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A Home-Based Older Person Upstreaming Prevention Physical Therapy (HOP-UP-PT) program utilizing community partnership referrals

Wilson CM, Arena SK, Adcock K, Colling D. Home Healthc. Now2019; 37(2): 88-96.

Affiliation

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30829786

Abstract

Traditional home healthcare reimbursement models emphasize intervention after a medical or functional issue occurs, and there is little evidence of preventative home-based physical therapy services for those at highest risk of becoming homebound due to illness, injury, or functional limitation. The purpose of this study was to describe the development and initial pilot results of the Home-based Older Person Upstreaming Prevention Physical Therapy (HOP-UP-PT) Program. The prospective observational pilot study included five participants referred from a community center. The HOP-UP-PT Program utilized fall risk, functional, environmental, cognitive, and health-related assessments. Two males and three females aged 73 to 92 years were enrolled. Outcomes suggest that health, functional, and environmental benefits may be achieved when an older person participates in the HOP-UP-PT Program. Safety and health benefits gained by two individuals referred to the program, but who did not meet inclusion criteria, are also reported. Evidence emerging from this pilot study suggests trends toward improved functional outcomes associated with reduced fall risk and customized home-based safety recommendations among older adults participating in the HOP-UP-PT Program.



Ambulation patterns post-discharge in older adults identified as fall risk: a descriptive pilot study

King BJ, Brown R, Steege L, Wang H, Kuo FL, Brown C. Res. Gerontol. Nurs. 2019; ePub(ePub): ePub.

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PMID

30816981

Abstract

Older adults identified as fall risk during a hospital stay may be at high risk for decreased ambulation during hospitalization and after discharge. Little is known about ambulation frequency in older adults identified as fall risk during a hospital stay or their trajectory of ambulation patterns after an acute hospitalization. Individual ambulation frequency, patterns, functional performance, and fear of falls for 14 older adults were studied. Accelerometers were worn by patients during their hospital stay and for 4 weeks post-discharge. Novel analytics using piecewise regression were used to analyze data. Patterns of ambulation were heterogeneous, and 64% of patients demonstrated no change in the first 2 weeks post-discharge. Increase in ambulation frequency was positively correlated with higher Katz Activities of Daily Living Index scores, gait speed, and lower fear of falls score. Ambulation patterns in older adults identified as fall risk show promise in capturing ambulation recovery and functional ability post-discharge.

Association between gaps in antihypertensive medication adherence and injurious falls in older community-dwelling adults: a prospective cohort study

Dillon P, Smith SM, Gallagher PJ, Cousins G. *BMJ Open* 2019; 9(3): e022927.

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Abstract

OBJECTIVE: Growing evidence suggests that older adults are at an increased risk of injurious falls when initiating antihypertensive medication, while the evidence regarding long-term use of antihypertensive medication and the risk of falling is mixed. However, long-term users who stop and start these medications may have a similar risk of falling to initial users of antihypertensive medication. Our aim was to evaluate the association between gaps in antihypertensive medication adherence and injurious falls in older (≥ 65 years) community-dwelling, long-term (≥ 1 year) antihypertensive users.

DESIGN: Prospective cohort study. **SETTING:** Irish Community Pharmacy. **PARTICIPANTS:** Consecutive participants presenting a prescription for antihypertensive medication to 106 community pharmacies nationwide, community-dwelling, ≥ 65 years, with no evidence of cognitive impairment, taking antihypertensive medication for ≥ 1 year ($n=938$). **MEASURES:** Gaps in antihypertensive medication adherence were evaluated from linked dispensing records as the number of 5-day gaps between sequential supplies over the 12-month period prior to baseline. Injurious falls during follow-up were recorded via questionnaire during structured telephone interviews at 12 months.

RESULTS: At 12 months, 8.1% ($n=76$) of participants reported an injurious fall requiring medical attention. The mean number of 5-day gaps in medication refill behaviour was 1.47 (*SD* 1.58). In adjusted, modified Poisson models, 5-day medication refill gaps at baseline were associated with a higher risk of an injurious fall during follow-up (aRR 1.18, 95% CI 1.02 to 1.37, $p=0.024$).

CONCLUSION: Each 5-day gap in antihypertensive refill adherence increased the risk of self-reported injurious falls by 18%. Gaps in antihypertensive adherence may be a marker for increased risk of injurious falls. It is unknown whether adherence-interventions will reduce subsequent risk. This finding is hypothesis generating and should be replicated in similar populations.

Keywords

adherence; antihypertensive therapy; injurious falls; older adults

Balance and gait in the elderly: a contemporary review

Osoba MY, Rao AK, Agrawal SK, Lalwani AK. *Laryngoscope Investig. Otolaryngol.* 2019; 4(1): 143-153.

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Abstract

BACKGROUND: The prevalence of balance and gait deficits increases with age and is associated with the increased incidence of falls seen in the elderly population; these falls are associated with significant morbidity and mortality.

OBJECTIVES: To review changes in gait and balance associated with aging and the effect of visual perturbations on gait and balance in the elderly to provide a basis for future research.

METHODS: PubMed and Cochrane Library were searched for articles from 1980 to present pertaining to gait and balance in older adults (>60) and younger adults (<60). Search terms included balance, posture, gait, locomotion, gait variability, gait disorders, gait disturbance, elderly, aging, falls, vision, visual, vestibular, and virtual reality. The references section of queried articles was also used to find relevant studies. Studies were excluded if subjects had a diagnosed gait or balance disorder.

RESULTS: Elderly adults show age-related decline in sensory systems and reduced ability to adapt to changes in their environment to maintain balance. Elderly adults are particularly dependent on vision to maintain postural stability. Distinct changes in spatiotemporal gait parameters are associated with aging, such as slower gait and increased gait variability, which are amplified with exposure to visual perturbations. Increased gait variability, specifically with mediolateral perturbations, poses a particular challenge for elderly adults and is linked to increased falls risk. Virtual reality training has shown promising effects on balance and gait.

CONCLUSION: Elderly adults show age-related decline in balance and gait with increased gait variability and an associated increased risk of falls. **LEVEL OF EVIDENCE:** 5.

Keywords

Gait; balance; elderly; spatiotemporal; virtual reality; visual perturbations

Complex walking tasks and risk for cognitive decline in high functioning older adults

Rosso AL, Metti AL, Faulkner K, Redfern M, Yaffe K, Launer L, Elizabeth Shaaban C, Nadkarni NK, Rosano C. J. *Alzheimers Dis.* 2019; ePub(ePub): ePub.

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PMID: 30814353

Abstract

BACKGROUND: Performance on complex walking tasks may provide a screen for future cognitive decline.

OBJECTIVE: To identify walking tasks that are most strongly associated with subsequent cognitive decline.

METHODS: Community-dwelling older adults with Modified Mini-Mental State (3MS) >85 at baseline (n = 223; mean age = 78.7, 52.5% women, 25.6% black) completed usual-pace walking and three complex walking tasks (fast-pace, narrow-path, visuospatial dual-task). Slope of 3MS scores for up to 9 subsequent years (average = 5.2) were used to calculate a cognitive maintainer (slope ≥ 0) or decliner (slope < 0) outcome variable. Logistic regression models assessed associations between gait speeds and being a cognitive decliner. A sensitivity analysis in a subsample of individuals (n = 66) confirmed results with adjudicated mild cognitive impairment (MCI) or dementia at 8-9 years post-walking assessment.

RESULTS: Cognitive decliners were 52.5% of the sample and on average were slower for all walking tasks compared to maintainers. In models adjusted for demographic and health variables, faster fast-pace (OR = 0.87 per 0.1 m/s, 95% CI: 0.78, 0.97) and dual-task (OR = 0.84 per 0.1 m/s, 95% CI: 0.73, 0.96) gait speeds were associated with lower likelihood of being a cognitive decliner. Usual-pace gait speed was not associated (OR = 0.96 per 0.1 m/s, 95% CI: 0.85, 1.08). RESULTS were nearly identical in analyses with adjudicated MCI or dementia as the outcome.

CONCLUSION: Fast-pace and dual-task walking may provide simple and effective tools for assessing risk for cognitive decline in older individuals with high cognitive function. Such screening tools are important for strategies to prevent or delay onset of clinically meaningful change.

Keywords

Cognitive disorders; epidemiology; geriatrics; walking speed

Developing an intervention for fall-related injuries in dementia (DIFRID): an integrated, mixed-methods approach

Wheatley A, Bamford C, Shaw C, Flynn E, Smith A, Beyer F, Fox C, Barber R, Parry SW, Howel D, Homer T, Robinson L, Allan LM. *BMC Geriatr.* 2019; 19(1): e57.

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PMID: 30819097

Abstract

BACKGROUND: Falls in people with dementia can result in a number of physical and psychosocial consequences. However, there is limited evidence to inform how best to deliver services to people with dementia following a fall. The aim of the DIFRID study was to determine the feasibility of developing and implementing a new intervention to improve outcomes for people with dementia with fall-related injuries; this encompasses both short-term recovery and reducing the likelihood of future falls. This paper details the development of the DIFRID intervention.

METHODS: The intervention was designed using an integrated, mixed-methods approach. This involved a realist synthesis of the literature and qualitative data gathered through interviews and focus groups with health and social care professionals (n = 81). An effectiveness review and further interviews and observation were also conducted and are reported elsewhere. A modified Delphi panel approach with 24 experts was then used to establish a consensus on how the findings should translate into a new intervention. After feedback from key stakeholders (n = 15) on the proposed model, the intervention was manualised and training developed.

RESULTS: We identified key components of a new intervention covering three broad areas: • Ensuring that the circumstances of rehabilitation are optimised for people with dementia • Compensating for the reduced ability of people with dementia to self-manage • Equipping the workforce with the necessary skills and information to care for this patient group
Consensus was achieved on 54 of 69 statements over two rounds of the Delphi surveys. The statements were used to model the intervention and finalise the accompanying manual and protocol for a feasibility study. Stakeholder feedback was generally positive and the majority of suggested intervention components were approved. The proposed outcome was a 12-week complex multidisciplinary intervention primarily based at the patient's home.

CONCLUSIONS: A new intervention has been developed to improve outcomes for people with dementia following a fall requiring healthcare attention. The feasibility of this intervention is currently being tested. **TRIAL REGISTRATION:** ISRCTN41760734 (16/11/2015).

Keywords

Delphi consensus; Dementia; Falls; Intervention development; Realist synthesis



Dual task performance and history of falls in community-dwelling older adults

Tomas-Carus P, Biehl-Printes C, Pereira C, Vieiga G, Costa A, Collado-Mateo D. *Exp. Gerontol.* 2019; ePub(ePub): ePub.

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30825548

Abstract

INTRODUCTION: Falls are a common problem for older adults, and the identification of people at high risk of falling is a major challenge to health systems.

OBJECTIVE: To evaluate the association between the history of falls and single-task Timed Up and Go Test (single TUG) or dual-task TUG variables.

METHODS: Three hundred seventy seven community-dwelling older persons, with ages ranging from 65 and 92 years, participated in this cross-sectional study. Each participant performed two tests: single TUG and dual TUG. The cognitive task for dual TUG consisted of counting backward by one from 100 while performing the test. The number of cognitive errors, cognitive stops and motor stops were recorded. A new variable comprising time, errors and stops in the dual TUG was computed.

RESULTS: The number of falls was significantly associated with mean single and dual TUG performance, mean cognitive errors, mean cognitive stops and mean motor stops. The score in the single TUG time was not able to significantly classify participants as fallers or non-fallers in any of the sexes. On the other hand, the variable "dual TUG time spent adding cognitive stops and cognitive errors" achieved the best ability to classify women as fallers or non-fallers, while "dual task cost" and "dual TUG time spent adding cognitive stops" were the best variables to classify men.

CONCLUSIONS: Dual TUG including cognitive stops and cognitive errors may be more capable than the single TUG to detect differences and accurately classify fallers and non-fallers in the elderly.

Keywords

Balance; Elderly; Falling risk; Simultaneous task; Timed-up and go

Enabling older adults to carry out paperless falls-risk self-assessments using guidetomeasure-3D: a mixed methods study

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Abstract

BACKGROUND: The home environment falls-risk assessment process (HEFAP) is a widely used falls prevention intervention strategy which involves a clinician using paper-based measurement guidance to ensure that appropriate information and measurements are taken and recorded accurately. Despite the current use of paper-based guidance, over 30% of all assistive devices installed within the home are abandoned by patients. This is in part due to poor fit between the device, the patient, and the environment in which it is installed. Currently HEFAP is a clinician-led process, however, older adult patients are increasingly being expected to collect HEFAP measurements themselves as part of the personalisation agenda. Without appropriate patient-centred guidance, levels of device abandonment to are likely to rise to unprecedented levels. This study presents guidetomeasure-3D, a mobile 3D measurement guidance application designed to support patients in carrying out HEFAP self-assessments.

AIM: The aim of this study is to present guidetomeasure-3D, a web-enabled 3D mobile application that enables older-adult patients to carry out self-assessment measurement tasks, and to carry out a mixed-methods evaluation of its performance, and associated user perceptions of the application, compared with a 2D paper-based equivalent.

METHODS: Thirty-four older adult participants took part in a mixed-methods within-subjects repeated measures study set within a living lab. A series of HEFAP self-assessment tasks were carried out according to two treatment conditions: 1) using the 3D guidetomeasure-3D application; 2) using a 2D paper-based guide. SUS questionnaires and semi-structured interviews were completed at the end of the task. A comparative statistical analysis explored performance with regards to measurement accuracy, accuracy consistency, task efficiency, and system usability. Interview transcripts were analysed using inductive and deductive thematic analysis (informed by UTAUT).

RESULTS: The guidetomeasure-3D application outperformed the 2D paper-based guidance in terms of accuracy (smaller mean error difference in 11 out of 12 items), accuracy consistency ($p < 0.05$, for 6 out of 12 items), task efficiency ($p = 0.003$), system usability ($p < 0.00625$, for two out of 10 SUS items), and clarity of guidance ($p < 0.0125$, for three out of four items). Three high-level themes emerged from interviews: Performance Expectancy, Effort Expectancy, and Social Influence. Participants reported that guidetomeasure-3D provided improved visual quality, clarity, and more precise guidance overall. Real-time audio instruction was reported as being particularly useful, as was the use of the object rotation and zoom functions which were associated with improving user confidence particularly when carrying out more challenging tasks.

CONCLUSIONS: This study reveals that older adults using guidetomeasure-3D achieved improved levels of accuracy and efficiency along with improved satisfaction and increased levels of confidence compared with the 2D paper-based equivalent. These results are significant and promising for overcoming HEFAP equipment abandonment issue. Furthermore they constitute an important step towards overcoming challenges associated with older adult patients, the digitisation of healthcare, and realising the enablement of patient self-care and management via the innovative use of mobile technologies. Numerous opportunities for the generalisability and transferability of the findings of this research are also proposed. Future research will explore the extent to which mobile 3D visualisation technologies may be utilised to optimise the clinical utility of HEFAP when deployed by clinicians.

Language: en

Keywords

3D mobile visualisation; assistive equipment; extrinsic risk factors; falls; health informatics; measurement guidance; occupational therapy; self-assessment; technology-based systems

Epidemiological characteristics and factors influencing falls among elderly adults in long-term care facilities in Xiamen, China

Zhang L, Zeng Y, Weng C, Yan J, Fang Y. *Medicine (Baltimore)* 2019; 98(8): e14375.

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30813138

Abstract

Falling in the elderly is an important social issue, especially for those who are in long-term care (LTC) facilities, in addition to being a significant economic burden. This study aims to investigate the epidemiological characteristics and identify the factors influencing falls in LTC residents. We enrolled 260 participants aged 60+ years by multistage sampling across 13 LTC facilities in Xiamen, China, in 2016. Epidemiological characteristics and falls were observed and recorded during a 12-month period using a revised FROP-Com Scale. Multiple logistic regression modeling was performed to determine the factors influencing falls. A total of 218 (83.8%) valid questionnaires were returned. 152 falls (range 1-7, mean 0.7 ± 1.3 falls/person/y) occurred in the previous year, with 69 residents (31.7%) experiencing 1 or more falls. Most participants who fell were female (71%), living in cities (85.5%), had a higher BMI (22.1 ± 4.2), and had a chronic disease (99.9%). Of all falls, 39.1% occurred in the bedroom and 26.1% in the bathroom, 58% during daytime hours between 6:00 AM and noon. Thirty-six percent of falls resulted in an injury (e.g., bruises and fractures). The principal reason for falling was due to slipping (23.2%). There were 2 interactions on fall rate between ADL and feet and footwear (OR=3.120, $P < .001$; OR=3.010, $P = .007$ in Models 1 and 3), and between ADL and cognitive status (OR=4.401, $P < .001$; OR=4.101, $P = .005$ in Models 2 and 3). Multiple regression analysis indicated that ADL, balance and gait, medical conditions, cognitive status, living environment, feet and footwear and sensory loss were factors influencing falls among elderly adults in LTC facilities. Falls occur frequently and mostly unwitnessed among elderly adults in LTC facilities, highlighting the need for more effective and individualized fall prevention. Fall efficacy enhancing programs for nursing home residents should take degree of self-care, chronic diseases, sensory loss, foot injuries, cognitive impairment, living environment, and gender into account.

Exploring the relationship between timed up and go test times and falls in an inpatient geriatric psychiatry unit: a retrospective case-control study

Citation

Struble-Fitzsimmons D, Pinto Zipp G, DeLuca D, Zhang N. J. Geriatr. Phys. Ther. 2019; ePub(ePub): ePub.

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Abstract

BACKGROUND AND PURPOSE: Inpatient geriatric psychiatry units have the highest fall rates in the acute care setting and most falls in this population occur during the mobility tasks of transfers and ambulation. The Timed Up and Go (TUG) test includes these 2 specific functional tasks and has been used to predict falls in other geriatric populations but has never been tested in an inpatient geriatric psychiatry unit. The purpose of this study was to determine whether the TUG time measurements of inpatient geriatric psychiatry patients were associated with falling.

METHODS: The study was a retrospective chart review using a case-control design. The sample was obtained from patients admitted to 1 inpatient geriatric psychiatry unit during the 4-month study period.

RESULTS: The total sample size was $N = 62$ and included 33 nonfallers and 29 fallers. The mean age of fallers ($M = 75.8$, $SD = 9.6$) was not significantly different from the age of nonfallers ($M = 74.0$, $SD = 7.6$), $P = .424$. Both groups had higher proportions of female subjects; nonfallers were 75.8% ($n = 25$) female and fallers were 69.0% ($n = 20$) female. Most nonfallers (84.8%) completed the TUG testing without an assistive device, while most fallers (48.3%) used a walker. A significant difference was found between the TUG times of nonfallers and fallers, $U = 737.00$, $z = 3.65$, $P < .001$, $r = 0.46$. Fallers took longer to complete the TUG test (median = 26.5) than nonfallers (median = 13.6). The TUG time explanatory variable was statistically significant, $P = .002$. Increasing TUG times were associated with an increased likelihood of patient falls (odds ratio = 1.10). The optimal TUG cutoff score was 16.5 seconds, with 79.3% sensitivity and 72.7% specificity.

CONCLUSIONS: The TUG time measurement was found to be associated with falling. A cutoff time of 16.5 seconds is recommended to identify nonfallers from fallers in the inpatient geriatric psychiatry setting.

Facial fractures as a result of falls in the elderly: concomitant injuries and management strategies

Liu FC, Halsey JN, Oleck NC, Lee ES, Granick MS. *Craniomaxillofac. Trauma Reconstr.* 2019; 12(1): 45-53.

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PMCID

[PM6391279](https://pubmed.ncbi.nlm.nih.gov/30815215/)

Abstract

Mechanical falls are a common cause of facial trauma in the elderly population. It has been shown that the likelihood of sustaining a facial fracture due to a fall or activities of daily life significantly increases with age. Craniomaxillofacial fractures are most common during the first three decades of life; however, elderly patients more frequently require lengthy hospital stays and surgical intervention, and have shown increased complication rates compared with younger patients. The objective of this study was to examine the prevalence of facial fractures secondary to mechanical falls in the elderly population to analyze mechanism of injury, comorbidities, and fracture management. A retrospective review of all facial fractures as a result of falls in the elderly population in a level 1 trauma center in an urban environment was performed for the years 2002 to 2012. Patient demographics were collected, as well as location of fractures, concomitant injuries, and surgical management strategies. During the time period examined, 139 patients were identified as greater than 60 years of age and having sustained a fracture of the facial skeleton as the result of a fall. The average age was 75.7 (range, 60-103) years, with no gender predominance of 50.4% female and 49.6% male. There were a total of 205 fractures recorded. The most common fractures were those of the orbit (42.0%), nasal bone (23.4%), zygoma (13.2%), and zygomaticomaxillary complex (7.32%). The average Glasgow Coma Scale on arrival was 12.8 (range, 3-15). Uncontrolled hemorrhage was noted on presentation to the trauma bay in five patients. Twenty-one patients were intubated on, or prior to, arrival to the trauma bay, and 44 required a surgical airway. The most common concomitant injury was a long bone fracture (23.5%), followed by cervical spine fracture (18.5%), skull fracture (17.3%), intracerebral hemorrhage (17.3%), rib fracture (17.3%), ophthalmologic injuries (6.2%), short bone fracture (4.9%), pelvic fracture (2.9%), thoracic spine fracture (1.2%), and lumbar spine fracture (1.2%). Of the 114 patients admitted to the hospital, 53 were admitted to an intensive care setting. The average hospital length of stay was 8.97 days (range, 0-125).

Sixteen patients expired. Surgical management of fractures in the operating room was required in 47 of the 139 patients. Of the patients treated, 36.2% required an open reduction and internal fixation procedure. Facial fractures as a result of falls in the geriatric population represent an increasing number of cases in clinical practice as life expectancy steadily rises. These patients require a specific standard of treatment since they are more susceptible to nosocomial infections, as well as have higher complication rates and longer recovery time. Concomitant injuries such as cervical spine and pelvic fractures can greatly increase risk of mortality. Surgical and soft tissue management must be approached with caution to optimize function and aesthetics while preventing secondary infection. The authors hope that this study can provide some insight and further investigation as there is a dearth of literature to the management of facial fractures in falls in elderly patients.

Language: en

Keywords

elderly facial fractures; elderly falls; facial trauma in the elderly; falls in the elderly

Falls, frailty, vision, and aging

Citation

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30827750

Abstract

[Abstract unavailable]

Language: en

Long-term strength and balance training in prevention of decline in muscle strength and mobility in older adults

Aartolahti E, Lönnroos E, Hartikainen S, Häkkinen A. *Aging Clin. Exp. Res.* 2019; ePub(ePub): ePub.

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PMID

30830597

Abstract

BACKGROUND: Reductions in muscle strength and poor balance may lead to mobility limitations in older age. **AIMS:** We assessed the effects of long-term once-weekly strength and balance training (SBT) on muscle strength and physical functioning in a community-based sample of older adults.

METHODS: 182 individuals [130 women and 52 men, mean age 80 (SD ± 3.9) years] underwent supervised SBT as part of the Geriatric Multidisciplinary Strategy for the Good Care of the Elderly study. Training was offered once a week for 2.3 years. Isometric knee extension and flexion strength, chair rise, maximal walking speed, timed up and go (TUG) and Berg Balance Scale (BBS) were measured at baseline, after 2-year training and at post intervention follow-up. A linear mixed model was used to examine the change in physical functioning over time.

RESULTS: During the intervention, both women (2.5 s, $p < 0.001$) and men (1.4 s, $p = 0.013$) improved their chair rise capacity. Women's knee extension and flexion strength improved by 14.1 N ($p = 0.003$) and 16.3 N ($p < 0.001$), respectively. Their maximal walking speed also improved by 0.08 m/s ($p < 0.001$). In men, no changes in muscle strength or walking speed occurred during training or follow-up. No changes in BBS and TUG were observed at the end of the intervention, but decrease in BBS was observed at post-intervention follow-up in men.

CONCLUSIONS: In community-dwelling older adults with variety in health and functioning supervised strength and balance training once a week may help to prevent age-related decline in mobility and muscle strength.

Keywords

Balance; Exercise; Geriatric assessment; Intervention; Physical performance; Resistance training

Mediating role of fall-related efficacy in a fall prevention program

Yoshikawa A, Smith ML. *Am. J. Health Behav.* 2019; 43(2): 393-405.

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PMID

30808478

Abstract

Objectives: We examined the multidimensionality of the new Perceived Ability to Prevent and Manage Fall Risks (PAPMFR) scale that assesses fall-related efficacy (FE) and the mediating role of EF between fear of falling (FOF) and functional mobility (FM). **Methods:** We carried out a secondary data analysis of 552 participants (mean age = 76.45, SD = 7.79) in a fall prevention program, A Matter of Balance Volunteer Lay Leader Model (AMOB/VLL). We used exploratory and confirmatory factor analyses to evaluate the PAPMFR scale. We used structural equation modeling to test the mediating role of PAPMFR between FOF and FM. **Results:** We identified 3 dimensions of PAPMFR: steadiness/balance, gait, and fall management. We confirmed the mediating effect of the PAPMFR on the relation between FOF and FM with acceptable fit in cross-sectional ($\chi^2/df = 2.25$, RMSEA = .06, 95% CI:.04 to.09, CFI =.98 SRMR =.03) and half-longitudinal ($\chi^2/df = 3.04$, RMSEA =.08, 95% CI:.07 to.09, CFI =.95, SRMR =.04) models. **Conclusions:** AMOB/VLL shows promise to enhance FE, which may mediate FM improvements among participants. Findings suggest that improving confidence to prevent and manage falls can complement exercise training to promote active aging. Future research should investigate various FE dimensions.

Language: en

Mediterranean diet and risk of falling in community-dwelling older adults

Ballesteros JM, Struijk EA, Rodriguez-Artalejo F, López-García E. *Clin. Nutr.* 2019; ePub(ePub): ePub.

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PMID

30824269

Abstract

BACKGROUND: Although the association between nutrition and muscle and bone health has been widely studied, the role of adequate nutrition in the prevention of falls remains uncertain. Therefore, this study examined the association between a Mediterranean-style dietary pattern and the risk of falling in older adults.

METHODS: We performed a prospective cohort study with 2,071 participants aged ≥ 60 y from the Seniors-ENRICA study. In 2008-2010, adherence to the Mediterranean diet was assessed with the MEDAS score, and study participants were followed-up through 2012 to assess incident falls during the previous year.

RESULTS: Over a median follow-up of 3.5 years, 402 (19.4%) people reported at least one fall (69.2% of them fell once and 30.8% ≥ 2 times). After adjustment for potential confounders, participants in the highest tertile of the MEDAS score showed a lower frequency of falling compared with those in the lowest tertile (OR: 0.72; 95% confidence interval 0.53-0.98; P-trend: 0.04). Consuming ≥ 2 servings/day of vegetables was the individual target of the MEDAS score that showed a significant association with a lower risk of falling (OR: 0.63; 95% CI 0.44-0.89). Targets for consumption of fruit, red and process meat, butter and margarine, wine, fish and nuts also showed some tendency to a slightly lower risk of falls.

CONCLUSION: The Mediterranean diet was associated with lower risk of falling among older Spanish adults. These findings suggest that the total benefit from the Mediterranean diet is due to the accumulated or synergic impact of several foods rather than a single one.

Keywords

Elderly adults; Falls; Mediterranean diet

Modification of potentially inappropriate prescribing following fall-related hospitalizations in older adults

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PMID: 30834489

Abstract

BACKGROUND: There is strong evidence that potentially inappropriate prescribing is associated with falls in older adults. Fall-related hospitalizations should trigger medication review.

OBJECTIVES: The aim of this before-and-after cohort study was to explore patterns of relevant potentially inappropriate prescribing in older people with fall-related hospitalizations.

METHODS: Data on older adults with hospitalizations for falls, fractures and syncope between 2012 and 2016 were collected from 44 general practices in Ireland. Fall-related prescribing was defined from the Screening Tool for Older Persons' Prescriptions (sedatives and vasodilators) and the Screening Tool to Alert doctors to Right Treatment (vitamin D). Prevalence of prescriptions were estimated from general practice and hospital discharge records. Mixed-effects logistic regression was conducted to compare the 12-month pre- and post-hospitalization periods.

RESULTS: Overall, 927 individuals (68% female, average age 81.2 years; standard deviation 8.6) were included, 45% of whom had a diagnosis of fracture, 28% had syncope, and 27% had a fall without fracture/syncope. After adjustment for covariates and practice clustering effects, both vitamin D and sedatives had higher odds of prescription post-hospitalization (adjusted odds ratio [aOR] 4.47, 95% confidence interval [CI] 2.09-9.54, and aOR 1.75, 95% CI 1.29-2.39, respectively). With adjustments for age and sex, having a fracture was associated with new initiation of vitamin D (aOR 2.81, 95% CI 1.76-4.46) and having syncope was associated with continuing on vasodilators (aOR 1.99, 95% CI 1.06-3.74). No factors were associated with new sedative initiation.

CONCLUSION: Fall-related potentially inappropriate prescribing is prevalent in older adults who have a history of falls, and continues after discharge from hospital. Future studies should investigate why such prescribing is initiated after a fall-related hospitalization, and explore interventions that could reduce such hazardous prescribing.

Relationship between daily and in-laboratory gait speed among healthy community-dwelling older adults

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30837520

Abstract

Gait speed in laboratory settings (in-laboratory gait speed) is one of the important indicators associated with the decline in functional abilities in older adulthood. Recently, it has become possible to measure gait speed during daily living (daily gait speed) using accelerometers. However, the relationship between these two gait speed parameters is unclear. This study aimed to compare in-laboratory gait speed, measured by a sheet-type pressure sensor, and daily gait speed, measured by an accelerometer, in healthy community-dwelling older adults. Participants were aged ≥ 60 years, residing in Takahama city, Aichi, Japan. To calculate daily gait speed, participants were instructed to wear a tri-axial accelerometer on their waist. A total of 1965 participants were included in the final analysis. The results showed a weak association ($r = 0.333$, $p < 0.001$) between the two gait speed parameters. Furthermore, average daily gait speed was significantly lower than average in-laboratory gait speed. However, both gait speed parameters declined significantly with age. These results suggest that, in addition to in-laboratory gait speed, daily gait speed may be a helpful parameter for predicting decline in functional abilities.

Language: en

The association between social engagement, mild cognitive impairment and falls among older primary care patients

Quach LT, Ward RE, Pedersen MM, Leveille SG, Grande L, Gagnon DR, Bean JF. *Arch. Phys. Med. Rehabil.* 2019; ePub(ePub): ePub.

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30825422

Abstract

OBJECTIVES: To examine associations between mild cognitive impairment (MCI) and falls among primary care patients, and to investigate whether social engagement (SE) modifies these associations.

DESIGN: Cross sectional analysis using baseline data from an observational cohort study.
SETTING: Primary Care **PARTICIPANTS:** 430 community-dwelling older adults at risk of mobility decline with a mean age of 76.6 (range 65 to 96). **MAIN OUTCOME MEASURES:** The number of falls in the past year was reported at the baseline interview. MCI was identified using a cutoff of 1.5 SD below the age-adjusted mean on at least two of the standardized cognitive performance tests. SE (e.g. keeping in touch with friends and family, volunteering, and participating social activities...) was assessed with the Late Life Function and Disability Instrument, and required a score above the median value 49.5 out of 100.

RESULTS: MCI was present among 42% of participants and 42% reported at least one fall in the preceding year. Using Generalized Estimating Equations, MCI was associated with a 77% greater rate of falls ($p < 0.05$). There was a statistically significant interaction between SE and MCI on the rate of falls ($p < 0.01$), such that at a high level of SE, MCI was not statistically associated with falls ($p = 0.83$). In participants with lower levels of SE, MCI is associated with 1.3 greater rate of falls ($p < 0.01$).

CONCLUSIONS: While MCI is associated with a greater risk for falls, higher levels of SE may play a protective role.

Keywords

Falls; Mild Cognitive Impairment; Social Engagement

The effectiveness and cost-effectiveness of strength and balance Exergames to reduce falls risk for people aged 55 years and older in UK assisted living facilities: a multi-centre, cluster randomised controlled trial

Stanmore EK, Mavroei A, de Jong LD, Skelton DA, Sutton CJ, Benedetto V, Munford LA, Meekes W, Bell V, Todd C. *BMC Med.*2019; 17(1): e49.

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30813926

Abstract

BACKGROUND: Falls are the leading cause of fatal and non-fatal unintentional injuries in older people. The use of Exergames (active, gamified video-based exercises) is a possible innovative, community-based approach. This study aimed to determine the effectiveness of a tailored OTAGO/FaME-based strength and balance Exergame programme for improving balance, maintaining function and reducing falls risk in older people.

METHODS: A two-arm cluster randomised controlled trial recruiting adults aged 55 years and older living in 18 assisted living (sheltered housing) facilities (clusters) in the UK. Standard care (physiotherapy advice and leaflet) was compared to a tailored 12-week strength and balance Exergame programme, supported by physiotherapists or trained assistants. Complete case analysis (intention-to-treat) was used to compare the Berg Balance Scale (BBS) at baseline and at 12 weeks. Secondary outcomes included fear of falling, mobility, fall risk, pain, mood, fatigue, cognition, healthcare utilisation and health-related quality of life, and self-reported physical activity and falls.

RESULTS: Eighteen clusters were randomised (9 to each arm) with 56 participants allocated to the intervention and 50 to the control (78% female, mean age 78 years). Fourteen participants withdrew over the 12 weeks (both arms), mainly for ill health. There was an adjusted mean improvement in balance (BBS) of 6.2 (95% CI 2.4 to 10.0) and reduced fear of falling ($p = 0.007$) and pain ($p = 0.02$) in the Exergame group. Mean attendance at sessions was 69% (mean exercising time of 33 min/week). Twenty-four percent of the control group and 20% of the Exergame group fell over the trial period. The change in fall rates significantly favoured the intervention (incident rate ratio 0.31 (95% CI 0.16 to 0.62, $p = 0.001$)). The point estimate of the incremental cost-effectiveness ratio (ICER) was £15,209.80 per quality-adjusted life year (QALY). Using 10,000 bootstrap replications, at the lower bound of the NICE threshold of £20,000 per QALY, there was a 61% probability of

Exergames being cost-effective, rising to 73% at the upper bound of £30,000 per QALY.

CONCLUSIONS: Exergames, as delivered in this trial, improve balance, pain and fear of falling and are a cost-effective fall prevention strategy in assisted living facilities for people aged 55 years or older. **TRIAL REGISTRATION:** The trial was registered at ClinicalTrials.gov on 18 Dec 2015 with reference number NCT02634736.

Language: en

The feasibility of a vision-based sensor for longitudinal monitoring of mobility in older adults with dementia

Dolatabadi E, Zhi YX, Flint AJ, Mansfield A, Iaboni A, Taati B. *Arch. Gerontol. Geriatr.* 2019; 82: 200-206.

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PMID

30831526

Abstract

BACKGROUND: Gait and balance functions decline through the course of dementia, and can serve as a marker of changes in physical status and falls risk. We have developed a technology (AMBIENT), based on a vision-based sensor, which enables the frequent, accurate, and unobtrusive measurement of gait and balance.

OBJECTIVE: The objective of this study was to examine the feasibility of using AMBIENT technology for frequent assessment of mobility in people with dementia within an inpatient setting. In particular, we examined technical feasibility, and the feasibility of participant recruitment, data collection and analysis.

METHODS: AMBIENT was installed in a specialized dementia inpatient unit. AMBIENT captured gait bouts as the participants walked within the view of the sensor during their

daily routine and computed the spatiotemporal parameters of gait.

RESULTS: Twenty participants (age: 76.9 ± 6.7 years, female: 50%) were recruited over a period of 6 months. We recorded a total of 3843 gait bouts, of which 1171 could be used to extract gait data. On average, 58 ± 47 walking sequences per person were collected over a recording period of 28 ± 20 days. We were able to consistently extract six quantitative parameters of gait, consisting of stride length, stride time, cadence, velocity, step length asymmetry, and step time asymmetry. **SIGNIFICANCE:** This study demonstrates the feasibility of longitudinal tracking of gait in a dementia inpatient setting. This technology has important potential applications in monitoring functional status over time, and the development of dynamic falls risk assessments.

Language: en

Keywords

Dementia; Gait; Longitudinal monitoring; Postural stability; Quantitative; Sensor technology

The sensitivity and specificity of the balance evaluation systems test-BESTest in determining risk of fall in stroke patients

Sahin IE, Guclu-Gunduz A, Yazıcı G, Ozkul C, Volkan-Yazici M, Nazliel B, Tekindal MA. *NeuroRehabilitation* 2019; 44(1): 67-77.

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30814369

Abstract

BACKGROUND: Balance disorders cause disability in stroke and increase risk of falls. The Balance Evaluation Systems Test (BESTest), examines balance, determines parameters causing balance disorders, provides information on risk factors for falls.

OBJECTIVE: To investigate the sensitivity and specificity of the BESTest in determining the risk of falls in stroke patients.

METHODS: Fifty patients with chronic stroke were included in the study. Balance was assessed using BESTest, Berg Balance Scale (BBS), Activity Specific Balance Confidence scale (ABC) and Biodex-BioSway Balance System. To examine the content validity of BESTest, the relationship between BESTest and other balance assessment methods was examined. The internal consistency reliability of BESTest was evaluated by Cronbach's α coefficient. Analysis of receiver operating characteristics (ROC) was performed to determine cut-off point, sensitivity and specificity.

RESULTS: BESTest, BBS, ABC and Biodex-BioSway Balance System results of faller stroke patients were worse than that of non-faller ($p < 0.05$). Internal consistency of BESTest was found to be Cronbach's $\alpha = 0.960$. The BESTest value of area under curve (AUC) was 0.844, with a cut-off point of 69.44%, a sensitivity of 75% and a specificity of 84.6% ($p < 0.01$).

CONCLUSION: BESTest is reliable and valid with high sensitivity and specificity in determining the risk of fall in stroke patients.

Keywords

BESTest; Stroke; balance; risk of falls

Wearable sensors system for an improved analysis of freezing of gait in Parkinson's disease using electromyography and inertial signals

Mazzetta I, Zampogna A, Suppa A, Gumiero A, Pessione M, Irrera F. *Sensors (Basel)* 2019; 19(4): s19040948.

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30813411

Abstract

We propose a wearable sensor system for automatic, continuous and ubiquitous analysis of Freezing of Gait (FOG), in patients affected by Parkinson's disease. FOG is an unpredictable gait disorder with different clinical manifestations, as the trembling and the shuffling-like phenotypes, whose underlying pathophysiology is not fully understood yet. Typical trembling-like subtype features are lack of postural adaptation and abrupt trunk inclination, which in general can increase the fall probability. The targets of this work are detecting the FOG episodes, distinguishing the phenotype and analyzing the muscle activity during and outside FOG, toward a deeper insight in the disorder pathophysiology and the assessment of the fall risk associated to the FOG subtype. To this aim, gyroscopes and surface electromyography integrated in wearable devices sense simultaneously movements and action potentials of antagonist leg muscles. Dedicated algorithms allow the timely detection of the FOG episode and, for the first time, the automatic distinction of the FOG phenotypes, which can enable associating a fall risk to the subtype. Thanks to the possibility of detecting muscles contractions and stretching exactly during FOG, a deeper insight into the pathophysiological underpinnings of the different phenotypes can be achieved, which is an innovative approach with respect to the state of art.

Language: en

Keywords

Parkinson's disease; gait analysis; inertial signal; sensor fusion; surface electromyography; telemedicine; wearable sensors

Humans use multi-objective control to regulate lateral foot placement when walking

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30840620

Abstract

A fundamental question in human motor neuroscience is to determine how the nervous system generates goal-directed movements despite inherent physiological noise and redundancy. Walking exhibits considerable variability and equifinality of task solutions. Existing models of bipedal walking do not yet achieve both continuous dynamic balance control and the equifinality of foot placement humans exhibit. Appropriate computational models are critical to disambiguate the numerous possibilities of how to regulate stepping movements to achieve different walking goals. Here, we extend a theoretical and computational Goal Equivalent Manifold (GEM) framework to generate predictive models, each posing a different experimentally testable hypothesis. These models regulate stepping movements to achieve any of three hypothesized goals, either alone or in combination: maintain lateral position, maintain lateral speed or "heading", and/or maintain step width. We compared model predictions against human experimental data. Uni-objective control models demonstrated clear redundancy between stepping variables, but could not replicate human stepping dynamics. Most multi-objective control models that balanced maintaining two of the three hypothesized goals also failed to replicate human stepping dynamics. However, multi-objective models that strongly prioritized regulating step width over lateral position did successfully replicate all of the relevant step-to-step dynamics observed in humans. Independent analyses confirmed this control was consistent with linear error correction and replicated step-to-step dynamics of individual foot placements. Thus, the regulation of lateral stepping movements is inherently multi-objective and balances task-specific trade-offs between competing task goals. To determine how people walk in their environment requires understanding both walking biomechanics and how the nervous system regulates movements from step-to-step. Analogous to mechanical "templates" of locomotor biomechanics, our models serve as "control templates" for how humans regulate stepping movements from each step to the next. These control templates are symbiotic with well-established mechanical templates, providing complimentary insights into walking regulation.

Language: en

Stability-normalised walking speed: a new approach for human gait perturbation research

McCrum C, Willems P, Karamanidis K, Meijer K. J. *Biomech.* 2019; ePub(ePub): ePub.

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30827703

Abstract

In gait stability research, neither self-selected walking speeds, nor the same prescribed walking speed for all participants, guarantee equivalent gait stability among participants. Furthermore, these options may differentially affect the response to different gait perturbations, which is problematic when comparing groups with different capacities. We present a method for decreasing inter-individual differences in gait stability by adjusting walking speed to equivalent margins of stability (MoS). Eighteen healthy adults walked on a split-belt treadmill for two-minute bouts at 0.4 m/s up to 1.8 m/s in 0.2 m/s intervals. The stability-normalised walking speed (MoS = 0.05 m) was calculated using the mean MoS at touchdown of the final 10 steps of each speed. Participants then walked for three minutes at this speed and were subsequently exposed to a treadmill belt acceleration perturbation. A further 12 healthy adults were exposed to the same perturbation while walking at 1.3 m/s: the average of the previous group. Large ranges in MoS were observed during the prescribed speeds (6-10 cm across speeds) and walking speed significantly ($P < 0.001$) affected MoS. The stability-normalised walking speeds resulted in MoS equal or very close to the desired 0.05 m and reduced between-participant variability in MoS. The second group of participants walking at 1.3 m/s had greater inter-individual variation in MoS during both unperturbed and perturbed walking compared to 12 sex, height and leg length-matched participants from the stability-normalised walking speed group. The current method decreases inter-individual differences in gait stability which may benefit gait perturbation and stability research, in particular studies on populations with different locomotor capacities. [Preprint: <https://doi.org/10.1101/314757>].

Language: en

Keywords

Dynamic stability; Falls; Locomotion; Margins of stability; Motor control; Postural balance

Systematic review of yoga and balance: effect on adults with neuromuscular impairment

Green E, Huynh A, Broussard L, Zunker B, Matthews J, Hilton CL, Aranha K. Am. J. Occup. Ther. 2019; 73(1): 7301205150p1-7301205150p11.

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30839270

Abstract

This systematic review examines the efficacy of yoga as a neuromuscular intervention for community-dwelling populations at risk for falls to determine its utility for use in occupational therapy intervention. Populations included older adults and adults with traumatic brain injury (TBI), cerebrovascular accident (CVA), dementia and Alzheimer's disease (AD)-type dementia, multiple sclerosis (MS), and Parkinson's disease (PD). Benefits of yoga include improved posture control, improved flexibility of mind and body, relaxation, and decreased anxiety and stress. A systematic review of the literature was conducted to understand the salutary benefits of yoga for clients who are at risk for falls because of neuromuscular issues. Moderate evidence supports the use of yoga to decrease the risk for falls for community-dwelling older adults and people with CVA, dementia and AD-type dementia, and MS. Studies involving people with TBI and PD did not include strong enough evidence to be able to make a clear classification.

Language: en