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A balanced approach to falls prevention: application in the real world

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DOI 10.1002/hpja.42 **PMID** 29573015

Abstract

BACKGROUND: Falls place a heavy burden on the health system, impacting on an individual's quality of life, often resulting in a fear of falling, reduction in independence and at times admission to residential care. This study aimed to determine health professionals' confidence in discussing falls prevention strategies, topics discussed and the barriers and enablers to falls prevention discussions with clients aged 60 years and over.

METHOD: A cross-sectional self-complete online survey was undertaken with a sample of health professionals (n = 191) who had engaged in the services of the Stay On Your Feet® programmes delivered by the Injury Matters in Western Australia (WA).

RESULTS: The majority of participants were physiotherapists (25.7%), registered nurses (17.8%) and occupational therapists (11%) located in metropolitan (56%) and regional (44%) WA. Most health professionals (80.2%) were "highly" confident discussing falls prevention strategies.

DISCUSSION of falls prevention included the benefits of strength and balance exercises (83%), eating a healthy diet (78.7%), regular eyesight checks (64.5%), reviewing medications (54.8%) and exposure to sunlight (50.3%). The main enablers to falls prevention were knowledge (89.7%), skills to identify (77.7%) and implement (66.3%) falls prevention strategies, and access to printed resources (74.9%), while the main barrier was appointment times (14.6%).

CONCLUSION: Health professionals' indicated that they are confident in discussing falls prevention strategies, and although a range of falls prevention strategies were discussed, limited attention was directed at the pharmacists' review of medications, eyesight checks and increasing vitamin D levels.

SO WHAT?: Health professionals are discussing falls prevention strategies with their clients. A more multifaceted approach should be encouraged with an emphasis on all prevention strategies.

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PDF Y Endnote Y

A high-yield fall risk and adverse events screening questions from the Stopping Elderly Accidents, Death, and Injuries (STEADI) guideline for older emergency department fall patients

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Abstract

OBJECTIVES: The objectives were to examine whether responses to the Stopping Elderly Accidents, Death, and Injuries (STeADI) questions predicted adverse events after an older adult emergency department (ED) fall visits and to identify factors associated with such recurrent fall.

METHODS: We conducted a prospective study at 2 urban, teaching hospitals. We included patients aged ≥ 65 who presented to the ED for an accidental fall. Data were gathered for fall relevant co-morbidities, high-risk medications for falls and the responses to 12 questions from the STeADI guideline recommendation. Our outcomes were the number of 6-month adverse events which were defined as mortality, ED revisit, subsequent hospitalization, recurrent falls and a composite outcome.

RESULTS: There were 548 (86.3%) patients who completed follow-up and 243 (44.3%) patients experienced an adverse event after a fall within 6 months. In multivariate analysis, 7-questions from the STeADI guideline predicted various outcomes. The question "Had previous fall" predicted recurrent falls (Odds ratio [OR]= 2.45, 95% confidence interval [CI] =1.52 to 3.97), the question "Feels unsteady when walking sometimes" (OR= 2.34, 95% CI = 1.44 to 3.81) and "Lost some feeling in their feet" predicted recurrent falls. In addition to recurrent falls risk, supplemental questions "Use or have been advised to use a cane or walker", "Take medication that sometimes makes them feel light-headed or more tired than usual", "Take medication to help sleep or improve mood" and "Have to rush to a toilet" predicted other outcomes.

CONCLUSION: A STeADI score of ≥ 4 did not predict adverse outcomes though seven individual questions from the STeADI guidelines were associated with increased adverse outcomes within 6 months. These may be organized into three categories (previous falls, physical activity and high-risk medications) and may assist emergency physicians to evaluate and refer high-risk fall patients for a comprehensive falls evaluation. This article is protected by copyright. All rights reserved.

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Characteristics of fall-related traumatic brain injury in older adults

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(Copyright © 2018, John Wiley and Sons)

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Abstract

AIM: To determine the characteristics of fall-related traumatic brain injury (FRTBI) in older adults.

METHODS: Retrospective medical chart review of 339 patients aged 65 years and older admitted for TBI in 2014 due to a fall. Characteristics analysed include demographics, fall circumstances, prior emergency department (ED) visits, polypharmacy, readmission, functional status, and specialist outpatient clinic (SOC) utilisation before and after FRTBI.

RESULTS: 339 (37.4%) patients admitted due to FRTBI were 65 years old and above, 112 (33.0%) for subdural haemorrhage (SDH); 227 (67.0%) for head injury (HI), with a mean age of 80 years. 46 (41.1%) patients with SDH and 107 (47.1%) with HI had a previous ED visit within the last year while

22 (19.6%) of SDH and 49 (21.6%) of HI had hospitalisation 3 months prior to FRTBI. FRTBI was associated with significant decline in activities of daily living, polypharmacy and increased SOC appointments ($P < 0.001$). Mortality was 11 (3.2%). Mild cognitive impairment or dementia was significantly associated with admissions for FRTBI, 3.31 (95% CI 1.68 - 6.51, $P = 0.001$) using logistic regression.

CONCLUSIONS: FRTBI is associated with significant functional decline and increased resource utilisation with almost half of the patients had prior ED visits or hospitalisation. Future studies should focus on falls risk assessment and interventions for high risk older adults prior to discharge from ED and hospital, and its impact on readmissions due to FRTBI.

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Complications and socioeconomic costs associated with falls in the elderly population

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(Copyright © 2018, Korean Academy of Rehabilitation Medicine)

DOI 10.5535/arm.2018.42.1.120 **PMID** 29560332 **PMCID** PMC5852215

Abstract

OBJECTIVE: To explore the incidence, characteristics, complications and socioeconomic impacts associated with falls in community-dwelling elderly.

METHODS: From September 1, 2015 to October 12, 2015, a questionnaire-based survey was conducted involving a total of 2,012 elderly who lived in Guro-gu (Seoul), Yeongdeungpo-gu (Seoul), Yangpyeong-gu (Gyeonggi-do), Dalseong-gu (Daegu), and Jung-gu (Daegu). The subjects were interviewed using a structured questionnaire to obtain demographic characteristics and comprehensive falling histories. The socioeconomic cost related to falls was estimated using the statistical data provided by the Health Insurance Review and Assessment Service.

RESULTS: Falls were recorded in 666 out of the 2,012 subjects (33.1%) during the past year. Frequent falls occurred during December, in the afternoons, when the floor was slippery. The most common injuries included the low back and the most common injury type was sprain. The total direct costs related to falls involving the 2,012 subjects were 303,061,019 KRW (Korean won). The average medical cost related to falls in the 2,012 subjects was 150,627 KRW and the average medical cost of 666 subjects who experienced falls was 455,047 KRW. Estimates of the total population over the age of 60 years showed that the annual direct costs associated with falls in Korea over the age of 60 years were about 1.378 trillion KRW.

CONCLUSION: This study was conducted to explore the incidence, characteristics, complications, and socioeconomic impacts of falls in community-dwelling elderly. This study is expected to be used as a source of basic data for the establishment of medical policy for the elderly and the development of a fall prevention program for the elderly in Korea.

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Detecting agitation and aggression in people with dementia using sensors-a systematic review

Khan SS, Ye B, Taati B, Mihailidis A.

Alzheimers Dement. 2018; ePub(ePub): ePub.

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Abstract

Agitation and aggression are among the most challenging symptoms of dementia. Agitated persons with dementia can harm themselves, their caregivers, or other patients in a care facility. Automatic detection of agitation would be useful to alert caregivers so that appropriate interventions can be performed. The building blocks in the automatic detection of agitation and aggression are appropriate sensing platforms and generalized predictive models. In this article, we perform a systematic review of studies that use different types of sensors to detect agitation and aggression in persons with dementia. We conclude that actigraphy shows some evidence of correlation with incidences of agitation and aggression; however, multimodal sensing has not been fully evaluated for this purpose. Based on this systematic review, we provide guidelines and recommendations for future research directions in this field.

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Different cognitive frailty models and health- and cognitive-related outcomes in older age: from epidemiology to prevention

Panza F, Lozupone M, Solfrizzi V, Sardone R, Dibello V, Di Lena L, D'Urso F, Stallone R, Petrucci M, Giannelli G, Quaranta N, Bellomo A, Greco A, Daniele A, Seripa D, Logroscino G.

J. Alzheimers Dis. 2018; 62(3): 993-1012.

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Abstract

Frailty, a critical intermediate status of the aging process that is at increased risk for negative health-related events, includes physical, cognitive, and psychosocial domains or phenotypes. Cognitive frailty is a condition recently defined by operationalized criteria describing coexisting physical frailty and mild cognitive impairment (MCI), with two proposed subtypes: potentially reversible cognitive frailty (physical frailty/MCI) and reversible cognitive frailty (physical frailty/pre-MCI subjective cognitive decline). In the present article, we reviewed the framework for the definition, different models, and the current epidemiology of cognitive frailty, also describing neurobiological mechanisms, and exploring the possible prevention of the cognitive frailty progression. Several studies suggested a relevant heterogeneity with prevalence estimates ranging 1.0-22.0% (10.7-22.0% in clinical-based settings and 1.0-4.4% in population-based settings). Cross-sectional and

longitudinal population-based studies showed that different cognitive frailty models may be associated with increased risk of functional disability, worsened quality of life, hospitalization, mortality, incidence of dementia, vascular dementia, and neurocognitive disorders. The operationalization of clinical constructs based on cognitive impairment related to physical causes (physical frailty, motor function decline, or other physical factors) appears to be interesting for dementia secondary prevention given the increased risk for progression to dementia of these clinical entities. Multidomain interventions have the potential to be effective in preventing cognitive frailty. In the near future, we need to establish more reliable clinical and research criteria, using different operational definitions for frailty and cognitive impairment, and useful clinical, biological, and imaging markers to implement intervention programs targeted to improve frailty, so preventing also late-life cognitive disorders.

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Fear of falling in community-dwelling older adults: a cause of falls, a consequence, or both?

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PLoS One 2018; 13(3): e0194967.

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(Copyright © 2018, Public Library of Science)

DOI 10.1371/journal.pone.0194967 **PMID** 29596521

Abstract

BACKGROUND: Despite the number of studies that have tried to demonstrate that there is an association between previous falls and the fear of falling, the relationship between these two variables remains a matter of controversy.

OBJECTIVES: Our objective was to investigate whether the fear of falling is a cause of falls, a consequence, or both in community-dwelling adults aged ≥ 75 years old.

METHODS: A descriptive, longitudinal, prospective study was performed. A total of 640 individuals were interviewed between 2009 and 2011. Sociodemographic data, health status, history of falls and fear of falling were assessed at baseline and at 24 months.

RESULTS: The prevalence of falls at baseline was 25% as opposed to 35.2% at 24 months. The prevalence of the fear of falling was 41.5% at baseline. Logistic regression analysis showed a significant association between a history of falls and the fear of falling. Other factors associated with the fear of falling were female gender, comorbidity, depressive symptoms, and disability. In total, 41.7% of the subjects who had reported a fear of falling at baseline had suffered at least one fall 24 months later. Unadjusted Cox regression analysis revealed that the fear of falling was a risk factor for falls. According to the final model adjusted for other covariates, the only reliable predictor was female gender. The Cox model stratified by gender failed to show a crude association between fear of falling and falls.

CONCLUSION: A previous history of falls in the previous year was a good predictor of the fear of falling; but the fear of falling was a predictor of falls during follow-up only in the unadjusted model, pointing to strong gender turns out as an effect modifier of the association of FOF and subsequent falls.

Nursing staff working in elderly care should not only routinely assess patients' previous history of falls, but also evaluate their fear of falling and its associated factors.

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Gait and balance in the aging population: fall prevention using innovation and technology

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Maturitas 2018; 110: 51-56.

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Abstract

On a global basis, adults 65 years of age and older experience falls more frequently than younger individuals, and these often result in severe injuries as well as increased healthcare costs. Gait and balance disorders in this population are among the most common causes of falls and negatively influence quality of life and survivorship. Although falls are a major public health problem and guidelines/recommendations are available to physicians, many are fully aware of different assessments, tools, and resources available for intervention. Given the risk for potentially devastating outcomes if severe injuries occur secondary to a fall, fall prevention strategies in clinical offices is a timely consideration in today's health care landscape. This paper presents a three-tier model, comprising assessment, prevention, and intervention, to highlight methods, proactive programs, and innovative tools and technology that have been developed for fall prevention. Awareness of these resources will enhance the clinician's ability to accurately assess balance and gait, which can improve physical function, and decrease the risk of falls for both average-risk and high-risk older adults.

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How older adults and their informal carers prevent falls: an integrative review of the literature

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Abstract

Falls in older persons are prevalent and costly for the individual and the health system. Falls prevention guidelines have been developed from best evidence to minimise falls in older persons. AIM: To synthesise the literature on falls prevention strategies used by community dwelling older persons and/or their informal carers and to compare the commonly adopted strategies with those recommended by falls prevention guidelines.

DATA SOURCES: Health sciences databases for full text articles published in English plus reference list searching of included articles.

REVIEW METHOD: An integrative review approach. Studies were included if they identified fall prevention management strategies used by community dwelling older adults and/or their informal carers. Quality appraisal was undertaken using appropriate Joanna Briggs Institute critical appraisal tools. Information relevant to the aim of the review were extracted and coded into categories then inductively sorted into sub-themes and themes.

RESULTS: Of the seventeen studies included in the review, eleven identified older adults' falls prevention strategies, two investigated fall prevention strategies used by carers, and four explored perspectives of older persons together with their carers, representing the perspectives of an estimated 501 older persons and 102 carers. Strategies used by older adults arose because of self-awareness about their changing physical ability, and advice and support mainly from family or friends. Carer fall prevention strategy was predominantly around protection of the older adult from falling by discouraging independence.

CONCLUSIONS: The fall self-management strategies adopted by older adults and their carers to prevent falls, in the main, do not align with international best practice fall prevention guidelines.

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Impaired set shifting is associated with previous falls in individuals with and without Parkinson's disease

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Gait Posture 2018; 62: 220-226.

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(Copyright © 2018, Elsevier Publishing)

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Abstract

BACKGROUND: Individuals with Parkinson's disease (PD) are at increased risk for falls, which lead to substantial morbidity and mortality. Understanding the motor and non-motor impairments associated with falls in PD is critical to informing prevention strategies. In addition to motor symptoms, individuals with PD exhibit non-motor deficits, including impaired set shifting, an aspect of executive function related to cognitive flexibility that can be measured quickly with the Trailmaking Test.

RESEARCH QUESTION: To determine whether impaired set shifting is associated with fall history in people with and without PD.

METHODS: We examined associations between set shifting, PD status, and fall history (≥ 1 falls in the previous 6 months) in data from PD patients ($n = 65$) with and without freezing of gait (FOG) and community-dwelling neurologically-normal older adults (NON-PD) ($n = 73$) who had participated in our rehabilitation studies.

RESULTS: Impaired set shifting was associated with previous falls after controlling for age, sex, overall cognitive function, PD status, FOG, and PD disease duration (OR = 1.29 [1.03-1.60]; $P = 0.02$).

Consistent with literature, PD and FOG were also independently associated with increased fall prevalence (PD OR = 4.15 [95% CI 1.65-10.44], $P < 0.01$; FOG OR = 3.63 [1.22-10.80], $P = 0.02$). Although the strongest associations between set shifting and falling were observed among PD without FOG (OR = 2.11) compared to HOA (OR = 1.14) and PD with FOG (OR = 1.46), no statistically-significant differences were observed across groups.

SIGNIFICANCE: Impaired set shifting is associated with previous falls in older adults with and without PD. Set shifting may be useful to include in fall risk assessments, particularly when global cognitive measures are within reference limits.

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Improved prediction of falls in community-dwelling older adults through phase-dependent entropy of daily-life walking

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DOI 10.3389/fnagi.2018.00044 **PMID** 29556188 **PMCID** PMC5844982

Abstract

Age and age-related diseases have been suggested to decrease entropy of human gait kinematics, which is thought to make older adults more susceptible to falls. In this study we introduce a new entropy measure, called phase-dependent generalized multiscale entropy (PGME), and test whether this measure improves fall-risk prediction in community-dwelling older adults. PGME can assess phase-dependent changes in the stability of gait dynamics that result from kinematic changes in events such as heel strike and toe-off. PGME was assessed for trunk acceleration of 30 s walking epochs in a re-analysis of 1 week of daily-life activity data from the FARA study, originally described by van Schooten et al. (2016). The re-analyzed data set contained inertial sensor data from 52 single- and 46 multiple-time prospective fallers in a 6 months follow-up period, and an equal number of non-falling controls matched by age, weight, height, gender, and the use of walking aids. The predictive ability of PGME for falls was assessed using a partial least squares regression. PGME had a superior predictive ability of falls among single-time prospective fallers when compared to the other gait features. The single-time fallers had a higher PGME ($p < 0.0001$) of their trunk acceleration at 60% of their step cycle when compared with non-fallers. No significant differences were found between PGME of multiple-time fallers and non-fallers, but PGME was found to improve the prediction model of multiple-time fallers when combined with other gait features. These findings suggest that taking into account phase-dependent changes in the stability of the gait dynamics has additional value for predicting falls in older people, especially for single-time prospective fallers.

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Kidney function, gait pattern and fall in the general population: a cohort study

Sedaghat S, Darweesh SKL, Verlinden VJA, van der Geest JN, Dehghan A, Franco OH, Hoorn EJ, Ikram MA.

Nephrol. Dial. Transplant. 2018; ePub(ePub): ePub.

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(Copyright © 2018, Oxford University Press)

DOI 10.1093/ndt/gfy043 **PMID** 29566168

Abstract

BACKGROUND: Gait disturbance is proposed as a mechanism for higher risk of fall in kidney disease patients. We investigated the association of kidney function with gait pattern in the general population and tested whether the association between impaired kidney function and fall is more pronounced in subjects with lower gait function.

METHODS: We included 1430 participants (mean age: 60 years) from the Rotterdam Study. Kidney function was assessed using estimated glomerular filtration rate (eGFR) and albumin-to-creatinine ratio (ACR). We assessed global gait, gait velocity and seven independent gait domains: Rhythm, Phases, Variability, Pace, Tandem, Turning and Base of Support. Regression models adjusted for cardiometabolic and neurological factors were used. We evaluated whether participants with impaired kidney function and impaired gait fell more in the previous year.

RESULTS: The study population had a median (interquartile range) ACR of 3.6 (2.5-6.2) mg/g and mean \pm SD eGFR of 87.6 ± 15 mL/min/1.73 m². Higher ACR and lower eGFR were associated with lower global gait score [per doubling of ACR: -0.10, 95% confidence interval (CI): -0.14 to -0.06, and per SD eGFR: -0.09, 95% CI: -0.14 to -0.03] and slower gait speed (ACR: -1.44 cm/s, CI: -2.12 to -0.76; eGFR: -1.55 cm/s, CI: -2.43 to -0.67). Worse kidney function was associated with lower scores in Variability domain. The association between impaired kidney function and history of fall was present only in participants with lower gait scores [odds ratio (95% CI): ACR: 1.34 (1.09-1.65); eGFR: 1.58 (1.07-2.33)].

CONCLUSIONS: We observed a graded association between lower kidney function and impaired gait suggesting that individuals with decreased kidney function, even at an early stage, need to be evaluated for gait abnormalities and might benefit from fall prevention programmes.

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Low intensity vibration of ankle muscles improves balance in elderly persons at high risk of falling

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PLoS One 2018; 13(3): e0194720.

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Abstract

In our study we examined postural performance of young healthy persons (HY), elderly healthy persons (HE), and elderly persons at high risk of falling (FR). Anterio-posterior (AP) and medio-lateral

(ML) ankle and hip angular deviations, as well as linear displacements of the center of mass (COM) were assessed in persons standing with eyes either open or closed, while none, and 40 and 30 Hz vibrations were applied bilaterally to the ankle muscle gastrocnemius. During quiet standing with eyes open, balance parameters in FR group differed from those in healthy groups. ML ankle and hip angular deviations, as well as COM linear displacements were noticeably larger in FR group. During quiet standing with eyes closed, all balance parameters in participants of all groups had a clear trend to increase. During standing with eyes open, 40 Hz vibration increased all but one balance parameter within HY group, ankle angular deviations in HE group, but none in FR group. In response to 30 Hz vibration, only ankle angular deviations and COM linear displacements increased in HY group. There were no changes in both elderly groups. During standing with eyes closed, 40 and 30 Hz vibrations did not produce consistent changes in balance parameters in HY and HE groups. In FR persons, 40 Hz vibration did not change balance parameters. However, in FR groups, 30 Hz vibration decreased ankle and hip angular deviations, and COM linear displacements. The major result of the study is a finding that low intensity vibration of ankle muscles makes balance better in elderly persons at high risk of falling. This result is clinically relevant because it suggests that applying mild vibration to ankle muscles while standing and walking might benefit elderly persons, improving their postural performance and reducing a risk of unexpected falls.

PDF Y Endnote Y

Mediator effect of balance problems on association between grip strength and falls in older adults: results from the KORA-Age Study

Arvandi M, Strasser B, Volaklis K, Ladwig KH, Grill E, Matteucci Gothe R, Horsch A, Laxy M, Siebert U, Peters A, Thorand B, Meisinger C.

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DOI 10.1177/2333721418760122 **PMID**29568795 **PMCID** PMC5858620

Abstract

OBJECTIVE: To examine the association between grip strength and history of falls among older individuals, and to assess the possible mediating effect of balance problems on this relationship.

METHOD: Data originate from KORA (Cooperative Health Research in the Region of Augsburg)-Age Study of 808 individuals (65 years and above). Follow-up assessment occurred 3 years later.

RESULTS: The risk of falls within the last 12 months was reduced on average by 3% (odds ratio [OR] 95% confidence interval [95% CI] = 0.97 [0.94, 0.99]; p value = .026) per 1-kg increase in maximum grip strength after adjusting for age and gender. There was a trend toward an indirect effect of grip strength through the mediator variable balance problems (p value = .043).

DISCUSSION: Increased muscular strength is associated with a reduced risk of falls in older age after adjustment for age and gender. The association is partially mediated by balance problems. Thus, in older adults, muscle-strengthening exercises may decrease the risk of falling.

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Motor planning error: toward measuring cognitive frailty in older adults using wearables

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Sensors (Basel) 2018; 18(3): s18030926.**Affiliation:** Interdisciplinary Consortium on Advanced Motion Performance (iCAMP), Michael E. DeBakey Department of Surgery, Baylor College of Medicine, Houston, TX 77030, USA. najafi.bijan@gmail.com.

(Copyright © 2018, Multidisciplinary Digital Publishing Institute)

DOI 10.3390/s18030926 **PMID** 29558436**Abstract**

Practical tools which can be quickly administered are needed for measuring subtle changes in cognitive-motor performance over time. Frailty together with cognitive impairment, or 'cognitive frailty', are shown to be strong and independent predictors of cognitive decline over time. We have developed an interactive instrumented trail-making task (iTMT) platform, which allows quantification of motor planning error (MPE) through a series of ankle reaching tasks. In this study, we examined the accuracy of MPE in identifying cognitive frailty in older adults. Thirty-two older adults (age = 77.3 ± 9.1 years, body-mass-index = 25.3 ± 4.7 kg/m², female = 38%) were recruited. Using either the Mini-Mental State Examination or Montreal Cognitive Assessment (MoCA), 16 subjects were classified as cognitive-intact and 16 were classified as cognitive-impaired. In addition, 12 young-healthy subjects (age = 26.0 ± 5.2 years, body-mass-index = 25.3 ± 3.9 kg/m², female = 33%) were recruited to establish a healthy benchmark. Subjects completed the iTMT, using an ankle-worn sensor, which transforms ankle motion into navigation of a computer cursor. The iTMT task included reaching five indexed target circles (including numbers 1-to-3 and letters A&B placed in random order) on the computer-screen by moving the ankle-joint while standing. The ankle-sensor quantifies MPE through analysis of the pattern of ankle velocity. MPE was defined as percentage of time deviation between subject's maximum ankle velocity and the optimal maximum ankle velocity, which is halfway through the reaching pathway. Data from gait tests, including single task and dual task walking, were also collected to determine cognitive-motor performance. The average MPE in young-healthy, elderly cognitive-intact, and elderly cognitive-impaired groups was $11.1 \pm 5.7\%$, $20.3 \pm 9.6\%$, and $34.1 \pm 4.2\%$ ($p < 0.001$), respectively. Large effect sizes (Cohen's $d = 1.17-4.56$) were observed for discriminating between groups using MPE. Significant correlations were observed between the MPE and MoCA score ($r = -0.670, p < 0.001$) as well as between the MPE and dual task stride velocity ($r = -0.584, p < 0.001$). This study demonstrated feasibility and efficacy of estimating MPE from a practical wearable platform with promising results in identifying cognitive-motor impairment and potential application in assessing cognitive frailty. The proposed platform could be also used as an alternative to dual task walking test, where gait assessment may not be practical. Future studies need to confirm these observations in larger samples.

PDF Y Endnote Y**Nutritional strategies to reduce falls risk in older people**

Nash L, Bergin N.

Nurs. Older People 2018; 30(3): 20-24.**Affiliation:** Airedale NHS Foundation Trust, West Yorkshire, England.

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Abstract

A literature review found an association between increased falls risk and malnutrition, sarcopenia, vitamin D deficiency and dehydration. Strategies to identify, prevent and treat these conditions can help to reduce falls risk in at-risk groups such as frail, older people. Nurses can reduce falls risk in older people by raising awareness of risk factors and embedding nutritional strategies in local falls reduction strategies.

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PDF Will get ILL Endnote Y

Outcomes after falls continue to worsen despite trauma and geriatric care advancements

Charles EJ, Napoli NJ, Johnston LE, Foster CA, Goode DA, Parker TB, Sharp EA, Barnes L, Young JS. *Am. Surg.* 2018; 84(3): 392-397.

(Copyright © 2018, Southeastern Surgical Congress)

DOI unavailable **PMID** 29559054

Abstract

The most common mechanism of traumatic injury is ground-level fall. The objective of this study was to understand how patients sustaining falls and their outcomes have evolved. An institutional trauma database was used to identify adult patients who suffered a fall and were admitted to a Level I trauma center during two distinct time periods: 1998 to 2003 (past) and 2008 to 2013 (current). Data on anticoagulant use and comorbidities was gathered by retrospective chart review of patients treated during 2003 and 2013. Univariable analyses and multivariable regression were used to evaluate demographics and outcomes. A total of 6116 patients were identified, with a 24 per cent increase in number of falls between groups. Current fall patients are older (70 vs 66 years, $P < 0.001$), more often admitted to intensive care (28 vs 12%, $P < 0.001$), have longer lengths of stay (5 vs 4 days, $P < 0.001$), are frequently discharged to skilled nursing facilities (24 vs 8%, $P < 0.001$), and have higher mortality (5 vs 3%, $P = 0.002$). The adjusted odds of mortality for patients treated during 2003 and 2013 was associated with age, gender, injury severity score, and Glasgow Coma Scale score. Current fall patients use more health care resources and have worse outcomes, despite advances in trauma and geriatric care.

PDF N Endnote Y

Predictors of mortality in elder patients with proximal humeral fracture

Myeroff CM, Anderson JP, Sveom DS, Switzer JA.

Geriatr Orthop Surg Rehabil 2018; 9: e2151458517728155.

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DOI 10.1177/2151458517728155 **PMID** 29560284 **PMCID** PMC5851103

Abstract



BACKGROUND: Known possible consequences of proximal humerus fractures include impaired shoulder function, decreased independence, and increased risk for mortality. The purpose of this report is to describe the survival and independence of elderly patients with fractures of the proximal humerus, treated in our institution, relative to patient characteristics and treatment method.

METHODS: Retrospective cohort study from 2006 to 2012.

SETTING: Community-based hospital with level 1 designation.

PATIENTS/PARTICIPANTS: Three hundred nineteen patients ≥ 60 years who presented to the emergency department with an isolated fracture of the proximal humerus were either admitted to the inpatient ward for the organization and provision of immediate definitive care or discharged with the expectation of coordination of their care as an outpatient. Treatment was nonoperative or operative.

OUTCOME MEASURES: One- and 2-year mortality.

RESULTS: Significant predictors of mortality at 1 year included Charlson Comorbidity Index (CCI; continuous, hazard ratio [HR] = 1.40; 95% confidence interval [CI]: 1.06-1.86), body mass index (BMI; <25 vs ≥ 25 ; HR = 3.43; 95% CI: 1.45-8.14), and American Society of Anesthesiologists (ASA) disease severity score (3-4 vs 1-2; HR = 4.48; 95% CI: 1.21-16.55). In addition to CCI and BMI, reliance on a cane/walker/wheelchair at the time of fracture predicted mortality at 2 years (vs unassisted ambulation; HR = 3.13; 95% CI: 1.59-5.88). Although the Neer classification of fracture severity significantly correlated with inpatient admission ($P < .001$), it was not significantly associated with mortality or with loss of living or ambulatory independence. Among admitted patients, 64% were discharged to a facility with a higher level of care than their prefracture living facility. Twenty percent of study patients experienced a loss in ambulatory status by at least 1 level at 1 year postfracture.

CONCLUSION: In a cohort of elderly patients with fractures of the proximal humerus, patient characteristics including comorbidities, ASA classification, and lower BMI were associated with increased mortality. Specifically, those admitted at the time of fracture and treated nonoperatively had the highest mortality rate and, likely, represent the frailest cohort. Those initially treated as outpatients and later treated operatively had the lowest mortality and, likely, represent the healthiest cohort. These data are inherently biased by prefracture comorbidities but help stratify our patients' mortality risk at the time of injury.

PDF Y Endnote Y

Recalibrating disparities in perceived and actual balance abilities in older adults: a mixed-methods evaluation of a novel exergaming intervention

Ellmers TJ, Paraskevopoulos IT, Williams AM, Young WR.

J. Neuroengineering Rehabil. 2018; 15(1): e26.

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DOI 10.1186/s12984-018-0369-8 **PMID** 29566720

Abstract

BACKGROUND: Published reports suggest a disparity between perceived and actual balance abilities, a trait associated with increased fall-risk in older adults. We investigate whether it is possible to

'recalibrate' these disparities using a novel gaming intervention.

METHODS: We recruited 26 older adults for a 4-week intervention in which they participated in 8-sessions using a novel gaming intervention designed to provide explicit, augmented feedback related to postural control. Measures of perceived balance abilities (Falls Efficacy Scale-International) and actual postural control (limits of stability) were assessed pre- and post-intervention. We used focus groups to elicit the opinions of participants about how the game may have influenced balance abilities and confidence.

RESULTS: A stronger alignment was observed between postural control and perceived balance capabilities post-intervention (i.e., significant correlations between Falls Efficacy Scale-International scores and limits of stability which were not present pre-intervention). Also, significant improvements in measures of postural control were observed, with these improvements confined to the aspects of postural control for which the exergame provided explicit, augmented feedback. Qualitative data revealed that the intervention made participants more "aware" of their balance abilities.

CONCLUSIONS: Our results demonstrate that it is possible to recalibrate the perceptions of older adults relating to their balance abilities through a targeted, short-term intervention. We propose that the post-intervention improvements in postural control may have been, in part, the result of this recalibration; with altered perceptions leading to changes in balance performance.

FINDINGS support the application of novel interventions aimed at addressing the psychological factors associated with elderly falls.

PDF Y Endnote Y

Reducing falls in older adults recently discharged from hospital: a systematic review and meta-analysis

Naseri C, Haines TP, Etherton-Beer C, McPhail S, Morris ME, Flicker L, Netto J, Francis-Coad J, Lee DA, Shorr R, Hill AM.

Age Ageing 2018; ePub(ePub): ePub.

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(Copyright © 2018, Oxford University Press)

DOI 10.1093/ageing/afy043 **PMID** 29584895

Abstract

BACKGROUND: older adults are known to have increased falls rates and functional decline following hospital discharge, with substantial economic healthcare costs. This systematic review aimed to synthesise the evidence for effective falls prevention interventions in older adults recently discharged from hospital.

METHODS: literature searches of six databases of quantitative studies conducted from 1990 to June 2017, reporting falls outcomes of falls prevention interventions for community-dwelling older adults discharged from hospital were included. Study quality was assessed using a standardised JBI critical appraisal tool (MAStARI) and data pooled using Rev-Man Review Manager®.

RESULTS: sixteen studies (total sample size N = 3,290, from eight countries, mean age 77) comprising 12 interventions met inclusion criteria. We found home hazard modification interventions delivered

to those with a previous falls history (1 study), was effective in reducing the number of falls (RR 0.63, 95%CI 0.43, 0.93, Low GRADE evidence). Home exercise interventions (3 studies) significantly increased the proportion of fallers (OR 1.74, 95%CI 1.17, 2.60, Moderate GRADE evidence), and did not significantly reduce falls rate (RR 1.27, 95%CI 0.99, 1.62, Very Low GRADE evidence) or falls injury rate (RR 1.16, 95%CI, 0.83,1.63, Low GRADE evidence). Nutritional supplementation for malnourished older adults (1 study) significantly reduced the proportion of fallers (HR 0.41, 95% CI 0.19, 0.86, Low GRADE evidence).

CONCLUSION: the recommended falls prevention interventions for older adults recently discharged from hospital are to provide home hazard minimisation particularly if they have a recent previous falls history and consider nutritional supplementation if they are malnourished.

PDF Y Endnote Y

Risk factors predicting subsequent falls and osteoporotic fractures at 4 years after distal radius fracture-a prospective cohort study

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Arch. Osteoporos. 2018; 13(1): 32.

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DOI 10.1007/s11657-018-0445-5 **PMID** 29558002

Abstract

In a prospective cohort of 113 patients followed 4 years after distal radius fracture (DRF), 24% of patients experienced a subsequent fall and 19% experienced a subsequent fracture. People with poor balance, greater fracture-specific pain/disability, low bone density, and prior falls had nearly a three times higher risk of subsequent falls.

PURPOSE: To determine the extent to which modifiable risk factors alone or in combination with bone mineral density (BMD) and non-modifiable risk factors predict subsequent falls and osteoporotic (OP) fractures after distal radius fracture (DRF).

METHODS: We assessed a cohort of patients (n = 191; mean age = 62 ± 8 years; female = 88%) shortly after DRF (baseline) and again at 4 years to identify subsequent falls or OP fractures. Baseline predictors included age, sex, prior falls, and modifiable risk factors such as balance, muscle strength, physical activity, fear of falling, BMD, fracture-specific pain/disability, and general health status. Univariate, multivariate, and stepwise logistic regression analyses were conducted to compute odds ratio (OR) with 95% CI to determine the extent of association between the risk factors and outcomes.

RESULTS: Among the 113 patients, who completed 4-year follow-up, 24% reported ≥ 1 subsequent fall and 19% reported ≥ 1 subsequent fracture. Significant predictors of subsequent falls included poor balance (OR = 3.3), low total hip BMD (OR = 3.3), high patient-rated wrist evaluation (PRWE) score (OR = 3.0), and prior falls (OR = 3.4). When adjusted for BMD, age, and sex; only prior falls (OR = 4.1) remained a significant independent predictor of future falls. None of the modifiable or non-modifiable risk factors were significantly associated with subsequent fractures.

CONCLUSION: Prior falls (≥ 2) is an independent predictor of subsequent falls in patients with DRF. In clinical practice, screening of patients for prior falls, balance, fracture-specific pain/disability, and BMD may identify those who might be at risk of subsequent falls after their first DRF.

PDF Y Endnote Y

Selective prescribing of statins and the risk of mortality, hospitalizations, and falls in aged care services

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(Copyright © 2018, Elsevier Publishing)

DOI 10.1016/j.jacl.2018.02.012 **PMID** 29574073

Abstract

BACKGROUND: Compared to randomized controlled trials, nonexperimental studies often report larger survival benefits but higher rates of adverse events for statin use vs nonuse.

OBJECTIVE: We compared characteristics of statin users and nonusers living in aged care services and evaluated the relationships between statin use and all-cause mortality, all-cause and fall-related hospitalizations, and number of falls during a 12-month follow-up.

METHODS: A prospective cohort study of 383 residents aged ≥ 65 years was conducted in six Australian aged care services. Data were obtained from electronic medical records and medication charts and through a series of validated assessments.

RESULTS: The greatest differences between statin users and nonusers were observed in activities of daily living, frailty, and medication use (absolute standardized difference >0.40), with users being less dependent and less frail but using a higher number of medications. Statin use was associated with a decreased risk of all-cause mortality (adjusted hazard ratio [HR] 0.58, 95% confidence interval [CI] 0.37-0.93) and hospitalizations (HR 0.67, 95% CI 0.46-0.98). After exclusion of residents unable to sit or stand, statin use was associated with a nonsignificant increase in the risk of fall-related hospitalizations (HR 1.47, 95% CI 0.80-2.68) but with a lower incidence of falls (incidence rate ratio 0.67, 95% CI 0.47-0.96).

CONCLUSIONS: The observed associations between statin use and the outcomes may be largely explained by selective prescribing and deprescribing of statins and variation in likelihood of hospitalization based on consideration of each resident's clinical and frailty status. Randomized deprescribing trials are needed to guide statin prescribing in this setting.

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PDF Y Endnote Y

Severity of sarcopenia is associated with postural balance and risk of falls in community-dwelling older women

Gadelha AB, Neri SGR, Oliveira RJ, Bottaro M, David AC, Vainshelboim B, Lima RM.

Exp. Aging Res. 2018; ePub(ePub): ePub.

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(Copyright © 2018, Informa - Taylor and Francis Group)

DOI 10.1080/0361073X.2018.1449591 **PMID** 29558320

Abstract

BACKGROUND/STUDY CONTEXT: Falls represent the leading cause of accidental deaths in the elderly. Sarcopenia is a geriatric syndrome defined as the loss of muscle mass and strength. However, the association between falls and sarcopenia is still unclear. Thus, the aim of the present study was to investigate the association between different stages of sarcopenia and postural balance, risk of falls, and fear of falling in community-dwelling older women.

METHODS: A total of 196 women (68.6 ± 6.5 years) underwent body composition (Dual-energy X-ray Absorptiometry), muscle strength (isokinetic), and functional (Timed Up-and-Go) assessments. Sarcopenia was classified according to European Working Group on Sarcopenia in Older People. Center of pressure (CoP) sway, risk, and fear of falling were assessed through force platform, QuickScreen, and Falls Efficacy Scale, respectively. ANOVA models and chi-squared were used to compare groups.

RESULTS: Severe sarcopenic subjects presented higher risk of falling when compared to the other stages ($p < 0.01$). Regarding CoP sway, both mean speed and mediolateral range were significantly higher in severe sarcopenia when compared to both nonsarcopenia and presarcopenia ($p < 0.05$). Fear of falling was higher in all sarcopenia stages when compared to nonsarcopenic individuals ($p < 0.05$).

CONCLUSION: Sarcopenia negatively affects balance, and both risk and fear of falling in community-dwelling older women. Moreover, this study provides evidence that sarcopenia severity is further associated to reduced balance and imposes an even greater risk of falls in the elderly.

PDF Y endnote Y

The association between fear of falling and motor imagery abilities in older community-dwelling individuals

Grenier S, Richard-Devantoy S, Nadeau A, Payette MC, Benyebdri F, Duhaime MB, Gunther B, Beauchet O.

Maturitas 2018; 110: 18-20.

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DOI 10.1016/j.maturitas.2018.01.001 **PMID** 29563030



Abstract

We investigated the association between fear of falling (FoF) and motor imagery (MI) abilities in older people. Cross-sectional data from 3552 French older adults were used to conduct a multiple linear regression analysis looking at the association between FoF and MI abilities after controlling for several factors (e.g. gender, age, history of falls). MI abilities were significantly lower in older adults reporting a FoF compared with those without this fear. The presence of lower MI abilities, reflecting deficits in gait control, may explain why older people with a FoF are at higher risk of falling.

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PDF Y Endnote Y

The P3 parietal-to-frontal shift relates to age-related slowing in a selective attention task

Reuter EM, Voelcker-Rehage C, Vieluf S, Parianen Lesemann F, Godde B.

J. Psychophysiol. 2017; 31(2): 49-66.

(Copyright © 2017, Hogrefe and Huber Publishers)

DOI 10.1027/0269-8803/a000167 **PMID** unavailable

Abstract

Older adults recruit relatively more frontal as compared to parietal resources in a variety of cognitive and perceptual tasks. It is not yet clear whether this parietal-to-frontal shift is a compensatory mechanism, or simply reflects a reduction in processing efficiency. In this study we aimed to investigate how the parietal-to-frontal shift with aging relates to selective attention. Fourteen young and 26 older healthy adults performed a color Flanker task under three conditions (incongruent, congruent, neutral) and event-related potentials (ERPs) were measured. The P3 was analyzed for the electrode positions Pz, Cz, and Fz as an indicator of the parietal-to-frontal shift. Further, behavioral performance and other ERP components (P1 and N1 at electrodes O1 and O2; N2 at electrodes Fz and Cz) were investigated. First young and older adults were compared. Older adults had longer response times, reduced accuracy, longer P3 latencies, and a more frontal distribution of P3 than young adults. These results confirm the parietal-to-frontal shift in the P3 with age for the selective attention task. Second, based on the differences between frontal and parietal P3 activity the group of older adults was subdivided into those showing a rather equal distribution of the P3 and older participants showing a strong frontal focus of the P3. Older adults with a more frontally distributed P3 had longer response times than participants with a more equally distributed P3. These results suggest that the frontally distributed P3 observed in older adults has no compensatory function in selective attention but rather indicates less efficient processing and slowing with age.

PDF N Endnote Y

Do people with Parkinson's disease look at task relevant stimuli when walking? An exploration of eye movements

Hunt D, Stuart S, Nell J, Hausdorff JM, Galna B, Rochester L, Alcock L.

Behav. Brain Res. 2018; ePub(ePub): ePub.

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(Copyright © 2018, Elsevier Publishing)

DOI 10.1016/j.bbr.2018.03.003 **PMID** 29559336

Abstract

Highlights:

- During walking, PD make more task-irrelevant fixations compared to controls.
- With visual cues, fixation locations were similar between PD and controls.
- When crossing a salient obstacle, PD made more task-relevant fixations than controls.
- Poorer visual acuity was associated with fewer fixations during walking in PD only.
- Improving the saliency of relevant stimuli may be a useful, cost-effective home-based modification for PD.

PDF Y Endnote Y

Factors affecting walking ability in female patients with rheumatoid arthritis

Morita Y, Ito H, Torii M, Hanai A, Furu M, Hashimoto M, Tanaka M, Azukizawa M, Arai H, Mimori T, Matsuda S.

PLoS One 2018; 13(3): e0195059.

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(Copyright © 2018, Public Library of Science)

DOI 10.1371/journal.pone.0195059 **PMID** 29584787

Abstract

OBJECTIVE: To determine the factors associated with gait parameters in female patients with rheumatoid arthritis (RA).

METHODS: The gait analysis was performed in a large cohort of RA patients, and three basic gait parameters (step length, cadence and gait speed) were calculated. Clinical and laboratory data were also collected. Factors associated with gait parameters were analyzed using multivariable linear regression in the three models with forced entry. Then, we divided those patients with Health Assessment Questionnaire disability index (HAQ) scores ≤ 0.5 into two groups according to their gait speed that were compared to identify the characteristics of patients with a good HAQ score but poor walking ability.

RESULTS: A total of 318 female patients were analyzed. Knee extension strength had the strongest positive association with all three gait parameters ($P < 0.0001$), while methotrexate use was also positively associated with all three gait parameters (step length: $P < 0.05$, cadence: $P < 0.05$ in model 1 and 2; $P < 0.01$ in model 3, gait speed: $P < 0.01$). The disease activity score was negatively associated with step length and gait speed (step length, gait speed: $P < 0.01$ in model 1 and 2; $P < 0.05$ in model 3). 26% of patients with good HAQ scores showed slow gait speed. Patients with good HAQ scores and slow gait speed had higher disease activity scores ($P < 0.05$) and lower knee extension strength ($P < 0.0001$) than those with good HAQ scores and normal gait speed.

CONCLUSIONS: High knee extension strength, low disease activity and administration of methotrexate were strongly associated with good walking ability in female patients with RA. And,

even if patients showed good HAQ scores, about quarter of those patients had poor walking ability, and they showed higher disease activity, lower knee extension strength, compared to the patients with normal gait speed.

PDF Y Endnote Y

Over-focused? The relation between patients' inclination for conscious control and single- and dual-task motor performance after stroke

Denneman RPM, Kal EC, Houdijk H, Kamp JV.

Gait Posture 2018; 62: 206-213.

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(Copyright © 2018, Elsevier Publishing)

DOI 10.1016/j.gaitpost.2018.03.008 **PMID** 29571088

Abstract

BACKGROUND: Many stroke patients are inclined to consciously control their movements. This is thought to negatively affect patients' motor performance, as it disrupts movement automaticity. However, it has also been argued that conscious control may sometimes benefit motor performance, depending on the task or patients' motor or cognitive capacity.

AIM: To assess whether stroke patients' inclination for conscious control is associated with motor performance, and explore whether the putative association differs as a function of task (single- vs dual) or patients' motor and cognitive capacity.

METHODS: Univariate and multivariate linear regression analysis were used to assess associations between patients' disposition to conscious control (i.e., Conscious Motor Processing subscale of Movement-Specific Reinvestment Scale; MSRS-CMP) and single-task (Timed-up-and-go test; TuG) and motor dual-task costs (TuG while tone counting; motor DTC%). We determined whether these associations were influenced by patients' walking speed (i.e., 10-m-walk test) and cognitive capacity (i.e., working memory, attention, executive function).

RESULTS: Seventy-eight clinical stroke patients (<6 months post-stroke) participated. Patients' conscious control inclination was not associated with single-task TuG performance. However, patients with a strong inclination for conscious control showed higher motor DTC%. These associations were irrespective of patients' motor and cognitive abilities.

CONCLUSION: Patients' disposition for conscious control was not associated with single task motor performance, but was associated with higher motor dual task costs, regardless of patients' motor or cognitive abilities. **CLINICAL RELEVANCE:** Therapists should be aware that patients' conscious control inclination can influence their dual-task performance while moving. Longitudinal studies are required to test whether reducing patients' disposition for conscious control would improve dual-tasking post-stroke.

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PDF Y Endnote Y

Research of falls risk of taking central nervous system drugs in oncology inpatients

Li Y, Zhang Q, Yang X, Zheng L, Yang J, Zhao H, Yang D.

Curr. Probl. Cancer 2018; ePub(ePub): ePub.

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(Copyright © 2018, Mosby Publishers, Publisher Elsevier Publishing)

DOI 10.1016/j.currproblcancer.2018.01.008 **PMID** 29580676

Abstract

This study aimed to analyze the medication use and related falls risk of central nervous system(CNS) drugs in oncology inpatients, explore the association between CNS drugs and falls. In this study, we enrolled inpatients, hospitalized in the oncology department of the Teaching Hospital of Chengdu University of Traditional Chinese Medicine, from March 2013 to October 2015. All inpatients were divided into two groups: taking-CNS drugs group (treatment group) and non CNS drugs group (control group). The falls risk between two groups were being compared and analyzed.

RESULTS showed that a total of 768 inpatients were enrolled in this study; 401 of them were males and 367 were females; the average age was 47.9±5.8 year-old. Of them, 129 were taking CNS drugs, while 639 were not. In the treatment group, the number of fall patients was 39, at an incidence rate of 30.23%; of the 39 fall patients, 3 suffered fractures, and 1 suffered an intracranialhemorrhage; while in the control group, the incidence of falls totaled at 45, at an incidence rate of 7.04%; 4 of the patients suffered fractures. The difference of incidence rate between two groups had statistical significance ($P < 0.01$). The incidence rate of falls in the treatment group was 4.29 times that in the control group. By the further analysis of CNS drugs, results implied that hypnotics, sedatives, selective serotonin reuptake inhibitors (no patient taking tricyclic antidepressants in this study), opioids, antiepileptics and antipsychotics had relationship with falls ($OR > 1$). Our finding indicates that oncology inpatients have a higher risk of falls resulting from taking CNS drugs. Therefore, it is necessary to build up a systemic mechanism of nursing safety management on preventing falls of oncology inpatients, to improve nursing quality, and reduce the risk of falls.

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PDF Y Endnote Y**Risk of fall in patients with COPD**

Hakamy A, Bolton CE, Gibson JE, McKeever TM.

Thorax 2018; ePub(ePub): ePub.

Affiliation: Division of Epidemiology and Public Health, School of Medicine, University of Nottingham, Nottingham, UK.

(Copyright © 2018, BMJ Publishing Group)

DOI 10.1136/thoraxjnl-2017-211008 **PMID** 29563161

Abstract

A matched cohort study was conducted to determine the incidence of falls in patients following a diagnosis of COPD using a UK primary care database. 44 400 patients with COPD and 175 545 non-COPD subjects were identified. The incidence rate of fall per 1000 person-years in patients with COPD was higher (44.9; 95% CI 44.1 to 45.8) compared with non-COPD subjects (24.1; 95% CI 23.8 to

24.5) ($P < 0.0001$). Patients with COPD were 55% more likely to have an incident record of fall than non-COPD subjects (adjusted HR, 1.55; 95% CI 1.50 to 1.59). The greater falls risk in patients with COPD needs consideration and modifiable factors addressed.

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PDF Endnote Y

Stability basin estimates fall risk from observed kinematics, demonstrated on the Sit-to-Stand task

Shia V, Moore TY, Holmes P, Bajcsy R, Vasudevan R.

J. Biomech. 2018; ePub(ePub): ePub.

Affiliation: Mechanical Engineering, University of Michigan, United States.

(Copyright © 2018, Elsevier Publishing)

DOI 10.1016/j.jbiomech.2018.02.022 **PMID** 29571600

Abstract

The ability to quantitatively measure stability is essential to ensuring the safety of locomoting systems. While the response to perturbation directly reflects the stability of a motion, this experimental method puts human subjects at risk. Unfortunately, existing indirect methods for estimating stability from unperturbed motion have been shown to have limited predictive power. This paper leverages recent advances in dynamical systems theory to accurately estimate the stability of human motion without requiring perturbation. This approach relies on kinematic observations of a nominal Sit-to-Stand motion to construct an individual-specific dynamic model, input bounds, and feedback control that are then used to compute the set of perturbations from which the model can recover. This set, referred to as the stability basin, was computed for 14 individuals, and was able to successfully differentiate between less and more stable Sit-to-Stand strategies for each individual with greater accuracy than existing methods.

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PDF Y Endnote Y

Types of falls and strategies for maintaining stability on an unstable surface

Błażkiewicz M, Wiszomirska I, Kaczmarczyk K, Wit A.

Med. Pr. 2018; ePub(ePub): ePub.

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DOI 10.13075/mp.5893.00639 **PMID** 29565045

Abstract

BACKGROUND: Falls constitute an important health issue. They cause significant morbidity, mortality and have marked psychological effects on the individual, too. The aim of this study has been to determine parameters describing human movement strategies for balance and the reaction if balance is lost as a result of an unstable ground, and to attempt to describe the types of falls. **MATERIAL AND METHODS:** The study group comprised 20 volunteers. Kinematic parameters of falling and dynamic stability were measured using the Vicon Motion System and the Biodex Balance

System SD. During the test, subjects stood for 20 s on the tilting platform. The analysis was conducted based on the first recordings, when the participants were not prepared for the event and their reactions were natural. A cluster analysis tool was applied to divide the behavior of people during the test.

RESULTS: Based on motion range for kinematic parameters, the cluster analysis revealed 2 types of human behavior: falling (stepping) and restoring balance. Two types of falls were also observed: side and back falls. Moreover, on the basis of angular values for tilting plate, 4 zones were determined. The frequency of access to these zones by each joint revealed 3 strategies to maintain balance: ankle, knee and hip strategy.

CONCLUSIONS: A set of initial conditions that may be used for future numerical simulations was also determined. Furthermore, the results presented in this study are likely to support the analysis of the effects and the falling patterns. *Med Pr* 2018;69(3).

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PDF Y Endnote Y

Validity of the ActiGraph activity monitor for individuals who walk slowly post-stroke

Campos C, DePaul VG, Knorr S, Wong JS, Mansfield A, Patterson KK.

Top. Stroke Rehabil. 2018; ePub(ePub): ePub.

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(Copyright © 2018, Informa - Taylor and Francis Group)

DOI 10.1080/10749357.2018.1446487 **PMID** 29557275

Abstract

BACKGROUND: Slow and asymmetric gait post-stroke may reduce the accuracy of accelerometers (e.g. ActiGraph [AG]) to measure activity.

OBJECTIVE: To (1) determine the validity of AG step counts post-stroke; (2) develop guidelines for low frequency extension filter (LFE) use; and (3) determine the feasibility of daily accelerometer wear.

METHODS Adults with ($n = 33$) and without stroke ($n = 20$) wore three devices for approximately 7 h on a single day: ankle AG, waist AG, and a reference accelerometer at the ankle (REFA). AG step counts processed with and without the LFE were compared to REFA with paired difference tests. Agreement was measured with intraclass correlation coefficients ($ICC_{3,1}$). Relationships between error (AG - REFA) and motor impairment and gait performance were plotted to determine a threshold for LFE application. A feasibility questionnaire was distributed to participants to investigate the applicability of the AG in clinical populations.

RESULTS Step counts from ankle AG in the stroke group ($p = 0.53$) and waist AG in the healthy group ($p = 0.10$) were similar to REFA. Waist AG under-counted, and ankle and waist AG with LFE over-counted steps in the stroke group (all $p < 0.0001$). $ICC_{3,1}$ ranged from 0.70 to 0.82 (stroke) and 0.79-0.92 (healthy). Ankle AG error and stance time symmetry (stroke) were correlated ($r = 0.41$, $p = 0.02$); however, no threshold for LFE application was revealed. Ankle AG was rated very comfortable by 26/33 participants with stroke and 12/20 healthy participants.

CONCLUSIONS The AG worn at the unaffected ankle without LFE produced the most accurate step count in people with stroke. We were unable to establish guidelines for LFE use.

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