Safety Literature 29th December 2019

A fall in the previous 12 months predicts fracture in the subsequent 5 years in postmenopausal women

Afrin N, Sund R, Honkanen R, Koivumaa-Honkanen H, Rikkonen T, Williams L, Kroger H.
Osteoporos. Int. 2019; ePub(ePub): ePub.

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DOI 10.1007/s00198-019-05255-5 **PMID** 31858171

Abstract

PURPOSE: The purpose of this study was to evaluate if a history of falls predicts future postmenopausal fractures and if this prediction variesaccording to frequency, mechanism, and severity of falls and site of fractures.

METHODS: This study used data from OSTPRE prospective cohort. Total study population consisted of 8744 postmenopausal women (mean age 62.2 years) who responded to postal enquiry in 1999 (baseline) and in 2004 (follow-up).

RESULTS: Women were classified by frequency (non/occasional/frequent fallers), mechanism (slip/nonslip), and severity (injurious/ non-injurious) of falls and fractures by site (major osteoporotic/other). A total of 1693 (19.4%) women reported a fall during the preceding 12 months in 1999; 812 a slip fall, 654 a nonslip, 379 an injurious fall, and 1308 a non-injurious fall. A total of 811 women (9.3%) sustained a fracture during the 5-year follow-up period (1999-2004); 431 major osteoporotic fractures and 380 other fractures. Compared with non-fallers, earlier falls predicted subsequent fractures with an OR of 1.41 (95% CI 1.19-1.67, $p \leq 0.001$), 1.43 (95% CI 1.14-1.80, $p = 0.002$) for earlier slip falls, and 1.35 (95% CI 1.04-1.74, $p = 0.02$) for earlier nonslip falls. Earlier injurious falls predicted future fractures (OR = 1.64, 95% CI 1.21-2.23, $p \leq 0.01$), especially other fractures (OR = 1.86, 95% CI 1.24-2.80, $p \leq 0.01$), but not major osteoporotic fractures (OR = 1.37, 95% CI 0.89-2.10, $p = 0.151$). Fracture risk predictions for earlier non-injurious falls was OR = 1.36, 95% CI 1.12-1.64, $p = 0.002$. These risk patterns remain same after adjustments.

CONCLUSION: History of falls (especially injurious falls) predicts subsequent fractures (mainly other fractures compared with major osteoporotic fractures) inpostmenopausal women. We aimed to investigate if history of falls (frequency, mechanism, and severity) is a predictor of future fractures in postmenopausal women. Our results indicate that history of falls (especially injurious falls) appeared to be an indicator for subsequent fracture overall. Earlier injurious falls were stronger predictors for future other fractures than for typical major osteoporotic fractures.

Language: en

Keywords Fall; Fracture; Injurious fall

A feasibility study of a home-based lifestyle-integrated physical exercise training and home modification for community-living older people (Part 2): the FIT-at-Home fall prevention program

Müller C, Lautenschläger S, Dörge C, Voigt-Radloff S. Disabil. Rehabil. 2019; ePub(ePub): ePub.

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DOI 10.1080/09638288.2019.1700564 **PMID** 31868030

Abstract

Purpose: This study was conducted in a home-based context where trained occupational therapists delivered progressive physical exercise training and home modification intervention for preventing falls, namely the FIT-at-Home intervention. We assessed the feasibility of the intervention's content and mode of delivery from the occupational therapists' perspective as well as the feasibility of study procedures.Methods: We used a mixed-methods approach, which generated qualitative data from 14 OTs' after delivering the intervention via interviews and quantitative data of the study procedures via questionnaires and documentation sheets.Results: In total, 16 of the 17 older people completed the intervention. Of 9 recorded falls, no serious physical problems occurred. Qualitative data suggested that the intervention content and mode was feasible. Only minor adaptations to the program are needed based on the users' feedback. The main benefit was seen in the fact that simple exercises can be integrated into everyday life for older people with restricted mobility.Conclusion: The FIT-at-Home intervention comprising lifestyle-integrated balance and strength exercises and home safety is feasible for occupational therapists to deliver. The findings will help to further refine the intervention and study procedures.Implications for rehabilitationFalling is a frequent and serious health problem for many community-living older people, and the incidence of injurious falls increases with advancing age.Home visiting programs comprising physical exercise training and home modification appear to be beneficial for older people with poor health, functional limitations, and limited mobility.This study indicates that it is feasible to introduce lifestyle-integrated balance and strength exercises, performed as part of daily routine for older people at risk of falling.Behavioural self-management strategies have the potential to improve the implementation of exercises during the course of rehabilitation treatment and afterward.

Language: en

Keywords

Fall prevention; balance training; exercise; home modification; intervention; lifestyle-integrated; older people; strength training

Associations between home injury falls and prior hospitalizations in community dwelling older adults: a population case-crossover study

Adams CM, Tancredi DJ, Bell JF, Catz SL, Romano PS. Injury 2019; ePub(ePub): ePub.

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DOI 10.1016/j.injury.2019.11.035 **PMID** 31858987

Abstract

OBJECTIVE: The purpose of this study was to examine risk factor and temporal associations between acute care hospitalization and post-discharge home injury falls in a population-based analysis sample of community dwelling older adults.

METHODS: We applied a unidirectional case-crossover design to a retrospective analysis sample derived from healthcare administrative data from all non-federal licensed hospitals in the State of California. The analysis sample was comprised of California residents age 65 years or older with a record of treatment for injury fall occurring at home from January 1, 2014 to December 31, 2014. A conditional Poisson regression with fixed person effects and a robust estimator of variance was used to calculate the incidence rate ratio of acute care admissions during the 90 day period immediately preceding an injury fall, with the period of 360-271 days prior to index fall as reference.

RESULTS: The rate of acute care admissions was 121% greater (IRR: 2.21; 95% CI 2.15-2.27) during the 90 days immediately preceding the index injury fall than 181-360 days prior. Period effects on rates of admissions were significantly higher in the acute care treatment subsample (IRR 2.63; 95% CI 2.51-2.76) than the emergency department treatment subsample (IRR 2.00; 95% CI 1.94-2.07). Discharge to post-acute care facilities; discharge to home health and Elixhauser comorbidity index all significantly modified period effects on acute care admissions.

CONCLUSIONS: Older adults have an increased risk of falling at home after being discharged from an acute care hospitalization, with highest risk occurring during the 90-day post-discharge period. Special consideration should be given to assessing hospital-associated changes in fall risk among geriatric patients prior to discharge directly home. Discharge planning should include efforts to reduce home fall risk during the period of transition from hospital care.

Language: en

Keywords Community dwelling; Injury falls; Injury prevention; Older adult falls; Post-hospital home falls

Don't fall for that: a residency curricular innovation about fall prevention

Lee DR, Lo JC, Tran HN. Perm. J. 2019; 24: e19.058.

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DOI 10.7812/TPP/19.058 **PMID** 31852047

Abstract

INTRODUCTION: Amid a growing geriatric population and rise in frailty-related morbidity, fall prevention represents an opportunity to improve patient outcomes and reduce health care costs. Traditional lectures on geriatric content have had limited impact on physician behaviors; however, use of multimodal teaching can be more effective in building knowledge and skills.

OBJECTIVE: To develop a novel, engaging fall prevention program to empower internal medicine residents to identify and manage patients at risk of falls and fall-related injuries.

METHODS: Two 20-minute multimodal workshops were created: 1) a classroom session with a video depicting a fall scenario, a team exercise ("Where's the Fall Risk?") and review of the American Geriatrics Society Beers Criteria; and 2) a small-group session reviewing a screening algorithm, case study, physical examination maneuvers, and patient resources.
INNOVATION: The first workshop included a 5-minute Kaiser Permanente video depicting an older couple whose travel plans are upended by a fall and how they modify their home and lifestyle, a competitive game in which trainees identify fall hazards, an overview of Beers Criteria, and Medical Knowledge Self-Assessment Program questions to apply knowledge to practice. The second workshop, held in small groups before clinic, included a discussion of the Centers for Disease Control and Prevention's fall prevention screening algorithm, review of a case, and education on how to properly perform the Timed Up and Go test.

CONCLUSION: Fall prevention remains an important yet undertaught topic for trainees and practicing physicians. These brief multicomponent workshops can be easily implemented and adapted for all clinical learners.

Language: en

Exploring risk of falls and dynamic unbalance in cerebellar ataxia by inertial sensor assessment

Caliandro P, Conte C, Iacovelli C, Tatarelli A, Castiglia SF, Reale G, Serrao M. Sensors (Basel) 2019; 19(24): s19245571.

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DOI 10.3390/s19245571 **PMID** 31861099

Abstract

BACKGROUND: Patients suffering from cerebellar ataxia have extremely variable gait kinematic features. We investigated whether and how wearable inertial sensors can describe the gait kinematic features among ataxic patients.

METHODS: We enrolled 17 patients and 16 matched control subjects. We acquired data by means of an inertial sensor attached to an ergonomic belt around pelvis, which was connected to a portable computer via Bluetooth. Recordings of all the patients were obtained during overground walking. From the accelerometric data, we obtained the harmonic ratio (HR), i.e., a measure of the acceleration patterns, smoothness and rhythm, and the step length coefficient of variation (CV), which evaluates the variability of the gait cycle.

RESULTS: Compared to controls, patients had a lower HR, meaning a less harmonic and rhythmic acceleration pattern of the trunk, and a higher step length CV, indicating a more variable step length. Both HR and step length CV showed a high effect size in distinguishing patients and controls ($p < 0.001$ and $p = 0.011$, respectively). A positive correlation was found between the step length CV and both the number of falls ($R = 0.672$; $p = 0.003$) and the clinical severity (ICARS: $R = 0.494$; $p = 0.044$; SARA: $R = 0.680$; $p = 0.003$).

CONCLUSION: These findings demonstrate that the use of inertial sensors is effective in evaluating gait and balance impairment among ataxic patients.

Language: en

Keywords

balance; cerebellar ataxia; gait analysis; inertial sensors; movement analysis; personalized medicine; rehabilitation

Factors determining the increased risk of falls in individuals with knee pain in the Malaysian Elders Longitudinal Research (MELoR) study

Mat S, Razack AH, Lim J, Khong SY, Kamaruzzaman SB, Chin AV, Abbas AA, Hairi NN, Othman S, Tan MP. Front. Med. (Lausanne) 2019; 6: e277.

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DOI 10.3389/fmed.2019.00277 **PMID** 31850355

Abstract

Objectives: While the negative impact of falls in older persons has been recognized, the association between knee pains and falls remains inconclusive due to underreporting and undertreatment of knee pain. This study was conducted to evaluate the relationship between knee pain and knee pain severity with falls risk and to further determine factors which influence this potential relationship. Design: This was cross-sectional study from the Malaysian Elders Longitudinal Research (MELoR) study. Setting: Urban community dwellers in a middle-income South East Asian country. Participants: One thousand two hundred twelve of a representative sample of community dwelling older persons aged 55 years and older. Outcome measures: Falls in the preceding 12 months and knee pain were collected during a home-based computer-assisted interview. Physical and functional performance were measured using the Timed Up and Go test and the Katz and Lawton scales, respectively. Psychological status was determined using the Depression Anxiety and Stress Scale (DASS-21). Results: Of the 1,212 participants included in this analysis, knee pain was present in 402 (33.17%) individuals (124 (30.85%) mild, 210 (52.24%) moderate, 68 (16.92%) severe). The presence of knee pain was associated with increased risk of falls [odds Ratio, OR(95% confidence interval, CI): 1.81 (1.37-2.38)]. Severe knee pain was an independent predictor for falls after adjustment for functional impairment and psychological status. Mild, moderate, and severe knee pain had a specific indirect effect on falls through reducing functional impairment, which in turn increases their psychological concern. Conclusion: Future studies should explore this relationship prospectively and evaluate whether interventions which alleviate psychological concerns and improve function will reduce falls risk in those with mild to moderate knee pain.

Language: en

Keywords

accidental falls; aged; depression; disability; osteoarthritis

Impact of rheumatoid arthritis and its management on falls, fracture and bone mineral density in UK Biobank

Clynes MA, Jameson K, Prieto-Alhambra D, Harvey NC, Cooper C, Dennison EM. Front. Endocrinol. (Lausanne) 2019; 10: e817.

Affiliation

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DOI 10.3389/fendo.2019.00817 **PMID** 31849841

Abstract

Objectives: Rheumatoid arthritis (RA) is a systemic chronic inflammatory disease which presents with polyarthritis in addition to extra-articular manifestations. Historically, studies have shown a link between RA and adverse musculoskeletal outcomes but these studies were reported before the widespread use of biologic therapies. The aim of this study was therefore to investigate associations between RA, RA medications and bone mineral density, falls and fractures, using UK Biobank data. Methods: Diagnosis of RA was made using Hospital Episode Statistics (HES) ICD-10 coding. We assessed RA relationships with estimated bone mineral density (eBMD) from heel quantitative ultrasound measurements, self-reported falls (in last year) and HES recorded fracture, adjusted for age, ethnicity, BMI, smoking status, and physical activity. Results: Of 502,543 participants, 3849 (1.4%) of women and 1643 (0.7%) of men had a diagnosis of RA. Median age of the participants was 57 years (IQR 50-63) in women and 58 (IQR 50-64) in men. RA was associated with lower eBMD (men: β -0.244, 95% CI -0.378, -0.110 $p < 0.001$; women: β -0.217, 95% CI -0.297, -0.138 $p < 0.001$) a reported fall in the last year (men: OR 1.54, 95% CI 1.26, 1.87 $p < 0.001$; women: OR 1.36, 95% CI 1.19, 1.56 $p < 0.001$) and fracture in women (OR 1.76, 95% CI 1.43, 2.16 $p < 0.001$). Corticosteroid therapy in men (β -0.934, 95% CI -1.565, -0.304 $p = 0.004$) and disease modifying anti-rheumatic drug (DMARD) use in both sexes (men: β -0.437, 95% CI -0.761, -0.112 $p = 0.008$; women: β -0.243, 95% CI -0.421, -0.065 $p = 0.007$), but not biologic therapy, were associated with a lower eBMD with RA. Conclusions: RA was associated with lower eBMD, increased falls and fracture. Corticosteroid and DMARD therapy, but not biologic therapy, were associated with lower eBMD.

Language: en

Keywords

Biobank; fall; fracture; osteoporosis; rheumatoid arthritis

Reactive postural responses to continuous yaw perturbations in healthy humans: the effect of aging

Mileti I, Taborri J, Rossi S, Del Prete Z, Paoloni M, Suppa A, Palermo E. Sensors (Basel) 2020; 20(1): s20010063.

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DOI 10.3390/s20010063 **PMID** 31861945

Abstract

Maintaining balance stability while turning in a quasi-static stance and/or in dynamic motion requires proper recovery mechanisms to manage sudden center-of-mass displacement. Furthermore, falls during turning are among the main concerns of community-dwelling elderly population. This study investigates the effect of aging on reactive postural responses to continuous yaw perturbations on a cohort of 10 young adults (mean age 28 ± 3 years old) and 10 older adults (mean age 61 ± 4 years old). Subjects underwent external continuous yaw perturbations provided by the RotoBit1D platform. Different conditions of visual feedback (eyes opened and eyes closed) and perturbation intensity, i.e., sinusoidal rotations on the horizontal plane at different frequencies (0.2 Hz and 0.3 Hz), were applied. Kinematics of axial body segments was gathered using three inertial measurement units. In order to measure reactive postural responses, we measured body-absolute and joint absolute rotations, center-of-mass displacement, body sway, and inter-joint coordination. Older adults showed significant reduction in horizontal rotations of body segments and joints, as well as in center-of-mass displacement. Furthermore, older adults manifested a greater variability in reactive postural responses than younger adults. The abnormal reactive postural responses observed in older adults might contribute to the well-known age-related difficulty in dealing with balance control during turning.

Language: en

Keywords

aging; dynamic posturography; kinematics; postural stability; reactive postural responses; yaw perturbation

Associations between home injury falls and prior hospitalizations in community dwelling older adults: a population case-crossover study

Adams CM, Tancredi DJ, Bell JF, Catz SL, Romano PS. Injury 2019; ePub(ePub): ePub.

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DOI 10.1016/j.injury.2019.11.035 **PMID** 31858987

Abstract

OBJECTIVE: The purpose of this study was to examine risk factor and temporal associations between acute care hospitalization and post-discharge home injury falls in a population-based analysis sample of community dwelling older adults.

METHODS: We applied a unidirectional case-crossover design to a retrospective analysis sample derived from healthcare administrative data from all non-federal licensed hospitals in the State of California. The analysis sample was comprised of California residents age 65 years or older with a record of treatment for injury fall occurring at home from January 1, 2014 to December 31, 2014. A conditional Poisson regression with fixed person effects and a robust estimator of variance was used to calculate the incidence rate ratio of acute care admissions during the 90 day period immediately preceding an injury fall, with the period of 360-271 days prior to index fall as reference.

RESULTS: The rate of acute care admissions was 121% greater (IRR: 2.21; 95% CI 2.15-2.27) during the 90 days immediately preceding the index injury fall than 181-360 days prior. Period effects on rates of admissions were significantly higher in the acute care treatment subsample (IRR 2.63; 95% CI 2.51-2.76) than the emergency department treatment subsample (IRR 2.00; 95% CI 1.94-2.07). Discharge to post-acute care facilities; discharge to home health and Elixhauser comorbidity index all significantly modified period effects on acute care admissions.

CONCLUSIONS: Older adults have an increased risk of falling at home after being discharged from an acute care hospitalization, with highest risk occurring during the 90-day post-discharge period. Special consideration should be given to assessing hospital-associated changes in fall risk among geriatric patients prior to discharge directly home. Discharge planning should include efforts to reduce home fall risk during the period of transition from hospital care.

Language: en

Keywords Community dwelling; Injury falls; Injury prevention; Older adult falls; Post-hospital home falls

Development of the fall prevention index on the movable scaffold for construction workers

Min SN, Subramaniyam M, Park SJ, Lee KS. Work 2019; ePub(ePub): ePub.

Affiliation

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DOI 10.3233/WOR-193070 **PMID** 31868724

Abstract

BACKGROUND: Falls are caused by difficulties in maintaining stable posture or center of pressure (COP). Studies on construction-related falls and their prevention are limitedOBJECTIVE:To propose a fall prevention index (FPI) based on the working environment at height (with or without a handrail) and experience of workers on movable scaffolds.

METHODS: Thirty participants were enrolled, and their COP distances were measured at the time of falling in the anterior-posterior (AP), mediolateral (ML), and diagonal directions.

RESULTS: The probability of falling in the diagonal direction is almost zero for workers with more than 20 years of experience and that in the AP direction is almost zero for workers with up to 30 years of experience. There was almost zero probability of falling in the ML direction for workers with >15 years of experience. This index can be used as a tool for predicting the risk of falls, screening workers, and implementing proactive measures to prevent falling accidents on work sites.

CONCLUSIONS: Preventing falls from movable scaffolds (and height in general) is needed in the construction industry. We propose a fall prevention index based on the working environment (at height, with or without handrail) and experience of workers on movable scaffolds.

Language: en

Keywords

Center of pressure; construction industry; fall accident; falling limit

point

Factors affecting fear of falls in patients with chronic stroke

Yadav T, Bhalerao G, Shyam AK. Top. Stroke Rehabil. 2019; ePub(ePub): ePub.

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DOI 10.1080/10749357.2019.1658419 **PMID** 31847729

Abstract

Objective: The aim of this study was to find the factors associated with fear of falls in patients having chronic stroke.Methods: Inclusion criterion was subjects with cerebral stroke for more than 3 months. A structured interview of 82 subjects was conducted with a questionnaire with questions regarding personal factors such as gender, side affected, number of comorbidities, and setting of physical therapy sessions. Depression was assessed using Patient Health Questionnaire-9, lower extremity motor function was assessed using Fugl-Meyer scale, and functional mobility was assessed using Timed Up and Go. Chi-square analysis was done on the above factors to find significant factors followed by logistic regression of the factors found significant in Chi square.Results: Lower extremity Fugl-Meyer score was significantly associated with fear of falls (p value 0.047 with Odds ratio of 1.136, 95% CI 1.002-1.287) in patients having chronic stroke while treatment factors, such as setting of physical therapy sessions, and personal factors, such as gender, side affected, number of comorbidities, depression, functional mobility, or use of walking aid, were not found to have significant association.Conclusion: The lower extremity Fugl-Meyer score is associated with fear of falls in patients having chronic stroke.

Language: en

Keywords

Stroke; falls; fear; logistic regression; lower extremity; odds ratio

Fall-related traumatic brain injury in children ages 0-4 years

Haarbauer-Krupa J, Haileyesus T, Gilchrist J, Mack KA, Law CS, Joseph A. J. Saf. Res. 2019; 70: 127-133.

Affiliation

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DOI 10.1016/j.jsr.2019.06.003 **PMID** 31847987

Abstract

INTRODUCTION: Falls are the leading cause of traumatic brain injury (TBI) for children in the 0-4 year age group. There is limited literature pertaining to fall-related TBIs in children age 4 and under and the circumstances surrounding these TBIs. This study provides a national estimate and describes actions and products associated with fall-related TBI in this age group.

METHOD: Data analyzed were from the 2001-2013 National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP), a nationally representative sample of emergency departments (ED). Case narratives were coded for actions associated with the fall, and product codes were abstracted to determine fall location and product type. All estimates were weighted.

RESULTS: An estimated 139,001 children younger than 5 years were treated annually in EDs for nonfatal, unintentional fall-related TBI injuries (total = 1,807,019 during 2001-2013). Overall, child actions (e.g., running) accounted for the greatest proportion of injuries and actions by others (e.g., carrying) was highest for children younger than 1 year. The majority of falls occurred in the home, and involved surfaces, fixtures, furniture, and baby products.

CONCLUSIONS: Fall-related TBI in young children represents a significant public health burden. The majority of children seen for TBI assessment in EDs were released to home. Prevention efforts that target parent supervision practices and the home environment are indicated. Practical applications: Professionals in contact with parents of young children can remind them to establish a safe home and be attentive to the environment when carrying young children to prevent falls.

Language: en

Keywords

Falls; Pediatrics; Traumatic brain injury; Young children

Torso kinematics during gait and trunk anthropometry in pregnant fallers and non-fallers

McCrory JL, Chambers AJ, Daftary A, Redfern MS. Gait Posture 2019; 76: 204-209.

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DOI 10.1016/j.gaitpost.2019.11.012 **PMID** 31864172

Abstract

BACKGROUND: Pregnant women experience numerous physiological and biomechanical alterations which may be associated with their increased risk of experiencing a fall. Gait alterations in other populations who fall include increased step width and mediolateral trunk motion. It is not known if pregnant women who have fallen exhibit these alterations. RESEARCH QUESTION: Our purpose was to examine torso kinematics and step width during gait in pregnant fallers, pregnant non-fallers and non-pregnant controls. We also examined trunk anthropometry in the pregnant groups to determine if pregnant fallers have different trunk physiques than pregnant non-fallers.

METHODS: 3D kinematic data were collected on 14 pregnant fallers, 15 pregnant non-fallers and 40 non-pregnant controls. Pregnant women were in their second or third trimester of pregnancy. Frontal plane translations of C7 and L4, step width, stride length, walking velocity, and 3D thoracic and pelvic kinematics were determined. Anthropometric torso measurements were obtained on the pregnant women. A series of MANCOVAs was performed (covariate: walking velocity, $\alpha = 0.05$) to compare the dependent variables between pregnant fallers, pregnant non-fallers, and controls. Tukey post-hoc analyses were performed when appropriate ($\alpha = 0.05$). A MANOVA compared anthropometric variables between pregnant fallers and non-fallers ($\alpha = 0.05$).

RESULTS: Pregnant non-fallers exhibited greater step width and frontal and transverse plane angles at heel contact and range of motion over the gait cycle when compared to the fallers. Trunk anthropometry did not differ between pregnant fallers and non-fallers. SIGNIFICANCE: Pregnancy-associated gait alterations differed between fallers and non-fallers. Greater step width of the pregnant non-fallers increased the base of support, thus increasing stability. Exercise participation may allow pregnant women to better adapt to their altered physiques and be more able to prevent a fall should a trip or slip occur.

Language: en

Keywords

Fallers; Gait; Kinematics; Pregnancy; Walking