Safety Literature 10th May 2020

A comparison of turn and straight walking phases as predictors of incident falls

Gulley E, Ayers E, Verghese J. Gait Posture 2020; 79: 239-243.

DOI 10.1016/j.gaitpost.2020.05.002 **PMID** unavailable

Abstract

BACKGROUND: While gait assessments are recommended to evaluate fall risk in older adults, these often involve walking in a straight line, even though one-third of steps taken throughout the day involve turning. Falls that occur during a turn tend to be more serious than falls that occur during a straight walk, but little is known about how gait variables collected during a turn can predict falls.

RESEARCH QUESTION: How do gait characteristics collected from straight and turning walking phases predict falls in older adults?

METHODS: We prospectively examined the association between six quantitative gait variables measured during normal walking turn and straight walking phases as predictors of incident falls in a community-based sample of older adults (N = 253; mean age 78.5; 51% women). Cox regressions adjusted for multiple potential confounders were used to examine the associations.

RESULTS: Participants had significantly slower stride velocity (57.81 vs 83.26 cm/s), shorter stride length (74.76 vs 101.81 cm,), lower swing (30.1 vs 32.41%), higher double support (39.79 vs 35.19%), and more swing (30.09 vs 32.41%) and stride length variability (31.86 vs 6.35 %) during turns compared with straights. Higher swing percent in both turns (adjusted hazard ratio; HR 0.92, 95% CI 0.87, 0.97) and straights (HR 0.89, 95% CI 0.84, 0.96) was associated with reduced risk of falls. Higher double support percent during both turns (HR 1.04, 95% CI 1.01, 1.07) and straights (HR 1.06, 95% CI 1.02, 1.09) was associated with increased risk of falls. More swing variability during turns (HR 1.03, 95% CI 1.00, 1.06), but not straights, was associated with increased risk of falls.

SIGNIFICANCE: Gait variables collected during turning and walking straight were similar in their predictions of future falls. In the future, clinical research that builds on these findings could improve identification and prevention of falls.

Language: en

Keywords

Falls; Gait; Turns

Association of abductor hip muscle atrophy with fall-related proximal femur fractures in the elderly

Erinc S, Bozca MA, Bankaoğlu M, Çakırtürk S, Yahşi Y, Özdemir HM. Injury 2020; ePub(ePub): ePub.

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Abstract

OBJECTIVE: The purpose of this study was to evaluate an association between fall-related intertrochanteric or femoral neck fractures and gluteus medius and minimus atrophy, furthermore, to find a correlation of whether any difference between femoral neck or intertrochanteric fracture and degree of muscle atrophy MATERIALS AND METHODS: A retrospective review of 230 patients with intertrochanteric or femoral neck fracture, aged > 65 years, and 60 age- matched controls was performed. We assessed gluteus medius and minimus atrophy and calculated the cross-sectional area (CSA) and ratio of lean muscle to adipose infiltration (M/A ratio) for each muscle.

RESULTS: The atrophy scores for the g.medius and g.minimus muscles on the fractured side were significantly higher than scores on the healthy side and scores in the control group. The atrophy scores for the g.medius on the healthy side were not significantly different from scores in the control group. The atrophy scores for g.medius were significantly different between the fractured side and the healthy side for all ages, the atrophy scores for g.minimus was significantly different in the patients aged over 75. There was no significant difference in the following parameters between the fractured side and healthy side of the patients aged 65 - 75 years; the atrophy score, CSA and M/A ratio. The patients have a lower CSA and M/A ratio on the fractured side than on the healthy side and lower CSA and M/A ratio than in the control group. However, there were no significant differences in the M/A ratio between the healthy side and the control group. CSA was not significantly different between the fractured side and healthy side in the male patients and in the patients with lower BMI (<30). There was no significant difference in the atrophy scores between subjects with intertrochanteric versus femoral neck fractures, the CSAs of the g.medius and g.minimus were significantly different between the intertrochanteric fracture and femoral neck fracture groups.

CONCLUSIONS: The fractured sides showed greater g.medius and g.minimus muscle atrophy, which may be a predictor of fall-related hip fractures in the elderly. Gluteal muscle volume may be associated with proximal femur fracture subtype.

Language: en

Keywords

Aging; Gluteus medius; Hip abductor muscles; Hip fractures; Proximal femur fracture

Balance confidence and turning behavior as a measure of fall risk

Almajid R, Goel R, Tucker C, Keshner E. Gait Posture 2020; 80: 1-6.

DOI 10.1016/j.gaitpost.2020.05.020 **PMID** unavailable

Abstract

BACKGROUND: Diminished balance confidence increases the risk of a fall and falls that occur when turning during walking are associated with an eightfold increase in hip fractures compared to when walking in a straight trajectory. Although an effect of aging on turning is revealed, the role of gender during turning is not yet clear.

RESEARCH QUESTION: How can balance confidence impact turning behavior in younger, middle-aged, and older men and women?

METHODS: This cross-sectional study included 22 young adults (11 women), 13 middle-aged adults (9 women), and 13 older adults (6 women). Participants ranked their balance confidence using the activities-specific balance confidence (ABC) scale and completed two different turns: Turn1 (around the cone) and Turn2 (turn to sit). Measures obtained for each turn included: turning time, step count, and peak trunk velocities (PTV) in pitch, yaw, and roll.

RESULTS: In Turn1, older adults exhibited an increase in turning time and step count relative to younger adults (both $p < 0.03$). In Turn2, older adults showed an increase in turning time and roll PTV compared to the middle-aged group (both $p < 0.02$). Lower scores in ABC were significantly correlated with an increase in Turn1 time ($p < 0.001$) and step count ($p = 0.04$) in middle-aged and older adults, respectively. Bivariate correlations revealed that women with lower scores on the ABC took more time to complete both turns (both $p = 0.01$).

SIGNIFICANCE: Older adults demonstrated longer turning time, more steps, and higher roll PTV while turning that were associated with decreased balance confidence scores. The association between decreased balance confidence and turning kinematics implies a relationship between turning and increased fall risk. These results suggest that testing for fall risk requires tests of activities that are performed outside traditional clinical settings and gait laboratories.

Language: en

Keywords

TUG; Aging; Fear of falling; Gender effects; motor behaviour

Balance performance in patients with heart failure

Tanriverdi A, Kahraman BO, Ozsoy I, Acar S, Senturk B, Ozpelit E, Akdeniz B, Savci S. Heart Lung 2020; ePub(ePub): ePub.

DOI 10.1016/j.hrtlng.2020.04.004 **PMID** unavailable

Abstract

BACKGROUND: It has been suggested that patients with heart failure (HF) have an increased fall rate. Although balance is one of the most important risk factors for fall, there is not sufficient information about balance in HF.

OBJECTIVE: To compare static, dynamic and functional balance between patients with HF and healthy controls.

METHODS: Twenty-seven patients with HF and 22 healthy controls were recruited in this study. The Unilateral Stance (US) and Limits of Stability (LOS) tests were used to measure static and dynamic balance, respectively. Functional balance was assessed with Berg Balance Scale.

RESULTS: There was no significant difference in age, gender and body mass index between the groups ($p > 0.05$). There was a significant difference in US with open eyes between the groups ($p < 0.05$). Reaction time (backward and left), endpoint excursion (backward), maximum excursion (forward and backward) and directional control (forward and right) variables of LOS were significantly different between the groups ($p < 0.05$).

CONCLUSIONS: Patients with HF have impaired static, dynamic and functional balance. Considering the balance impairment, a comprehensive balance assessment performed and balance training should be included in the management of HF as a part of the cardiac rehabilitation program.

Language: en

Keywords

Balance; Cardiac rehabilitation; Heart failure

Evaluation of a balance and mobility program for older adults at risk of falling: a mixed methods study

Osho OA, Harbidge C, Hogan DB, Manns PJ, Jones CA. J. Eval. Clin. Pract. 2020; ePub(ePub): ePub.

DOI 10.1111/jep.13413 **PMID** unavailable

Abstract

RATIONAL, AIMS, AND OBJECTIVES: The FallProof Balance and Mobility Program is a multifactorial fall prevention intervention that targets intrinsic risk factors such as muscle strength, balance, gait, and posture. Using mixed methods, we evaluated the implementation of the program for older adults at high risk of falling in the community.

METHODS: A pre-post program evaluation and semi-structured interviews were used to evaluate FallProof Balance and Mobility Program offered to older adults who were recurrent fallers. Over a 1-year period, the 12-week program was offered five times. Feasibility, acceptability, and outcome evaluation along with semi-structured interviews were done. Over the course of the evaluation, participants were evaluated three times (baseline, 12, and 16 weeks).

RESULTS: Of the 19 participants, who enrolled in the program, 16 completed the program and 12 attended at least 80% of the classes. Fourteen participants had mildly impaired cognition (Montreal Cognitive Assessment <26). Large gains (effect size 0.90) were seen with self-management (Partner-in-Health Scale). Participants were very satisfied with the program. Three themes emerged from the semi-structured interviews: (a) fall-related benefits, (b) variety of activities and motivating instructors, and (c) deterrents to participation.

CONCLUSION: Findings provided insights into pragmatic issues of implementing a balance and mobility program for older adults at risk of falling. The FallProof program was found to be feasible and acceptable in a small cohort of older adults from the community.

Language: en

Keywords

elderly; falls; mobility; rehabilitation; prevention program

Immersive virtual reality in stroke patients as a new approach for reducing postural disabilities and falls risk: a case series

Cortés-Pérez I, Nieto-Escamez FA, Obrero-Gaitán E. Brain Sci. 2020; 10(5): e296.

DOI 10.3390/brainsci10050296 **PMID** unavailable

Abstract

Stroke is a neurologic disorder considered the first cause of disability worldwide due to motor, cognitive, and sensorial sequels. Balance dysfunctions in stroke survivors increase the risk of falls and physiotherapeutic rehabilitation is essential to reduce it. Virtual reality (VR) seems to be an alternative to conventional physiotherapy (CT), providing virtual environments and multisensorial inputs to train balance in stroke patients. The aim of this study was to assess if immersive VR treatment is more effective than CT to improve balance after stroke. This study got the approval from the Ethics Committee of the University of Almeria. Three chronic ischemic stroke patients were selected. One patient who received 25 sessions of immersive VR intervention for two months was compared with another patient who received equivalent CT and a third patient with no intervention. Balance, gait, risk of falling, and vestibular and visual implications in the equilibrium were assessed. After the interventions, the two patients receiving any of the treatments showed an improvement in balance compared to the untreated patient. In comparison to CT, our results suggest a higher effect of immersive VR in the improvement of balance and a reduction of falls risk due to the active upright work during the VR intervention.

Language: en

Keywords

gait; stroke; balance; falls risk; conventional physiotherapy; immersive virtual reality

Physical and psychological factors associated with poor self-reported health status in older adults with falls

Kim J, Byun M, Kim M. Int. J. Environ. Res. Public Health 2020; 17(10): e3548.

DOI 10.3390/ijerph17103548 **PMID** unavailable

Abstract

BACKGROUND: Previous studies have proposed various physical tests for screening fall risk in older adults. However, older adults may have physical or cognitive impairments that make testing difficult. This study describes the differences in individual, physical, and psychological factors between adults in good and poor self-rated health statuses. Further, we identified the physical or psychological factors associated with self-rated health by controlling for individual variables.

METHODS: Data from a total of 1577 adults aged 65 years or over with a history of falls were analyzed, using the 2017 National Survey of Older Persons in South Korea. Self-reported health status was dichotomized as good versus poor using the 5-point Likert question: "poor" (very poor and poor) and "good" (fair, good, and very good).

RESULTS: Visual/hearing impairments, ADL/IADL restriction, poor nutrition, and depression were more frequently observed in the group with poor self-rated health. Multivariable logistic regression revealed that poor self-reported health was significantly associated with hearing impairments (OR: 1.51, 95% CI 1.12-2.03), ADL limitation (OR: 1.77, 95% CI 1.11-2.81), IADL limitation (OR: 2.27, 95% CI 1.68-3.06), poor nutrition (OR: 1.36, 95% CI 1.05-1.77), and depression (OR 3.77, 95% CI 2.81-5.06).

CONCLUSIONS: Auditory impairment, ADL/IADL limitations, poor nutrition, and depression were significantly associated with poor self-reported health. A self-rated health assessment could be an alternative tool for older adults who are not able to perform physical tests.

Language: en

Keywords

fall; older adults; public health; self-reported health status

Poorer visual acuity is independently associated with impaired balance and step length but not overall physical performance in older adults

Sorbello S, Quang Do V, Palagyi A, Keay L. J. Aging Phys. Act. 2020; ePub(ePub): ePub.

DOI 10.1123/japa.2019-0057 **PMID** unavailable

Abstract

This study examined the association between varying levels of visual acuity (VA) and physical performance (Short Physical Performance Battery) in older adults. A cross-sectional analysis of participants aged ≥50 years with a clinical diagnosis of vision loss across two studies was undertaken. Of 434 (96%) participants with available VA data, 74% (320/434) had nil, 7% (32/434) had mild, 8% (33/434) had moderate, and 11% (49/434) had severe visual impairment. Poorer VA of both better and worse eye was found to be significantly associated with poorer standing balance (p =.006 and p =.004, respectively); worse VA of the better eye was significantly associated with increased number of steps per meter (p =.005). Mean total Short Physical Performance Battery score of this study population was lower than published normative data for this age group. Physical activity programs for older people with reduced VA should be targeted at improving balance and gait skills to reduce falls risk.

Language: en

Keywords

Australia; falls risk; low vision; physical function

Prediction of balance perturbations and falls on stairs in older people using a biomechanical profiling approach: a 12-month longitudinal study

Ackermans T, Francksen N, Lees C, Papatzika F, Arampatzis A, Baltzopoulos V, Lisboa P, Hollands M, O'Brien T, Maganaris C. J. Gerontol. A Biol. Sci. Med. Sci. 2020; ePub(ePub): ePub.

DOI 10.1093/gerona/glaa130 **PMID** unavailable

Abstract

BACKGROUND: Stair falls are a major health problem for older people, but presently there are no specific screening tools for stair fall prediction. The purpose of the present study was to investigate whether stair fallers could be differentiated from non-fallers by biomechanical risk factors or physical/psychological parameters and to establish the biomechanical stepping profile posing the greatest risk for a stair fall.

METHODS: Eighty-seven older adults (age: 72.1±5.2 y) negotiated an instrumented seven-step staircase and performed a range of physical/psychological tasks. K-means clustering was used to profile the overall stair negotiation behaviour with biomechanical parameters indicative of fall risk as input. Falls and events of balance perturbation (combined "hazardous events") were then monitored during a 12-month follow-up. Cox-regression analysis was performed to examine if physical/psychological parameters or biomechanical outcome measures could predict future hazardous events. Kaplan-Meier survival curves were obtained to identify the stepping strategy posing a risk for a hazardous event.

RESULTS: Physical/psychological parameters did not predict hazardous events and the commonly used Fall Risk Assessment Tool (FRAT) classified only 1/17 stair fallers at risk for a fall. Single biomechanical risk factors could not predict hazardous events on stairs either. On the contrary, two particular clusters identified by the stepping profiling method in stair ascent were linked with hazardous events.

CONCLUSION: This highlights the potential of the stepping profiling method to predict stair fall risk in older adults against the limited predictability of single parameter approaches currently used as screening tools.

Language: en

Keywords

fall risk; clustering; stair negotiation; stepping behaviour

The role of hip abductor strength in identifying older persons at risk of falls: a diagnostic accuracy study

Gafner SC, Bastiaenen CHG, Ferrari S, Gold G, Trombetti A, Terrier P, Hilfiker R, Allet L. Clin. Interv. Aging 2020; 15: 645-654.

DOI 10.2147/CIA.S246998 **PMID** unavailable

Abstract

Background/Objectives: Early detection of fall risk in persons older than 65 is of clinical relevance, but the diagnostic accuracy of currently used functional tests (eg short physical performance battery [SPPB] and timed up and go test [TUG]) to assess older persons' fall risks remains moderate. Recent literature highlights the importance of strong hip abductors to prevent falls. We thus aimed to assess the diagnostic accuracy of hip abductor strength measures to assess older persons' fall risks.

Methods: Hip abductor maximum voluntary isometric strength (ABD MVIS), rate of force generation (ABD RFG), and the SPPB and TUG functional fall risk assessments were assessed in 60 persons aged over 65 years (82.0 ± 6.1 years). The diagnostic accuracy (area under the curve [AUC], sensitivity [sens], specificity [spec], positive predictive value [PPV], negative predictive value [NPV], and positive and negative likelihood ratios [LR+, LR-]) was evaluated at a clinically important 90% sensitivity level. Cut-off values for clinical use were calculated.

Results: In our population, hip ABD MVIS (AUC 0.8, sens 90.6%, spec 57.1%, PPV 70.7%, NPV 84.2%, LR+ 2.1, LR- 0.2, and cut-off value ≤ 1.1 N/kg) and hip ABD RFG (AUC 0.8, sens 90.6%, spec 46.4%, PPV 65.9%, NPV 81.3%, LR+ 1.7, LR- 0.2, and cut-off ≤ 8.47 N/kg/s) show diagnostic accuracy comparable to other fall risk assessments (SPPB and TUG) and a high net sensitivity when used in a test battery.

Conclusion: Hip ABD MVIS or RFG shows good diagnostic accuracy to differentiate between older fallers and nonfallers compared to the chosen external criterion history of falls. The high net sensitivity when hip ABD MVIS or RFG is combined with currently used fall risk assessments shows promise in contributing value to a test battery and should be investigated further in longitudinal studies.

Language: en

Keywords

accidental falls; aged; functional performance; hip; measurement study; muscle strength

Understanding the aetiology of fear of falling from the perspective of a fear-avoidance model - a narrative review

Peeters G, Bennett M, Donoghue OA, Kennelly S, Kenny RA. Clin. Psychol. Rev. 2020; 79: e101862.

DOI 10.1016/j.cpr.2020.101862 **PMID** unavailable

Abstract

Approximately half of older adults experience fear of falling (FoF) but the aetiology is unclear. The aim is to review the literature on physiological, mood and cognitive factors associated with FoF and to interpret these findings in the context of a fear-avoidance model that provides a causal framework for the development of FoF. There is growing evidence that the development of FoF is influenced by balance problems and falls, and emerging evidence for a role for cognitive factors, particularly attention and processing of sensory information. While there may also be a role for mood/temperament in the development of FoF, current evidence is weak. We argue that these factors co-exist and interact, which complicates assessment and design of the most appropriate intervention. The fear avoidance model offers a novel framework for explaining the mechanism of developing FoF and the discrepancy between experienced and perceived fall risk. This model specifically capitalizes on recent insights into fundamental learning mechanisms underlying emotion and fear. The proposed models provide hypotheses for future research and indications for improving efficacy of existing treatment programs.

Language: en

Keywords

Depression; Accidental falls; Anxiety; Cognitive function; Falls efficacy; Fear-avoidance learning

Falls: descriptive rates and circumstances in age-unspecified patients with locally advanced esophageal cancer

Childs DS, Yoon HH, Eiring RA, Jin Z, Jochum JA, Pitot HC, Jatoi A. Support. Care Cancer 2020; ePub(ePub): ePub.

DOI 10.1007/s00520-020-05511-z **PMID** unavailable

Abstract

PURPOSE: Falls can occur in older cancer patients, but few studies have examined falls in an age-unspecified group of patients with locally advanced esophageal cancer. Because these patients are often administered neuropathy-inducing agents, are weak, and can develop orthostatic symptoms, examining falls appears relevant.

METHODS: Electronic medical records were used to examine falls and their circumstances in locally advanced esophageal cancer patients treated with chemotherapy and radiation and often surgery.

RESULTS: Among 300 patients, 62 (21%) suffered a fall, yielding 6 falls per 100 patient years. The median age at first fall was 64 years (range 31 to 83). The median time from cancer diagnosis to first fall was 11 months (range 0 to 107). Forty-two patients (68%) who fell had active cancer; 20 (32%) were cancer-free. Fall-related injuries occurred in 42 patients and included fractures, hematomas, and other musculoskeletal events. Eighteen patients (29%) fell repeatedly. Neuropathy, general weakness, and orthostatic symptoms were associated with falls ("He does state his neuropathy is more bothersome…. He did have a fall last week…." "He has been increasingly weak to the point where he fell down last week…." "Upon rising… [he] felt like somebody had put a sheet over his eyes, felt very lightheaded, and fell to the floor…."). At times, falls occurred under commonplace circumstances, such as slipping on ice or tripping on an underfoot pet.

CONCLUSION: Regardless of patient age, clinicians should remain vigilant for fall risk in adult patients with locally advanced esophageal cancer.

Language: en

Keywords

Falls; Fracture; Neuropathy; Esophageal cancer; Younger patients

Validation of the Hendrich II Fall Risk Model: the imperative to reduce modifiable risk factors

Hendrich AL, Bufalino A, Groves C. Appl. Nurs. Res. 2020; 53: e151243.

DOI 10.1016/j.apnr.2020.151243 **PMID** unavailable

Abstract

AIM: To validate the psychometrics of the Hendrich II Fall Risk Model (HIIFRM) and identify the prevalence of intrinsic fall risk factors in a diverse, multisite population.

BACKGROUND: Injurious inpatient falls are common events, and hospitals have implemented programs to achieve "zero" inpatient falls.

METHODS: Retrospective analysis of patient data from electronic health records at nine hospitals that are part of Ascension. Participants were adult inpatients (N = 214,358) consecutively admitted to the study hospitals from January 2016 through December 2018. Fall risk was assessed using the HIIFRM on admission and one time or more per nursing shift.

RESULTS: Overall fall rate was 0.29%. At the standard threshold of HIIFRM score ≥ 5, 492 falls and 76,800 non-falls were identified (fall rate 0.36%; HIIFRM specificity 64.07%, sensitivity 78.72%). Area under the receiver operating characteristic curve was 0.765 (standard error 0.008; 95% confidence interval 0.748, 0.781; $p < 0.001$), indicating moderate accuracy of the HIIFRM to predict falls. At a lower cut-off score of ≥4, an additional 74 falls could have been identified, with an improvement in sensitivity (90.56%) and reduction in specificity (44.43%).

CONCLUSION: Analysis of this very large inpatient sample confirmed the strong psychometric characteristics of the HIIFRM. The study also identified a large number of inpatients with multiple fall risk factors (n = 77,292), which are typically not actively managed during hospitalization, leaving patients at risk in the hospital and after discharge. This finding represents an opportunity to reduce injurious falls through the active management of modifiable risk factors.

Language: en

Keywords

Fall risk factors; Hendrich II Fall Risk Model; Injurious fall risk reduction; Inpatient falls