Safety Literature 17th November 2019

A modelling-based economic evaluation of primary-care-based fall-risk screening followed by fall-prevention intervention: a cohort-based Markov model stratified by older age groups

Franklin M, Hunter RM. Age Ageing 2019; ePub(ePub): ePub.

Affiliation

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DOI 10.1093/ageing/afz125 **PMID** 31711110

Abstract

BACKGROUND: fall-risk assessment with fall-prevention intervention referral for at-risk groups to avoid falls could be cost-effective from a care-payer perspective. AIMS: to model the cost-effectiveness of a fall-risk assessment (QTUG compared to TUG) with referral to one of four fall-prevention interventions (Otago, FaME, Tai Chi, home safety assessment and modification) compared to no care pathway, when the decision to screen is based on older age in a primary care setting for community-dwelling people.

METHODS: a cohort-based, decision analytic Markov model was stratified by five age groupings (65-70, 70-75, 65-89, 70-89 and 75-89) to estimate cost per quality-adjusted life years (QALYs). Costs included fall-risk assessment, fall-prevention intervention and downstream resource use (e.g. inpatient and care home admission). Uncertainty was explored using univariate, bivariate and probabilistic sensitivity analyses.

RESULTS: screening with QTUG dominates (>QALYs; 85%), relative to those aged 70-74 (~10 < 30%) or 65-69 (<10%). In the older age group, only a 10% referral uptake is required for the QTUG with FaME or Otago modelled care pathways to remain cost-effective.

CONCLUSION: the highest probability of cost-effectiveness observed was a care pathway incorporating QTUG with FaME in those aged 75-89. Although the model does not fully represent current NICE Falls guidance, decision makers should still give careful consideration to implementing the aforementioned care pathway due to the modelled high probability of cost-effectiveness.

Language: en

Keywords
cost-effectiveness; economic model; fall-prevention intervention; fall-risk screening; falls; older people

Balance training using virtual reality improves balance and physical performance in older adults at high risk of falls

Phu S, Vogrin S, Al Saedi A, Duque G. Clin. Interv. Aging 2019; 14: 1567-1577.

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DOI 10.2147/CIA.S220890 **PMID** 31695345

Abstract

PURPOSE: Exercise programs designed for falls prevention have been proven effective in reducing falls by approximately 21%. Virtual reality may provide a viable alternative intervention for falls prevention. This study compared the effects of virtual reality training using the Balance Rehabilitation Unit (BRU) versus exercise using a modified Otago Exercise Programme (EX) on improving balance and physical performance in the short-term restorative care setting of the Gait and Balance Gym (Gabagym).

PATIENTS AND METHODS: This was a pre- and post-intervention study of 195 participants (median age 78 years, IQR 73-84; 67% female) who presented with a risk and/or history of falls. Participants were assigned to either EX (n=82) or BRU (n=63). Supervised sessions occurred twice a week for 6 weeks. Participants receiving interventions were compared to a separate group (n=50) with similar characteristics who did not receive any intervention. Balance and physical performance were assessed at initial and final attendance and included the 5 Times Sit to Stand (5STS) test, Timed Up and Go (TUG), gait speed and posturography assessment using the BRU. Fear of falling was assessed using the Falls Efficacy Scale. Handgrip strength and adherence were also monitored.

RESULTS: Post-intervention, EX and BRU groups achieved similar improvements and reported similar adherence rates (71% vs 72%, respectively). Both intervention groups improved in balance and physical performance measures. Both interventions showed significantly better improvement than the non-intervention group in TUG ($p<0.001$), gait speed ($p=0.021$), limits of stability in posturography assessment ($p=0.008$), FES-I score ($p=0.013$) and handgrip strength ($p=0.021$). Only the BRU group improved control of static posture in the eyes closed ($p=0.002$) and foam eyes closed ($p=0.006$) tasks.

CONCLUSION: This study highlights the potential use of virtual reality as a practical alternative to improve outcomes of balance training for reduction of falls risk in older adults.

Language: en

Keywords

exercise; falls; fractures; posture; virtual reality

Comparison of a static, independent balance protocol and the National Institute on Aging balance protocol on stability and risk of falling in the elderly

Jacobson BH, Sellers J, Monaghan T, Schnaiter-Brasche J, Loy K, Estrada C, Moghaddam M. Activ. Adapt. Aging 2019; 43(1): 37-50.

DOI

10.1080/01924788.2018.1467140

Abstract

Falls by the elderly are preceded by muscle weakness and deteriorated sensory input. The aim of this study was to compare the effectiveness of an independent static balance (ISB) protocol with the National Institute on Aging (NIA) supervised protocol for improving balance. Sixteen participants (age 88.6 ± 4.3 year) were randomly placed in the ISB or NIA group. Pre- and posttests included fall risk (FR), overall stability (OS), anterior/posterior index (API), and medial and lateral index (MLI). Training consisted of 20 min, 2 × weeks for 12 weeks. The NIA group demonstrated greater improvement in all variables compared to the ISB group except for FR; however, there were no significant differences ($p > 0.05$) between the groups among any dependent variable. Static balance exercises conducted independently led to similar improvements in balance and FR reduction as the highly supervised NIA protocol. Balance can be improved independently without close supervision thus allowing personnel to tend to other patients.

Language: en

Keywords

Balance; elderly; exercise; falls

Effectiveness of combined cognitive and physical interventions to enhance functioning in older adults with mild cognitive impairment: a systematic review of randomized controlled trials

Yang C, Moore A, Mpofu E, Dorstyn D, Li Q, Yin C. Gerontologist 2019; ePub(ePub): ePub.

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DOI 10.1093/geront/gnz149 **PMID** 31697831

Abstract

BACKGROUND AND OBJECTIVES: Cognitive training delivered in conjunction with physical activity, may help to optimize aging and delay or prevent dementia in individuals with mild cognitive impairment (MCI). However, their efficacy is less well studied compared to pharmaceutical treatments. This systematic review synthesizes the emerging evidence on combined cognitive-physical interventions for enhancing functioning in older adults with MCI, with implications for practice and research. RESEARCH DESIGN AND METHODS: We searched the PubMed, PsycINFO, Ageline, Medline, Web of Science and ProQuest databases, and hand-searched articles published between July 2013 and November 2018. Only randomized controlled trials which incorporated cognitive and physical components targeted to individuals with MCI over the age of 50 were eligible. Our search yielded 10 eligible, independent articles.

RESULTS: Intervention participants with MCI self-reported, or demonstrated, improved functioning across a range of cognitive (global cognitive function, executive function, processing speed, memory, attention, mood, emotion, motivation, brain cortex, orientation), and physical (gait, balance, mobility) outcomes. Interventions which combined cognitive-physical training were comparable to those which isolated these same elements, in terms of their effects on executive function, processing speed, attention, mood, and cardiorespiratory fitness.

DISCUSSION AND IMPLICATIONS: There is preliminary evidence to support the positive effects of multicomponent interventions to improve cognitive-motor abilities in older adults at risk of developing dementia. The strength of this research evidence is, however, limited. Longitudinal studies are needed to determine whether these effects are maintained over time. The optimal intervention intensity and length also need to be established.

Language: en

Keywords

Aged; Cognition; Dementia; Exercise

Effects of aquatic on balance and preventing of fall among healthy elderly men

Taheri M, Mirmoezzi M, Sabaghi M. Safety Promot. Inj. Prev. (Tehran) 2018; 6(3): 144-151.

DOI

unavailable

PMID

unavailable

Abstract

Background and Objectives: Falling in the elderly is a serious problem that results in bone fracture and loss of Activities of daily living due to fear of falling. Therefore, the aim of the study was to determine effects of Aquatic on balance and preventing of falls among healthy elderly men.

Materials and Methods: This was a quasi-experimental before/after study without a control group. 22 elderly men with an average age of 64.31±2.87 years volunteered. Functional tests of Berg Balance Scale (BBS) for static balance, and Timed Up & Go (TUG) for dynamic balance and Chair Stand Test (CST) for lower extremity strength were measured in pre and post-test. The exercise protocol included a combination of resistance training, stretching and balance exercises that were followed up for 10 weeks, with three sessions per week. At all stages of the research, Ethical considerations (optional, confidentiality of results, harmlessness of the training program, etc.) were carried out. Paired t-test was used at a significant level of 0.05.

Results: The results of paired t-test showed that 10 weeks exercise in water improves static balance, dynamic balance and muscle strength ($P \leq 0.05$) and decreases the risk of falling in the elderly ($P \leq 0.01$).

Conclusion: According to the results of this study, it seems that the exercise program in water improves balance and muscle strength as the most important indicator for preventing the risk of falling of the elderly. And it is suggested that due to good water benefits for Elderly, water resistance exercises will be on the agenda in trainers, experts and activists in the field.

Language: en

Keywords

Aquatic; Balance; Elderly; Falls

Effects of benzodiazepines on orthostatic blood pressure in older people

Rivasi G, Kenny RA, Ungar A, Romero-Ortuno R. Eur. J. Intern. Med. 2019; ePub(ePub): ePub.

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DOI 10.1016/j.ejim.2019.10.032 **PMID** 31706708

Abstract

BACKGROUND: Older people taking benzodiazepines (BDZs) have higher risk of falling, which is mainly attributed to cognitive and psychomotor effects. BDZs may also have hypotensive effects. We investigated the association between BDZs and orthostatic blood pressure behaviour in older people.

METHODS: We retrospectively analysed data from an outpatient clinic where people aged 60 or older underwent a geriatric assessment. Non-invasive beat-to-beat orthostatic systolic blood pressure (SBP) was assessed at regular time intervals before and after an active stand test. We compared clinical characteristics between BDZs users and non-users and also investigated if BDZs use was an independent predictor of baseline SBP. Factors associated with SBP change were investigated using a repeated measures general linear model.

RESULTS: Of 538 participants (67.7% female, mean age 72.7), 33 (6.1%) reported regular BDZs use. BDZ users had lower baseline SBP (149 versus 161 mmHg, $P < 0.05$). Multiple linear regression confirmed BDZs use as independent predictor of baseline SBP in N = =538. At 10 s post-stand, the SBP difference between BDZs use groups became maximum (21 mmHg); at this point, SBP still seemed to be decreasing in BDZ-users, whereas in controls it seemed to be recovering. After adjustment (age, sex, hypertension, frailty, comorbidity, antihypertensives), BDZs were associated with greater SBP reduction between baseline and 10 s post-stand ($P < 0.05$).

CONCLUSION: Older people taking BDZs may have a higher risk of orthostatic hypotension, perhaps due to an exaggerated immediate BP drop. This adds to other BDZ-related falls risks. BDZs should be avoided in older people at risk of falling.

Language: en

Keywords

Benzodiazepines; Blood pressure; Falls; Older people; Orthostatism

Fall-related emergency department visits and hospitalizations among community-dwelling older adults: examination of health problems and injury characteristics

Choi NG, Choi BY, Dinitto DM, Marti CN, Kunik ME. BMC Geriatr. 2019; 19(1): e303.

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DOI 10.1186/s12877-019-1329-2 **PMID** 31711437

Abstract

BACKGROUND: Fall injuries and related healthcare use among older adults are increasing in the United States. This study examined chronic illnesses, sensory and memory problems, and injury characteristics that were associated with ED visits and hospitalizations among older adults who received medical attention for fall injuries within a 91-day reference period.

METHODS: Data were from the publicly available 2013-2017 US National Health Interview Survey files (unweighted N = 1840 respondents aged > 60 years with fall injuries). We first described socioeconomic, health/mental health, healthcare utilization, and injury characteristics among three groups: those who neither visited an ED nor were hospitalized for their fall injury, those who visited an ED only, and those who were hospitalized. Then, using multinomial logistic regression analysis, we examined associations of healthcare utilization (ED visit only and hospitalization vs. no ED visit/hospitalization) with chronic illnesses, other health problems, and injury characteristics, controlling for socioeconomic factors.

RESULTS: Of older adults who received medical attention for fall injuries, a little more than one-third had an ED visit only and a little less than a fifth had an overnight hospital stay. Multivariable analysis showed that lung disease and memory problems were associated with higher risk of ED visit only; hip and head injuries, facial injuries, and broken bones/fractures (from any type of injury) were more likely to result in hospitalization than other injuries. Fall injuries sustained inside the home, falls from loss of balance/dizziness, and living alone were also more likely to result in hospitalization.

CONCLUSIONS: These healthcare utilization findings indicate the significant toll that fall injuries exact on older adults and healthcare systems. Fall prevention should target risk factors that are specific to serious injuries requiring costly care. Strategies for implementing scalable, adaptable, and measurable fall prevention models by primary care and emergency medical service providers and ED staff are needed.

Language: en

Keywords

ED; Fall injury; Falls; Hospitalization

Non-collision incidents on buses due to acceleration and braking manoeuvres leading to falling events among standing passengers

Silvano AP, Ohlin M. J. Transp. Health 2019; 14: e100560.

DOI

10.1016/j.jth.2019.04.006

Abstract

Background

On public transport buses, standing passengers are subject to acceleration and braking driver manoeuvres which may lead to a falling event.

Purpose and procedures

This study investigates the characteristics of such events connected to driver manoeuvres (i.e., acceleration or braking), passenger conditions (i.e., boarding, travelling, alighting), and injury severity. The data for analyses comprise three and a half years (2015-2018). All passengers were standing at the time of the fall event and were treated at hospital emergency departments (ED) after the falling event.

Findings

The results highlight aspects which may need further attention. For example, the involvement of females is not only high for the 65 + age group, this is also the case for younger age groups which indicates that acceleration/deceleration threshold values for sustaining balance may differ by gender. Furthermore, driver manoeuvres and passenger conditions are important characteristics impacting the mechanisms of falling differently. In acceleration manoeuvres, older passengers (aged 65+) are most often involved in a fall inmediately after boarding, whereas falls during braking manoeuvres are most common while travelling, and mostly involving the 25-64 years-old age group.

Conclusions

These findings may indicate that acceleration and braking manoeuvres should be studied separately. It is worth noting that driving style might influence the risk of losing balance for standing passengers, and shortening the time to get seated can be beneficial for reducing the risk of falling, especially for the elderly users after boarding the bus.

Language: en

Keywords

Bus operation; Falling events; Injury severity; Non-collision; Public transport; Standing passengers

Parkinson's disease and symptomatic osteoarthritis are independent risk factors of falls in the elderly

Teder-Braschinsky A, Märtson A, Rosenthal M, Taba P. Clin. Med. Insights Arthritis Musculoskelet. Disord. 2019; 12: e1179544119884936.

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DOI

10.1177/1179544119884936

PMID

31700249

Abstract

OBJECTIVES: Deteriorating functionality and loss of mobility, resulting from Parkinson's disease, may be worsened by osteoarthritis, which is the most common form of joint disease causing pain and functional impairment. We assessed the association between symptomatic hip or knee osteoarthritis, falls, and the ability to walk among patients with Parkinson's disease compared to a control group.

METHODS: A total of 136 patients with Parkinson's disease in Southern Estonia and 142 controls with an average age of 76.8 and 76.3 years, respectively, were enrolled in a retrospective case-control study. Information on falls and related fractures during the previous year was collected from the patients with Parkinson's disease and controls. Covariates included gender, age, mobility, duration of Parkinson's disease, and fractures.

RESULTS: Patients with Parkinson's disease were at an increased risk of falls compared to the control group, and for the higher risk of fractures. Symptomatic knee or hip osteoarthritis was a significant independent predictor of falls in both patients with Parkinson's disease and controls. The higher risk for fractures during the previous year was demonstrated in symptomatic osteoarthritis. Risk factors for falls included also female gender, use of sleep pills, and the inability to walk 500 m.

CONCLUSIONS: Symptomatic hip and knee osteoarthritis are risk factors for falls and related fractures among the elderly population with and without Parkinson's disease. The inability to walk 500 m could be used as a simple predictive factor for the increased risk of falls among elderly populations.

Language: en

Keywords Parkinson’s disease; elderly; falls; osteoarthritis; risk factors

Potential drug interactions in drug therapy prescribed for older adults at hospital discharge: cross-sectional study

Dias BM, Santos FSD, Reis AMM. Sao Paulo Med. J. 2019; 137(4): 369-378.

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DOI 10.1590/1516-3180.2019.013405072019

PMID 31691770

Abstract

BACKGROUND: Older adults with a range of comorbidities are often prescribed multiple medications, which favors drug interactions.

OBJECTIVES: To establish the frequency of potential drug interactions in prescriptions at hospital discharge among older adults and to identify the associated factors. DESIGN AND SETTING: Cross-sectional study conducted in a public hospital.

METHODS: An initial face-to-face interview, data collection from the electronic medical records (covering sociodemographic, clinical, functional and drug therapy-related variables) and telephone follow-up after discharge were conducted to confirm the medication prescribed at discharge. Drug interactions were identified through the Micromedex DrugReax software, along with interactions that should be avoided among the elderly, as per the 2015 American Geriatric Society/Beers criteria. Multivariable logistic regression was performed.

RESULTS: Potential for drug interactions was identified in the discharge drug therapy of 67.8% of the 255 older adults evaluated (n = 172), and 54.5% (n = 145) of the drug interactions were major. Among the drug interactions that should be avoided among older adults, those that increase the risk of falls were the most frequent. The drug interactions thus identified were independently associated with polypharmacy (odds ratio, OR = 12.62; 95% confidence interval, CI 6.25-25.50; P = 0.00), diabetes mellitus (OR = 2.16; 95% CI 1.05-4.44; P = 0.04), hypothyroidism (OR = 7.29; 95% CI 2.03-26.10; P = 0.00), chronic kidney disease (OR = 3.41; 95% CI 1.09-10.64; P = 0.03) and hospitalization in geriatric units (OR = 0.45; 95% CI 0.22-0.89; P = 0.02).

CONCLUSION: The frequency of potential drug interactions in drug therapy prescribed at discharge for these older adults was high. Polypharmacy, diabetes mellitus, hypothyroidism and chronic kidney disease were positively associated with occurrences of drug interactions, while hospitalization in geriatric units showed an inverse association.

Language: en

Predictors of real-life mobility in community-dwelling older adults: an exploration based on a comprehensive framework for analyzing mobility

Giannouli E, Fillekes MP, Mellone S, Weibel R, Bock O, Zijlstra W. Eur. Rev. Aging Phys. Activ. 2019; 16: 19.

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DOI 10.1186/s11556-019-0225-2 **PMID** 31700551

Abstract

BACKGROUND: Reduced mobility is associated with a plethora of adverse outcomes. To support older adults in maintaining their independence, it first is important to have deeper knowledge of factors that impact on their mobility. Based on a framework that encompasses demographical, environmental, physical, cognitive, psychological and social domains, this study explores predictors of different aspects of real-life mobility in community-dwelling older adults.

METHODS: Data were obtained in two study waves with a total sample of n = 154. Real-life mobility (physical activity-based mobility and life-space mobility) was assessed over one week using smartphones. Active and gait time and number of steps were calculated from inertial sensor data, and life-space area, total distance, and action range were calculated from GPS data. Demographic measures included age, gender and education. Physical functioning was assessed based on measures of cardiovascular fitness, leg and handgrip strength, balance and gait function; cognitive functioning was assessed based on measures of attention and executive function. Psychological and social assessments included measures of self-efficacy, depression, rigidity, arousal, and loneliness, sociableness, perceived help availability, perceived ageism and social networks. Maximum temperature was used to assess weather conditions on monitoring days.

RESULTS: Multiple regression analyses indicated just physical and psychological measures accounted for significant but rather low proportions of variance (5-30%) in real-life mobility. Strength measures were retained in most of the regression models. Cognitive and social measures did not remain as significant predictors in any of the models.

CONCLUSIONS: In older adults without mobility limitations, real-life mobility was associated primarily with measures of physical functioning. Psychological functioning also seemed to play a role for real-life mobility, though the associations were more pronounced for physical activity-based mobility than life-space mobility. Further factors should be assessed in order to achieve more conclusive results about predictors of real-life mobility in community-dwelling older adults.

Language: en

Keywords Life-space; Smartphones; physical activity

Robotic balance assessment in community-dwelling older people with different grades of impairment of physical performance

Cella A, De Luca A, Squeri V, Parodi S, Puntoni M, Vallone F, Giorgeschi A, Garofalo V, Zigoura E, Senesi B, De Michieli L, Saglia J, Sanfilippo C, Pilotto A. Aging Clin. Exp. Res. 2019; ePub(ePub): ePub.

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DOI 10.1007/s40520-019-01395-0

PMID 31691151

Abstract

BACKGROUND: Impaired physical performance is common in older adults and has been identified as a major risk factor for falls. To date, there are no conclusive data on the impairment of balance parameters in older subjects with different levels of physical performance. AIMS: The aim of this study was to investigate the relationship between different grades of physical performance, as assessed by the Short Physical Performance Battery (SPPB), and the multidimensional balance control parameters, as measured by means of a robotic system, in community-dwelling older adults.

METHODS: This study enrolled subjects aged ≥ 65 years. Balance parameters were assessed by the hunova robot in static and dynamic (unstable and perturbating) conditions, in both standing and seated positions and with the eyes open/closed.

RESULTS: The study population consisted of 96 subjects (62 females, mean age 77.2 ± 6.5 years). According to their SPPB scores, subjects were separated into poor performers (SPPB < 8, n = 29), intermediate performers (SPPB = 8-9, n = 29) and good performers (SPPB > 9, n = 38). Poor performers displayed significantly worse balance control, showing impaired trunk control in most of the standing and sitting balance tests, especially in dynamic (both with unstable and perturbating platform/seat) conditions.

CONCLUSIONS: For the first time, multidimensional balance parameters, as detected by the hunova robotic system, were significantly correlated with SPPB functional performances in community-dwelling older subjects. In addition, balance parameters in dynamic conditions proved to be more sensitive in detecting balance impairments than static tests.

Language: en

Keywords

Assessment; Balance; Physical function; Physical performance; Robotic device

Shifting maladaptive fall risk appraisal in older adults through an in-home Physio-fEedback and Exercise pRogram (PEER): a pilot study

Thiamwong L, Huang HJ, Ng BP, Yan X, Sole ML, Stout JR, Talbert S. Clin. Gerontol. 2019; ePub(ePub): ePub.

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DOI

10.1080/07317115.2019.1692120

PMID

31713464

Abstract

Objectives: 1) examine the preliminary effectiveness of the Physio-feEdback and Exercise pRogram (PEER) for shifting maladaptive to adaptive fall risk appraisal and reducing fall risk, 2) determine the participants' feedback and acceptability of the program.Methods: Forty-one older adults were assigned to either PEER intervention or attention control group. The 8-week PEER intervention consists of a visual physio-feedback, cognitive reframing, and combined group and home-based exercise led by a trained peer coach. The attention control group read fall prevention brochures and continued their normal activities. BTrackS Balance Test (BBT), short version of Fall Efficacy Scale International (short FES-I) and CDC fall risk checklist were measured from pre- to post-intervention. The feedback and acceptability were conducted at the program conclusion.Results: About 11% of participants in the PEER group had positive shifting but none in the attention control group. Up to 32% of the participants in attention control had negative shifting compared to 5.3% in the PEER group. PEER group reported significant decreases in fall risk and high acceptability of the program.Conclusions: PEER intervention facilitates a shift from maladaptive to adaptive fall risk appraisal and reduces fall risk.Clinical Implications: Preventive interventions promoting alignment between perceive and physiological fall risk may contribute to reducing falls and increasing exercise adherence.

Language: en

Keywords

Behavioral intervention; community; exercise; fall; feedback; home; older adult; peer coaching; risk; technology

Sub-acute more than chronic hyponatremia is associated with serious falls and hip fractures

Bhandari SK, Adams AL, Li BH, Rhee CM, Sundar S, Krasa H, Danforth KN, Kanter MH, Kalantar-Zadeh K, Jacobsen SJ, Sim JJ. Intern. Med. J. 2019; ePub(ePub): ePub.

Affiliation

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DOI 10.1111/imj.14684 **PMID** 31707754

Abstract

BACKGROUND: Falls and hip fractures among older people are associated with high morbidity and mortality. Hyponatremia may be a risk for falls/hip fractures, but the effect of hyponatremia duration is not well understood. AIMS: We sought to evaluate individuals with periods of sub-acute and chronic hyponatremia on subsequent risk for serious falls and/or hip fractures.

METHODS: Retrospective cohort study in the period 1/1/1998-6/14/2016 within an integrated health system of individuals aged ≥55 years with ≥2 outpatient serum sodium measurements. Hyponatremia was defined as sodium <135 mEq/L with sub-acute (<30 days) and chronic (>/=30 days) and analyzed as a time-dependent exposure. Multivariable Cox proportional hazards modeling was used to estimate hazard ratios (HRs) for serious falls/hip fractures based on sodium category.

RESULTS: Among 1 062 647 individuals totaling 9 762 305 sodium measurements, 96 096 serious falls/hip fracture events occurred. Incidence (per-1000-person-years) of serious falls/hip fractures were 11.5, 27.9, and 19.8 for normonatremia, sub-acute, and chronic hyponatremia. Any hyponatremia duration compared to normonatremia had a serious falls/hip fractures HR (95%CI) of 1.18(1.15, 1.22), with sub-acute and chronic hyponatremia having HRs of 1.38(1.33, 1.42) and 0.91(0.87, 0.95), respectively. Examined separately, the serious falls HR was 1.37(1.32, 1.42) and 0.92(0.88, 0.96) in sub-acute and chronic hyponatremia, respectively. Hip fracture HRs were 1.52(1.42, 1.62) and 1.00(0.92, 1.08) for sub-acute and chronic hyponatremia, respectively, compared to normonatremia.

CONCLUSIONS: Our findings suggest that early/sub-acute hyponatremia appears more vulnerable and associated with serious falls/hip fractures. Whether hyponatremia is a marker of frailty or a modifiable risk factor for falls remains to be determined. This article is protected by copyright. All rights reserved.

Language: en

Keywords

Falls; Hip Fractures; Hyponatremia; Patient Safety

A novel method of near-miss event detection with software defined RADAR in improving railyard safety

Banerjee S, Santos J, Hempel M, Ghasemzadeh P, Sharif H. Safety (Basel) 2019; 5(3): e55.

DOI

10.3390/safety5030055

Abstract

Railyards are one of the most challenging and complex workplace environments in any industry. Railyard workers are constantly surrounded by dangerous moving objects, in a noisy environment where distractions can easily result in accidents or casualties. Throughout the years, yards have been contributing 20–30% of the total accidents that happen in railroads. Monitoring the railyard workspace to keep personnel safe from falls, slips, being struck by large object, etc. and preventing fatal accidents can be particularly challenging due to the sheer number of factors involved, such as the need to protect a large geographical space, the inherent dynamicity of the situation workers find themselves in, the presence of heavy rolling stock, blind spots, uneven surfaces and a plethora of trip hazards, just to name a few. Since workers spend the majority of time outdoors, weather conditions also play an important role, i.e., snow, fog, rain, etc. Conventional sensor deployments in yards thus fail to consistently monitor this workspace. In this paper, the authors have identified these challenges and addressed them with a novel detection method using a multi-sensor approach. They have also proposed novel algorithms to detect, classify and remotely monitor Employees-on-Duty (EoDs) without hindering real-time decision-making of the EoD. In the proposed solution, the authors have used a fast spherical-to-rectilinear transform algorithm on fish-eye images to monitor a wide area and to address blindspots in visual monitoring, and employed Software-Defined RADAR (SDRADAR) to address the low-visibility problem. The sensors manage to monitor the workspace for 100 m with blind detection and classification. These algorithms have successfully maintained real-time processing delay of ≤0.1 s between consecutive frames for both SDRADAR and visual processing.

Language: en

Keywords

accident; close-call; image processing; near-miss; radar; railroad; rolling stock; safety; software-defined; yard safety

A vision-based approach for fall detection using multiple cameras and convolutional neural networks: A case study using the UP-Fall detection dataset

Espinosa R, Ponce H, Gutiérrez S, Martínez-Villaseñor L, Brieva J, Moya-Albor E. Comput. Biol. Med. 2019; 115: e103520.

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DOI

10.1016/j.compbiomed.2019.103520

PMID

31698242

Abstract

The automatic recognition of human falls is currently an important topic of research for the computer vision and artificial intelligence communities. In image analysis, it is common to use a vision-based approach for fall detection and classification systems due to the recent exponential increase in the use of cameras. Moreover, deep learning techniques have revolutionized vision-based approaches. These techniques are considered robust and reliable solutions for detection and classification problems, mostly using convolutional neural networks (CNNs). Recently, our research group released a public multimodal dataset for fall detection called the UP-Fall Detection dataset, and studies on modality approaches for fall detection and classification are required. Focusing only on a vision-based approach, in this paper, we present a fall detection system based on a 2D CNN inference method and multiple cameras. This approach analyzes images in fixed time windows and extracts features using an optical flow method that obtains information on the relative motion between two consecutive images. We tested this approach on our public dataset, and the results showed that our proposed multi-vision-based approach detects human falls and achieves an accuracy of 95.64% compared to state-of-the-art methods with a simple CNN network architecture.

Language: en

Keywords

Computer vision; Healthcare; Human activity recognition; Human fall detection; Machine learning

Asymptomatic carotid stenosis is associated with mobility and cognitive dysfunction and heightens falls in older adults

Gray VL, Goldberg AP, Rogers MW, Anthony L, Terrin ML, Guralnik JM, Blackwelder WC, Lam DFH, Sikdar S, Lal BK. J. Vasc. Surg. 2019; ePub(ePub): ePub.

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Abstract

BACKGROUND: Atherosclerosis of the carotid bifurcation with plaque formation causes asymptomatic carotid artery stenosis (ACAS), which may also be associated with cerebral hypoperfusion. Cerebral hypoperfusion adversely affects multiple aspects of mobility and cognition. This study tests the hypothesis that community-dwelling older adults with a 50% or greater diameter-reducing ACAS will have mobility and cognitive impairments that heighten their risk for falls.

METHODS: Eighty community-dwelling adults completed a mobility assessment (Short Physical Performance Battery, Berg Balance Scale, Four Square Step Test, Dynamic Gait Index, Timed Up and Go, and gait speed), self-reported physical function (Activities-Specific Balance Confidence, SF-12 Physical Function Component), and cognitive tests (Mini-Mental State Examination). Falls were recorded for the past 6 months. Standardized carotid ultrasound examination classified participants into no stenosis (<50% diameter reduction) (n = 54), moderate stenosis (50%-69%) (n = 17), and high-grade stenosis (70%-99%) (n = 9) groups. Linear and logistic regression analyses determined the associations between these measures and the degree of stenosis (three groups).

RESULTS: Logistic regression analysis showed their degree of stenosis was associated with reductions in mobility (Short Physical Performance Battery [P =.008], Berg Balance Scale [P =.0008], Four Square Step Test [P =.005], DGI [P =.0001], TUG [P =.0004], gait speed [P =.02]), perceived physical function (ABC [P <.0001], SF-12 Physical Function Component [P <.0001]), and cognition (MMSE [P =.003]). Adults with moderate- and high-grade stenosis had a greater incidence of falls compared with those without stenosis (relative risk, 2.86; P =.01).

RESULTS remained unchanged after adjustment for age, sex and cardiovascular risk factors.

CONCLUSIONS: ACAS is associated with impaired mobility and cognition that are accompanied with increased fall risk. These impairments increased with worsening severity.

Language: en

Keywords Asymptomatic carotid artery stenosis; Balance; Cognition; Falls; Physical function

Best practices for data visualization: creating and evaluating a report for an evidence-based fall prevention program

Khasnabish S, Burns Z, Couch M, Mullin M, Newmark R, Dykes PC. J. Am. Med. Inform. Assoc. 2019; ePub(ePub): ePub.

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31697326

Abstract

This case report applied principles from the data visualization (DV) literature and feedback from nurses to develop an effective report to display adherence with an evidence-based fall prevention program. We tested the usability of the original and revised reports using a Health Information Technology Usability Evaluation Scale (Health-ITUES) customized for this project. Items were rated on a 5-point Likert scale, strongly disagree (1) to strongly agree (5). The literature emphasized that the ideal display maximizes the information communicated, minimizes the cognitive efforts involved with interpretation, and selects the correct type of display (eg, bar versus line graph). Semi-structured nurse interviews emphasized the value of simplified reports and meaningful data. The mean (standard deviation [SD]) Health-ITUES score for the original report was 3.86 (0.19) and increased to 4.29 (0.11) in the revised report (Mann Whitney U Test, $z = -12.25$, $P < 0.001$). Lessons learned from this study can inform report development for clinicians in implementation science.

Language: en

Keywords

data visualization; evidence-based; fall prevention; health-ITUES; usability

Comparable stride time fractal dynamics and gait adaptability in active young and older adults under normal and asymmetric walking

Ducharme SW, Kent JA, Van Emmerik REA. Front. Physiol. 2019; 10: e1318.

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31708794

Abstract

Previous research indicates the correlation structure of gait parameters (i.e., fractal dynamics) decreases with age. This decrease is suggested to reflect a reduced capacity for locomotor adaptation in older adults. The purpose of this study was to investigate potential differences between physical activity-matched young and older adults' fractal dynamics and gait adaptability during unperturbed and asymmetric walking, and to determine if fractal dynamics predict adaptive capacity. Fifteen young (28.9 ± 5.6 years, nine women) and 15 older (64.7 ± 2.7, nine women) adults with similar habitual physical activity levels walked at preferred speed, half of preferred speed, and asymmetrically whereby their dominant and non-dominant legs moved at preferred and half-preferred speed, respectively. Fractal correlations (scaling exponent α) of stride times were assessed through detrended fluctuation analysis, and gait adaptation to asymmetric walking on the basis of lower limb relative phase. Both cohorts displayed similar fractal dynamics at preferred speed and asymmetric walking, while older adults exhibited greater α during slow walking. Both groups exhibited comparable gait adaptation to split-belt walking based on analysis of lower limb relative phase. Fractal dynamics during preferred speed and asymmetric walking was moderately associated with gait adaptation in the young and older adult cohorts, respectively. In these activity-matched groups, there were no age-based reductions in fractal dynamics or gait adaptation, and fractal scaling α was moderately associated with gait adaptation. These findings suggest that stride time fractal dynamics and gait adaptation may be preserved in older adults who habitually perform moderate intensity physical activity.

Language: en

Keywords
aging; correlation structure; detrended fluctuation analysis; gait adaptation; physical activity; split-belt treadmill; statistical persistence; variability

Efficacy of dual-task training with two different priorities instructional sets on gait parameters in patients with chronic stroke

Sengar S, Raghav D, Verma M, Alghadir AH, Iqbal A. Neuropsychiatr. Dis. Treat. 2019; 15: 2959-2969.

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Abstract

PURPOSE: Balance is controlled through a complex process involving sensory, visual, vestibular and cerebral functioning which get affected by various neurological disorders such as in stroke. Various types of exercises are designed to address the imbalance that is developed due to these neurological disorders. This study aimed to compare the efficacy of dual-task training using two different priority instructional sets in improving gait parameters in patients with chronic stroke.

METHODS: This study was a randomized, pretest-posttest experimental group design that compared between two different priority instructional sets (fixed versus variable) of the dual-task training. A convenience sample of thirty patients with chronic stroke due to ruptured middle cerebral artery (mean age±SD = 55.76±5.23; range 48-65 years) was recruited and equally allocated into two groups. Group 1 received dual-task training with fixed priority instructional sets and group 2 received dual-task training with variable priority instructional sets. Both groups were trained for a period of 45 mins each session, 3-sessions per week for 4 weeks. The timed 10-m walk test and foot prints on walkway paper were used to assess the gait parameters (walking speed, stride length and step length) before and after the training session.

RESULTS: Within-group analysis revealed a significant improvement ($p<0.05$) on gait parameters for both the groups. Furthermore, Cohen's d calculation for the treatment effect size revealed highly larger effect size on gait parameters in group 2 (Cohen's d>2 SD) than group 1 (Cohen's d<2 SD) for the all variables.

CONCLUSION: The dual-task training with variable priority instructional sets (group 2) was more effective than dual-task training with fixed priority instructional sets (group 1) in improving gait parameters such as gait speed, stride length, and step length in patients with chronic stroke. Physiotherapists should spread awareness and use this specific set of exercises

Language: en

Keywords

dual-task balance training; fixed priority training; gait velocity; step length; stride length; stroke; variable priority training

Epidemiology of maxillofacial trauma in a prehospital service in Brazil

Avansini Marsicano J, Zanelato Cavalleri N, Cordeiro DM, Mori GG, Gurgel Calvet da Silveira JL, Leal do Prado R. J. Trauma Nurs. 2019; 26(6): 323-327.

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DOI

10.1097/JTN.0000000000000470

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31714493

Abstract

Understanding facial trauma behaviors in different populations can help enhance effective prevention and efficient management of public resources in order to offer better treatment in large health systems. The aim of this study was to assess the epidemiology of maxillofacial trauma treated by a public health emergency care service. A cross-sectional study was conducted to assess maxillofacial trauma in patients treated by a public health service of emergency care at a midsize city in southern Brazil. Facial trauma records were retrieved directly from medical records from January 2010 to April 2014. The following variables were collected: patient age, sex, destination of patient after initial treatment, cause of trauma, and type of injury. Statistical analyses were performed using G tests with Williams' corrections ($p < .05$). The most frequent cause was road traffic collision (39.6%), followed by falls (33.6%) and interpersonal violence (22.0%). The prevalence of falls was higher in older adults. A statistically significant association was observed between age and causes ($p < .05$). After the initial care provided by the prehospital service, 44.1% of the patients were referred to secondary care centers and 40.1% to hospitals. Traffic accidents were the most common cause of facial trauma in Brazil, with a higher prevalence in young men. Falls were also a big concern for facial injuries, especially among older adults. Although most lesions could be classified as minor trauma, many patients are being treated at hospitals, which may increase the costs to the public health system.

Language: en

Fall risk prediction in multiple sclerosis using postural sway measures: a machine learning approach

Sun R, Hsieh KL, Sosnoff JJ. Sci. Rep. 2019; 9(1): e16154.

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DOI

10.1038/s41598-019-52697-2

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31695127

Abstract

Numerous postural sway metrics have been shown to be sensitive to balance impairment and fall risk in individuals with MS. Yet, there are no guidelines concerning the most appropriate postural sway metrics to monitor impairment. This investigation implemented a machine learning approach to assess the accuracy and feature importance of various postural sway metrics to differentiate individuals with MS from healthy controls as a function of physiological fall risk. 153 participants (50 controls and 103 individuals with MS) underwent a static posturography assessment and a physiological fall risk assessment. Participants were further classified into four subgroups based on fall risk: controls, low-risk MS (n = 34), moderate-risk MS (n = 27), high-risk MS (n = 42). Twenty common sway metrics were derived following standard procedures and subsequently used to train a machine learning algorithm (random forest - RF, with 10-fold cross validation) to predict individuals' fall risk grouping. The sway-metric based RF classifier had high accuracy in discriminating controls from MS individuals (>86%). Sway sample entropy was identified as the strongest feature for classification of low-risk MS individuals from healthy controls. Whereas for all other comparisons, mediolateral sway amplitude was identified as the strongest predictor for fall risk groupings.

Language: en

Prevalence of falls on Mount Fuji and associated with risk factors: a questionnaire survey study

Uno T, Fujino M, Ohwaki A, Horiuchi M. Int. J. Environ. Res. Public Health 2019; 16(21): e16214234.

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DOI

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PMID

31683707

Abstract

Since little is known about the detailed situations of falls on Mount Fuji, the aim of this study was to clarify the risk factors of falls on Mount Fuji in Japan. We conducted a questionnaire survey of 556 participants who had climbed Mount Fuji and collected the following information: fall situation, mental status, fatigue feeling, sex, age, climbing experience on Mount Fuji and other mountains, summit success, whether staying at a lodge, use of a tour guide, and symptoms of acute mountain sickness. Among the 556 participants, 167 had a fall (30%). Among 167 participants who had experienced a fall, 30 had fallen more than three times (18%). The main cause (>60%) of fall were slips. The most optimal model using multiple logistic regression (no fall = 0, and fall = 1) found eight significant risk factors, including sex, prior climbing experience on Mount Fuji, staying overnight at a lodge, subjective feeling of relaxation, sleepiness, emotional stability, dullness, and eyestrain. These results suggest that females, people who have no prior climbing experience on Mount Fuji, and people who did not stay at a lodge should pay attention to an increased risk of falls on Mount Fuji.

Language: en

Keywords

climbing experience; high altitude; multiple logistic regression; sex difference; subjective feelings

Prevalence of pediatric dizziness and imbalance in the United States

Brodsky JR, Lipson S, Bhattacharyya N. Otolaryngol. Head Neck Surg. 2019; ePub(ePub): ePub.

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Abstract

OBJECTIVES: Understand the prevalence of vestibular symptoms in US children. STUDY DESIGN: Cross-sectional analysis. SETTING: 2016 National Health Interview Survey.

SUBJECTS AND METHODS: Responses from the 2016 National Health Interview Survey for children ages 3 to 17 years were examined to determine the prevalence of vestibular symptoms and provider-assigned diagnoses.

RESULTS: Dizziness or imbalance was reported in 3.5 (95% confidence interval, 3.1-3.9) million patients (5.6%) with a mean age of 11.5 years. Dizziness was reported in 1.2 million patients (2.0%) with a mean age of 12.7 years and balance impairment in 2.3 million patients (3.7%) with a mean age of 10.6 years. Prevalence of dizziness and imbalance did not vary by sex (P =.6, P =.2). Evaluation by a health professional was reported for 42% of patients with dizziness and 43% of patients with imbalance, with diagnoses reported in 45% and 48% of patients with dizziness and imbalance, respectively. The most common diagnoses reported for dizziness were depression or child psychiatric disorder (12%), side effects from medications (11%), head/neck injury or concussion (8.4%), and developmental motor coordination disorder (8.3%). The most common diagnoses reported for imbalance were blurred vision with head motion, "bouncing" or rapid eye movements (9.1%), depression or child psychiatric disorder (6.2%), head/neck injury or concussion (6.1%), and side effects from medications (5.9%).

CONCLUSION: The national prevalence of childhood vestibular symptoms is more common than previously thought. Reported diagnoses varied greatly from the literature, suggesting a need for increased awareness of causes of vestibular symptoms in children.

Language: en

Keywords

balance impairment; dizziness; imbalance; pediatric vestibular; vertigo

The association of malnutrition with falls and harm from falls in hospital inpatients: findings from a 5-year observational study

Lackoff AS, Hickling D, Collins PF, Stevenson KJ, Nowicki TA, Bell JJ. J. Clin. Nurs. 2019; ePub(ePub): ePub.

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DOI 10.1111/jocn.15098 **PMID** 31715045

Abstract

BACKGROUND: Inpatient falls continue to be a significant clinical issue and whilst malnutrition is a known risk factors for falls, few studies have investigated its association with inpatient falls. This study aimed to explore the independent association between malnutrition and falls risk as well as harm from falls in hospital inpatients.

METHODS: Malnutrition identified in annual malnutrition audits was combined with inpatient falls data captured through the electronic patient incident reporting system in the 12 months following audit days. Audit data was available for 1849 inpatients across 2011-2015 and covariate associations between age, gender, BMI, malnutrition, falls and harmful falls were analysed. The reporting of this paper is in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations (see Supplementary File 1).

RESULTS: The prevalence of malnutrition was 32.4% (n = 543) and 171 (9.2%) inpatients experienced a fall with 0.7% (n = 13) categorised as harmful. In bivariate analysis, patients who fell were more likely to be older (median 79.0 vs. 70.0 years; p < .0001) or malnourished (40.9% vs. 31.5%; p = .021). Malnutrition (p < .0001) and having a lower BMI (p = .026) were significant predictors of harmful falls. Regression modelling demonstrated that only increasing age increased the likelihood of having an inpatient fall (OR 1.022 95% CI1.021-1.046; p < .0001). Malnourished inpatients were almost 8 times more likely to have a harmful fall than those not malnourished (OR 7.94 95% CI 1.457- 43.338; p = .017), independent of age and BMI.

CONCLUSIONS: Malnourished patients are more likely to experience a harmful fall. Assessment of malnutrition should be incorporated into fall risk assessments as a way of

Language: en

Keywords

Malnutrition; falls; hospitals; inpatients; quality audit; risk

The impact of conductive hearing loss on balance

Horowitz G, Ungar OJ, Levit Y, Himmelfarb M, Handzel O. Clin. Otolaryngol. 2019; ePub(ePub): ePub.

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DOI

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PMID

31696660

Abstract

BACKGROUND: Balance is a complex process involving the coordinated activities of multiple sensory, motor and biomechanical components. Balance function may be disturbed in subjects suffering from hearing loss but the impairment has been attributed to the pathology underlying the hearing loss.

AIM: The purpose of the study was to investigate the possible interference of simulated conductive hearing loss with the ability to maintain postural balance.

METHODS: Twenty normal hearing subjects, 20-30 years old underwent the computerized dynamic posturography test battery before and after plugging their external ear canals with earplugs thus simulating a 40dB conductive hearing loss.

RESULTS: Eighteen females and two males were tested before and after plugging their ear canals. Average CHL was 40 ± 4.9dB. The composite equilibrium score was significantly diminished after plugging the ears with an average sway score of 73.5% ($p < 0.05$, $T = 2.27$). The fourth test condition was specifically affected with an average sway score of 72.85% with earplugs ($p < 0.05$, $T = 2.37$).

CONCLUSIONS: Conductive hearing loss has a negative effect on balance. This can be theoretically explained by the association between hearing loss and saccular dysfunction.

Language: en

The influence of carrying an anterior load on attention demand and obstacle clearance before, during, and after obstacle crossing

Jehu DA, Saunders D, Richer N, Paquet N, Lajoie Y. Exp. Brain Res. 2019; ePub(ePub): ePub.

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DOI

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31690972

Abstract

Carrying an anterior load during obstacle negotiation increases attention demand, which may differ at various crossing stages. Less is known on the impact of lower visual field obstruction and the weight of the anterior load on obstacle negotiation and attention demand. The objectives of this study were to: (1) determine if carrying a weighted anterior load, lower visual field occlusion, or both, modify obstacle clearance and/or reaction time (RT); and (2) examine whether RT is modulated across obstacle crossing phases as measured by a probe RT protocol. Sixteen young adults crossed an obstacle while carrying no load, a clear 5 kg load, and an opaque 5 kg load, while performing a simple RT task. Auditory stimuli were presented at five locations: (1) two steps before the obstacle; (2) one step before the obstacle; (3) as the leading limb crossed the obstacle; (4) as the lead limb touched down after the obstacle; and (5) as the trail limb crossed the obstacle. The toe clearance height of the leading limb was greatest for the weighted opaque box load type followed by the weighted clear box type compared to the no box load type. Carrying an anterior load during obstacle crossing did not influence RT. RTs were longer at the pre-crossing and beginning of the crossing phases compared to after-crossing phases.

RESULTS suggest that carrying a weighted anterior load and lower visual field occlusion increase the risk for tripping. Attention demands differ across obstacle crossing phases during dual-tasking and should be considered in fall-risk assessments.

Language: en

Keywords

Anterior load; Attention; Carrying; Obstacle clearance; Vision occlusion

Towards a wearable system for predicting the freezing of gait in people affected by Parkinson's disease

Demrozi F, Bacchin R, Tamburin S, Cristani M, Pravadelli G. IEEE J. Biomed. Health Inform. 2019; ePub(ePub): ePub.

DOI

10.1109/JBHI.2019.2952618

PMID

31715577

Abstract

Some wearable solutions exploiting on-body acceleration sensors have been proposed to recognize Freezing of Gait (FoG) in people affected by Parkinson Disease (PD). Once a FoG event is detected, these systems generate a sequence of rhythmic stimuli to allow the patient restarting the march. While these solutions are effective in detecting FoG events, they are unable to predict FoG to prevent its occurrence. This paper fills in the gap by presenting a machine learning-based approach that classifies accelerometer data from PD patients, recognizing a pre-FOG phase to further anticipate FoG occurrence in advance. Gait was monitored by three tri-axial accelerometer sensors worn on the back, hip and ankle. Gait features were then extracted from the accelerometer's raw data through data windowing and non-linear dimensionality reduction. A k-nearest neighbor algorithm (k-NN) was used to classify gait in three classes of events: pre-FoG, no-FoG and FoG. The accuracy of the proposed solution was compared to state of-the-art approaches. Our study showed that: (i) we achieved performances overcoming the state-of-the-art approaches in terms of FoG detection, (ii) we were able, for the very first time in the literature, to predict FoG by identifying the pre-FoG events with an average sensitivity and specificity of, respectively, 94.1% and 97.1%, and (iii) our algorithm can be executed on resource-constrained devices. Future applications include the implementation on a mobile device, and the administration of rhythmic stimuli by a wearable device to help the patient overcome the FoG.

Language: en