

**SafetyLit August 19<sup>th</sup> 2018****Avoiding anchoring bias by moving beyond 'mechanical falls' in geriatric emergency medicine**

Nagaraj G, Hullick C, Arendts G, Burkett E, Hill KD, Carpenter CR.

*Emerg. Med. Australas.* 2018; ePub(ePub): ePub.

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**DOI** 10.1111/1742-6723.13129 **PMID** 30091183

**Abstract** [Abstract unavailable]

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**Epidemiology of distal radius fracture in Akershus, Norway, in 2010-2011**

Solvang HW, Nordheggen RA, Clementsen S, Hammer OL, Randsborg PH.

*J. Orthop. Surg. Res.* 2018; 13(1): e199.

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**DOI** 10.1186/s13018-018-0904-0 **PMID** 30103788

**Abstract**

**BACKGROUND:** Several studies published over the last decade indicate an increased incidence of distal radius fractures (DRF). With Norway having one of the highest reported incidence of DRFs, we conducted a study to assess the epidemiology of DRFs and its treatment in the catchment area of Akershus University Hospital (AHUS).

**METHODS:** Patients 16 years or older who presented to AHUS with an acute DRF during the years 2010 and 2011 were prospectively recorded and classified according to the AO fracture classification system. The mechanism of injury and treatment modality were noted.

**RESULTS:** Overall, 1565 patients with an acute DRF presented to the institution in 2010-2011, of which 1134 (72%) were women. The overall annual incidence was 19.7 per 10,000 inhabitants 16 years or older. Women had an exponential increase in incidence after the age of 50, though the incidence for both genders peaked after the age of 80 years. There was an even distribution between extra- and intra-articular fractures. Falling while walking outside was the most common mechanism of injury. Of the 1565 registered, 418 (26.7%) patients underwent surgery, with a volar locking plate being the preferred surgical option in 77% of the cases.

**CONCLUSION:** The overall incidence of distal radius fractures was lower in our study than earlier reports from Norway. Postmenopausal women had a higher risk of fracture than the other groups, and low-energy injuries were most dominant. 26.7% were treated operatively, which is higher than earlier reports, and might reflect an increasing preference for surgical treatment.

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### **Exergaming in a moving virtual world to train vestibular functions and gait; a proof-of-concept study with older adults**

Swanenburg J, Wild K, Straumann D, de Bruin ED.

*Front. Physiol.* 2018; 9: e988.

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**DOI** 10.3389/fphys.2018.00988 **PMID** 30108511 **PMCID** PMC6080593

#### **Abstract**

**Background:** The use of Exergames designed to improve physical and cognitive functioning is relatively new in rehabilitation. Exergaming allows the training of skills, the handling of tools, and procedures; however, often, the potential of these aspects are not assessed before they are adopted in clinical settings. This study aimed at exploring the effects of exergaming on vestibular functions and gait in healthy community dwelling older adults using a proof-of-concept study design registered under ClinicalTrials.gov NCT03160352.

**Methods:** A pre-test-post-test one-group study design comprising 10 older adults (mean age of 73.5 ± 7.6 years, four males) investigated the feasibility of eight exergaming training sessions (for 160 min) and the effects on dynamic visual acuity (DVA), functional gait assessment (FGA), and extended timed get-up-and-go (ETGUG). The simulator sickness questionnaire (SSQ) and the game scores were evaluated for the feasibility of the intervention. Wilcoxon test and Cohen's d (*d*) were chosen to test for differences and for effect size estimation.

**Results:** Exergaming led to a significantly improved DVA ( $z = -2.50$ ,  $p = 0.01$ ,  $d = 1.35$ ) with improvements in 9 out of 10 participants. In addition, the FGA significantly improved with a large effect size ( $z = -2.25$ ,  $p = 0.02$ ,  $d = 1.17$ ). Specifically, component tasks such as walking with horizontal head turns ( $p = 0.03$ ), gait with a narrow base of support ( $p = 0.03$ ), ambulating backward ( $p = 0.05$ ) significantly improved. The ETGUG component task Gait initiation significantly improved ( $p = 0.04$ ). No change was found in gait speed and SSQ. The game scores of the participants improved continuously during the course of the intervention for every game.

**Discussion:** This proof-of-concept study suggests that the use of exergaming that requires active stepping movements and that contains moving game projection is feasible and facilitates gaze stability during head movements in healthy community dwelling older adults. Aspects of functional gait and gait initiation also improved. Future research aimed at testing this exergaming intervention in patients suffering from vestibular impairments is warranted.

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### **Fear, defensive strategies and caring for cognitively impaired family members**

Spencer D, Funk LM, Herron RV, Gerbrandt E, Dansereau L.

*J. Gerontol. Soc. Work* 2018; ePub(ePub): ePub.

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**DOI** 10.1080/01634372.2018.1505796 **PMID** 30102135

#### **Abstract**



One topic rarely addressed in the literature on older adults and interpersonal violence is the violence that can be experienced by family carers in relationship with a person living with cognitive impairment. This violence tends to remain hidden and is rarely framed as intimate partner violence. We examine how situations of intimidation and violence invoked fear in family carers and how they interpreted and reacted to these circumstances. Interview and diary data were collected from family members who had previously or were currently experiencing some form of aggression in caring for someone with cognitive impairment or dementia. Drawing on discussions of fear and applying the analytic lens of defensive strategies, we explore how these carers responded to situations of intimidation and violence.

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### **Frailty score on admission predicts mortality and discharge disposition in elderly trauma patients over the age of 65 y**

Curtis E, Romanowski K, Sen S, Hill A, Cocanour C.

*J. Surg. Res.* 2018; 230: 13-19.

**Affiliation:** Department of Surgery, University of California - Davis Medical Center, Sacramento, California.

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**DOI** 10.1016/j.jss.2018.04.017 **PMID** 30100028

#### **Abstract**

**BACKGROUND:** Although many frailty scales exist, a single scale has not been agreed upon to define frailty. Herein, we determined whether the Canadian Study on Health and Aging Clinical Frailty Scale (CSHA CFS) can predict the risk of elderly patients for hospital mortality and discharge to skilled nursing facilities (SNFs) following traumatic injury.

**METHODS:** Charts from trauma patients aged  $\geq 65$  y admitted from December 1, 2011 to December 31, 2013 were retrospectively examined. Age, mechanism of injury, Glasgow coma score, systolic blood pressure and heart rate on arrival, injury severity score, hospital mortality, length of stay, and discharge disposition were recorded. Frailty scores were determined from admission data using the CSHA CFS. Univariate and multivariate analyses were performed.

**RESULTS:** A total of 1403 patients were included. The mean age was  $77.6 \pm 8.6$  y. Patients with falls presented higher frailty scores than patients who sustained injuries through other mechanisms ( $4.58 \pm 1.2$  versus  $3.52 \pm 1.15$ ;  $P < 0.00001$ ) and were significantly older ( $79.5 \pm 8.6$  versus  $73.4 \pm 7.4$ ;  $P < 0.00001$ ). Frailty scores of nonsurvivors were significantly higher than those of survivors ( $4.6 \pm 1.3$  versus  $4.2 \pm 1.2$ ;  $P < 0.01$ ). Age, Glasgow coma score, and CSHA CFS combined were associated with mortality (odds ratio: 1.52; confidence interval: 1.37-1.69). A higher frailty score was associated with earlier death and increased mortality.

**CONCLUSIONS:** CSHA CFS is simple and provides frailty scores that can help identifying elderly patients at high risk for in-hospital mortality and discharge to SNF following traumatic injury.

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### **Gender perspective on older people's exercise preferences and motivators in the context of falls prevention: a qualitative study**

Sandlund M, Pohl P, Ahlgren C, Skelton DA, Melander-Wikman A, Bergvall-Kåreborn B, Lundin-Olsson L.

*Biomed. Res. Int.* 2018; 2018: e6865156.

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**DOI** 10.1155/2018/6865156 **PMID** 30112416 **PMCID** PMC6077582

#### **Abstract**

**BACKGROUND:** Several factors have previously been identified to positively influence the uptake and adherence for fall prevention exercise programmes. There is, however, a lack of studies investigating if men and women differ in their views and preferences for fall prevention exercises. **AIM:** To explore exercise preferences and motivators of older community-dwelling women and men in the context of falls prevention from a gender perspective.

**METHODS:** Workshops including multistage focus group discussions were conducted with 18 older community-dwelling people with and without history of falls. Participants were purposively selected and divided into two groups. Each group met on six occasions over a period of five months. Participatory and Appreciative Action and Reflection methodology was used to guide the discussions. A qualitative content analysis approach was used in the analysis.

**RESULTS:** Older participants had many diverse preferences and confirmed that individually tailored exercise, in terms of mode, intensity, challenge, and social context, is important. Moreover, important factors for exercise adherence and maintenance included the experience of individual confirmation; different spirit lifters to increase enjoyment; and personal tricks to maintain exercise routines. The individual differences within genders were more diverse than the differences between women and men.

**CONCLUSION:** Exercise interventions to prevent falls should be individually tailored, based on the specific needs and preferences of the older participant, and do not appear to require gender specific approaches. To increase adherence, intrinsic motivation for exercise may be encouraged by competence enhancing confirmations, energizing spirit lifters, and practical tips for exercise maintenance. The study provides an awareness about women's and men's preferences for fall prevention exercises, and this information could be used as guidance in designing inclusive exercise interventions.

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### **Is it possible to predict falls in older adults using gait kinematics?**

Marques NR, Spinoso DH, Cardoso BC, Moreno VC, Kuroda MH, Navega MT.

*Clin. Biomech.* 2018; 59: 15-18.

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**DOI** 10.1016/j.clinbiomech.2018.08.006 **PMID** 30114546



### Abstract

**BACKGROUND:** Gait kinematic parameters have been reported as an important clinical tool to assess the risk of falls in older adults. However, the ability of these parameters to predict falls in the older population is still unclear.

**OBJECTIVE:** To identify the ability that gait kinematic parameters present to predict fall in older adults.

**METHODS:** Data from 102 older adults, who live in a community setting, were considered for this study. For data collection, older subjects had to walk on a 14 meter-walkway in their preferred gait speed. The incidence of falls was recorded at baseline together with gait kinematics and then every three months during the period of the study. The ability of gait kinematic parameters to predict falls was tested using the ROC curve.

**RESULTS:** Stance time variability, swing time, and stride length presented a sensitivity to predict falls in older adults higher than 70%.

**CONCLUSION:** Gait kinematic parameters, such as stance variability, swing time, and stride length may predict future falls in older adults.

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### Low efficacy using the 256-Hz tuning fork when evaluating the influence of somatosensation in balance control for relatively healthy elderly

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

**DOI** 10.1080/00016489.2018.1488084 **PMID** 30113876

### Abstract

**BACKGROUND:** Diminished foot somatosensation contributes to balance deficits and increased fall risk. However, it remains unclear if the 256-Hz tuning fork is adequate to measure, in the outpatient clinical setting, somatosensation in relatively healthy elderly.

**AIMS/OBJECTIVES:** To evaluate the performance of the 256-Hz tuning fork compared to other measures of somatosensation and balance.

**MATERIAL AND METHODS:** Thirty-six subjects (mean 69.4 ± 5.3 years) were allocated into four 256-Hz tuning fork sensation groups (TFSG) based on their ability to detect vibration at the first metatarsal, malleolus, tibia or no sites. A biothesiometer measured vibration perception thresholds (VPTs) and 20 monofilaments tactile pressure sensation thresholds (TPSTs). Balance was evaluated with posturography, functional balance tests and questionnaires.

**RESULTS:** There were no significant differences in age, VPTs or TPSTs between the four TFSGs, nor in outcome of functional balance tests, posturography and questionnaires. Very few significant associations were found between TFSGs and VPTs, TPSTs, functional balance tests, posturography and questionnaires.

**CONCLUSIONS AND SIGNIFICANCE:** Somatosensation measured with a 256-Hz tuning fork seems to

be a minor determinant for balance and thus superfluous when evaluating the importance of vibration perception for balance control in relatively healthy elderly.

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**MOVING BEYOND: age-related motor deficits**

Riva G.

*Cyberpsychol. Behav. Soc. Netw.* 2018; 21(8): 532.

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(Copyright © 2018, Mary Ann Liebert Publishers)

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**Abstract** [Abstract unavailable]

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**Neighborhood walkability and physical activity among older women: tests of mediation by perceptions and moderation by depressive symptoms**

Orstad SL, McDonough MH, James P, Klenosky DB, Laden F, Mattson M, Troped PJ.

*Prev. Med.* 2018; ePub(ePub): ePub.

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(Copyright © 2018, Elsevier Publishing)

**DOI** 10.1016/j.ypmed.2018.08.008 **PMID** 30092314

**Abstract**

Features that enhance neighborhood walkability (higher population density, street connectivity and access to destinations) are associated with higher levels of physical activity among older adults. The perceived neighborhood environment appears to mediate associations between the objective built environment and physical activity. The role of depressed mood in these associations is poorly understood. We examined the degree to which depressive symptoms moderated indirect associations between the objective neighborhood environment and physical activity via the perceived neighborhood environment in older women. We analyzed data on 60,133 women (mean age =  $73.1 \pm 6.7$  years) in the U.S. Nurses' Health Study cohort who completed the 2008 questionnaire. Self-reported measures included the Geriatric Depression Scale, perceived presence of recreational facilities, retail destinations, sidewalks, and crime, and participation in recreational physical activity and neighborhood walking. We created an objective walkability index by summing z-scores of intersection and facility counts within 1200-meter residential network buffers and census tract-level population density. We used multiple regression with bootstrap-generated 95% bias-corrected confidence intervals (BC CIs) to test for mediation and moderated mediation. OBJECTIVE walkability predicted 1.99 times greater odds of neighborhood walking (95% BC CI = 1.92, 2.06) and 1.38 times greater odds of meeting physical activity recommendations (95% BC CI = 1.34, 1.43) via the perceived neighborhood environment. These indirect associations were weaker among women with higher depressive symptom scores. Women living in more walkable areas had more positive perceptions of their neighborhood and, in turn, engaged in more physical activity,

particularly if they reported lower depressive symptoms, than women living in less walkable areas.  
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**Reducing hypnotic use in insomnia management among Australian veterans: results from repeated national interventions**

Kalisch Ellett LM, Lim R, Pratt NL, Kerr M, Ramsay EN, LeBlanc TV, Barratt JD, Roughead EE.  
*BMC Health Serv. Res.* 2018; 18(1): e626.

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**DOI** 10.1186/s12913-018-3443-9 **PMID** 30092801

**Abstract**

**BACKGROUND:** The Australian Government Department of Veterans' Affairs (DVA) Veterans' Medicines Advice and Therapeutics Education Services (Veterans' MATES) programme conducted two intervention (March 2009, follow-up intervention June 2012) both of which aimed to reduce hypnotic use among Australian veterans. We evaluated the effectiveness of the interventions, and estimated the associated health consequences.

**METHODS:** Both interventions targeted veterans who had been dispensed hypnotics prior to the intervention. Patient-specific prescriber feedback containing patient details and the volume of hypnotics dispensed, along with tailored educational information, was mailed to general practitioners. Veterans, pharmacists and directors of care in residential aged care facilities were mailed tailored educational information. Interrupted time-series and segmented regression modelling were used to determine the effect of the two interventions on the rate of hypnotics dispensing. The cumulative patient-months of hypnotic treatment avoided as a result of the interventions was calculated. We estimated improvements in health consequences of as a result of hypnotic treatment avoided based on the results of cohort studies in the same population identifying the association between hypnotic and sedative use on the outcomes of falls, and confusion.

**RESULTS:** After the first Veterans' MATES intervention in March 2009, hypnotic use declined by 0.2% each month, when compared to the baseline level ( $p = 0.006$ ). The intervention effect was attenuated after one year, and use of hypnotics was found to increase by 0.2% per month after March 2010. Following the second intervention in June 2012, there was a further significant decline in use of 0.18% each month over the 12 months of follow up ( $p = 0.049$ ). The cumulative effect of both interventions resulted in 20,850 fewer patient-months of treatment with hypnotics. This cumulative reduction in hypnotic use was estimated to lead to a minimum of 1 fewer hospital admissions for acute confusion and 7 fewer hospital admissions due to falls.

**CONCLUSIONS:** The Veterans' MATES insomnia interventions which involved multiple stakeholders were effective in reducing hypnotic use among older Australians. Repetition of key messages led to sustained practice change.

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### **Vegetable diversity, injurious falls, and fracture risk in older women: a prospective cohort study**

Sim M, Blekkenhorst LC, Lewis JR, Bondonno CP, Devine A, Zhu K, Woodman RJ, Prince RL, Hodgson JM.

*Nutrients* 2018; 10(8): e10081081.

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(Copyright © 2018, MDPI Publishing)

**DOI** 10.3390/nu10081081 **PMID** 30104494

#### **Abstract**

The importance of vegetable diversity for the risk of falling and fractures is unclear. Our objective was to examine the relationship between vegetable diversity with injurious falling and fractures leading to hospitalization in a prospective cohort of older Australian women ( $n = 1429$ ,  $\geq 70$  years). Vegetable diversity was quantified by assessing the number of different vegetables consumed daily. Vegetable intake (75 g servings/day) was estimated using a validated food frequency questionnaire at baseline (1998). Over 14.5 years, injurious falls (events = 568, 39.7%), and fractures (events = 404, 28.3%) were captured using linked health records. In multivariable-adjusted Cox regression models, women with greater vegetable diversity (per increase in one different vegetable/day) had lower relative hazards for falls (8%;  $p = 0.02$ ) and fractures (9%;  $p = 0.03$ ). A significant interaction between daily vegetable diversity (number/day) and total vegetable intake (75 g servings/day) was observed for falls ( $p_{\text{interaction}} = 0.03$ ) and fractures ( $p_{\text{interaction}} < 0.001$ ). The largest benefit of higher vegetable diversity were observed in the one third of women with the lowest vegetable intake ( $< 2.2$  servings/day; falls HR 0.83 95% CI (0.71–0.98); fractures HR 0.74 95% CI (0.62–0.89)). Increasing vegetable diversity especially in older women with low vegetable intake may be an effective way to reduce injurious fall and fracture risk.

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### **What predicts falls in Parkinson disease? Observations from the Parkinson's Foundation registry**

Parashos SA, Bloem BR, Browner NM, Giladi N, Gurevich T, Hausdorff JM, He Y, Lyons KE, Mari Z, Morgan JC, Post B, Schmidt PN, Wielinski CL.

*Neurol. Clin. Pract.* 2018; 8(3): 214-222.

**Affiliation:** Struthers Parkinson's Center (SAP, CLW), HealthPartners, Golden Valley, MN; Department of Neurology, Medical College of Georgia, Augusta University; Parkinson's Foundation (PNS), Miami, FL; and Department of Biostatistics (SSW), University of Florida, Gainesville.

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**DOI** 10.1212/CPJ.0000000000000461 **PMID** 30105161 **PMCID** PMC6075989

#### **Abstract**

**BACKGROUND:** We undertook this study to identify patients with Parkinson disease (PD) with no or rare falls who may progress to frequent falling by their next annual follow-up visit.

**METHODS:** We analyzed data in the National Parkinson Foundation Quality Improvement Initiative database to identify factors predicting which patients with PD with no or rare falls at the baseline visit will report at least monthly falls at the annual follow-up visit. Multivariable models were constructed using logistic regression. Variables were introduced in 4 blocks: in the 1st block,





variables present at or before the baseline visit were entered; in the 2nd, baseline visit assessments; in the 3rd, interventions implemented during baseline visit; and, in the 4th block, changes in comorbidities, living situation, and treatment between visits.

**RESULTS:** Of 3,795 eligible participants, 3,276 (86.3%) reported no or rare falls at baseline visit, and of them, 382 (11.7%) reported at least monthly falls at follow-up visit. Predictors included female sex, <90% diagnostic certainty, motor fluctuations, levodopa treatment, antidepressant treatment, prior deep brain stimulation (DBS), worse quality of life, Hoehn & Yahr stage 2 or 3, worse semantic fluency, and, between visits, addition of amantadine, referral to occupational therapy, social services, or DBS, new diagnoses of cancer or osteoarthritis, and increased emergency visits.

**CONCLUSIONS:** This large-scale analysis identified several predictors of progression to falling in PD. Such identifiers may help target patient subgroups for falls prevention intervention. Some factors are modifiable, offering opportunities for developing such interventions.

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#### **An analysis of falls and those who fall in a chronic care facility**

McGibbon CA, Slayter JT, Yetman L, McCollum A, McCloskey R, Gionet SG, Oakley H, Jarrett P. *J. Am. Med. Dir. Assoc.* 2018; ePub(ePub): ePub.

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**DOI** 10.1016/j.jamda.2018.06.022 **PMID** 30108033

#### **Abstract**

**OBJECTIVES:** Falls in hospitals lead to adverse patient outcomes and prevention of falls is of utmost importance. Little is known about fall and injury rates in chronic care facilities, which are similar to skilled nursing facilities in the United States. Current fall risk tools in this setting are not well studied. Enhancing the understanding of how patient characteristics relate to fall circumstances is also needed.

**DESIGN:** Retrospective analysis of falls over 3 years on consecutive admissions and discharges.

**SETTING AND PARTICIPANTS:** A 104-bed geriatric chronic care facility. **MEASURES:** Fall and injury data, descriptive data for patients measuring mobility, balance, cognition, function, and frailty in relation to risk of falls and fall circumstances were analyzed.

**RESULTS:** There were 1141 falls, with an overall fall rate of 8.48 falls per 1000 occupied bed days. The overall injury rate was 37.2 injuries per 100 falls. Being male and frail, having a mobility aid, poor mobility, balance, or cognition were associated with falling. Patients with good balance but poor cognition was more likely to fall outside their room, while those with poor mobility/balance fell more often in their room. The Clinical Frailty Scale performed modestly well at predicting falls with an odds ratio of 2.5 (95% confidence interval 1.9-3.2).

**CONCLUSIONS AND IMPLICATIONS:** Fall rates in chronic care facilities differ from what is reported in other settings. Patient characteristics such as male, use or misuse of a mobility aid, and poor cognition are more common in fallers. Fall circumstances differ in those with poor cognition compared with those with poor mobility and balance. More research focusing on frailty, cognition,



and mobility/balance is needed to develop accurate tools that can predict those at a high risk of falls in these facilities.

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**Automatic measurement of fall risk indicators in timed up and go test**

Dubois A, Bihl T, Bresciani JP.

*Inform. Health Soc. Care.* 2018; ePub(ePub): ePub.

**Affiliation:** Department of Neuroscience & Movement Science, University of Fribourg , Fribourg , Switzerland.

(Copyright © 2018, Informa Healthcare)

**DOI** 10.1080/17538157.2018.1496089 **PMID** 30102095

**Abstract**

Fall risk assessment is usually conducted in specialized centers using clinical tests. Most of the time, these tests are performed only after the occurrence of health problems potentially affecting gait and posture stability. Our aim is to define fall risk indicators that could routinely be used at home to automatically monitor the evolution of fall risk over time. We used the standard Timed Up and Go (T.U.G.) test to classify 43 individuals into two classes of fall risk, namely high- vs low- risk. Several parameters related to the gait pattern and the sitting position included in the T.U.G. test were automatically extracted using an ambient sensor (Microsoft Kinect sensor). We were able to correctly classify all individuals using machine learning on the combination of two parameters among gait speed, step length and speed to sit down. Coupled to an ambient sensor installed at home to monitor the relevant parameters in daily activities, these algorithms could therefore be used to assess the evolution of fall risk, thereby improving fall prevention.

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**Cerebellum and cognition in multiple sclerosis: the fall status matters**

Schreck LM, Ryan SPP, Monaghan PG.

*J. Neurophysiol.* 2018; ePub(ePub): ePub.

**Affiliation:** Health and Exercise Science, Colorado State University, United States.

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**DOI** 10.1152/jn.00245.2018 **PMID** 30110238

**Abstract**

Kalron et al. report people with Multiple Sclerosis (PwMS) who fall show a decreased cerebellar volume along with decreased overall cognition compared to non-fallers. While this paper focuses on cerebellar and cognitive alterations in PwMS, these findings may also be explained by additional factors such as aging and have the potential for broader impact in additional clinical populations who simultaneously experience cognitive and mobility dysfunction.

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### **Discriminative ability and clinical utility of the Timed Up and Go (TUG) in identifying falls risk in people with multiple sclerosis: a prospective cohort study**

Quinn G, Comber L, McGuigan C, Galvin R, Coote S.

Clin. Rehabil. 2018; ePub(ePub): ePub.

**Affiliation:** School of Allied Health, Faculty of Education & Health Sciences, Health Research Institute, University of Limerick, Limerick, Ireland.

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**DOI** 10.1177/0269215518793481 **PMID** 30103642

#### **Abstract**

**OBJECTIVE:** To investigate discriminative ability and clinical utility of the Timed Up and Go under single- and dual-task conditions between fallers and non-fallers in multiple sclerosis (MS).

**DESIGN:** Prospective cohort study.

**SETTING:** Neurology service in a tertiary hospital.

**SUBJECTS:** Participants were 101 people with MS and Expanded Disability Status Scale score of 3-6.5. One participant withdrew after the baseline assessment, and hence the data were analysed for 100 participants.

**INTERVENTIONS:** No specific intervention.

**MAIN MEASURES:** Timed Up and Go and Timed Up and Go-Cognitive. Three-month prospective diaries recorded falls.

**RESULTS:** Mean age was 52.6 (SD 10.7) and 66 were female. Majority of the participants had progressive MS (72) and 73 used a walking aid; 56 participants recorded 791 falls. The area under the receiver operating characteristic curve values for Timed Up and Go and Timed Up and Go-Cognitive in distinguishing fallers (person with  $\geq 1$  fall) from non-fallers are 0.60 and 0.57, respectively, and in distinguishing multiple fallers ( $\geq 2$  falls) the values are 0.46 and 0.43. A Timed Up and Go score of  $\geq 9$  seconds has a sensitivity of 0.82 and a specificity of 0.34 to identify fallers and a sensitivity of 0.79 and a specificity of 0.27 to identify multiple fallers. A Timed Up and Go-Cognitive score of  $\geq 11$  seconds has a sensitivity of 0.77 and a specificity of 0.30 to identify fallers and a sensitivity of 0.71 and a specificity of 0.26 to identify multiple fallers.

**CONCLUSION:** The Timed Up and Go and Timed Up and Go-Cognitive do not demonstrate sufficient clinical utility or discriminative ability for assessing falls risk in MS.

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### **Epidemiology of spinal fractures and associated spinal cord injuries in Iceland**

Kristinsdottir EA, Knutsdottir S, Sigvaldason K, Jonsson H, Ingvarsson PE.

*Spinal Cord Ser. Cases* 2018; 4: e74.

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**DOI** 10.1038/s41394-018-0112-5 **PMID** 30109138 **PMCID** PMC6086877

#### **Abstract**

**STUDY DESIGN:** A retrospective epidemiological study.



**SETTING:** Landspítali University Hospital, Iceland.

**OBJECTIVES:** Assessment of epidemiological data and risk factors for traumatic spinal fractures (SFs) and associated spinal cord injury (SCI).

**METHODS:** A retrospective review of hospital admissions due to traumatic SFs during a 5-year period, with analysis of epidemiological parameters and occurrence of concomitant SCI. Patients with asymptomatic SFs and non-traumatic SCI were excluded.

**RESULTS:** A total of 487 patients were diagnosed with a SF or 310 PMI (per million inhabitants), 42 of them (9%, 27 PMI) with an associated SCI. The mean age was 56 years, males were 57%. Falls were the leading cause of both SFs (49%) and SCIs (43%). Low falls (<1 m) caused SFs more often in elderly women (67%, mean age 77 years) and more than 96% were without SCI. Road traffic accidents (RTA) caused 31% of SFs and 26% of SCIs. Seat belts were not used in 20% of car accidents, but information was missing in 27%. Sports/leisure-related accidents caused SFs in 12% of cases, whereof horseback riding accidents were the most common (36%).

**CONCLUSIONS:** SFs led to SCI in 9% of patients. Several risk factors were common for SFs and SCIs but two major differences were seen: SFs without SCI were most common in older women due to low falls, while the risk of a concomitant SCI increased in young patients, in males, in falls from high levels and when driving without using seat belts. Preventive efforts should therefore be directed towards these risk factors.

#### **PDF Y Endnote Y**

#### **Evaluating the ability of a trauma team activation tool to identify severe injury: a multicentre cohort study**

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*Scand. J. Trauma Resusc. Emerg. Med.* 2018; 26(1): e63.

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#### **Abstract**

**BACKGROUND:** Sensitive decision making tools should assist prehospital personnel in the triage of injured patients, identifying those who require immediate lifesaving interventions and safely reducing unnecessary under- and overtriage. In 2014 a new trauma team activation (TTA) tool was implemented in Central Norway. The overall objective of this study was to evaluate the ability of the new TTA tool to identify severe injury.

**METHODS:** This was a multi-center observational cohort study with retrospective data analysis. All patients received by trauma teams at seven hospitals in Central Norway between 01.01.2015 to 31.12.2015 were included. Severe injury was defined as Injury Severity Score (ISS) > 15. Overtriage was defined as the rate of patients with TTA and ISS < 15, whilst patients with TTA and ISS > 15 were defined as correctly triaged.

**RESULTS:** A total of 1141 patients were identified, of which 998 were eligible for triage criteria analysis. Median age was 35 years (IQR 20-58) and the male proportion was 67%. Mechanism of injury was predominantly blunt trauma (96%) with transport related accidents (62%) followed by

falls (22%) the most common. Overall, median injury severity score (ISS) was low and severely injured patients (ISS > 15) comprised 13% of the cohort. Utility of specific TTA criteria were: physiology 20%, anatomical injury 21%, mechanism of injury (MOI) 53% and special causes 6%. Overtriage among all patients was 87%, and for those with physiologic criteria 66%, anatomical injury 82%, mechanism of injury 97% and special causes criteria 92%, respectively.

**CONCLUSIONS:** Severe injury was infrequent and there was a substantial rate of overtriage. The ability of the TTA tool was relatively insensitive in identifying severe injury, but showed increased performance when utilizing physiologic and anatomical injury criteria. Many of the TTA mechanism of injury criteria might be considered for removal from the triage tool due to substantial rates of overtriage. This has relevance for the proposed development of national Norwegian TTA criteria.

#### PDF Y Endnote Y

#### Normative data for the sway balance system

Brett BL, Zuckerman SL, Terry DP, Solomon GS, Iverson GL.

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#### Abstract

**OBJECTIVE:** Static balance, postural stability, and reaction time are commonly impaired after a sport-related concussion. The Sway Balance System assesses postural sway (ie, stability) and simple reaction time using the triaxial accelerometer built into iOS mobile devices. The purpose of this study was to provide normative data for children and adolescents and to examine for age and sex differences on the Sway Balance System.

**DESIGN:** Cross-sectional study.

**SETTING:** Middle and high schools across the United States.

**PARTICIPANTS:** Participants were 3763 youth aged 9 to 21 years who completed the Sway Balance System Sports protocol in accordance with the company's recommended methods (ie, 1 acclimation trial and 2-3 baseline tests).

**INDEPENDENT VARIABLES:** Age and sex.

**MAIN OUTCOME MEASURES:** Sway Balance score (0-100) and Sway Reaction Time score (0-100).

**STATISTICAL ANALYSIS:** A multivariate analysis of variance examined the effects of age and sex on balance and reaction time scores.

**RESULTS:** Sway Balance and Reaction Time scores significantly differed by age [ $F(10, 7494) = 39.68, P < 0.001, V = 0.10, \eta p = 0.05$ ] and sex [ $F(4, 7494) = 55.29, P < 0.001, V = 0.06, \eta p = 0.03$ ]. Post hoc analyses revealed that older groups generally had better scores than younger groups on all balance comparisons ( $ps < 0.001$ ) and many reaction time comparisons. Girls performed better than boys on balance [ $F(2, 3747) = 53.79, P < 0.001, \eta p = 0.03$ ] and boys had faster reaction times [ $F(2, 3747) = 37.11, P < 0.001, \eta p = 0.02$ ].

**CONCLUSIONS:** Age and sex are important factors to consider when assessing Balance and Reaction Time scores using the Sway Balance System's Sports protocol in youth. We provide age- and sex-

based normative values for the Sway Balance System, which will likely be helpful when using this technology to assess and manage concussions.

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**On the internal reaction forces, energy absorption, and fracture in the hip during simulated sideways fall impact**

Fleps I, Enns-Bray WS, Guy P, Ferguson SJ, Cripton PA, Helgason B.

*PLoS One* 2018; 13(8): e0200952.

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**Abstract**

The majority of hip fractures have been reported to occur as a result of a fall with impact to the greater trochanter of the femur. Recently, we developed a novel cadaveric pendulum-based hip impact model and tested two cadaveric femur-pelvis constructs, embedded in a soft tissue surrogate. The outcome was a femoral neck fracture in a male specimen while a female specimen had no fracture. The aim of the present study was, first, to develop a methodology for constructing and assessing the accuracy of explicit Finite Element Models (FEMs) for simulation of sideways falls to the hip based on the experimental model. Second, to use the FEMs for quantifying the internal reaction forces and energy absorption in the hip during impact. Third, to assess the potential of the FEMs in terms of separating a femoral fracture endpoint from a non-fracture endpoint. Using a non-linear, strain rate dependent, and heterogeneous material mapping strategy for bone tissue in these models, we found the FEM-derived results to closely match the experimental test results in terms of impact forces and displacements of pelvic video markers up to the time of peak impact force with errors below 10%. We found the internal reaction forces in the femoral neck on the impact side to be approximately 35% lower than the impact force measured between soft tissue and ground for both specimens. In addition, we found the soft tissue to be the component that absorbed the largest part of the energy of the tissue types in the hip region. Finally, we found surface strain patterns derived from FEM results to match the fracture location and extent based on post testing x-rays of the specimens. This is the first study with quantitative data on the energy absorption in the pelvic region during a sideways fall.

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**Test-retest reliability of non-linear methods to assess walking dynamics**

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**Abstract**



The present study investigated the day-to-day reliability (quantified by the absolute and relative reliability) of nonlinear methods that assess human locomotion dynamics. Twenty-four participants completed 5 minutes of treadmill walking at self-selected preferred speed on two separate days. Lower limb kinematics were recorded at 100Hz and hip, knee and ankle joint angles, three dimensional sacrum marker displacement and stride time intervals were extracted for 170 consecutive strides. The largest Lyapunov exponent and correlation dimension were calculated for the joint angle and sacrum displacement data using three different state space reconstruction methods (group average, test-retest average, individual time delay and embedding dimension). Sample entropy and detrended fluctuation analysis were applied to the stride time interval time series. Relative reliability was assessed using intra-class correlation coefficients and absolute reliability was determined by measurement error (ME). The group average state space reconstruction method resulted in the best relative and absolute reliability of the LyE parameter when compared to the individual and test-retest average methods. The detrended fluctuation analysis exhibited good reliability, while sample entropy showed poor reliability. The results comprise a reference material that can inspire and guide future studies of non-linear gait dynamics.

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### **Walking with perturbations: a guide for biped humans and robots**

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#### **Abstract**

This paper provides an update on the neural control of bipedal walking in relation to bioinspired models and robots. It is argued that most current models or robots are based on the construct of a symmetrical CPG (central pattern generator). However, new evidence suggests that CPG functioning is basically asymmetrical with its flexor half linked more tightly to the rhythm generator. The stability of bipedal gait, which is an important problem for robots and biological systems, is also addressed. While it is not possible to determine how biological biped systems guarantee stability, robot solutions can be useful to propose new hypothesis for biology. In the second part of this review, the focus is on gait perturbations, which is an important topic in robotics in view of the frequent falls of robots when faced with perturbations. From the human physiology it is known that the initial reaction often consists of a brief interruption followed by an adequate response. For instance, the successful recovery from a trip is achieved using some basic reactions (termed elevating and lowering strategies), that depend on the phase of the step cycle of the trip occurrence. Reactions to stepping unexpectedly in a hole depend on comparing expected and real feedback. Implementation of these ideas in models and robotics starts to emerge, with the most advanced robots being able to learn how to fall safely and how to deal with complicated disturbances such as provided by walking on a split-belt.

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