

## Safety Literature 3<sup>rd</sup> July 2022

### Bedtime monitoring for fall detection and prevention in older adults

Fernández-Bermejo Ruiz J, Dorado Chaparro J, Santofimia Romero MJ, Villanueva Molina FJ, Del Toro García X, Bolaños Peño C, Llumiguano Solano H, Colantonio S, Flórez-Revuelta F, López JC. *Int. J. Environ. Res. Public Health* 2022; 19(12): e7139.

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#### Abstract

Life expectancy has increased, so the number of people in need of intensive care and attention is also growing. Falls are a major problem for older adult health, mainly because of the consequences they entail. Falls are indeed the second leading cause of unintentional death in the world. The impact on privacy, the cost, low performance, or the need to wear uncomfortable devices are the main causes for the lack of widespread solutions for fall detection and prevention. This work present a solution focused on bedtime that addresses all these causes. Bed exit is one of the most critical moments, especially when the person suffers from a cognitive impairment or has mobility problems. For this reason, this work proposes a system that monitors the position in bed in order to identify risk situations as soon as possible. This system is also combined with an automatic fall detection system. Both systems work together, in real time, offering a comprehensive solution to automatic fall detection and prevention, which is low cost and guarantees user privacy. The proposed system was experimentally validated with young adults.

RESULTS show that falls can be detected, in real time, with an accuracy of 93.51%, sensitivity of 92.04% and specificity of 95.45%. Furthermore, risk situations, such as transiting from lying on the bed to sitting on the bed side, are recognized with a 96.60% accuracy, and those where the user exits the bed are recognized with a 100% accuracy.

Language: en

#### Keywords

fall prevention; assisted living; bedtime monitoring; fall detection; wearable sensors

## **Benefits of two 24-week interactive cognitive-motor programs on body composition, lower-body strength, and processing speed in community dwellings at risk of falling: a randomized controlled trial**

Rosado H, Pereira C, Bravo J, Carvalho J, Raimundo A. *Int. J. Environ. Res. Public Health* 2022; 19(12): e7117.

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### **Abstract**

This 24-week randomized controlled trial study evaluated the effects of two interactive cognitive-motor programs on body composition, lower-body strength, and processing speed in community dwellings at risk of falling. Forty-eight participants ( $75.0 \pm 5.4$  years) were allocated into EG1 (psychomotor intervention program), EG2 (combined program (psychomotor intervention + whole-body vibration)), and a control group. EG programs induced significant improvements in bone mass, lower-body strength, and processing speed ( $p < 0.05$ ), with similar treatment effects on lower-body strength and processing speed and higher bone mineral content and density within EG2. The fall rate decreased in EG1 (44.2%) and EG2 (63%) ( $p < 0.05$ ). After the 12-week no-intervention follow-up, improvements in lower-body strength were reversed in both EGs, but those in processing speed were maintained, mainly in EG2 ( $p < 0.05$ ). In conclusion, both programs were accepted and well tolerated. The combined program led to additional benefits in bone mass. Both programs positively impacted physical and cognitive risk factors for falls and injuries. They induced similar improvements in lower-body strength and processing speed, decreasing the fall rate. These findings suggest that both programs are successful for fall and injury prevention in the studied population.

Language: en

### **Keywords**

aging; cognitive function; falls; muscle strength; bone mineral density; psychomotor intervention

## **Combined effect of lower muscle quality and quantity on incident falls and fall-related fractures in community-dwelling older adults: a 3-year follow-up study**

Yamada M, Kimura Y, Ishiyama D, Otobe Y, Suzuki M, Koyama S, Arai H. Bone 2022; ePub(ePub): ePub.

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**DOI** 10.1016/j.bone.2022.116474 **PMID** 35752409

### **Abstract**

**OBJECTIVE:** Falls and fractures are serious geriatric adverse events worldwide, and skeletal muscle is considered to be a key factor in these incidents. The objective of this study was to investigate the combined effect of lower muscle quality and quantity on the incidence of falls and fall-related fractures in a 3-year follow-up period among community-dwelling older adults.

**METHODS:** We recruited community-dwelling adults aged 65 years and older who were living independently in 2018. A total of 773 older participants were analyzed in this study. The outcomes were incident falls and fall-related fractures during the 3-year follow-up period. At baseline, we assessed muscle quality and quantity using ultrasonography, and we categorized the participants into four groups based on their combination of poor/better muscle quality and poor/better muscle quantity. Cox proportional hazards models were used to estimate the hazard ratios (HRs) and 95 % confidence intervals (CIs) of the relationships among items in the four groups and the time to incident falls and fall-related fractures.

**RESULTS:** During the 3-year follow-up period, 178 participants (23.0 %) had a fall incident and 51 participants (6.6 %) had fall-related fractures. Older adults with lower muscle quality and quantity had significantly elevated risks of incident falls according to multivariate analyses using older adults with better muscle quality and quantity as the reference (adjusted HR: 1.54 [95 % CI 1.06-2.23]). However, there were no significant differences in fall-related fractures among the four groups.

**CONCLUSION:** We found that lower muscle quality and quantity led to higher incidents of falls; thus, identifying community-dwelling older adults with lower muscle quality and quantity is necessary to provide them fall preventive measures and maybe to reduce fall-related outcomes.

Language: en

### **Keywords**

Fall; Community-dwelling older adults; Fall-related fracture; Muscle quality; Muscle quantity

## **Combined use of transcutaneous electrical nerve stimulation and short foot exercise improves navicular height, muscle size, function mobility, and risk of falls in healthy older adults**

Namsawang J, Muanjai P. *Int. J. Environ. Res. Public Health* 2022; 19(12): e7196.

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**DOI** 10.3390/ijerph19127196 **PMID** 35742445

### **Abstract**

Electrical stimulation is an established method that is used to improve muscle strength. The present study compared changes in the navicular drop test (NDT), muscle size, the five times sit to stand (5TSTS) test, the timed up and go (TUG) test, and the risk of falls in response to transcutaneous electrical nerve stimulation (TENS) plus short foot exercise (SFE) and SFE alone in 68 healthy elderly participants aged 65-75 years. Participants were randomly assigned to two groups: TENS plus SFE and SFE alone (with sham TENS). Measurements of NDT, muscle size, 5TSTS, TUG, and risk of falls were made before and after 4 weeks of training. The NDT was significantly improved by a median of 0.31 mm in the TENS plus SFE group and 0.64 mm in the SFE alone group ( $p < 0.001$ ). Similarly, there was a significant improvement in Falls Efficacy Scale International (FES-I), 5TSTS, and TUG for both groups ( $p < 0.001$ ). The abductor hallucis muscle size increased by 0.23 cm<sup>2</sup> in the TENS plus SFE group and 0.26 cm<sup>2</sup> in the SFE alone group ( $p < 0.001$ ). There were no significant differences between the two groups for any variables ( $p > 0.05$ ) except TUG, which showed a greater improvement in the TENS plus SFE group ( $p = 0.008$ ). Our findings demonstrated that TENS plus SFE and SFE alone improved intrinsic foot muscle size. However, TENS plus SFE tended to improve NDT more than SFE alone, particularly in cases of severe muscle weakness. Thus, the combined use of TENS plus SFE could be recommended for muscle strengthening and balance programs for fall prevention in older adults.

Language: en

### **Keywords**

elderly; abductor hallucis muscle; cross-sectional area; electrical stimulation; functional test; intrinsic foot exercise

## Effects of multicomponent and dual-task exercise on falls in nursing homes: the AgeingOn Dual-Task study

Rezola-Pardo C, Irazusta J, Mugica-Errazquin I, Gamio I, Sarquis-Adamson Y, Gil SM, Ugartemendia M, Montero-Odasso M, Rodriguez-Larrad A. *Maturitas* 2022; 164: 15-22.

(Copyright © 2022, Elsevier Publishing)

DOI 10.1016/j.maturitas.2022.06.006 PMID 35763894

### Abstract

**OBJECTIVE:** To compare the effects of a multicomponent exercise program and a dual-task exercise program on the number of falls (fall rate) and number of fallers (fall incidence) and on parameters associated with fall risk in older adults living in long-term nursing homes (LTNH). **STUDY DESIGN:** This is a secondary analysis of a single-blind randomized controlled trial involving 85 older adults in nine LTNHs (Gipuzkoa, Spain). Participants allocated to the multicomponent group underwent a twice-a-week 3-month individualized and progressive resistance and balance program. The dual-task group performed simultaneous cognitive training with the same multicomponent exercises. **MAIN OUTCOMES:** Fall rate and incidence were analyzed using Poisson regression (adjusting for cognitive function and previous fall rate) and Kaplan-Meier analysis, respectively. Handgrip asymmetry, single- and dual-task TUG velocity and cost were assessed using two-way ANOVA for repeated measures and paired Student's t-tests.

**RESULTS:** The dual-task group showed a 3.8 times greater risk of falling than the multicomponent group during the intervention, and a 2.59 times greater risk during the 12-month follow-up. There were no between-group differences in fall incidence. There were between-group differences in handgrip strength asymmetry in favor of the multicomponent group. While only the multicomponent group improved on the TUG test, the dual-task group improved on dual-task cost.

**CONCLUSIONS:** Compared with the dual-task program, the multicomponent exercise program showed more benefits in reducing falls and in parameters associated with fall risk in LTNH residents. Future studies are warranted to confirm our results and continue to explore physical and cognitive interventions to prevent falls in LTNHs. Australian New Zealand Clinical Trials Registry ACTRN12618000536268.

Language: en

### Keywords

Falls; Dual-task; Long-term nursing homes; Physical exercise

## **Efficacy of overground robotic gait training on balance in stroke survivors: a systematic review and meta-analysis**

Lorusso M, Tramontano M, Casciello M, Pece A, Smania N, Morone G, Tamburella F. *Brain Sci.* 2022; 12(6): e713.

(Copyright © 2022, Switzerland Molecular Diversity Preservation International (MDPI) AG)

**DOI** 10.3390/brainsci12060713 **PMID** 35741599

### **Abstract**

Strokes often lead to a deficit in motor control that contributes to a reduced balance function. Impairments in the balance function severely limit the activities of daily living (ADL) in stroke survivors. The present systematic review and meta-analysis primarily aims to explore the efficacy of overground robot-assisted gait training (o-RAGT) on balance recovery in individuals with stroke. In addition, the efficacy on ADL is also investigated. This systematic review identified nine articles investigating the effects of o-RAGT on balance, four of which also assessed ADL. The results of the meta-analysis suggest that o-RAGT does not increase balance and ADL outcomes more than conventional therapy in individuals after stroke. The data should not be overestimated due to the low number of studies included in the meta-analysis and the wide confidence intervals. Subgroup analyses to investigate the influence of participant's characteristics and training dosage were not performed due to lack of data availability. Further well-designed randomized controlled trials are needed to investigate the efficacy of o-RAGT on balance in individuals with stroke.

Language: en

### **Keywords**

balance function; overground exoskeleton; overground robot-assisted gait training; stroke

## **Factors associated with and 1-year outcomes of fear of falling in a geriatric post-hip fracture assessment**

Jaatinen R, Luukkaala T, Hongisto MT, Kujala MA, Nuotio MS. Aging Clin. Exp. Res. 2022; ePub(ePub): ePub.

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**DOI** 10.1007/s40520-022-02159-z **PMID** 35727456

### **Abstract**

**BACKGROUND:** Hip fracture causes not only physical injury but also psychological trauma. Fear of falling (FoF) is related to poor recovery, loss of mobility and mortality. There is limited data on the clinical factors affecting post-hip fracture FoF and its consequences.

**OBJECTIVE:** To investigate the factors associated with and 1-year outcomes of post-hip fracture FoF.

**METHODS:** An observational prospective cohort study. Data were collected on hospital admission, at a geriatric outpatient assessment 4-6 months post-hip fracture and by telephone interviews 1 year after the index fracture. FoF was assessed with a dichotomous single-item question. Logistic regression analyses were conducted to examine the age, gender and multivariable-adjusted association between baseline and the geriatric assessment domains with FoF. Follow-up outcomes included changes in mobility, living arrangements and mortality.

**RESULTS:** Of the 916 patients included, 425 (49%) had FoF at the time of their geriatric assessment. These patients were predominantly female and were living alone in their own homes with supportive home care. They scored lower on tests of physical performance. Less FoF was documented in patients with diagnosed cognitive disorders before the index fracture and in those with Clinical Dementia Rating  $\geq 1$ . After adjusting for age and gender, no association was observed between FoF and any of the 1-year follow-up outcomes.

**CONCLUSION:** Post-hip fracture FoF is common and associated with female gender, polypharmacy, poor daily functioning, poor physical performance and depressive mood. Patients with cognitive disorders have less FoF than those without. FoF appears to have no impact on the follow-up outcomes.

Language: en

### **Keywords**

Cognition; Rehabilitation; Fear of falling; Hip fracture

## **Global prevalence of falls in the older adults: a comprehensive systematic review and meta-analysis**

Salari N, Darvishi N, Ahmadipanah M, Shohaimi S, Mohammadi M. J. Orthop. Surg. Res. 2022; 17(1): e334.

(Copyright © 2022, Holtzbrinck Springer Nature Publishing Group - BMC)

**DOI** 10.1186/s13018-022-03222-1 **PMID** 35765037

### **Abstract**

**BACKGROUND:** With increasing life expectancy, declining mortality, and birth rates, the world's geriatric population is increasing. Falls in the older people are one of the most common and serious problems. Injuries from falls can be fatal or non-fatal and physical or psychological, leading to a reduction in the ability to perform activities of daily living. The aim of this study was to determine the prevalence of falls in the older people through systematic review and meta-analysis.

**METHODS:** In this systematic review and meta-analysis, the data from studies on the prevalence of falls in the older people in the world were extracted in the databases of Scopus, Web of Science (WoS), PubMed and Science Direct, and Google Scholar, Magiran and Scientific Information Database (SID) without any time limit until August 2020. To analyze the eligible studies, the stochastic effects model was used, and the heterogeneity of the studies with the  $I^2$  index was investigated. Data analysis was conducted with Comprehensive Meta-Analysis software (Version 2).

**RESULTS:** In the review of 104 studies with a total sample size of 36,740,590, the prevalence of falls in the older people of the world was 26.5% (95% CI 23.4-29.8%). The highest rate of prevalence of falls in the older people was related to Oceania with 34.4% (95% CI 29.2-40%) and America with 27.9% (95% CI 22.4-34.2%). The results of meta-regression indicated a decreasing trend in the prevalence of falls in the older people of the world by increasing the sample size and increasing the research year ( $P < 0.05$ ).

**CONCLUSION:** The problem of falls, as a common problem with harmful consequences, needs to be seriously considered by policymakers and health care providers to make appropriate plans for preventive interventions to reduce the rate of falls in the older people.

Language: en

### **Keywords**

Accident; Prevalence; Systematic review; Meta-analysis; Fall

## High challenge exercise and learning safe landing strategies among community-dwelling older adults: a randomized controlled trial

Arkkukangas M, Strömqvist Bååthe K, Ekholm A, Tonkonogi M. *Int. J. Environ. Res. Public Health* 2022; 19(12): e7370.

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### Abstract

There is limited research on optimal exercise programs that effectively decrease falls and fall-related injuries in older populations. This randomized controlled trial (RCT) aimed to explore the effects of a 12-week Judo4Balance program on falling techniques, physical and psychological functions, health status, and physical activity levels among 200 community-dwelling older adults (79% women and 21% men) with a mean age of 72 years. The 200 participants were randomly allocated for the Judo4Balance program (n = 100) or control group (n = 100). The RCT intervention started in mid-January 2020 and was abruptly interrupted because of the COVID-19 pandemic. A restart of the RCT was initiated in September 2021, and the 12-week intervention was offered to two groups. This study reports the results from three points of assessment: baseline, 20-month follow-up, and 12-week postintervention. At 20 months follow-up, the control group had significantly decreased physical activity levels (summer  $p = 0.002$  and winter  $p = 0.003$ ); similar changes were not seen in the exercise group. In the exercise group, learning falling techniques in 6-9 weeks led to sustained fall competence at 20 months follow-up. Further, significant improvements in physical function (exercise group  $p = 0.009$  and control group  $p < 0.001$ ) and learning falling techniques ( $p < 0.001$  for both groups) were noted in both groups after the 12-week intervention. This effective, supervised, group-based, high-challenge multicomponent exercise program needs to be further evaluated for possible impact on falls and fall-related injuries.

Language: en

### Keywords

older adults; physical activity; exercise; judo; martial arts; motor skill

## Home-based exercises are as effective as equivalent doses of centre-based exercises for improving walking speed and balance after stroke: a systematic review

Nascimento LR, Rocha RJ, Boening A, Ferreira GP, Perovano MC. J. Physiother. 2022; ePub(ePub): ePub.

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DOI 10.1016/j.jphys.2022.05.018 PMID 35753966

### Abstract

**QUESTIONS:** In people who have had a stroke, how comparable are the effects of home-based exercises with those of equivalent centre-based exercises for improving walking speed, balance, mobility and participation? Is the comparability of the effects of these two types of exercise maintained beyond the intervention period? **DESIGN:** Systematic review of randomised controlled trials. **SEARCH STRATEGY:** Searches were conducted on MEDLINE, AMED, EMBASE, Cochrane, PsycINFO and PEDro databases, without date or language restrictions. **PARTICIPANTS:** Participants in the reviewed studies were ambulatory adults at any time after stroke. **INTERVENTIONS:** The experimental intervention consisted of home-based exercises, which was compared with equivalent doses of centre-based exercises. **OUTCOME MEASURES:** Walking speed, balance, mobility and participation. **DATA ANALYSIS:** The quality of included trials was assessed using the PEDro scores. Outcome data were extracted from the eligible trials and combined in random-effects meta-analyses. The quality of evidence was determined according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

**RESULTS:** Nine trials involving 609 participants were included. Random-effects meta-analyses provided high-quality evidence that home-based and centre-based exercises provide similar effects on walking speed (MD -0.03 m/s, 95% CI -0.07 to 0.02) and balance (MD 0 points, 95% CI -1 to 2).

**RESULTS** regarding mobility (SMD -0.4, 95% CI -1.3 to 0.4) and participation (MD -5 points, 95% CI -19 to 10) were imprecise. For most outcomes, the effects of home-based exercises and centre-based exercises remained similar beyond the intervention period.

**CONCLUSION:** Effects of home-based prescribed exercises on walking speed, balance, mobility and participation are likely to be similar to improvements obtained by equivalent doses of centre-based exercises after stroke. **REVIEW REGISTRATION:** PROSPERO (CRD42021254642).

Language: en

### Keywords

Mobility; Rehabilitation; Stroke; Gait; Balance

## **Prevalence of falls in noninstitutionalized people aged 65-80 and associations with sex and functional tests: a multicenter observational study**

Blanco-Blanco J, Albornos-Muñoz L, Costa-Menéndez M, García-Martínez E, Rubinat-Arnaldo E, Martínez-Soldevila J, Moreno-Casbas MT, Bays-Moneo AB, Gea-Sánchez M. *Res. Nurs. Health* 2022; ePub(ePub): ePub.

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### **Abstract**

Falls have a considerable impact on the functional prognosis of older adults. The main focus of this multicenter, retrospective, observational study was to examine the prevalence of falls in Spanish people aged 65-80 years still living at home. The secondary aims included examining the overall sociodemographic and clinical variables associated with a history of falls and then stratifying these findings by sex. We also aimed to determine the differences between sexes with regard to the history and consequences of falls and to evaluate associations between fall history and functional performance tests. The 747 older adults had all participated in the otago exercise program, which is a progressive home program of strength, balance, and endurance exercises. They were recruited by nurses in 21 primary care centers in 10 Spanish provinces between September 2017 to December 2018. The participants' mean age was 72.2 (SD: 4.3) years, and 67% were women. We recorded sociodemographic and clinical variables, functional performance test results, and any falls and/or injuries in the last 12 months. We found that 32% had fallen, 36% of those had fallen more than once, and 48% had sustained injuries when they fell. The bivariate analysis showed that women had more than twice the odds of falling than men and that living alone and being obese or overweight increased the odds of a fall, although living alone was not associated with falls in the multivariable analysis. Our results could guide the development of risk-specific fall prevention programs to prevent disabilities in older people.

Language: en

### **Keywords**

older adults; accidental falls; sex differences; otago exercise program; physical functional performance

## Recent fall and high imminent risk of fracture in older men and women

Kim KM, Lui LY, Cummings SR. Age Ageing 2022; 51(6): afac141.

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DOI 10.1093/ageing/afac141 PMID 35753766

### Abstract

**BACKGROUND:** despite fall history being a well-known risk factor for falls and fractures, the association between very recent falls and imminent fracture risk is not clearly elucidated.

**OBJECTIVE:** to study the very recent (<4 months) fall-related absolute risk of fractures in the following year.

**METHODS:** two large prospective cohort studies of women (Study of Osteoporotic Fractures [SOF]) and men (Osteoporotic Fractures in Men Study [MrOS]) aged 65 years or older were included. Data on falls were collected every 4 months, and the primary outcomes were any non-spine and hip fractures in the next 12 months.

**RESULTS:** a total of 9,704 women contributed 419,149, and 5,994 men contributed 223,885 four-monthly periods of observations during the 14.8-year SOF and 12.6-year MrOS follow-up. Falls within 4 months indicated a high risk of non-spine and hip fractures in the following year for both sexes; in women, a recent fall indicated an 8.1% absolute risk of a non-spine fracture within 1 year, a 2.5-fold higher risk than that in women without falls, a 2.5% absolute risk of hip fracture, and a 3.1-fold increased risk. Falls increased the risk of fractures regardless of whether a fracture occurred or not. Men had similar risk patterns, albeit with a lower absolute risk of fracture.

**CONCLUSIONS:** in older people, a fall within 4 months indicates a high risk of fracture in the next year, regardless of fracture occurrence. A recent fall warrants urgent evaluation and consideration of treatments to reduce the imminent risk of fractures.

Language: en

### Keywords

fracture; older people; fall; osteoporosis

## Square-stepping exercise program effects on fall-related fitness and BDNF levels in older adults in Korea: a randomized controlled trial

Cha HJ, Kim KB, Baek SY. *Int. J. Environ. Res. Public Health* 2022; 19(12): e7033.

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### Abstract

The risk of dementia increases with age. To mitigate this risk, we examined the effect of a square-stepping exercise (SSE) program on fall-related fitness and brain-derived neurotrophic factor (BDNF) levels. Twenty older adults in Korea were randomly assigned to either the experimental or control group (each group  $n = 10$ ). Participants performed SSE for 70 min per session, twice a week, for 12 weeks with a certified instructor. The average age of the participants was  $74.80 \pm 6.763$  years in the exercise group and  $72.50 \pm 6.519$  years in the control group. The experiment group showed significant improvement ( $p < 0.01$ ) in the lower muscle strength post-intervention. The paired t-test revealed a significant improvement ( $p < 0.01$ ) in the experimental group and a significant difference in the interaction effect ( $p < 0.01$ ) in the BDNF levels. There was a significant improvement ( $p < 0.05$ ) in the BDNF levels in the experimental group and a significant decrease ( $p < 0.05$ ) in the control group. The SSE program had a positive effect on fall-related fitness and BDNF levels.

Language: en

### Keywords

cognitive function; balance; leg strength; muscle strength; neurodegenerative disease

## **Real-world stair ambulation characteristics differ between prospective fallers and non-fallers in Parkinson's disease**

Roth N, Ullrich M, Kuderle A, Gladow T, Marxreiter F, Gassner H, Kluge F, Klucken J, Eskofier BM. IEEE J. Biomed. Health Inform. 2022; ePub(ePub): ePub.

(Copyright © 2022, Institute of Electrical and Electronics Engineers)

**DOI** 10.1109/JBHI.2022.3186766 **PMID** 35759602

### **Abstract**

Falls are among the leading causes of injuries or death for individuals from the age of 65 and the prevalence of falls is especially high for patients suffering from neurological diseases like Parkinson's disease (PD). Due to advancements in wearable sensor technology, inertial measurement units (IMUs) can be integrated unobtrusively into patients' everyday lives to monitor various mobility and gait parameters, which are related to common risk factors like reduced balance and reduced lower-limb muscle strength, or lower range of joints. Although stair ambulation is a fundamental part of our daily lives and is known for its unique challenges for the gait and balance system, long-term gait analysis studies have not investigated real-world stair ambulation parameters yet. Therefore, we applied a recently published gait analysis pipeline on real-world foot-worn IMU data of 40 PD patients over a recording period of two weeks to extract objective gait parameters from level walking but also from stair ascending and stair descending gait. In combination with fall records from a prospective three-month follow-up phase, we investigated group differences in gait parameters of future fallers compared to non-fallers for each individual gait activity. We found significant differences in stair ascending and descending parameters. Stance time was increased by up to 20% and gait speed reduced by up to 16% for fallers compared to non-fallers during stair walking. These differences were not present in level walking parameters. Hence, these results suggest that real-world stair ambulation provides sensitive parameters for mobility and fall risk due to the unique challenges stairs add to the balance and control system. Our work complements existing gait analysis studies by adding new insights into mobility and gait performance during real-world gait.

Language: en

**The effectiveness of rehabilitation interventions including outdoor mobility on older adults' physical activity, endurance, outdoor mobility and falls-related self-efficacy: systematic review and meta-analysis**

Geohagen O, Hamer L, Lowton A, Guerra S, Milton-Cole R, Ellery P, Martin FC, Lamb SE, Sackley C, Sheehan KJ. *Age Ageing* 2022; 51(6): afac120.

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DOI 10.1093/ageing/afac120 PMID 35737601

**Abstract**

**OBJECTIVE:** To determine the effectiveness of community-based rehabilitation interventions which incorporate outdoor mobility on physical activity, endurance, outdoor mobility and falls-related self-efficacy in older adults.

**DESIGN:** MEDLINE, Embase, CINAHL, PEDro and OpenGrey were searched systematically from inception to June 2021 for randomised controlled trials (RCTs) of community-based rehabilitation incorporating outdoor mobility on physical activity, endurance, outdoor mobility and/or falls-related self-efficacy in older adults. Duplicate screening, selection, extraction and appraisal were completed.

**RESULTS** were reported descriptively and with random-effects meta-analyses stratified by population (proactive [community-dwelling], reactive [illness/injury]).

**RESULTS:** A total of 29 RCTs with 7,076 participants were identified (66% high bias for at least one domain). The outdoor mobility component was predominantly a walking programme with behaviour change. Rehabilitation for reactive populations increased physical activity (seven RCTs, 587 participants. Hedge's  $g$  1.32, 95% CI: 0.31, 2.32), endurance (four RCTs, 392 participants. Hedges  $g$  0.24; 95% CI: 0.04, 0.44) and outdoor mobility (two RCTs with 663 participants. Go out as much as wanted, likelihood of a journey) at intervention end versus usual care. Where reported, effects were preserved at follow-up. One RCT indicated a benefit of rehabilitation for proactive populations on moderate-to-vigorous activity and outdoor mobility. No effect was noted for falls-related self-efficacy, or other outcomes following rehabilitation for proactive populations.

**CONCLUSION:** Reactive rehabilitation for older adults may include walking programmes with behaviour change techniques. Future research should address the potential benefit of a walking programme for proactive populations and address mobility-related anxiety as a barrier to outdoor mobility for both proactive and reactive populations.

Language: en

**Keywords**

physical activity; rehabilitation; systematic review; walking; older people; outdoor mobility; social