dual-task performance (cognitive and motor), and Tinetti Balance and Gait Scale evaluated balance and risk of falls. Considering the Fall Efficacy Scale, Tinetti Balance and Gait Scale, TUGstandard (sec), TUGcognitive (sec), and TUGmotor (sec) results of frail, pre-frail, and non-frail individuals with type 2 DM, a statistically significant difference was found between the groups ($p < 0.05$). This difference originated from the frail group. Considering the increase in old age and chronic syndromes, such as DM, it brings about, it was concluded that the early evaluation of older adults for frailty and balance was essential and that individually planned intervention could improve prognosis, reduce falls that might occur due to a loss of balance and muscle strength, and enhance the quality of life in older adults.

Keywords: balance; dual task; fear of falling; frailty; older adult; type 2 DM.

Construction and validation of a prediction model for fall risk in hospitalized older adults with osteoporosis

Sun L, Gu HY, Xu GH, Jiang JW, Wang TT, Li DD, Cui BH. Front Public Health. 2025 Jan 15;12:1526660.

DOI: 10.3389/fpubh.2024.1526660 **PMID:** 39882133 **PMCID**: PMC11776290

Abstract

Objective: The aim of this study is to develop and validate a prediction model for fall risk factors in hospitalized older adults with osteoporosis.

Methods: A total of 615 older adults with osteoporosis hospitalized at a tertiary (grade 3A) hospital in Nantong City, Jiangsu Province, China, between September 2022 and August 2023 were selected for the study using convenience sampling. Fall risk factors were identified using univariate and logistic regression analyses, and a predictive risk model was constructed and visualized through a nomogram. Model performance was evaluated using the area under the receiver operator characteristic curve (AUC), Hosmer-Lemeshow goodness-of-fit test, and clinical decision curve analysis, assessing the discrimination ability, calibration, and clinical utility of the model.

Results: Based on logistic regression analysis, we identified several significant fall risk factors for older adults with osteoporosis: gender of the study participant, bone mineral density, serum calcium levels, history of falls, fear of falling, use of walking aids, and impaired balance. The AUC was 0.798 (95% CI: 0.763-0.830), with a sensitivity of 80.6%, a specificity of 67.9%, a maximum Youden index of 0.485, and a critical threshold of 121.97 points. The Hosmer-Lemeshow test yielded a χ^2 value of 8.147 and $p = 0.419$, indicating good model calibration. Internal validation showed a C-index of 0.799 (95% CI: 0.768-0.801), indicating the model's high discrimination ability. Calibration curves showed good agreement between predicted and observed values, confirming good calibration. The clinical decision curve analysis further supported the model's clinical utility.

Conclusion: The prediction model constructed and verified in this study was to predict fall risk for hospitalized older adults with osteoporosis, providing a valuable tool for clinicians to implement targeted interventions for patients with high fall risks.

Keywords: fall; nomogram; nursing; osteoporosis (OP); prediction model; risk factors.

Stair-descent phenotypes in community-dwelling older adults determined using high-level balance tasks

Tanaka T, Hase K, Mori K, Wakida M, Arima Y, Kubo T, Taguchi M. Aging Clin Exp Res. 2025 Jan 29;37(1):34.

DOI: 10.1007/s40520-025-02929-5 **PMID:** 39878920 **PMCID**: PMC11779766

Abstract

Background: Falls on stairs are a major cause of severe injuries among older adults, with stair descent posing significantly greater risks than ascent. Variations in stair descent phenotypes may reflect differences in physical function and biomechanical stability, and their identification may prevent falls.

Aims: This study aims to classify stair descent phenotypes in older adults and investigate the biomechanical and physical functional differences between these phenotypes using hierarchical cluster analysis.

Methods: Eighty-two older adults participated in this study. Stair descent was measured using a three-dimensional motion analysis system. Physical function was assessed using measures of muscle strength, walking speed, the Timed Up and Go Test (TUG), and the Community Balance and Mobility Scale (CB&M).

Results: Hierarchical cluster analysis was performed on kinematic data obtained during stair descent. Three phenotypes were identified: neutral (N-type; 24%), extension (E-type; 52%), and rotation (R-type; 23%). There were no significant differences in lower limb muscle strength or walking speed among the different types, and TUG scores showed no differences in terms of mobility or balance abilities. However, CB&M scores were significantly lower for E-type and R-type compared to N-type. Sub-analyses revealed that while there were no differences in the mobility factor of CB&M between E-type and R-type, the strength factors were significantly lower compared to those for N-type.

Discussion: These results suggest that E-type and R-type stair-descent patterns may be influenced by declines in standing balance ability and muscle strength.

Conclusions: These findings may inform fall-prevention training programs related to stair descent among older adults**.**

Keywords: Clustering; Fall risk; Older adults; Physical function; Stair descent.

Older Fallers' Comprehensive Neuromuscular and Kinematic Alterations in Reactive Balance Control: Indicators of Balance Decline or Compensation? A Pilot Study

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Abstract

Background: Falls and fall consequences in older adults are global health issues. Previous studies have compared postural sways or stepping strategies between older adults with and without fall histories to identify factors associated with falls. However, more in-depth neuromuscular/kinematic mechanisms have remained unclear. This study aimed to comprehensively investigate muscle activities and joint kinematics during reactive balance control in older adults with different fall histories.

Methods: This pilot observational study recruited six community-dwelling older fallers (≥1 fall in past one year) and six older non-fallers, who received unpredictable translational balance perturbations in randomized directions and intensities during standing. The whole-body center-of-mass (COM) displacements, eight dominant-leg joint motions and muscle electrical activities were collected, and analyzed using the temporal and amplitude parameters.

Results: Compared to non-fallers, fallers had significantly: (a) smaller activation rate of the ankle dorsiflexor, delayed activation of the hip flexor/extensor, larger activation rate of the knee flexor, and smaller agonist-antagonist co-contraction in lower-limb muscles; (b) larger knee/hip flexion angles, longer ankle dorsiflexion duration, and delayed timing of recovery in joint motions; and (c) earlier downward COM displacements and larger anteroposterior overshooting COM displacements following unpredictable perturbations ($p < 0.05$).

Conclusions: Compared to non-fallers, fallers used more suspensory strategies for reactive standing balance, which compensated for inadequate ankle/hip strategies but resulted in prolonged recovery. A further longitudinal study with a larger sample is still needed to examine the diagnostic accuracies and training values of these identified neuromuscular/kinematic factors in differentiating fall risks and preventing future falls of older people, respectively.

Keywords: co-contraction index (CCI); community-dwelling; electromyographic (EMG); falls; kinematics; older adults; perturbation; postural sways; reactive balance.