

Safety Literature 21st June 2020**A 10-week yoga practice has no effect on cognition, but improves balance and motor learning by attenuating brain-derived neurotrophic factor levels in older adults**

Čekanauskaitė A, Skurvydas A, Zlibinaite L, Mickeviciene D, Kilikevičienė S, Solianik R. *Exp. Gerontol.* 2020; ePub(ePub): ePub.

(Copyright © 2020, Elsevier Publishing)

DOI 10.1016/j.exger.2020.110998 **PMID** 32544572

Abstract

Despite studies investigating the effect of yoga on cognitive and motor functioning in older adults, the effect on dual-task performance and motor learning and the specific mechanisms underlying the positive effect of yoga remain unclear. Thus, the aim of this study was to investigate the effects of yoga on cognition, balance under single- and dual-task conditions, and motor learning. The potential role of brain-derived neurotrophic factor (BDNF) in induced improvement was also explored. Participants aged 60-79 years were randomized to either a control group (n = 15) or a yoga group (n = 18) for a 10-week period. The yoga group received 90-min duration yoga classes two times per week. Changes in cognition, balance under single- and dual-task conditions, and learning fast and accurate reaching movements were assessed. Yoga practice decreased ($P < 0.05$) the velocity vector of the center of pressure under single- and dual-task conditions, whereas no changes in cognitive performance were observed. Although reaction and movement times during learning were decreased in both groups ($P < 0.05$), a faster reaction time ($P < 0.05$) and shorter movement time ($P < 0.05$) were observed in the yoga group than in the control group. Significant moderate relationships ($P < 0.05$) between changes in BDNF levels and functional improvements were observed. Thus, 10 weeks of yoga practice resulted in improved balance and learning in the speed-accuracy motor task that were mediated by increased BDNF levels, but had no impact on cognition in older adults.

Language: en

Keywords

Stress; Executive functions; BDNF; Dual-task; Mood

Association between dehydration and falls

Hamrick I, Norton D, Birstler J, Chen G, Cruz L, Hanrahan L. *Mayo Clin. Proc. Innov. Qual. Outcomes* 2020; 4(3): 259-265.

(Copyright © 2020, Elsevier Publishing)

DOI 10.1016/j.mayocpiqo.2020.01.003 PMID 32542217

Abstract

OBJECTIVE: To determine whether there is an association between dehydration and falls in adults 65 years and older.

Patients and Methods: We used University of Wisconsin Health electronic health records from October 1, 2011 to September 30, 2015 to conduct a retrospective cohort study of Midwestern patients 65 years and older and examined the association between dehydration at baseline (defined as serum urea nitrogen to creatinine ratio > 20, sodium level > 145 mg/dL, urine specific gravity > 1.030, or serum osmolality > 295 mOsm/kg) and falls within 3 years after baseline while accounting for prescriptions of loop diuretic, antidepressant, anticholinergic, antipsychotic, and benzodiazepine/hypnotic medications and demographic characteristics, using logistic regression.

Results: Of 30,634 patients, 37.9% (n=11,622) were dehydrated, 11.4% (n=3483) had a fall during follow-up, and 11.7% (n=3572) died during the follow-up period. We found a positive association of dehydration with falls alone (odds ratio [OR], 1.13; P=.002). For the outcome of falls or death, dehydration was positively associated (OR, 1.13; P=.001), along with loop diuretics (OR, 1.26; P<.001) and antipsychotic medications (OR, 1.52; P<.001).

Conclusion: More than one-third of older adults in this cohort were dehydrated, with a strong association between dehydration and falls. Understanding and addressing the risks associated with dehydration, including falls, has potential for improving quality of life for patients as they age.

Language: en

Keywords

EHR, electronic health record; ICD-9, International Classification of Diseases, Ninth Revision; med, medication; OR, odds ratio

Disability on performing daily living activities in the elderly and history of falls: an analysis of the National Health Survey, 2013

Drummond A, Pimentel WRT, Pagotto V, Menezes RL. Rev. Bras. Epidemiol. 2020; 23: e200055.

(Copyright © 2020, Associacao Brasileira de Pos-Graduacao em Saude Coletiva)

DOI 10.1590/1980-549720200055 **PMID** 32520105

Abstract

OBJECTIVE: The aim of this study was to verify the association between types of dependence for basic and instrumental activities of daily living and the occurrence of falls in the elderly.

METHODS: A cross-sectional, population-based study using data from 23,815 elderly people drawn from the National Health Survey (NHS) in 2013. The NHS, conducted by the Brazilian Institute of Geography and Statistics (IBGE) and the Ministry of Health, presents data collected in 81,767 households in more than 1,600 municipalities. The association between the independent variable (ADL disabilities) and the dependent variable (history of falls) was performed through multiple and crude analyses, regression.

RESULTS: There was a greater association between using the toilet and transfers (ABVD) and falls, and between shopping and taking care of finances (IADL) and falls. In addition, the association between Basic Activities of Daily Living and falls was greater for up to four activities, and the Instrumental Activities of Daily Living for up to three activities.

CONCLUSION: Thus, the results obtained in the NHS reinforce the planning of preventive strategies considering the functional dependence.

Language: en

Embarrassment experienced by older adults in relation to accidental falls: a concept analysis

Dolan H, Taylor-Piliae R. *Geriatr. Nurs.* 2020; ePub(ePub): ePub.

(Copyright © 2020, Elsevier Publishing)

DOI 10.1016/j.gerinurse.2020.05.007 **PMID** 32522426

Abstract

Embarrassment is commonly felt by older adults experiencing a fall, and embarrassment may cause older adults to adopt maladaptive behaviors by not implementing fall prevention strategies. Clarifying the concept of embarrassment for nursing and defining the concept as it relates to accidental falls and fall prevention among older adults was conducted using Walker and Avant's eight-step concept analysis process. The proposed definition of embarrassment experienced by older adults in relation to accidental falls is: The feeling of physical discomfort and exposure in a social situation due to the loss of control and self-esteem, as well as the inconsistency between one's personal identity as an independent and dignified person and the accidental fall or near fall behavior that threatens independence and dignity leading to emotional distress. Nurses recognizing older adults' potential fall-related embarrassment may increase older adults' adherence to fall prevention strategies and improve health outcomes.

Language: en

Keywords

Nursing; Accidental falls; Older adults; Concept analysis; Embarrassment

Factors associated with screening positive for high falls risk in fragility fracture patients: a cross-sectional study

Rotondi NK, Beaton DE, Sujic R, Bogoch E, Inrig T, Linton D, Weldon J, Jain R, Sale JEM. *BMC Musculoskelet. Disord.* 2020; 21(1): e372.

(Copyright © 2020, Holtzbrinck Springer Nature Publishing Group - BMC)

DOI 10.1186/s12891-020-03410-2 **PMID** 32532279

Abstract

BACKGROUND: We sought to report the prevalence of fragility fracture patients who were screened at high falls risk using a large provincial database, and to determine the characteristics associated with being screened at high falls risk.

METHODS: The study population included fragility fracture patients 50+ years of age who were screened at 35 hospital fracture clinics in Ontario over a 3.5 year period. The outcome was based on two screening questions measuring the risk of falling, both adapted from the STEADI (Stopping Elderly Accidents, Deaths & Injuries) tool. Multivariable associations of sociodemographic, fracture-related, and health-related characteristics were evaluated using logistic regression.

RESULTS: Of the sample, 9735 (44.5%) patients were classified as being at high falls risk, and 12,089 (55.3%) were not. In the multivariable logistic regression, being 80+ years of age (vs. 50-64 years of age), non-community dwelling (vs. living with spouse, family member, roommate), having a mental/physical impairment (vs. none), and taking multiple medications, were all strongly associated with being screened at high falls risk.

CONCLUSIONS: Living in a non-community dwelling and taking 4+ medications were the variables most strongly associated with being screened at high falls risk. These are potentially modifiable characteristics that should be considered when assessing falls risk in fragility fracture patients, and particularly when designing interventions for preventing subsequent falls. Ongoing work to address the higher risk of falls in the fragility fracture population is warranted.

Language: en

Keywords

Fragility fracture; Cross-sectional observational study; Deaths & Injuries); Risk of falling; STEADI (Stopping Elderly Accidents

Falls among Asians living in small apartments designed for older adults in Singapore

Ho EQY, Hong SI, Thang LL, Ong PH, Koh GCH. *J. Age. Environ.* 2020; 34(1): 31-47.

(Copyright © 2020, Informa - Taylor and Francis Group)

DOI 10.1080/02763893.2019.1627265 **PMID** unavailable

Abstract

This article aims to examine factors associated with falls in older adults residing in apartments designed with age-friendly features in Singapore. A cross-sectional study was conducted with 925 older adults aged 55 years and older, residing in studio apartments in Singapore. Multivariable backward logistic regression and independent factors associated with falls include older age, cataracts, urinary-tract disorders, general weakness, participation in family gatherings, and functional difficulty in dressing. Interaction effects were found for gender and walking long distances. Environmental factors were not independent factors for falls, although they were associated on bivariate analysis.

FINDINGS have implications on the importance of age-friendly design setting on fall prevention. Fall prevention efforts should be multidimensional and target modifiable risk factors for falls.

Language: en

Keywords

age-friendly environments; Aging-in-place; fall prevention; older adults

Fear of falling avoidance behavior affects the inter-relationship between vision impairment and diminished mobility in community-dwelling older adults

Lee SP, Hsu YW, Andrew L, Davis T, Johnson C. *Physiother. Theory Pract.* 2020; ePub(ePub): ePub.

(Copyright © 2020, Informa - Taylor and Francis Group)

DOI 10.1080/09593985.2020.1780656 **PMID** 32543314

Abstract

BACKGROUND: Age-related decline in vision may contribute to the development of fear of falling (FOF) behavior and reduced mobility, which are related to increased fall risk in older adults.

PURPOSE: To investigate the inter-relationship between vision impairment, physical mobility performance, and FOF behavior in community-dwelling older adults.

METHODS: A total of 400 participants from community centers (267 females; age = 74.8 (6.4), range = 65-97 years) participated in this cross-sectional study. Presence of age-related eye diseases (e.g. macular degeneration, cataracts, glaucoma, and retinopathy) and visual acuity (VA) was assessed. Physical mobility and FOF avoidance behavior were assessed using the Timed Up-and-Go (TUG) test and the Fear of Falling Avoidance Behavior Questionnaire (FFABQ). The inter-relationships between parameters were analyzed using mediation model analysis.

RESULTS: Significant decreases in mobility performance were observed in those with eye disease (eye disease = 9.56 [5.2] sec, no eye disease = 8.54 [2.75] sec; $p = .037$) and FOF avoidance behavior (avoiders = 12.87 [6.04] sec, non-avoiders = 8.51 [3.56] sec; $p < .001$). Furthermore, FOF behavior was found to significantly influence the inter-relationship between presence of eye disease and TUG performance ($p = .004$). VA alone had no significant effect on mobility ($p = .69$).

CONCLUSION: The presence of eye disease and the associated FOF behavior was related to decreased mobility and potentially increased fall risk. We recommend clinicians to inquire about the presence of eye disease and FOF behavior to identify risk factors related to falls in older adults.

Language: en

Keywords

fear of falling; Aging; vision; eye disease; falling

Lateral perturbation-induced and voluntary stepping in fallers and nonfallers after stroke

Gray VL, Fujimoto M, Rogers MW. Phys. Ther. 2020; ePub(ePub): ePub.

(Copyright © 2020, American Physical Therapy Association)

DOI 10.1093/ptj/pzaa109 PMID 32529236

Abstract

OBJECTIVE: A loss of balance poststroke from externally induced-perturbations or during voluntary movements is often recovered by stepping. The purpose of this study was to characterize stepping behavior during lateral induced waist-pull perturbations and voluntary steps in community-dwelling fallers and nonfallers with chronic stroke.

METHODS: This study used a cohort design. Thirty participants > 6 months poststroke were exposed to 24 externally triggered lateral waist-pull perturbations and 20 voluntary steps. Balance-tolerance-limit (BTL) (transition from single to multiple steps) and first step type were determined for the waist-pull perturbations. Step parameters of initiation time, velocity, first step length, and clearance were calculated at and above BTL and for the voluntary steps. Hip abductor/adductor torque, foot cutaneous sensation, and self-reported falls that occurred 6 months prior were evaluated.

RESULTS: Twelve participants were classified retrospectively as fallers and 18 as nonfallers. Fallers had a reduced BTL and took more medial first steps than nonfallers. Above BTL, no between-group differences were found in medial steps. At BTL, the nonparetic step clearance was reduced in fallers. Above BTL, fallers took longer to initiate a paretic and nonparetic step and had a reduced nonparetic step length and clearance when compared with nonfallers. There was a between group difference in step initiation time for voluntary stepping with the paretic leg ($P < .05$). Fallers had a reduced paretic abductor torque and impaired paretic foot cutaneous sensation.

CONCLUSION: A high fall rate poststroke necessitates effective fall prevention strategies. Given that more differences were found during perturbation induced stepping between fallers and non-fallers, further research assessing perturbation induced training on reducing falls is needed.

IMPACT: Falls assessments should include both externally induced perturbations, along with voluntary movements in determining the fall risk.

Language: en

Keywords

Falls; Balance; Reaction Time; Step; Stroke

Measuring gait variables using computer vision to assess mobility and fall risk in older adults with dementia

Ng KD, Mehdizadeh S, Iaboni A, Mansfield A, Flint A, Taati B. IEEE J. Transl. Eng. Health Med. 2020; 8: e2100609.

(Copyright © 2020, Institute of Electrical and Electronics Engineers)

DOI 10.1109/JTEHM.2020.2998326 PMID 32537265

Abstract

Fall risk is high for older adults with dementia. Gait impairment contributes to increased fall risk, and gait changes are common in people with dementia, although the reliable assessment of gait is challenging in this population. This study aimed to develop an automated approach to performing gait assessments based on gait data that is collected frequently and unobtrusively, and analysed using computer vision methods. Recent developments in computer vision have led to the availability of open source human pose estimation algorithms, which automatically estimate the joint locations of a person in an image. In this study, a pre-existing pose estimation model was applied to 1066 walking videos collected of 31 older adults with dementia as they walked naturally in a corridor on a specialized dementia unit over a two week period. Using the tracked pose information, gait features were extracted from video recordings of gait bouts and their association with clinical mobility assessment scores and future falls data was examined. A significant association was found between extracted gait features and a clinical mobility assessment and the number of future falls, providing concurrent and predictive validation of this approach.

Language: en

Keywords

dementia; falls; Computer vision; gait; pose tracking; stability

Older adults' perspectives on fall risk: linking results to the ICF

de Clercq H, Naudé A, Bornman J. J. Appl. Gerontol. 2020; ePub(ePub): ePub.

(Copyright © 2020, SAGE Publishing)

DOI 10.1177/0733464820929863 PMID 32525435

Abstract

The aim of this study is to establish the perceptions of older adults in the South African context regarding falls and to link these perceptions to the International Classification of Functioning, Disability and Health (ICF). Data were analyzed by a summative, conventional, and deductive approach. The analysis indicated that the Body Function and Structure codes were most frequently used during the discussions, but the contextual analysis of the most frequently used categories indicated that Activities and Participation were the participants' main focus. The main focus of fall assessment in older adults should therefore be on Activities and Participation, as this can assist them in decreasing their fall risk, irrespective of whether they had a previous fall. Contrary to the majority of current literature on falls, this study included both participants who had fallen and those who hadn't, resulting in richer data and themes gathered from the focus groups.

Language: en

Keywords

falls; older adults; fall risk; focus groups; disability and health; Disability and Health; fall perception; ICF; International Classification of Functioning

Older adults' preferences for, adherence to and experiences of two self-management falls prevention home exercise programmes: a comparison between a digital programme and a paper booklet

Mansson L, Lundin-Olsson L, Skelton DA, Janols R, Lindgren H, Rosendahl E, Sandlund M. *BMC Geriatr.* 2020; 20(1): e209.

(Copyright © 2020, Holtzbrinck Springer Nature Publishing Group - BMC)

DOI 10.1186/s12877-020-01592-x PMID 32539711

Abstract

BACKGROUND: Fall prevention exercise programmes are known to be effective, but access to these programmes is not always possible. The use of eHealth solutions might be a way forward to increase access and reach a wider population. In this feasibility study the aim was to explore the choice of programme, adherence, and self-reported experiences comparing two exercise programmes - a digital programme and a paper booklet.

METHODS: A participant preference trial of two self-managed fall prevention exercise interventions. Community-dwelling adults aged 70 years and older exercised independently for four months after one introduction meeting. Baseline information was collected at study start, including a short introduction of the exercise programme, a short physical assessment, and completion of questionnaires. During the four months intervention period, participants self-reported their performed exercises in an exercise diary. At a final meeting, questionnaires about their experiences, and post-assessments, were completed. For adherence analyses data from diaries were used and four subgroups for different levels of participation were compared. Exercise maintenance was followed up with a survey 12 months after study start. **RESULTS:** Sixty-seven participants, with mean age 77 ± 4 years were included, 72% were women. Forty-three percent chose the digital programme. Attrition rate was 17% in the digital programme group and 37% in the paper booklet group ($p = .078$). In both groups 50-59% reported exercise at least 75% of the intervention period. The only significant difference for adherence was in the subgroup that completed $\geq 75\%$ of exercise duration, the digital programme users exercised more minutes per week ($p = .001$). Participants in both groups were content with their programme but digital programme users reported a significantly higher ($p = .026$) degree of being content, and feeling supported by the programme ($p = .044$). At 12 months follow-up 67% of participants using the digital programme continued to exercise regularly compared with 35% for the paper booklet ($p = .036$).

CONCLUSIONS: Exercise interventions based on either a digital programme or a paper booklet can be used as a self-managed, independent fall prevention programme. There is a similar adherence in both programmes during a 4-month intervention, but the digital programme seems to facilitate long-term maintenance in regular exercise.

TRIAL REGISTRATION: ClinTrial: NCT02916849.

Language: en

Keywords

Aged; Aged, 80 and over; eHealth; Self-management; Exercise; Accidental falls; mHealth; Digital health; Falls prevention; Independent living

Relationship between balance, gait, and activities of daily living in older adults with dementia

Lee NG, Kang TW, Park HJ. *Geriatr Orthop Surg Rehabil* 2020; 11: e2151459320929578.

(Copyright © 2020, SAGE Publishing)

DOI 10.1177/2151459320929578 PMID 32528740

Abstract

INTRODUCTION: Gait characteristics are closely associated with executive functions including basic and high-level cognitive processes such as attention, working memory, decision-making, and problem-solving. Impaired cognitive function resulting from dementia is associated with loss of balance and poor activities of daily living (ADLs). If associations between gait parameters, balance, and ADLs are observed, then quantitative gait analysis may be optimal for reinforcing balance and ADL assessments in people with dementia. This study aimed to determine the association between balance, gait, and ADLs in older adults with dementia.

Materials and Methods: A cross-sectional study was conducted in 46 older adults who have been diagnosed with dementia. Measurements including the Mini-Mental State Examination-Korean version (MMSE-K), Berg Balance Scale (BBS), 10-meter walk test (10MWT), Modified Barthel index (MBI), and GAITRite were used to assess cognitive function, balance, walking speed, ADLs, and gait parameters, respectively. The Pearson product correlation coefficient (r) was used for correlation analysis.

Results and Discussion: Among the gait parameters, velocity was positively associated with the BBS, 10MWT, and MBI ($r = 0.341-0.516$, $P > .05$). Step length ($r = 0.301-0.586$, $P > .05$), stride length ($r = 0.329-0.580$, $P > .05$), and walk ratio ($r = 0.324-0.556$, $P > .05$) were positively associated with the MMSE-K, BBS, 10MWT, and MBI. A moderate positive association between single support time and MBI was observed ($r = 0.308$, $P = .039$). Additionally, a moderate negative association between double support time and the MBI was observed ($r = -0.349$, $P = .019$). This study presents the first empirical evidence on the association between balance, gait, and ADLs in older adults with dementia.

Conclusions: This study identified important associations between balance, gait, and ADL assessments in people with dementia. Further studies involving targeted interventions addressing gait parameters and improving balance and functional performance in people with dementia are required in the future.

Language: en

Keywords

dementia; older adults; activities of daily living; balance; gait parameters

Research priorities on falls in older adults with cancer

Sattar S, Haase K, Wildes T. J. Geriatr. Oncol. 2020; ePub(ePub): ePub.

(Copyright © 2020, Elsevier Publishing)

DOI 10.1016/j.jgo.2020.05.014 **PMID** 32540129

Abstract

[Abstract unavailable]

Language: en

Risk of falling and associated factors in older adults with a previous history of falls

Pellicer-García B, Antón-Solanas I, Ramón-Arbués E, García-Moyano L, Gea-Caballero V, Juárez-Vela R. *Int. J. Environ. Res. Public Health* 2020; 17(11): e4085.

(Copyright © 2020, MDPI: Multidisciplinary Digital Publishing Institute)

DOI 10.3390/ijerph17114085 **PMID** 32521701

Abstract

Falls in the elderly are one of the main geriatric syndromes and a clear indicator of fragility in the older adult population. This has serious consequences, leading to an increase in disability, institutionalization and death. The purpose of this cross-sectional study was to analyze the prevalence of risk of falling and associated factors in a population of 213 non-institutionalised, able older adults with a history of falling in the previous year. We used the following assessment tools: Questionnaire of the WHO for the study of falls in the elderly, Geriatric Depression Scale and Tinetti's Gait and Balance Assessment Tool. Age, using ambulatory assistive devices, poly medication, hospital admission following a fall and depression were significantly associated with risk of falling. In order to prevent fall reoccurrence, community-based fall prevention programs should be implemented.

Language: en

Keywords

accidental falls; aged; risk factors; gait; postural balance

Sex differences in perceptions toward falls among older adults living in the community in Singapore

Tay PKC, Chan A, Tan PJ, Wong CH. J. Aging Health 2020; ePub(ePub): ePub.

(Copyright © 2020, SAGE Publishing)

DOI 10.1177/0898264320925972 **PMID** 32544023

Abstract

Fall prevention strategies informed by understanding sex differences in the perception of falls may be fruitful.

OBJECTIVES: In the current research, we examined the consequence of having a recent fall episode on sex differences in fall perception based on the postulation that having a recent fall can lead to perceived susceptibility and attenuate male stereotypic perceptions toward falls.

METHODS and Results: Examining 549 older adults (337 women) living in the community, men reported higher falls efficacy, less negative perception related to the effect of a fall, and lower tendency to restrict activities to prevent falls. These sex differences were observed only among those who did not have a recent fall episode, and no significant sex differences were observed among those who fell.

DISCUSSION: The findings suggest that a recent fall episode may underlie sex differences in falls perception. The implications of sex differences in perceptions in falls for healthcare delivery and outcomes are discussed.

Language: en

Keywords

gender differences; falls; fear of falling; concerns about falls

Sleep quality, anxiety, and depression are associated with fall risk factors in older women

Serrano-Checa R, Hita-Contreras F, Jiménez-García JD, Achalandabaso-Ochoa A, Aibar-Almazán A, Martínez-Amat A. *Int. J. Environ. Res. Public Health* 2020; 17(11): e4043.

(Copyright © 2020, MDPI: Multidisciplinary Digital Publishing Institute)

DOI 10.3390/ijerph17114043 **PMID** 32517112

Abstract

Gait, dynamic balance, and functional mobility problems are well-known fall risk factors. Furthermore, sleep disturbances, anxiety, and depression are prevalent among older women. This study aimed to analyze the associations of sleep quality, anxiety, and depression with functional mobility, gait speed, and dynamic balance in community-dwelling postmenopausal women aged ≥ 60 years. A total of 271 women (69.18 ± 5.69 years) participated in this study. Functional mobility (Timed Up-and-Go Test), dynamic balance (3-meter tandem walk test), gait speed (OptoGait® optical detection system), sleep quality (Pittsburgh Sleep Quality Index), and anxiety and depression (Hospital Anxiety and Depression Scale) were assessed. Our results showed that poor sleep efficiency and the use of sleeping medication were related to decreased gait speed ($R^2 = 0.072$). Poor functional mobility was linked to depression and the use of sleeping medication ($R^2 = 0.159$). Additionally, increased symptoms of anxiety and depression were associated with worsened dynamic balance ($R^2 = 0.127$). In conclusion, poorer sleep quality is associated with slower gait speed and reduced functional mobility, which is also related, along with impaired dynamic balance, to higher levels of anxiety and depression.

Language: en

Keywords

depression; anxiety; dynamic balance; functionality; gait speed; sleep quality

Timed up and go and six-minute walking tests with wearable inertial sensor: one step further for the prediction of the risk of fall in elderly nursing home people

Buisseret F, Catinus L, Grenard R, Jójczyk L, Fievez D, Barvaux V, Dierick F. *Sensors* (Basel) 2020; 20(11): e3207.

(Copyright © 2020, MDPI: Multidisciplinary Digital Publishing Institute)

DOI 10.3390/s20113207 **PMID** 32516995

Abstract

Assessing the risk of fall in elderly people is a difficult challenge for clinicians. Since falls represent one of the first causes of death in such people, numerous clinical tests have been created and validated over the past 30 years to ascertain the risk of falls. More recently, the developments of low-cost motion capture sensors have facilitated observations of gait differences between fallers and nonfallers. The aim of this study is twofold. First, to design a method combining clinical tests and motion capture sensors in order to optimize the prediction of the risk of fall. Second to assess the ability of artificial intelligence to predict risk of fall from sensor raw data only. Seventy-three nursing home residents over the age of 65 underwent the Timed Up and Go (TUG) and six-minute walking tests equipped with a home-designed wearable Inertial Measurement Unit during two sets of measurements at a six-month interval. Observed falls during that interval enabled us to divide residents into two categories: fallers and nonfallers. We show that the TUG test results coupled to gait variability indicators, measured during a six-minute walking test, improve (from 68% to 76%) the accuracy of risk of fall's prediction at six months. In addition, we show that an artificial intelligence algorithm trained on the sensor raw data of 57 participants reveals an accuracy of 75% on the remaining 16 participants.

Language: en

Keywords

elderly; clinical tests; gait variability; risk of fall; wearable sensor

Using the Drug Burden Index to identify older adults at highest risk for medication-related falls

Blalock SJ, Renfro CP, Robinson JM, Farley JF, Busby-Whitehead J, Ferreri SP. *BMC Geriatr.* 2020; 20(1): e208.

(Copyright © 2020, Holtzbrinck Springer Nature Publishing Group - BMC)

DOI 10.1186/s12877-020-01598-5 PMID 32532276

Abstract

BACKGROUND: The Drug Burden Index (DBI) was developed to assess patient exposure to medications associated with an increased risk of falling. The objective of this study was to examine the association between the DBI and medication-related fall risk.

METHODS: The study used a retrospective cohort design, with a 1-year observation period. Participants ($n = 1562$) were identified from 31 community pharmacies. We examined the association between DBI scores and four outcomes. Our primary outcome, which was limited to participants who received a medication review, indexed whether the review resulted in at least one medication-related recommendation (e.g., discontinue medication) being communicated to the participant's health care provider. Secondary outcomes indexed whether participants in the full sample: (1) screened positive for fall risk, (2) reported 1+ falls in the past year, and (3) reported 1+ injurious falls in the past year. All outcome variables were dichotomous (yes/no).

RESULTS: Among those who received a medication review ($n = 387$), the percentage of patients receiving at least one medication-related recommendation ranged from 10.2% among those with DBI scores of 0 compared to 60.2% among those with DBI scores ≥ 1.0 (Chi-square (4)=42.4, $p < 0.0001$). Among those screened for fall risk ($n = 1058$), DBI scores were higher among those who screened positive compared to those who did not (Means = 0.98 (SD = 1.00) versus 0.59 (SD = 0.74), respectively, $p < 0.0001$).

CONCLUSION: Our findings suggest that the DBI is a useful tool that could be used to improve future research and practice by focusing limited resources on those individuals at greatest risk of medication-related falls.

Language: en

Keywords

Accidental falls; Aging; Medication; Health services; Medication therapy management

Does neuromodulation transcranial direct current stimulation (tDCS) associated with peripheral stimulation through exercise to walk have an impact on falls in people with Parkinson's disease?

Arêas FZS, Nakamura-Palacios EM, Boening A, Arêas GPT, Nascimento LR. Med. Hypotheses 2020; 144: e109916.

(Copyright © 2020, Elsevier Publishing)

DOI 10.1016/j.mehy.2020.109916 **PMID** 32526508

Abstract

Parkinson's disease (PD) is one of the most prevalent neurodegenerative diseases in the world, with a high degree of disability. Among the various therapeutic possibilities, brain stimulation appears in a promising approach, with deep brain stimulation (DBS) being the best described and successful, yet it has the limitation of being invasive. In this context we present transcranial direct current stimulation (tDCS), a non-invasive treatment that brings a new perspective when thinking about treatment of neurological diseases. It is easy to handle, low cost, few side effects and good adherence to patients. TDCS presents good evidence for clinical practice, but when it comes to PD the results obtained are inconclusive and some protocols have not yet been tested. In this hypothesis we propose that the use of tDCS applied in the supplemental motor areas, together with a gait training, can facilitate the motor learning and modulate the neurons for better potentiation of the exercises together with patients with walking difficulties due to PD.

Language: en

Keywords

Rehabilitation; Electrical stimulation; Gait; Parkinson

Effect of height of fall on mortality in patients with fall accidents: a retrospective cross-sectional study

Hsieh TM, Tsai CH, Liu HT, Huang CY, Chou SE, Su WT, Hsu SY, Hsieh CH. *Int. J. Environ. Res. Public Health* 2020; 17(11): e4136.

(Copyright © 2020, MDPI: Multidisciplinary Digital Publishing Institute)

DOI 10.3390/ijerph17114163 PMID 32545236

Abstract

BACKGROUND: Accidental falls are a common cause of injury and deaths. Both ground-level falls (GLF) and non-GLF may lead to significant morbidity or mortality. This study aimed to explore the relationship between height of falls and mortality.

METHOD: This is a retrospective study based on the data from a registered trauma database and included 8699 adult patients who were hospitalized between 1 January 2009 and 31 December 2017 for the treatment of fall-related injuries. Study subjects were divided into three groups of two categories based on the height of fall: GLF (group I: < 1 m) and non-GLF (group II: 1-6 m and group III: > 6 m). The primary outcome was in-hospital mortality. The adjusted odds ratio (AOR) of mortality adjusted for age, sex, and comorbidities with or without an injury severity score (ISS) was calculated using multiple logistic regression.

RESULTS: Among the 7001 patients in group I, 1588 in group II, and 110 in group III, patients in the GLF group were older, predominantly female, had less intentional injuries, and had more pre-existing comorbidities than those in the non-GLF group. The patients in the non-GLF group had a significantly lower Glasgow Coma Scale (GCS), a higher injury severity score (ISS), worse physiological responses, and required more procedures performed in the emergency department. The mortality rate for the patients in group I, II, and III were 2.5%, 3.5%, and 5.5%, respectively. After adjustment by age, sex, and comorbidities, group II and group III patients had significantly higher adjusted odds of mortality than group I patients (AOR 2.2, 95% CI 1.64-2.89, $p < 0.001$ and AOR 2.5, 95% CI 1.84-3.38, $p < 0.001$, respectively). With additional adjustment by ISS, group II did not have significantly higher adjusted odds of mortality than group I patients (AOR 1.4, 95% CI 0.95-2.22, $p = 0.082$), but group III patients still had significantly higher adjusted odds of mortality than group I patients (AOR 10.0, 95% CI 2.22-33.33, $p = 0.002$).

CONCLUSION: This study suggested that patients who sustained GLF and non-GLF were distinct groups of patients, and the height of fall did have an impact on mortality in patients of fall accidents. A significantly higher adjusted odds of mortality was found in the GLF group than in the non-GLF group after adjusting for age, sex, and comorbidities.

Language: en

Keywords

mortality; fall accident; ground-level falls (GLF); height of fall; injury severity score (ISS)

Effects of innovative hip-knee-ankle interlimb coordinated robot training on ambulation, cardiopulmonary function, depression, and fall confidence in acute hemiplegia

Park C, Oh-Park M, Dohle C, Bialek A, Friel K, Edwards D, Krebs HI, You JSH. NeuroRehabilitation 2020; ePub(ePub): ePub.

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Abstract

BACKGROUND: While Walkbot-assisted locomotor training (WLT) provided ample evidence on balance and gait improvements, the therapeutic effects on cardiopulmonary and psychological elements as well as fall confidence are unknown in stroke survivors.

OBJECTIVE: The present study aimed to compare the effects of Walkbot locomotor training (WLT) with conventional locomotor training (CLT) on balance and gait, cardiopulmonary and psychological functions and fall confidence in acute hemiparetic stroke.

METHODS: Fourteen patients with acute hemiparetic stroke were randomized into either the WLT (60-minute physical therapy +30-minute Walkbot-assisted gait training) or CLT (60min physical therapy +30min gait training) groups, 7 days/week over 2 weeks. Clinical outcomes included the Berg balance scale (BBS), functional ambulation category (FAC), heart rate (HR) and Borg rating of perceived exertion (BRPE), Beck depression inventory-II (BDI-II), and the activities-specific balance confidence (ABC) scale. The analysis of covariance (ANCOVA) was conducted at $P < 0.05$.

RESULTS: ANCOVA showed that WLT showed superior effects, compared to CLT, on FAC, HR, BRPE, BDI-II, and ABC scale ($P < 0.05$), but not on BBS ($P=0.061$).

CONCLUSIONS: Our results provide novel, promising clinical evidence that WLT improved balance and gait function as well as cardiopulmonary and psychological functions, and fall confidence in acute stroke survivors who were unable to ambulate independently.

Language: en

Keywords

cardiopulmonary function; hemiplegia; Neurorehabilitation; psychological function; robotic-assisted gait training; stroke; walkbot

Elucidating failure mechanisms in human femurs during a fall to the side using bilateral digital image correlation

Grassi L, Kok J, Gustafsson A, Zheng Y, Väänänen SP, Jurvelin JS, Isaksson H. J. Biomech. 2020; 106: e109826.

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Abstract

An improved understanding of the mechanical properties of human femurs is a milestone towards a more accurate assessment of fracture risk. Digital image correlation (DIC) has recently been adopted to provide full-field strain measurements during mechanical testing of femurs. However, it has typically been used to measure strains on the anterior side of the femur, whereas in both single-leg-stance and sideways fall loading conditions, the highest deformations result on the medial and lateral sides of the femoral neck. The goal of this study was to measure full-field deformations simultaneously on the medial and lateral side of the femoral neck in a configuration resembling a fall to the side. Twelve female cadaver femurs were prepared for DIC measurements and tested in sideways fall at 5 mm/s displacement rate. Two pairs of cameras recorded the medial and lateral side of the femoral neck, and deformations were calculated using DIC. The samples exhibited a two-stage failure: first, a compressive collapse on the superolateral side of the femoral neck in conjunction with peak force, followed by complete femoral neck fracture at the force drop following the post-elastic phase. DIC measurements corroborated this observation by reporting no tensile strains above yield limit for the medial side of the neck up to peak force. DIC measurements registered onto the bone micro-architecture showed strain localizations in proximity of cortical pores due to, for instance, blood vessels. This could explain previously reported discrepancies between simulations and experiments in regions rich with large pores, like the superolateral femoral neck.

Language: en

Keywords

Mechanical testing; Digital image correlation; Direction of principal strain; Femurs; Hip fractures; Sideways fall; Strain distribution

Epidemiology of balance disorders in primary care

Domínguez-Durán E, Mármol-Szombathy I, Palmero-Olmo E, Nogales-Nieves A, López-Urbano MJ, Palomo-Sánchez A, Alarcón-Balanza F, Ruiz-de Arcos M, Bullón-Fernández B, Valle-Martín F, Mora-Quintero A, Poyatos-Poyatos B, Manjón-Collado MT, Sánchez-Gómez S. *Acta Otorrinolaringol. Esp.* 2020; ePub(ePub): ePub.

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Abstract

BACKGROUND AND OBJECTIVE: In our country, there are no series of patients that have described the incidence of the different diseases which cause balance disorders (BD) in primary care. The objective of this study is to calculate the incidence of each disease to propose specific training measures.

MATERIALS AND METHOD: Prospective cross-sectional study. Patient data of five primary care physicians in five different primary care centres in our hospital area were collected. All patients who attended consultations for any type of vertigo, imbalance or dizziness over one year as the main reason for consultation were recruited. Using a diagnostic-therapeutic algorithm, patients were diagnosed and treated in primary care or referred for study in hospital care.

RESULTS: The population studied was 7,896 people. An annual incidence of BD of 2.2% was detected. Of the cases, 56.1% could be diagnosed and treated in primary care. Of the patients, 53.8% were diagnosed with some type of positional vertigo; the next three most frequent diagnoses were vestibular migraine, central nervous system ischaemia and medication side effects. These four groups accounted for 87.9% of the population.

CONCLUSIONS: The incidence of BD in primary care requires an approach that includes training in the diagnosis and treatment of benign paroxysmal positional vertigo, headache, cardiovascular risk factors and pharmacology. It is not necessary to prescribe vestibular suppressants in most patients.

Language: en

Keywords

Primary care; Atención primaria; Benign paroxysmal positional vertigo; Cerebral small vessel diseases; Drug-related side effects and adverse reactions; Efectos colaterales y reacciones adversas relacionados con fármacos; Enfermedad cerebral de pequeños vasos; Lesiones cerebrales vasculares; Migraña vestibular; Vascular brain injuries; Vértigo posicional paroxismal benigno; Vestibular migraine

Exploring of the mechanism of rib fracture caused by landing on different parts of the trunk after falls from height using finite element method

Hu WH, Shao Y, Li ZD, Zou DH, Zhang JH, Chen YJ, Wang HJ. *Fa Yi Xue Za Zhi* 2020; 36(2): 181-186.

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Abstract

OBJECTIVE To study the mechanism of rib fracture caused by landing on different parts of the trunk using finite element method, and to provide some new techniques and new ideas for the reconstruction of the whole process of falls from height.

METHODS The finite element method was used to study the rib fracture of human security model THUMS4.0 caused by landing on different parts of the trunk. Then the model was compared with actual cases and the mechanism of rib fracture caused by falls from height was analyzed from a biomechanical point of view.

RESULTS There were some differences in the stress and strain distribution as well as the rib fracture sites when different parts touched the ground. Ribs on both sides of the body were fractured when the front of the trunk touched the ground, and the fractures were mainly located in the junction of the ribs and costal cartilage and the midaxillary line area. When the right anterior part of the trunk touched the ground, rib fracture occurred first on the side that touched the ground, and rib fractures were mainly located in the area from the right midaxillary line to the posterior axillary line, and junction of ribs on both sides and costal cartilage. When the back of the trunk touched the ground, the fracture sites were mainly located on the back of the ribs on both sides. When the right posterior part of the trunk touched the ground, multiple rib fractures were likely to occur in the parts that touched the ground. The plastic strains were mainly concentrated at the fracture sites, while the von Mises stresses were not only concentrated at the fracture sites, but also at other sites.

CONCLUSION There are some differences in rib fracture location sites and injury mechanisms when different parts of the trunk touch the ground.

Language: en

Keywords

forensic pathology; biomechanics; finite element method; rib fractures; fractures, stress; injury caused by fall from height; damage mechanism

Improving safety, efficiency, and productivity: evaluation of fall protection systems for bridge work using wearable technology and utility analysis

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Abstract

The construction industry is experiencing a number of challenges. For example, construction workplaces report poor safety performance, widespread inefficiencies, and stagnant productivity rates. These challenges often translate into higher-order issues including cost overruns, schedule growths, and project failure. Accordingly, much of construction research has focused on identifying best practices to improve safety, efficiency, and productivity. However, the majority of these efforts focus on resolving one of these challenges (e.g., safety) rather than holistically addressing safety, efficiency, and productivity in unison. Unfortunately, such an approach can yield unintended consequences in certain circumstances. For example, a narrow focus on productivity may adversely affect safety performance, and vice versa. One nationwide safety issue that has received much recent attention is the protection of highway and bridge workers from falls to lower levels when working on bridge decks. In these circumstances, highway and bridge workers largely rely on existing bridge guardrails for their protection against falls. However, most bridge guardrails do not offer a barrier height of $107\pm 8\text{cm}$ ($42\pm 3\text{in.}$) for sufficient protection as per regulatory requirements. To protect these workers, a few transportation agencies are beginning to adopt passive fall protection systems that can be attached to the guardrails to temporarily increase the barrier height. The purpose of the current research was to support these efforts by evaluating four fall protection systems that are actively being considered for adoption based on the expected safety, efficiency, and productivity benefits they offer. The study objectives were accomplished through 96 field trials where physiological responses, postural demands, activity rates, and the associated utility were gathered from participating workers using wearable technology and a questionnaire survey. The research effort identified fall protection systems that offer the most advantages in terms of safety, efficiency, and productivity. The adoption of the recommended systems can yield substantial benefits in terms of safety, efficiency, and productivity, apart from reducing the risk of falls.

Language: en

Risk of falls in people with chronic kidney disease and related factors

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Abstract

OBJECTIVE: to identify the risk and prevalence of falls in the last year in chronic renal failure patients on hemodialysis; to associate the risk of falls with the fear of falling and socio-demographic-clinical variables.

METHOD: association study. 131 individuals participated in the study. The Morse Falls Scale, the Fall Efficacy Scale and the Tilburg Frailty Indicator were used. The data were analyzed by linear regression, the level of significance adopted was 0.05.

RESULTS: 97.7% were at risk for falls and 37.4% had at least one fall per year, with a mean of 2.02. Extreme concern about falling was presented by women, patients with less education, amputees, and frail individuals. Diabetes, as a comorbidity, and people with difficulty or need for assistance for ambulance showed a significant increase in the occurrence of falls.

CONCLUSION: high risk and high prevalence of falls were found in hemodialysis patients, greater in those with diabetes or mobility limitations. Fear of falling was identified especially in women and in people with less education. These findings challenge the role of preventing falls, both in hemodialysis sessions and in the adoption of strategies for activities of daily living that involve patients and their families.

Language: en