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A prospective study of the association between orthostatic hypotension and falls: definition matters

McDonald C, Pearce M, Kerr SR, Newton J.

Age Ageing 2016; ePub(ePub): ePub.

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DOI 10.1093/ageing/afw227 **PMID** 28013227

Abstract

BACKGROUND: falls are a common cause of morbidity and mortality in older people. Orthostatic hypotension (OH) is considered an important risk factor for falls, but longitudinal studies have failed to show a clear association. This disparity may be because conventional methods of measuring blood pressure (BP) changes are too imprecise and/or the diagnostic criteria for OH are inappropriate. Over recent years, beat-to-beat BP monitoring techniques, which enabled accurate measurement of vasodepression, have become widely used and in 2011 the American Academy of Neurology produced revised diagnostic criteria for OH.

OBJECTIVE: to use beat-to-beat monitoring to compare the prevalence of OH using the standard and revised diagnostic criteria and to establish which criteria are most valuable in predicting future falls.

DESIGN: two hundred and ninety-seven community-dwelling older people aged ≥65 years underwent assessment. Active stand using digital photoplethysmography was used to record postural change in BP. One hundred participants were asked to complete prospective weekly falls diaries for 12 months.

RESULTS: OH, defined according to the revised American Academy of Neurology diagnostic criteria, affected 25% of participants and was an independent predictor of falls (odds ratio 10.299, 95% confidence interval [95% CI]: 1.703-61.43, P = 0.011) and time to first fall (hazard ratio 3.017, 95% CI: 1.291-7.050, P = 0.011). OH, defined according to standard criteria, affected 80% of the population and was not associated with falls.

CONCLUSION: OH, defined according to 2011 criteria, is associated with falls and time to first fall. These findings indicate that beat-to-beat monitoring and the 2011 criteria for OH are valuable in the clinical assessment of older fallers.

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Association of prior falls with adverse outcomes after neurosurgical operations in the elderly

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World Neurosurg. 2016; ePub(ePub): ePub.

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DOI 10.1016/j.wneu.2016.12.023 **PMID** 28003169

Abstract

BACKGROUND: Despite the increasing number of elderly patients undergoing neurosurgical interventions, there are limited resources for preoperative assessment of frailty in this population.

We investigated the association between recent history of falls and surgical outcomes for these patients.
METHODS: We performed a prospective cohort study of all patients, 65 years and older, undergoing elective neurosurgical procedures from 2014-2015 in a tertiary referral medical center. We examined the association of sustaining a fall in the 6 months prior to the operation with discharge to a facility, readmissions, and complications in the first 30-days post-discharge. In order to control for confounding, we used multivariable regression models, and propensity score conditioning. Mixed effects models were used to control for clustering at the surgeon level.
RESULTS: During the study period, there were 143 elderly patients who underwent a neurosurgical procedure and met the inclusion criteria. Of these, 53.1% had a history of falls preoperatively. Mixed effects multivariable logistic regression analysis demonstrated an association between preoperative falls and discharge to a facility (OR, 1.35; 95% CI, 1.23-1.47), 30-day readmissions (OR, 1.57; 95% CI, 1.36-1.78), and 30-day complications (OR, 1.13; 95% CI, 1.03-1.23). Similar associations were present in propensity score adjusted models, and models stratified by cranial, and spinal procedures.
CONCLUSIONS: History of at least one fall in the 6 months prior to a neurosurgical operation was associated with increased risk of discharge to a facility, readmissions, and complications in the first 30-days post-discharge. History of prior falls should be taken into account during the preoperative risk assessment of neurosurgical patients.

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Do older adults who meet 2008 Physical Activity Guidelines have better physical performance than those who do not meet?
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J. Geriatr. Phys. Ther. 2016; ePub(ePub): ePub.
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DOI 10.1519/JPT.0000000000000118 **PMID** 28005830
Abstract
BACKGROUND AND PURPOSE: An observed consequence of aging is a decline in muscle performance that includes a loss in both muscle strength and muscle power. This decline can lead to loss of function and independence and is a predictor of disability in older adults. Although the 2008 Physical Activity (PA) Guidelines for Americans provides a guideline for muscle strengthening, there is no evidence that performing muscle strengthening 2 times a week for all major muscle groups is related to better performance on measures known to be important factors in development or progression of frailty in older adults. The purposes of this study were to assess muscle-strengthening and aerobic PA behaviors in older adults and to determine the relationship between the PA behaviors and physical performance measures.
METHODS: This was a cross-sectional study of 85 community-dwelling, ambulatory adults (50 women, 35 men) with a mean (standard deviation) age of 67.5 (5.6) years. All used an internet-based survey, TREST (Tracking Resistance Exercise and Strength Training), to report muscle-strengthening and aerobic PA behavior. Physical performance measures of grip strength, 10-m walk test (10-MWT), five-time sit-to-stand test (FTSST), and stair climb test (SCT) were obtained following completion of the survey. Participants were grouped by whether they met 2008 PA Guidelines for (1) muscle

strengthening 2 or more days per week, (2) muscle strengthening 2 or more days per week using all major muscle groups, or (3) 150 minutes or more per week of aerobic moderate to vigorous physical activity. Comparisons of physical performance measures were conducted between participants who met and did not meet guidelines using multivariate analyses. Significant multivariate results were followed with one-tailed t tests.
RESULTS AND DISCUSSION: The participants meeting muscle strengthening 2 or more days per week performed significantly better on measures of grip strength and SCT. Only 27% of participants met the more stringent-strengthening guideline of 2 or more days per week using all major muscle groups, and these individuals performed significantly better on the SCT and FTSST. The participants meeting the aerobic activity guideline performed significantly better on the SCT, the FTSST, and the 10-MWT.However, participants who met both the strengthening and aerobic activity guidelines performed significantly better on all 4 physical performance measures than participants who met neither of the guidelines.
CONCLUSIONS: Meeting guidelines for both aerobic and muscle-strengthening activities may be the most effective way of preserving muscle strength, muscle power, and gait velocity in older adults, but this conclusion must be tested with an intervention study.
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Effects of foot and ankle devices on balance, gait and falls in adults with sensory perception loss: a systematic review
Paton J, Hatton AL, Rome K, Kent B.
JBI Database Syst. Rev Implement. Rep. 2016; 14(12): 127-162.
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DOI 10.11124/JBISRIR-2016-003229 **PMID** 28009675
Abstract
BACKGROUND: Foot and ankle devices are being developed as a method of preventing people with sensory perception loss sustaining a fall. Such devices are believed to work by reducing the likelihood of a fall by improving the balance and gait of the user.
OBJECTIVES: The objective of the review was to evaluate the effectiveness of foot and ankle devices for the prevention of falls and the improvement of balance and gait in adults with sensory perception loss.
INCLUSION CRITERIA TYPES OF PARTICIPANTS: Participants were community-dwelling adults with bilateral pathological sensory perception loss.
TYPES OF INTERVENTION(S)/PHENOMENA OF INTEREST: The current review evaluated any foot or ankle device, including but not restricted to, all types of footwear (therapeutic and retail), insoles (customized and prefabricated) and ankle-foot orthoses (AFOs).
TYPES OF STUDIES: In the absence of randomized controlled trials (RCT), the review considered experimental and epidemiological study designs, except case series, individual case reports and

descriptive cross-sectional studies. OUTCOMES: The primary outcome was number of falls. Secondary outcome measures were clinical or laboratory measures of balance or gait. SEARCH STRATEGY: A search for published and unpublished literature from inception to March 2015 written in the English language was conducted across a number of major electronic databases. A three-step search strategy was developed using MeSH terminology and keywords to ensure all that relevant materials are captured.
METHODOLOGICAL QUALITY: Methodological quality of included studies was assessed by two reviewers, who appraised each study independently, using standardized Joanna Briggs Institute (JBI) critical appraisal tools.
DATA EXTRACTION: Quantitative data were extracted from the studies that were identified as meeting the criteria for methodological quality using the standardized JBI data extraction tools.
DATA SYNTHESIS: Due to the heterogeneity of populations, interventions and outcome measures, meta-analyses were not possible and results are presented in narrative form.
RESULTS: Nine trials (from 10 papers) involving 238 participants, (14 with multiple sclerosis and 16 with idiopathic peripheral neuropathy, 150 with diabetic neuropathy) and 58 controls were included in the review. No study reported falls as an outcome measure. The results of the included studies found that in people with sensory perception loss, postural sway improved with vibrating insoles and AFO, altering the softness and texture of the top cover had no effect on postural sway, wearing footwear over long distances or AFOs improved step-to-step consistency, and no foot and ankle device was reported to have a negative effect on the balance or gait of people with sensory perception loss. The methodological quality of the included studies was poor. No study used a randomized controlled trial (RCT) methodology. No study incorporated a follow-up period or tested the intervention within the context of the intended clinical environment.
CONCLUSION: There is limited evidence to suggest that footwear and insole devices can artificially alter postural stability and may reduce the step-to-step variability in adults with sensory perception loss. Varying the material properties of an insole does not notably affect static balance or gait.
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Exposure to anticholinergic and sedative drugs, risk of falls, and mortality: an elderly inpatient, multicenter cohort: Erratum
J. Clin. Psychopharmacol. 2017; 37(1): 26.

DOI 10.1097/JCP.0000000000000642 **PMID** 28009752
Abstract [Abstract unavailable]
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Falls prevention among older people and care providers: protocol for an integrative review
de la Cuesta-Benjumea C, Henriques MA, Abad-Corpa E, Roe B, Orts-Cortes MI, Lidón-Cerezuela B, Avendaño-Céspedes A, Oliver-Carbonell JL, Ardila CS.
J. Adv. Nurs. 2016; ePub(ePub): ePub.
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DOI 10.1111/jan.13245 **PMID** 28000238
Abstract

AIM: To review the evidence about the role of care providers in fall prevention in older adult's aged≥65 years, this includes their views, strategies and approaches on falls prevention and effectiveness of nursing interventions.
BACKGROUND: Some falls prevention programmes are successfully implemented and led by nurses and it is acknowledged the vital role they play in developing plans for fall prevention. Nevertheless, there has not been a systematic review of the literature that describes this role and care providers' views on fall's prevention initiatives.
DESIGN: A convergent synthesis of qualitative, quantitative and mixed methods studies. The eligibility criteria will be based on participants, interventions/exposure, comparisons and outcomes for quantitative studies and on population, the phenomena of interest and the context, for qualitative studies. To extract data and assess studies qualities members of the research team will work in pairs according to their expertise. The review will follow the guidelines for integrative reviews and the proposed methods will adhere to the PRISMA statement checklist complemented by the ENTREQ framework. As qualitative synthesis are emergent, all procedures and changes in procedure will be documented.
DISCUSSION: The review has a constructivist drive as studies that combine methods ought to be paradigmatic driven. Review questions are broad to allow issues emerge and have purposefully left the design flexible to allow for adjustments as the review progresses. The review seeks to highlight the roles that care providers play in fall prevention and their views on fall's prevention initiatives.

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Impact of fall prevention on nurses and care of fall risk patients
King B, Pecanac K, Krupp A, Liebzeit D, Mahoney J.
Gerontologist 2016; ePub(ePub): ePub.
Affiliation: Division of Geriatrics, School of Medicine and Public Health, University of Wisconsin-Madison.

DOI 10.1093/geront/gnw156 **PMID** 28011591
Abstract
PURPOSE OF THE STUDY: Falls are common events for hospitalized older adults, resulting in negative outcomes both for patients and hospitals. The Center for Medicare and Medicaid (CMS) has placed pressure on hospital administrators by identifying falls as a "never event", resulting in a zero falls goal for many hospitals. Staff nurses are responsible for providing direct care to patients and for meeting the hospital no falls goal. Little is known about the impact of "zero falls" on nurses, patients and the organization.
DESIGN AND METHODS: A qualitative study, using Grounded Dimensional Analysis (GDA) was conducted to explore nurses' experiences with fall prevention in hospital settings and the impact of those experiences on how nurses provide care to fall risk patients. Twenty-seven registered nurses and certified nursing assistants participated in in-depth interviews. Open, axial and selective coding was used to analyze data. A conceptual model which illustrates the impact of intense messaging from nursing administration to prevent patient falls on nurses, actions nurses take to address the message and the consequences to nurses, older adult patients and to the organization was developed.

RESULTS: Intense messaging from hospital administration to achieve zero falls resulted in nurses developing a fear of falls, protecting self and unit, and restricting fall risk patients as a way to stop messages and meet the hospital goal. IMPLICATIONS: Results of this study identify unintended consequences of fall prevention message on nurses and older adult patients. Further research is needed understand how nurse care for fall risk patients.

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Increased fall risk in patients with neovascular age-related macular degeneration: a three-year follow-up study
Chung SD, Hu CC, Lin HC, Kao LT, Huang CC.
Acta ophthalmol. 2016; ePub(ePub): ePub.
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DOI 10.1111/aos.13281 **PMID** 28000996
Abstract [Abstract unavailable]
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Involvement of Family Members and Professionals in Older Women's Post-Fall Decision Making
Bergeron CD, Hilfinger Messias DK, Friedman DB, Spencer SM, Miller SC.
Health Commun. 2016; ePub(ePub): ePub.
Affiliation: School of Public Health , Brown University.

DOI 10.1080/10410236.2016.1255844 **PMID** 28033475
Abstract
This exploratory, descriptive study examined involvement of family members and professionals in older women's post-fall decision making. We conducted semistructured interviews with 17 older women who had recently fallen and 11 individuals these women identified as being engaged in their post-fall decision-making processes. Qualitative data analysis involved open and axial coding and development of themes. After experiencing a fall, these older women's openness to others' opinions and advice; their assessments of types and credibility of potential information sources; and the communication practices they established with these sources influenced how they accessed, accepted, or rejected information from family members and professionals. Increased awareness of the involvement of others in post-fall decision making could enhance communication with older women who fall. Developing and implementing practical strategies to help family members and professionals initiate and engage in conversations about falls and their consequences could lead to more open decision making and improved post-fall quality of life among older women.
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Long-term risk of falls in an incident Parkinson's disease cohort: the Norwegian ParkWest study
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J. Neurol. 2016; ePub(ePub): ePub.
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DOI 10.1007/s00415-016-8365-z **PMID** 28000003

Abstract

The objective of this study is to examine the frequency, development, concomitants, and risk factors of falls in a population-based incident Parkinson's disease (PD) cohort. One hundred eighty-one drug-naïve patients with incident PD and 173 normal controls recruited from the Norwegian ParkWest study were prospectively monitored over 7 years. Information on falls was obtained biannually from patients, and at baseline and after 1, 3, 5, and 7 years of follow-up in control subjects. Generalized estimating equation models for correlated data were applied to investigate concomitant features of falls and risk factors for incident falls during 7 years of follow-up in PD. Overall, 64.1% of patients reported falling during the study period. The 7-year cumulative incidence of falls in non-falling patients at baseline (n = 153) was 57.5%, with a relative risk to controls of at least 3.1 (95% confidence interval 1.5-6.3; p < 0.002). Significant concomitants of falls in patients during the study period were higher age, Unified PD Rating Scale motor score, postural instability and gait difficulties (PIGD) phenotype, dementia, and follow-up time. Higher age at baseline, PIGD phenotype at 1-year visit, and follow-up time were independent risk factors for incident falls during follow-up. Nearly two-thirds of patients in the general PD population experience falls within 7 years of diagnosis, representing a more than threefold increased risk compared to age- and gender-matched controls. Patients with higher age at baseline and early PIGD have the greatest risk of falling and may, therefore, be the prime target of specialized assessment and treatment interventions.

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Old adult fallers display reduced flexibility of arm and trunk movements when challenged with different walking speeds

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Gait Posture 2016; 52: 280-286.

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DOI 10.1016/j.gaitpost.2016.12.004 **PMID** 28013150

Abstract

Specific patterns of pelvic and thorax motions are required to maintain stability during walking. This cross-sectional study explored older-adults' gait kinematics and their kinematic adaptations to different walking speeds, with the purpose of identifying mechanisms that might be related to increased risk for falls. Fifty-eight older adults from self-care residential facilities walked on a treadmill, whose velocity was systematically increased with increments of 0.1meters/second (m/s) from 0.5 to 0.9m/s, and then similarly decreased. Thorax, pelvis, trunk, arms, and legs angular total range of motion (tROM), stride time, stride length, and step width were measured. Twenty-one of the subjects reported falling, and 37 didn't fall. No significant effect of a fall history was found for any of the dependent variables. A marginally significant interaction effect of fall history and walking speed was found for arms' tROM (p=0.098). Speed had an effect on many of the measures for both groups. As the treadmill's velocity increased, the non-fallers increased their arm (15.9±8.6° to 26.6±12.7°) and trunk rotations (4.7±1.9° to 7.2±2.8°) tROM, whereas for the fallers the change of arm (14.7±14.8° to 20.8±13°) and trunk (5.5±2.9° to 7.3±2.3°) rotations tROM were moderate between the different walking speeds. We conclude that walking speed manipulation exposed

different flexibility trends. Only non-fallers demonstrated the ability to adapt trunk and arm ROM to treadmill speed i.e., had a more flexible pattern of behavior for arm and trunk motions, supporting the upper-body's importance for stability while walking.

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Predicting in-hospital and 1-year mortality in geriatric trauma patients using Geriatric Trauma Outcome Score
Ahl R, Phelan HA, Dogan S, Cao Y, Cook AC, Mohseni S
J. Am. Coll. Surg. 2016; ePub(ePub): ePub.
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DOI 10.1016/j.jamcollsurg.2016.12.011 **PMID** 28017806
Abstract
BACKGROUND: The Geriatric Trauma Outcome Score, GTOS (= [age] + [Injury Severity Score (ISS)x2.5] + 22 [if packed red blood cells (PRBC) transfused ≤24hrs of admission]), was developed and validated as a prognostic indicator for in-hospital mortality in elderly trauma patients. However, GTOS neither provides information regarding post-discharge outcomes, nor discriminates between patients dying with and without care restrictions. Isolating the latter, GTOS prediction performance was examined during admission and 1-year post-discharge in a mature European trauma registry.
STUDY DESIGN: All trauma admissions ≥65years in a university hospital during 2007-2011 were considered. Data regarding age, ISS, PRBC transfusion ≤24hrs, therapy restrictions, discharge disposition and mortality were collected. In-hospital deaths with therapy restrictions and patients discharged to hospice were excluded. GTOS was the sole predictor in a logistic regression model estimating mortality probabilities. Performance of the model was assessed by misclassification rate, Brier score and area under the curve (AUC).
RESULTS: The study population was 1080 subjects with a median age of 75 years, mean ISS of 10 and PRBC transfused in 8.2%). In-hospital mortality was 14.9% and 7.7% after exclusions. Misclassification rate fell from 14% to 6.5%, Brier score from 0.09 to 0.05. AUC increased from 0.87 to 0.88. Equivalent values for the original GTOS sample were 9.8%, 0.07, and 0.87. One-year mortality follow-up showed a misclassification rate of 17.6%, and Brier score of 0.13.
CONCLUSIONS: Excluding patients with care restrictions and discharged to hospice improved GTOS performance for in-hospital mortality prediction. GTOS is not adept at predicting 1-year mortality.

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Quantifying fall-related hazards in the homes of persons with glaucoma
Yonge AV, Swenor BK, Miller R, Goldhammer V, West SK, Friedman DS, Gitlin LN, Ramulu PY.
Ophthalmology 2016; ePub(ePub): ePub.
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DOI 10.1016/j.ophtha.2016.11.032 **PMID** 28017422

Abstract

OBJECTIVE: To characterize fall-related hazards in the homes of persons with suspected or diagnosed glaucoma, and to determine whether those with worse visual field (VF) damage have fewer home hazards.

DESIGN: Cross-sectional study using baseline (2013-2015) data from the ongoing Falls in Glaucoma Study (FIGS).

PARTICIPANTS: One-hundred seventy-four of 245 (71.0%) FIGS participants agreeing to the home assessment.

METHODS: Participants' homes were assessed using the Home Environment Assessment for the Visually Impaired (HEAVI). A single evaluator assessed up to 127 potential hazards in 8 home regions. In the clinic, binocular contrast sensitivity (CS) and better-eye visual acuity (VA) were evaluated, and 24-2 VFs were obtained to calculate average integrated VF (IVF) sensitivity.

MAIN OUTCOME MEASURES: Total number of home hazards.

RESULTS: No significant visual or demographic differences were noted between participants who did and did not complete the home assessment ($P > 0.09$ for all measures). Mean age among those completing the home assessment (n = 174) was 71.1 years, and IVF sensitivity ranged from 5.6 to 33.4 dB (mean = 27.2 dB, standard deviation [SD] = 4.0 dB). The mean number of items graded per home was 85.2 (SD = 13.2), and an average of 32.7 (38.3%) were identified as hazards. IVF sensitivity, CS, and VA were not associated with total home hazards or the number of hazards in any given room ($P > 0.06$ for all visual measures and rooms). The bathroom contained the greatest number of hazards (mean = 7.9; 54.2% of graded items classified as hazardous), and the most common hazards identified in at least 1 room were ambient lighting <300 lux and exposed light bulbs. Only 27.9% of graded rooms had adequate lighting. IVF sensitivity, CS, and VA were not associated with home lighting levels ($P > 0.18$ for all), but brighter room lighting was noted in the homes of participants with higher median income ($P < 0.001$).

CONCLUSIONS: Multiple home fall hazards were identified in the study population, and hazard numbers were not lower for persons with worse VF damage, suggesting that individuals with more advanced glaucoma do not adapt their homes for safety. Further work should investigate whether addressing home hazards is an effective intervention for preventing falls in this high-risk group.

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Reliability and minimal detectable change for sit-to-stand tests and the functional gait assessment for individuals with Parkinson disease

Petersen C, Steffen T, Paly E, Dvorak L, Nelson R.

J. Geriatr. Phys. Ther. 2016; ePub(ePub): ePub.

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DOI 10.1519/JPT.0000000000000102 **PMID** 27805924

Abstract

BACKGROUND AND PURPOSE: This study examined test-retest relative (intraclass correlation coefficient [ICC]) and absolute (minimum detectable change [MDC]) reliabilities for the 5 times sit-

to-stand (5×STS), 30-second sit-to-stand (30sSTS), and the functional gait assessment (FGA) tests in people with Parkinson disease (PD). In addition, correlation of these functional tests with a history of falls was examined over a 6-month period, and the internal consistency of the FGA was established.
METHODS: Twenty-two patients with PD (Hoehn and Yahr stages 1-3) completed 3 functional tests over 2 test-retest periods of 6 to 8 days. Falls were self-reported for the prior 6 months.
RESULTS AND DISCUSSION: Moderate-to-excellent test-retest ICC(2,2) and MDC95 values were found for the 30sSTS (0.94, 3 times) and ICC(2,1) and MDC95 values were found for the FGA (0.86, 4 points). The 5×STS demonstrated a lower ICC(2,2) and a high MDC95 value (0.74, 10 seconds). A significant correlation was only found between past falls and the FGA test ($r = -0.48$, $P < .05$) during session 1. Cronbach α values for the 10-item FGA during session 1 and session 2 were 0.75 and 0.85, respectively.
CONCLUSIONS: To assess for change over time, we found the 30sSTS and the FGA tests can be used reliably in patients with PD. A lower FGA score was associated with a higher chance of falls, and good internal consistency of the FGA was found.
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Standing balance and strength measurements in older adults living in residential care communities
Alqahtani BA, Ferchak MA, Huppert TJ, Sejdić E, Perera S, Greenspan SL, Sparto PJ.
Aging Clin. Exp. Res. 2016; ePub(ePub): ePub.
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DOI 10.1007/s40520-016-0693-4 **PMID** 28000144
Abstract
Research on balance and mobility in older adults has been conducted primarily in lab-based settings in individuals who live in the community. Although they are at greater risk of falls, residents of long-term care facilities, specifically residential care communities (RCCs), have been investigated much less frequently. We sought to determine the feasibility of using portable technology-based measures of balance and muscle strength (i.e., an accelerometer and a load cell) that can be used in any RCC facility. Twenty-nine subjects (age 87 ± 6 years) living in RCCs participated. An accelerometer placed on the back of the subjects measured body sway during different standing conditions. Sway in antero-posterior and mediolateral directions was calculated. Lower extremity strength was measured with a portable load cell and the within-visit reliability was determined. Assessments of grip strength, gait speed, frailty, and comorbidity were also examined. A significant increase in postural sway in both the AP and ML directions occurred as the balance conditions became more difficult due to alteration of sensory feedback ($p < 0.001$) or reducing the base of support ($p < 0.001$). There was an association between increased sway and increased frailty, more comorbidities and slower gait speed. All strength measurements were highly reliable (ICC = 0.93-0.99). An increase in lower extremity strength was associated with increased grip strength and gait speed. The portable instruments provide inexpensive ways for measuring balance and strength in the understudied RCC population, but additional studies are needed to examine their relationship with functional outcomes.
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Static posturography and falls according to pyramidal, sensory and cerebellar functional systems in people with multiple sclerosis

Kalron A, Givon U, Frid L, Dolev M, Achiron A.

PLoS One 2016; 11(10): e0164467.

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DOI 10.1371/journal.pone.0164467 **PMID** 27741268

Abstract

Balance impairment is common in people with multiple sclerosis (PwMS) and frequently impacts quality of life by decreasing mobility and increasing the risk of falling. However, there are only scarce data examining the contribution of specific neurological functional systems on balance measures in MS. Therefore, the primary aim of our study was to examine the differences in posturography parameters and fall incidence according to the pyramidal, cerebellar and sensory systems functional systems in PwMS. The study included 342 PwMS, 211 women and mean disease duration of 8.2 (S.D = 8.3) years. The study sample was divided into six groups according to the pyramidal, cerebellar and sensory functional system scores, derived from the Expanded Disability Status Scale (EDSS) data. Static postural control parameters were obtained from the Zebris FDM-T Treadmill (zebris® Medical GmbH, Germany). Participants were defined as "fallers" and "non-fallers" based on their fall history. Our findings revealed a trend that PwMS affected solely in the pyramidal system, have reduced stability compared to patients with cerebellar and sensory dysfunctions. Moreover, the addition of sensory impairments to pyramidal dysfunction does not exacerbate postural control. The patients in the pure sensory group demonstrated increased stability compared to each of the three combined groups; pyramidal-cerebellar, pyramidal-sensory and pyramidal-cerebellar-sensory groups. As for fall status, the percentage of fallers in the pure pyramidal, cerebellar and sensory groups were 44.3%, 33.3% and 19.5%, respectively. As for the combined functional system groups, the percentage of fallers in the pyramidal-cerebellar, pyramidal-sensory and pyramidal-cerebellar-sensory groups were 59.7%, 40.7% and 65%, respectively. This study confirms that disorders in neurological functional systems generate different effects on postural control and incidence of falls in the MS population. From a clinical standpoint, the present information can benefit all those engaged in physical rehabilitation of PwMS.

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The efficacy of treadmill training with and without projected visual context for improving walking ability and reducing fall incidence and fear of falling in older adults with fall-related hip fracture: a randomized controlled trial

van Ooijen MW, Roerdink M, Trekop M, Janssen TW, Beek PJ.

BMC Geriatr. 2016; 16(1): e215.

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DOI 10.1186/s12877-016-0388-x **PMID** 28031021

Abstract

BACKGROUND: The ability to adjust walking to environmental context is often reduced in older adults and, partly as result of this, falls are common in this population. A treadmill with visual

context projected on its belt (e.g., obstacles and targets) allows for practicing step adjustments relative to that context, while concurrently exploiting the great amount of walking practice associated with conventional treadmill training. The present study was conducted to compare the efficacy of adaptability treadmill training, conventional treadmill training and usual physical therapy in improving walking ability and reducing fear of falling and fall incidence in older adults during rehabilitation from a fall-related hip fracture.
METHODS: In this parallel-group, open randomized controlled trial, seventy older adults with a recent fall-related hip fracture (83.3 ± 6.7 years, mean ± standard deviation) were recruited from inpatient rehabilitation care and block randomized to six weeks inpatient adaptability treadmill training (n = 24), conventional treadmill training (n = 23) or usual physical therapy (n = 23). Group allocation was only blind for assessors. Measures related to walking ability were assessed as the primary outcome before and after the intervention and at 4-week and 12-month follow-up. Secondary outcomes included general health, fear of falling, fall rate and proportion of fallers.
RESULTS: Measures of general walking ability, general health and fear of falling improved significantly over time. Significant differences among the three intervention groups were only found for the Functional Ambulation Category and the dual-task effect on walking speed, which were in favor of respectively conventional treadmill training and adaptability treadmill training.
CONCLUSIONS: Overall, adaptability treadmill training, conventional treadmill training and usual physical therapy resulted in similar effects on walking ability, fear of falling and fall incidence in older adults rehabilitating from a fall-related hip fracture. Additional post hoc subgroup analyses, with stratification for pre-fracture tolerated walking distance and executive function, revealed several intervention effects in favor of adaptability and conventional treadmill training, indicating superiority over usual physical therapy for certain subgroups. Future well-powered studies are necessary to univocally identify the characteristics of individuals who will benefit most from a particular intervention. TRIAL REGISTRATION: The Netherlands Trial Register (NTR3222 , 3 January 2012).
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Understanding falls in progressive supranuclear palsy
Bluett B, Litvan I, Cheng S, Juncos J, Riley DE, Standaert DG, Reich SG, Hall DA, Kluger B, Shprecher D, Marras C, Jankovic J.
Parkinsonism Relat. Disord. 2016; ePub(ePub): ePub.
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DOI 10.1016/j.parkreldis.2016.12.009 **PMID** 28007518
Abstract
INTRODUCTION: Progressive supranuclear palsy (PSP) is characterized by frequent falls which worsen with disease progression, causing substantial morbidity and mortality. Few studies have investigated which factors contribute to falls in PSP, and all have involved few participants, thus lacking necessary statistical power. The aim of this study was to identify clinical parameters most significantly associated with increasing falls in PSP, using the largest sample of patients to date.
METHODS: Comprehensive clinical data were collected from 339 not demented PSP patients meeting the NINDS-SPSP criteria, who were divided into two groups - Infrequent Fallers (IF; n = 118) with rare falls, and Frequent Fallers (FF; n = 221) who fell occasionally to multiple times a day. Of 198 clinical parameters, we hypothesized 38 to be correlated with an increasing risk of falls. These 38

parameters were analyzed via univariate regression analysis to determine the strength of their association with fall frequency. Unit odds ratios identified the magnitude with which each parameter resulted in an increasing risk of falls.
RESULTS: Twenty-five of 38 parameters analyzed were significantly associated with fall frequency based on univariate analysis. Symptom duration, clinical measures of disease severity, and several motoric and oculomotor clinical parameters were associated with FF. Examined cognitive parameters and slowing of vertical saccades were not.
CONCLUSIONS: The clinical parameters identified as associated with increased frequency of falls improve our understanding of why they occur and may help identify not demented PSP patients at risk for increasing falls.

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Validation of evidence-based fall prevention programs for adults with intellectual and/or developmental disorders: a modified Otago exercise program
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Front. Public Health 2016; 4: e261.
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DOI 10.3389/fpubh.2016.00261 **PMID** 27999771 **PMCID** PMC5138240
INTRODUCTION: Evidence-based fall prevention (EBFP) programs significantly decrease fall risk, falls, and fall-related injuries in community-dwelling older adults. To date, EBFP programs are only validated for use among people with normal cognition and, therefore, are not evidence-based for adults with intellectual and/or developmental disorders (IDD) such as Alzheimer's disease and related dementias, cerebral vascular accident, or traumatic brain injury.
BACKGROUND: Adults with IDD experience not only a higher rate of falls than their community-dwelling, cognitively intact peers but also higher rates and earlier onset of chronic diseases, also known to increase fall risk. Adults with IDD experience many barriers to health care and health promotion programs. As the lifespan for people with IDD continues to increase, issues of aging (including falls with associated injury) are on the rise and require effective and efficient prevention.
METHODS: A modified group-based version of the Otago Exercise Program (OEP) was developed and implemented at a worksite employing adults with IDD in Montana. Participants were tested pre- and post-intervention using the Center for Disease Control and Prevention's (CDC) Stopping Elderly Accidents Deaths and Injuries (STEADI) tool kit. Participants participated in progressive once weekly, 1-h group exercise classes and home programs over a 7-week period. Discharge planning with consumers and caregivers included home exercise, walking, and an optional home assessment.
RESULTS: Despite the limited number of participants (n = 15) and short length of participation, improvements were observed in the 30-s Chair Stand Test, 4-Stage Balance Test, and 2-Minute Walk Test. Additionally, three individuals experienced an improvement in ambulation independence. Participants reported no falls during the study period.
DISCUSSION: Promising results of this preliminary project underline the need for further study of this modified OEP among adults with IDD. Future multicenter study should include more participants in diverse geographic regions with longer lengths of participation and follow-up.
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'It promoted a positive culture around falls prevention': staff response to a patient education programme-a qualitative evaluation

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BMJ Open 2016; 6(12): e013414.

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DOI 10.1136/bmjopen-2016-013414 **PMID** 28003295

Abstract

OBJECTIVES: The purpose of this study was to understand how staff responded to individualised patient falls prevention education delivered as part of a cluster randomised trial, including how they perceived the education contributed to falls prevention on their wards.

DESIGN: A qualitative explanatory study.

METHODS: 5 focus groups were conducted at participatory hospital sites. The purposive sample of clinical staff (including nurses, physiotherapists and quality improvement staff) worked on aged care rehabilitation wards when a cluster randomised trial evaluating a patient education programme was conducted. During the intervention period, an educator, who was a trained health professional and not a member of staff, provided individualised falls prevention education to patients with good levels of cognition (Mini-Mental State Examination >23/30). Clinical staff were provided with training to support the programme and their feedback was sought after the trial concluded, to understand how they perceived the programme impacted on falls prevention. Data were thematically analysed using NVivo qualitative data analysis software.

RESULTS: 5 focus groups were conducted at different hospitals (n=30 participants). Staff perceived that the education created a positive culture around falls prevention and further, facilitated teamwork, whereby patients and staff worked together to address falls prevention. The educator was perceived to be a valuable member of the team. Staff reported that they developed increased knowledge and awareness about creating a safe ward environment. Patients being proactive and empowered to engage in falls prevention strategies, such as ringing the bell for assistance, was viewed as supporting staff falls prevention efforts and motivating staff to change practice.

CONCLUSIONS: Staff responded positively to patient falls prevention education being delivered on their wards. Providing individualised patient education to older patients with good levels of cognition can empower staff and patients to work as a team to address falls prevention on hospital rehabilitation wards.

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Alterations in balance and mobility in people with epilepsy

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Epilepsy Behav. 2016; 66: 53-56.

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DOI 10.1016/j.yebeh.2016.10.021 **PMID** 28033546

Abstract

PURPOSE: People with epilepsy (PWE) are burdened by physical disability and side effects of antiepileptic drugs (AED) such as drowsiness and blurred vision. These factors place them at risk for reduced mobility and falls. The purpose of this study was to evaluate mobility and balance in PWE.

METHODS: This was a cross-sectional study of PWE and age- and sex-matched controls. We evaluated mobility and balance using the Timed Up and Go Test (TUG) and the Tinetti Mobility Test (TMT). Self-reported confidence in balance was assessed using the Activities-Specific Balance Confidence Scale (ABC). Clinical and demographic characteristics and particularly epilepsy-related variables were recorded.

RESULTS: We included 33 PWE and 33 controls. PWE had a mean age of 36.7years, and 61% were male. They had a mean of 1.52 of seizures per month and used a mean of 1.6 anti-epileptic drugs (AEDs). PWE scored significantly worse in all measures (TUG, TMT, ABC) when compared with controls. PWE had poor performance in 60.6% of cases in the TUG and in 48.5% of cases in the TMT, compared to none in the control group. There was good correlation between the three instruments. TUG scores were correlated with epilepsy duration, but not age, seizure control or AED use. On multivariate logistic regression, poor performance TMT was significantly associated with poor confidence in balance, according to the ABC.

CONCLUSIONS: PWE have significant alterations in balance and mobility, independently of AED use or seizure control. These alterations are reflected in a poor self-reported confidence in carrying out daily activities.

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Evaluation of the "medication fall risk score"

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Am. J. Health Syst. Pharm. 2017; 74(1): e32-e39.

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DOI 10.2146/ajhp150745 **PMID** 28007719

Abstract

PURPOSE: Results of a study evaluating the predictive validity of a fall screening tool in hospitalized patients are reported.

METHODS: Administrative claims data from two hospitals were analyzed to determine the discriminatory ability of the "medication fall risk score" (RxFS), a medication review fall-risk screening tool that is designed for use in conjunction with nurse-administered tools such as the Morse Fall Scale (MFS). Through analysis of data on administered medications and documented falls in a population of adults who underwent fall-risk screening at hospital admission over a 15-month period (n = 33,058), the predictive value of admission MFS scores, alone or in combination with retrospectively calculated RxFS-based risk scores, was assessed. Receiver operating characteristic (ROC) curve analysis and net reclassification improvement (NRI) analysis were used to evaluate improvements in risk prediction with the addition of RxFS data to the prediction model.

RESULTS: The area under the ROC curve for the predictive model for falls compromising both MFS and RxFS scores was computed as 0.8014, which was greater than the area under the ROC curve

associated with use of the MFS alone (0.7823, p = 0.0030). Screening based on MFS scores alone had 81.25% sensitivity and 61.37% specificity. Combined use of RxFS and MFS scores resulted in 82.42% sensitivity and 66.65% specificity (NRI = 0.0587, p = 0.0003).
CONCLUSION: Reclassification of fall risk based on coadministration of the MFS and the RxFS tools resulted in a modest improvement in specificity without compromising sensitivity.

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Fuzzy logic-based risk of fall estimation using smartwatch data as a means to form an assistive feedback mechanism in everyday living activities
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Healthc. Technol. Lett. 2016; 3(4): 263-268.
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DOI 10.1049/htl.2016.0064 **PMID** 28008361 **PMCID** PMC5168800
Abstract
This Letter aims to create a fuzzy logic-based assistive prevention tool for falls, based on accessible sensory technology, such as smartwatch, resulting in monitoring of the risk factors of falls caused by orthostatic hypotension (OH); a drop in systolic blood pressure (DSBP) >20 mmHg due to postural changes. Epidemiological studies have shown that OH is a high risk factor for falls and has a strong impact in quality of life (QoL) of the elderly's, especially for some cases such as Parkinsonians. Based on smartwatch data, it is explored here how statistical features of heart rate variability (HRV) can lead to DSBP prediction and estimation of the risk of fall. In this vein, a pilot study was conducted in collaboration with five Greek Parkinson's Foundation patients and ten healthy volunteers. Taking into consideration, the estimated DSBP and additional statistics of the user's medical/behavioural history, a fuzzy logic inference system was developed, to estimate the instantaneous risk of fall. The latter is fed back to the user with a mechanism chosen by him/her (i.e. vibration and/or sound), to prevent a possible fall, and also sent to the attentive carers and/or healthcare professionals for a home-based monitoring beyond the clinic. The proposed approach paves the way for effective exploitation of the contribution of smartwatch data, such as HRV, in the sustain of QoL in everyday living activities.
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Letter to the Editor regarding "Gait recording with inertial sensors - how to determine initial and terminal contact" by Bötzel and colleagues
Kluge F, Eskofier BM.
J. Biomech. 2016; ePub(ePub): ePub.
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DOI 10.1016/j.jbiomech.2016.07.043 **PMID** 28010948
Abstract [Abstract unavailable]

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Postural control is associated with cognition and fear of falling in patients with multiple sclerosis

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J. Neural. Transm. 2016; ePub(ePub): ePub.

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DOI 10.1007/s00702-016-1668-5 **PMID** 28005172

Abstract

Multiple sclerosis (MS) is a chronic inflammatory and neurodegenerative disease affecting various neurological domains, such as postural control, cognition, fear of falling, depression-anxiety, and fatigue. This study examined the associations of cognitive functions, fear of falling, depression-anxiety, and fatigue with postural control in patients with MS. Postural control (sway velocity) of 63 patients with MS (age 39.0 ± 8.9 years; %female 57%; Expanded Disability Status Scale score median (interquartile range) 2.0 (1.5)) was recorded on two platforms at stable and unstable conditions. Cognition, fear of falling, depression-anxiety, and fatigue were evaluated by a comprehensive neuropsychological assessment. The associations between these domains and postural control have been measured by multivariable linear regression (adjusted for age, gender, disability, and education). In stable condition, only working memory was associated with postural control ($p < 0.05$). In unstable condition, working memory, executive functions, attention/processing speed, and fear of falling were associated with postural control ($p < 0.05$). Specific cognitive domains and fear of falling were associated with postural control in MS patients, particularly in unstable condition. These findings highlight the association of cognitive functions and fear of falling with postural control in MS.

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