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Active video games for improving physical performance measures in older people: a meta-analysis

Taylor LM, Kerse N, Frakking T, Maddison R.

J. Geriatr. Phys. Ther. 2016; ePub(ePub): ePub.

Affiliation: National Institute for Health Innovation, the University of Auckland, Auckland, New Zealand. 2Auckland University of Technology, Auckland, New Zealand. 3General Practice and Primary Health Care, the University of Auckland, Auckland, New Zealand. 4The University of Groningen, Groningen, the Netherlands.

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Abstract

BACKGROUND AND PURPOSE: Participation in regular physical activity is associated with better physical function in older people (>65 years); however, older people are the least active of all age groups. Exercise-based active video games (AVGs) offer an alternative to traditional exercise programs aimed at maintaining or enhancing physical performance measures in older people. This review systematically evaluated whether AVGs could improve measures of physical performance in older people. Secondary measures of safety, game appeal, and usability were also considered.

METHODS: Electronic databases were searched for randomized controlled trials published up to April 2015. Included were trials with 2 or more arms that evaluated the effect of AVGs on outcome measures of physical performance in older people.

RESULTS: Eighteen randomized controlled trials ($n = 765$) were included. Most trials limited inclusion to healthy community-dwelling older people. With the exception of 1 trial, all AVG programs were supervised. Using meta-analyses, AVGs were found to be more effective than conventional exercise (mean difference [MD], 4.33; 95% confidence intervals [CIs], 2.93-5.73) or no intervention (MD, 0.73; 95% CI, 0.17-1.29) for improving Berg Balance scores in community-dwelling older people. Active video games were also more effective than control for improving 30-second sit-to-stand scores (MD, 3.99; 95% CI, 1.92-6.05). No significant differences in Timed Up and Go scores were found when AVGs were compared with no intervention or with conventional exercise.

CONCLUSIONS: Active video games can improve measures of mobility and balance in older people when used either on their own or as part of an exercise program. It is not yet clear whether AVGs are equally suitable for older people with significant cognitive impairments or balance or mobility limitations. Given the positive findings to date, consideration could be given to further development of age-appropriate AVGs for use by older people with balance or mobility limitations. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially.

PDF Y Endnote Y

An advanced scheme of compressed sensing of acceleration data for telemonitoring of human gait

Wu J, Xu H.

Biomed. Eng. Online 2016; 15(1): 27.

Affiliation: School of Mathematics and Computer Science, Fujian Normal University, Fuzhou, 350007, Fujian, China. sihajunmi@fjnu.edu.cn.

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Abstract

BACKGROUND: The compressed sensing (CS) of acceleration data has been drawing increasing attention in gait telemonitoring application. In such application, there still exist some challenging issues including high energy consumption of body-worn device for acceleration data acquisition and the poor reconstruction performance due to nonsparsity of acceleration data. Thus, the novel scheme of compressive sensing of acceleration data is needed urgently for solutions that are found to these issues.

METHODS: In our scheme, the sparse binary matrix is firstly designed as an optimal measurement matrix only containing a smallest number of nonzero entries. And then the block sparse Bayesian learning (BSBL) algorithm is introduced to reconstruct acceleration data with high fidelity by exploiting block sparsity. Finally, some commonly used gait classification models such as multilayer perceptron (MLP), support vector machine (SVM) and KStar are applied to further validate the feasibility of our scheme for gait telemonitoring application.

RESULTS: The acceleration data were selected from open Human Activity Dataset of Southern California University (USC-HAD). The optimal sparse binary matrix (a smallest number of nonzero entries is 8) is as strong as the full optimal measurement matrix such as Gaussian random matrix. Moreover, BSBL algorithm significantly outperforms existing conventional CS reconstruction algorithms, and reaches the maximal signal-to-noise ratio value (70 dB). In comparison, MLP is best for gait classification, and it can classify upstairs and downstairs patterns with best accuracy of 95 % and seven gait patterns with maximal accuracy of 92 %, respectively.

CONCLUSIONS: These results show that sparse binary matrix and BSBL algorithm are feasibly applied in compressive sensing of acceleration data to achieve the perfect compression and reconstruction performance, which has a great potential for gait telemonitoring application.

PDF Y Endnote Y

An integrated practice approach to mobility care for older people

Taylor J, Hill H, Kay K.

Nurs. Stand. (1987) 2016; 30(29): 51-60.

Affiliation: School of Nursing, Midwifery and Paramedicine (Melbourne campus), Faculty of Health Sciences, Australian Catholic University, Melbourne, Victoria, Australia.

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Abstract

Mobility is important to older people in nursing homes and residential facilities since it contributes to their health and quality of life. Many residents in such facilities require some form of assistance to move and accomplish activities of daily living. Therefore, nurses and healthcare assistants should have the knowledge and skills to provide effective mobility care. This article discusses three important aspects of mobility care: safety, mobility optimisation and person-centred approaches to care. Safety is important as residents and staff are at risk of injury during mobility care. Mobility optimisation is essential to ensure residents maintain their independence. Person-centred approaches to care are central to providing an integrated approach to mobility care.

PDF Not yet available Endnote Y

Appraising the uptake and use of recommendations for a common outcome data set for clinical trials: a case study in fall injury prevention

Copsey B, Hopewell S, Becker C, Cameron ID, Lamb SE.

Trials 2016; 17(1): e131.

Affiliation: Oxford Clinical Trials Research Unit, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Oxford, UK.

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Abstract

BACKGROUND: Many researchers and professional bodies are seeking consensus for core outcomes for clinical trials. The Prevention of Falls Network Europe (ProFaNE) developed a common outcome data set for fall injury prevention trials 10 years ago. This study assesses the impact of these recommendations.

METHODS: A systematic search (up to 16 January 2015) was performed using Web of Science, Scopus and PubMed for articles citing the ProFaNE recommendations. Randomised trials on fall prevention in older people were selected for further analysis. Data were extracted on study characteristics and adherence to the key domains recommended by the ProFaNE consensus: falls, fall injury, physical activity, psychological consequences and health-related quality of life. Details of non-recommended outcome measures used were also recorded.

RESULTS: The ProFaNE recommendations were cited in a total of 464 published articles, of which 34 were randomised trials on fall prevention in older people. Only one study (3 %) reported on all core domains. Most of the trials reported on falls ($n = 32/34$, 94 %) as a core outcome measure. Most of the recommendations within the falls domain were well-followed. Around half of the trials reported on fall-related injury ($n = 16/34$, 47 %). However, none reported the number of radiologically confirmed peripheral fracture events, which is the recommended outcome measure for injury. The other key domains (quality of life, physical activity and psychological consequences) were less frequently reported on, with a lack of consistency in the outcome measures used.

CONCLUSIONS: The ProFaNE recommendations had a limited effect on standardising the reporting of outcomes in randomised trials on fall injury prevention in older people during the search period. Authors of consensus guidelines should consider maximising buy-in by including a diversity of geographic areas and academic disciplines at the development stage and using a solid dissemination strategy.

PDF Y Endnote Y

Associated injuries in geriatric patients are frequent and severe

Toivari M, Suominen AL, Lindqvist C, Thorén H.

J. Oral Maxillofac. Surg. 2016; ePub(ePub): ePub.

Affiliation: Docent, Department of Oral and Maxillofacial Diseases, University of Helsinki and Helsinki University Hospital, Helsinki, Finland.

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Abstract

PURPOSE: It is hypothesized that facial trauma-associated injuries (AIs) are more frequent and severe in elderly than in younger adult patients. The purpose of this study was to determine the occurrence of, reasons for, and severity of AI in geriatric facial fractures and to compare the

differences between geriatric and younger adult patients.

MATERIALS AND METHODS: Two patient cohorts were included in this cross-sectional retrospective study. Geriatric patients were at least 65 years old ($n = 117$) and younger controls were 20 to 50 years old ($n = 136$). The main predictor was age, the primary outcome was AI, and secondary outcomes were affected organ system, multiple AIs, polytrauma, and mortality during hospitalization. The other explanatory variables were gender, trauma mechanism, and type of facial fracture. Statistical methods included χ^2 tests, risk analyses with 2×2 table, and logistic regression analyses.

RESULTS: AIs were significantly more common in geriatric patients (44.0%) than in younger controls (25.0%; $P < .001$). Also, multiple AIs ($P = .003$), polytrauma ($P = .039$), mortality ($P = .008$), limb injuries ($P = .005$), and spine injuries ($P = .041$) were significantly more common in the elderly. In the risk analyses, geriatric patients had a 1.8-fold risk for AI, a 2.6-fold risk for multiple AIs, and a 2.2-fold risk for polytrauma.

CONCLUSIONS: AIs are much more frequent and severe in geriatric patients, and the elderly die more often of their injuries. The results emphasize that elderly patients require specific attention and multi-professional collaboration in the diagnosis and sequencing of trauma treatment.

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Association between Berg Balance, Physiological Profile Assessment and physical activity, physical function and body composition: a cross-sectional study

Smee DJ, Berry HL, Waddington G, Anson J.

J. Frailty Aging 2016; 5(1): 20-26.

Affiliation: Disa J. Smee, 12C16, Department of Sport and Exercise Science, Faculty of Health, University of Canberra, Canberra, ACT, Australia 2601, Phone: +61 (0)2 62012927, Fax: +61 (0)2 62015615, E-mail: disa.smee@canberra.edu.au.

(Copyright © 2016, Journal of frailty and aging)

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Abstract

BACKGROUND: Falls are of great concern to older adults and costly to the health system. In addition the relationship between falls risk and falls risk predictor characteristics is complex.

OBJECTIVE: This study aimed to explore the relationship between two objective fall-risk measures tools, the Physiological Profile Assessment and the Berg Balance Scale and to determine how an individual's sex, level of physical function, health-related and body composition characteristics impact these objective falls risk measures.

DESIGN: A cross-sectional, observational study. **PARTICIPANTS:** 245 community-dwelling older adults (M age=68.12 years, SD=6.21; 69.8% female). **MEASUREMENTS:** Participants were assessed for falls-risk (Physiological Profile Assessment and the Berg Balance Scale), physical activity, physical functional and body composition characteristics. Pearson product-moment correlation coefficients were calculated to examine bivariate relationships and hierarchical multiple linear regression modelling was used to estimate the contribution of each predictor in explaining variance in falls-risk.

RESULTS: In females, there was a weak association between the two objective falls-risk measures ($r = -0.17$ $p < 0.05$). The number of falls in the previous 12 months explained 6% of variance in Physiological Profile Assessment scores, with bone density of the lumbar spine contributing a further

1%. In males and females, variance in the Berg Balance Scale showed that age (25%) and physical function (16% for females, 28% for males) contributed significantly to the explaining variance in the falls-risk measure.

CONCLUSION: Sex differences are apparent and as such males and females should be assessed (and potentially treated) differently with regards to falls risk. Results indicate that both falls risk assessment tools measure aspects of balance but are not interchangeable. The Berg Balance Scale may be more discriminative in older, less functioning adults and the Physiological Profile Assessment is more useful in assessing falls risk in females.

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Association between physical fitness and successful aging in Taiwanese older adults

Lin PS, Hsieh CC, Cheng HS, Tseng TJ, Su SC.

PLoS One 2016; 11(3): e0150389.

Affiliation: Department of Physical Therapy & Graduate Institute of Rehabilitation Science, College of Medicine, Chang Gung University, Taoyuan, Taiwan.

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Abstract

Population aging is escalating in numerous countries worldwide; among them is Taiwan, which will soon become an aged society. Thus, aging successfully is an increasing concern. One of the factors for achieving successful aging (SA) is maintaining high physical function. The purpose of this study was to determine the physical fitness factors associated with SA in Taiwanese older adults (OAs), because these factors are intervenable. Community-dwelling OAs aged more than 65 years and residing in Northern Taiwan were recruited in this study. They received a comprehensive geriatric assessment, which includes sociodemographic data, health conditions and behaviors, activities of daily living (ADL) and instrumental ADL (IADL) function, cognitive and depressive status, and quality of life. Physical fitness tests included the grip strength (GS), 30-second sit-to-stand (30s STS), timed up-and-go (TUG), functional reach (FR), one-leg standing, chair sit-and-reach, and reaction time (drop ruler) tests as well as the 6-minute walk test (6MWT). SA status was defined as follows: complete independence in performing ADL and IADL, satisfactory cognitive status (Mini-Mental State Examination ≥ 24), no depression (Geriatric Depression Scale < 5), and favorable social function (SF subscale ≥ 80 in SF-36). Adjusted multiple logistic regression analyses were performed. Among the total recruited OAs ($n = 378$), 100 (26.5%) met the aforementioned SA criteria. After adjustment for sociodemographic characteristics and health condition and behaviors, some physical fitness tests, namely GS, 30s STS, 6MWT, TUG, and FR tests, were significantly associated with SA individually, but not in the multivariate model. Among the physical fitness variables tested, cardiopulmonary endurance, mobility, muscle strength, and balance were significantly associated with SA in Taiwanese OAs. Early detection of deterioration in the identified functions and corresponding intervention is essential to ensuring SA.

PDF Y Endnote Y

Comorbid profile rather than age determines hip fracture mortality in a nonagenarian population

Graver A, Merwin S, Collins L, Kohn N, Goldman A.

HSS J 2015; 11(3): 223-235.

Affiliation: Department of Orthopaedic Surgery, Long Island Jewish Medical Center, 270-05 76th Avenue, New Hyde Park, NY 11040 USA ; Hofstra North Shore-LIJ School of Medicine, 500 Hofstra University, Hempstead, NY 11549 USA ; North Shore-LIJ Medical Group, University Orthopaedic Associates, 611 Northern Blvd Suite 200, Great Neck, NY 11021 USA ; North Shore University Hospital, 300 Community Drive, Manhasset, NY 11030 USA.

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Abstract

BACKGROUND: In light of poor outcomes with nonoperative management of hip fractures, orthopedic surgeons are faced with difficult decisions about which patients are too ill or too old for surgical treatment. **QUESTIONS/PURPOSES:** This study sought to investigate if patients over 90 years had different preoperative laboratory, clinical, and injury characteristics than younger patients with the same injury. We compared our cohort with previously published data. We wished to identify if there were pre-injury risk factors associated with 30-day mortality, which could be modified to enhance postoperative outcomes.

METHODS: This is a retrospective review of 198 operatively managed hip fractures in patients 75 years or older. We collected data on demographics, select preoperative laboratory values, injury type, comorbidities, and 30-day mortality.

RESULTS: Eleven (5.6%) of the cohort died within 30 days of surgery, 6.3% in the younger group, and 3.7% in the older group; the difference was not statistically significant. For baseline characteristics, there was no difference between the age groups for pre-injury comorbidities, hemoglobin, serum albumin, BUN, prevalence of UTI, or fracture type. A total of 67 (35.8%) patients had evidence of UTI on admission.

CONCLUSIONS: These findings reveal that in our dichotomized cohort, pre-injury characteristics were similar and age alone was not an independent predictor of mortality. These data may inform decision-making for orthopedic surgeons and the medical providers who consult to optimize these patients for surgery. We identified high rates of UTI in both age groups, a potentially remediable factor to optimize outcomes in hip fracture surgery in elderly patients.

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Effect of calendar age on physical performance: a comparison of standard clinical measures with instrumented measures in middle-aged to older adults

Stijntjes M, Meskers CG, de Craen AJ, van Lummel RC, Rispens SM, Slagboom PE, Maier AB.

Gait Posture 2016; 45: 12-18.

Affiliation: Department of Internal Medicine, Section of Gerontology and Geriatrics, VU University Medical Center, Amsterdam, The Netherlands.

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DOI 10.1016/j.gaitpost.2015.12.018 **PMID** 26979876

Abstract

BACKGROUND: Decline in physical performance is highly prevalent during aging. Identification of sensitive markers of age-related changes in physical performance is important for early detection, development of therapeutic strategies and insight into underlying mechanisms. We studied the

association of calendar age and familial longevity with standard clinical and instrumented measures of physical performance in a cohort of healthy middle-aged to older adults.

METHODS: Cross-sectional analysis within the Leiden Longevity Study consisting of offspring of nonagenarian siblings and their partners (n=300, mean age (SD) 65.3 (6.7) years). Standard clinical measures were 25-meter walking speed and total duration of the chair stand test (CST).

Instrumented measures were determined using a body fixed sensor. Dependence of physical performance on calendar age and familial longevity (offspring versus partner status) was analyzed using linear and logistic regression, respectively, adjusted for gender and height.

RESULTS: Higher calendar age was associated with slower walking speed and longer duration of the CST (standardized β (95% CI) -.024 (-.042; -.006) and .035 (.014;.056), respectively). Instrumented measures showed similar effect sizes with strongest associations for gait stability and symmetry in mediolateral direction and for the extension and flexion phase of sit-to-stand and stand-to-sit transfers, respectively. No differences were observed between offspring of nonagenarian siblings and their partners.

CONCLUSIONS: Standard clinical and instrumented measures of physical performance are associated with similar effect size to age-related changes in physical performance observable from middle age. The potential added value of instrumented measures for understanding underlying mechanisms requires further attention.

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Effects of Geriatric Interdisciplinary Home Rehabilitation on walking ability and length of hospital stay after hip fracture: a randomized controlled trial

Karlsson Å, Berggren M, Gustafson Y, Olofsson B, Lindelöf N, Stenvall M.

J. Am. Med. Dir. Assoc. 2016; ePub(ePub): ePub.

Affiliation: Department of Community Medicine and Rehabilitation, Geriatric Medicine, Umeå University, Umeå, Sweden.

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DOI 10.1016/j.jamda.2016.02.001 **PMID** 26975205

Abstract

OBJECTIVE: To evaluate if Geriatric Interdisciplinary Home Rehabilitation could improve walking ability for older people with hip fracture compared with conventional geriatric care and rehabilitation. A secondary aim was to investigate the postoperative length of hospital stay (LOS).

DESIGN: Randomized controlled trial.

SETTING: Geriatric ward, ordinary housing, and residential care facilities.

PARTICIPANTS: People operated on for a hip fracture (n = 205), aged 70 or older, including those with cognitive impairment, and living in the north of Sweden.

INTERVENTION: Home rehabilitation with the aim of early hospital discharge that was individually designed and carried out by an interdisciplinary team for a maximum of 10 weeks. Special priority was given to prevention of falls, independence in daily activities, and walking ability both indoors and outdoors.

MEASUREMENTS: Walking ability and the use of walking device was assessed in an interview during the hospital stay. These assessments were repeated along with gait speed measurements at 3- and 12-month follow-up. The length of the hospital stay after the hip fracture was recorded.

RESULTS: No significant differences were observed in walking ability, use of walking device, and gait

speed at the 3- and 12-month follow-up between the groups. At 12 months, 56.3% of the intervention group and 57.7% of the control group had regained or improved their prefracture walking ability. The median postoperative LOS in the geriatric ward was 6 days shorter for the intervention group ($P = .003$).

CONCLUSION: Participants receiving Geriatric Interdisciplinary Home Rehabilitation regained walking ability in the short- and long-term similar to those receiving conventional geriatric care and rehabilitation according to a multifactorial rehabilitation program. The intervention group had a significantly shorter postoperative LOS in the hospital.

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PDF Y Endnote Y

Effects of the Otago exercise program on fall efficacy, activities of daily living and quality of life in elderly stroke patients

Park Y, Chang M.

J. Phys. Ther. Sci. 2016; 28(1): 190-193.

Affiliation: Department of Occupational Therapy, College of Biomedical Science and Engineering, Inje University, Republic of Korea.

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DOI 10.1589/jpts.28.190 **PMID** 26957755 **PMCID** PMC4756001

Abstract

PURPOSE: The purpose of this study was to determine the effects of the Otago exercise program on fall efficacy, activities of daily living, and quality of life in elderly stroke patients.

SUBJECTS AND METHODS: Eight subjects performed the Otago exercise program three times per week, for 8 weeks. The outcome measures were the Fall Efficacy Scale score for fall efficacy, modified Barthel index for activities of daily living, and EQ-5D for quality of life.

RESULTS: In our comparison of the results before and after the intervention, we found that the Otago exercise program improved fall efficacy significantly as well as the score for activities of daily living and quality of life, though not significantly.

CONCLUSION: We consider that the Otago exercise program is an effective method for improving fall efficacy in elderly stroke patients.

PDF Y Endnote Y

Estimation of foot trajectory during human walking by a wearable inertial measurement unit mounted to the foot

Kitagawa N, Ogihara N.

Gait Posture 2016; 45: 110-114.

Affiliation: Department of Mechanical Engineering, Keio University, Yokohama 223-8522, Japan. Electronic address: ogihara@mech.keio.ac.jp.

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Abstract

To establish a supportive technology for reducing the risk of falling in older people, it is essential to clarify gait characteristics in elderly individuals that are possibly linked to the risk of falling during actual daily activities. In this study, we developed a system to monitor human gait in an outdoor

environment using an inertial measurement unit consisting of a tri-axial accelerometer and tri-axial gyroscope. Step-by-step foot trajectories were estimated from the sensor unit attached to the dorsum of the foot. Specifically, stride length and foot clearance were calculated by integrating the gravity-compensated translational acceleration over time during the swing phase. Zero vertical velocity and displacement corrections were applied to obtain the final trajectory, assuming the slope of the walking surface is negligible. Short, normal, and long stride-length walking of 10 healthy participants was simultaneously measured using the proposed system and a conventional motion capture system to evaluate the accuracy of the estimated foot trajectory. Mean accuracy and precision were approximately 20 ± 50 mm, for stride length, and 2 ± 7 mm for foot clearance, indicating that the swing phase trajectory of the sensor unit attached to the foot was reconstructed more accurately and precisely using the proposed system than with previously published methods owing to the flat floor assumption. Although some methodological limitations certainly apply, this system will serve as a useful tool to monitor human walking during daily activities.

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Falls and fall-related injuries among community-dwelling adults in the United States

Verma SK, Willetts JL, Corns HL, Marucci-Wellman HR, Lombardi DA, Courtney TK.

PLoS One 2016; 11(3): e0150939.

Affiliation: Environmental and Occupational Medicine and Epidemiology Program, Department of Environmental Health, Harvard T.H. Chan School of Public Health, Boston, MA, United States of America.

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Abstract

INTRODUCTION: Falls are the leading cause of unintentional injuries in the U.S.; however, national estimates for all community-dwelling adults are lacking. This study estimated the national incidence of falls and fall-related injuries among community-dwelling U.S. adults by age and gender and the trends in fall-related injuries across the adult life span.

METHODS: Nationally representative data from the National Health Interview Survey (NHIS) 2008 Balance and Dizziness supplement was used to develop national estimates of falls, and pooled data from the NHIS was used to calculate estimates of fall-related injuries in the U.S. and related trends from 2004-2013. Costs of unintentional fall-related injuries were extracted from the CDC's Web-based Injury Statistics Query and Reporting System.

RESULTS: Twelve percent of community-dwelling U.S. adults reported falling in the previous year for a total estimate of 80 million falls at a rate of 37.2 falls per 100 person-years. On average, 9.9 million fall-related injuries occurred each year with a rate of 4.38 fall-related injuries per 100 person-years. In the previous three months, 2.0% of older adults (65+), 1.1% of middle-aged adults (45-64) and 0.7% of young adults (18-44) reported a fall-related injury. Of all fall-related injuries among community-dwelling adults, 32.3% occurred among older adults, 35.3% among middle-aged adults and 32.3% among younger adults. The age-adjusted rate of fall-related injuries increased 4% per year among older women (95% CI 1%-7%) from 2004 to 2013. Among U.S. adults, the total lifetime cost of annual unintentional fall-related injuries that resulted in a fatality, hospitalization or treatment in an emergency department was 111 billion U.S. dollars in 2010.

CONCLUSIONS: Falls and fall-related injuries represent a significant health and safety problem for

adults of all ages. The findings suggest that adult fall prevention efforts should consider the entire adult lifespan to ensure a greater public health benefit.

PDF Y Endnote Y

Hearing and vision impairment and the 5-year incidence of falls in older adults

Gopinath B, McMahon CM, Burlutsky G, Mitchell P.

Age Ageing 2016; ePub(ePub): ePub.

Affiliation: Centre for Vision Research, Department of Ophthalmology and The Westmead Institute, University of Sydney, Sydney, New South Wales, Australia.

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Abstract

BACKGROUND: concurrent vision and hearing loss are common in older adults; however, epidemiological data on their relationship with the incidence of falls are lacking.

OBJECTIVE: we assessed the association between dual sensory impairment (DSI) and incidence of falls. We examined the influence of self-perceived hearing handicap and hearing aid use and risk of falls.

DESIGN: a population-based, cohort study of participants followed over 5 years. **SETTING:** Blue Mountains, west of Sydney, Australia. **SUBJECTS:** one thousand four hundred and seventy-eight participants aged 55 and older at baseline were included in longitudinal analyses.

METHODS: visual impairment was defined as presenting or best-corrected visual acuity less than 20/40 (better eye), and hearing impairment as average pure-tone air conduction threshold >25 dB HL (500-4,000 Hz, better ear). The shortened version of the hearing handicap inventory for the elderly was administered. Incident falls were assessed over the 12 months before each visit.

Cognitive impairment was determined using the Mini-Mental State Examination.

RESULTS: five-year incidence of falls was 10.4%. Participants with severe self-perceived hearing handicap versus no hearing handicap had increased risk of incident falls, multivariable-adjusted OR 1.93 (95% confidence intervals, CI, 1.02-3.64). Hearing aid users versus non-users had 75% increased likelihood of incident falls. Participants with co-existing best-corrected visual impairment and mild hearing loss (>25 to ≤40 dB HL) had higher odds of incident falls, OR 2.19 (95% CI 1.03-4.67). After excluding persons with cognitive impairment, this association did not persist.

CONCLUSION: these epidemiological data show that DSI in older adults could significantly increase their risk of falling.

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Influence of non-spatial working memory demands on reach-grasp responses to loss of balance: effects of age and fall risk

Westlake KP, Johnson BP, Creath RA, Neff RM, Rogers MW.

Gait Posture 2016; 45: 51-55.

Affiliation: Department of Physical Therapy & Rehabilitation Science, The University of Maryland, School of Medicine, 100 Penn Street, Baltimore, MD, United States.

(Copyright © 2016, Elsevier Publishing)

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Abstract

Reactive balance recovery strategies following an unexpected loss of balance are crucial to the prevention of falls, head trauma and other major injuries in older adults. While a longstanding focus has been on understanding lower limb recovery responses, the upper limbs also play a critical role. However, when a fall occurs, little is known about the role of memory and attention shifting on the reach to grasp recovery strategy and what factors determine the speed and precision of this response beyond simple reaction time. The objective of this study was to compare response time and accuracy of a stabilizing grasp following a balance perturbation in older adult fallers compared to non-fallers and younger adults while loading the processing demands of non-spatial, verbal working memory. Working memory was engaged with a progressively challenging verb-generation task that was interrupted by an unexpected sideways platform perturbation and a pre-instructed reach to grasp response.

RESULTS revealed that the older adults, particularly those at high fall risk, demonstrated significantly increased movement time to handrail contact and grasping errors during conditions in which non-spatial memory was actively engaged. These findings provide preliminary evidence of the cognitive deficit in attention shifting away from an ongoing working memory task that underlies delayed and inaccurate protective reach to grasp responses in older adult fallers.

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Involving the consumers: an exploration of users' and caregivers' needs and expectations on a fall prevention brochure: a qualitative study

Schoberer D, Breimaier HE, Mandl M, Halfens RJ, Lohrmann C.

Geriatr. Nurs. 2016; ePub(ePub): ePub.

Affiliation: Institute of Nursing Science, Medical University of Graz, Billrothgasse 6, 8010 Graz, Austria.

(Copyright © 2016, Elsevier Publishing)

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Abstract

This study aims to explore and compare nursing home residents', family members', and nursing staff's needs and expectations regarding a fall prevention brochure. Focus groups were carried out with 25 residents, 12 family members and 14 nursing staff separately, from three randomly selected nursing homes. Qualitative content analysis was used to analyze the data using a concept-driven coding frame.

RESULTS showed that residents want to be informed about dealing with extrinsic fall risks and coping strategies after a fall event. In addition, family members wanted to have detailed information on intrinsic fall risks as well as specific fall prevention strategies, such as body exercises. Of special importance for nursing staff was that not all falls are preventable even when preventive measures were taken. As the need and expectations of users differ substantially, one brochure could not comprise all postulated criteria and different brochures are necessary for residents and for family members.

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Using a community of practice to evaluate falls prevention activity in a residential aged care

organisation: a clinical audit

Francis-Coad J, Etherton-Beer C, Bulsara C, Nobre D, Hill AM.

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DOI 10.1071/AH15189 **PMID** 26982888

Abstract

OBJECTIVE This study evaluates whether a community of practice (CoP) could conduct a falls prevention clinical audit and identify gaps in falls prevention practice requiring action.

METHODS Cross-sectional falls prevention clinical audits were conducted in 13 residential aged care (RAC) sites of a not-for-profit organisation providing care to a total of 779 residents. The audits were led by an operationalised CoP assisted by site clinical staff. A CoP is a group of people with a shared interest who get together to innovate for change. The CoP was made up of self-nominated staff representing all RAC sites and comprised of staff from various disciplines with a shared interest in falls prevention.

RESULTS All 13 (100%) sites completed the audit. CoP conduct of the audit met identified criteria for an effective clinical audit. The priorities for improvement were identified as increasing the proportion of residents receiving vitamin D supplementation (mean 41.5%, s.d. 23.7) and development of mandatory falls prevention education for staff and a falls prevention policy, as neither was in place at any site. CoP actions undertaken included a letter to visiting GPs requesting support for vitamin D prescription, surveys of care staff and residents to inform falls education development, defining falls and writing a falls prevention policy.

CONCLUSION A CoP was able to effectively conduct an evidence-based falls prevention activity audit and identify gaps in practice. CoP members were well positioned, as site staff, to overcome barriers and facilitate action in falls prevention practice. What is known about the topic? Audit and feedback is an effective way of measuring clinical quality and safety. CoPs have been established in healthcare using workplace staff to address clinical problems but little is known about their ability to audit and influence practice change. What does this paper add? This study contributes to the body of knowledge on CoPs in healthcare by evaluating the performance of one in the domain of falls prevention audit action. What are the implications for practitioners? A CoP is an effective model to engage staff in the clinical audit process. Clinical audits can raise staff awareness of gaps in practice and motivate staff to plan and action change as recommended in best practice guidelines.

PDF Y Endnote Y

Vestibular asymmetry increases double support time variability in a counter-balanced study on elderly fallers

Larsson J, Miller M, Hansson EE.

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Affiliation: Department of Clinical Sciences, Family Medicine, Lund University, Jan Waldenströms gata 35, 205 02 Malmö, Sweden; Department of Health Sciences, Lund University, P.O. Box 157, 221 00 Lund, Sweden.

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Abstract

Vestibular asymmetry is a common cause of dizziness in the elderly, for whom it precipitates the risk of falling. Previous studies have shown that those with vestibular asymmetry displayed an altered variability in double support time (DST) compared to controls. However, swing time (SwT) variability findings are conflicting. In this study, we investigated if vestibular asymmetry might be causally connected to increased DST variability. We studied a group of eight elderly fallers with wrist fractures across three months, during which time four of them regained vestibular symmetry while four others developed an asymmetry. We evaluated the variability of DST and SwT, both when the participants suffered from vestibular asymmetry and when they did not. On average, variability in DST was significantly greater by 2.38 %CV (coefficient of variation) when participants scored positive for vestibular asymmetry compared to when not, $t(5)=4.39$, $p=0.01$, $\xi=1.67$. In contrast, SwT variability differed non-significantly by 0.44 %CV when participants had tested positive versus negative for vestibular asymmetry, $t(5)=-0.87$, $p=0.39$, $\xi=-0.29$. As a possible rationale for our results, we propose that increased DST variability may be the result of a re-stabilization strategy. Further research on DST variability and its correlation to the duration of vestibular asymmetry is recommended. Copyright © 2015 Elsevier B.V. All rights reserved.

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Which frailty measure is a good predictor of early post-operative complications in elderly hip fracture patients?

Kua J, Ramason R, Rajamoney G, Chong MS.

Arch. Orthop. Trauma Surg. 2016; ePub(ePub): ePub.

Affiliation: Department of Geriatric Medicine, Institute of Geriatrics and Active Ageing, Tan Tock Seng Hospital, 11 Jalan Tan Tock Seng, Singapore, 308433, Singapore.

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Abstract

INTRODUCTION: Current pre-operative assessment using, e.g., American Society of Anaesthesiologists score does not accurately predict post-operative outcomes following hip fracture. The multidimensional aspect of frailty syndrome makes it a better predictor of post-operative outcomes in hip fracture patients. We aim to discover which frailty measure is more suitable for prediction of early post-operative outcomes in hip fracture patients.

METHODS: Hundred consecutive hip fracture patients seen by the orthogeriatric service were included. We collected baseline demographic, functional and comorbidity data. In addition to ASA, a single blinded rater measured frailty using two scales (i) modified fried criteria (MFC) and (ii) reported edmonton frail scale (REFS). The MFC adopted a surrogate gait speed measure with two questions: (i) Climbing one flight of stairs and (ii) Ability to walk 1 km in the last 2 weeks. Immediate post-operative complications during the inpatient stay were taken as the primary outcome measure.

RESULTS: Subjects had mean age of 79.1 ± 9.6 years. Sixty six percent were female and 87 % of Chinese ethnicity. Eighty two percent had surgery, of which 37.8 % ($n = 31$) had post-operative complications. Frailty, measured by MFC (OR 4.46, $p = 0.04$) and REFS (OR 6.76, $p = 0.01$) were the only significant predictors of post-operative complications on univariate analyses. In the hierarchical logistic regression model, only REFS (OR 3.42, $p = 0.04$) predicted early post-operative complications. At 6 months follow-up, REFS significantly predicted [basic activities of daily living (BADL)] function on the multivariable logistic regression models. (BADL, OR 6.19, $p = 0.01$).

CONCLUSIONS: Frailty, measured by the REFS is a good predictor of early post-operative outcomes in

our pilot study of older adults undergoing hip surgery. It is also able to predict 6 months BADL function. We intend to review its role in longer-term post-operative outcomes and validate its potential role in pre-operative assessment of older adults undergoing hip surgery.

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Whole-brain grey matter density predicts balance stability irrespective of age and protects older adults from falling

Boisgontier MP, Cheval B, van Ruitenbeek P, Levin O, Renaud O, Chanal J, Swinnen SP.
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Affiliation: Movement Control and Neuroplasticity Research Group, Department of Kinesiology, Biomedical Sciences Group, KU Leuven, Leuven, Belgium; Leuven Research Institute for Neuroscience & Disease (LIND), KU Leuven, Leuven, Belgium.

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Abstract

Functional and structural imaging studies have demonstrated the involvement of the brain in balance control. Nevertheless, how decisive grey matter density and white matter microstructural organisation are in predicting balance stability, and especially when linked to the effects of ageing, remains unclear. Standing balance was tested on a platform moving at different frequencies and amplitudes in 30 young and 30 older adults, with eyes open and with eyes closed. Centre of pressure variance was used as an indicator of balance instability. The mean density of grey matter and mean white matter microstructural organisation were measured using voxel-based morphometry and diffusion tensor imaging, respectively. Mixed-effects models were built to analyse the extent to which age, grey matter density, and white matter microstructural organisation predicted balance instability.

RESULTS showed that both grey matter density and age independently predicted balance instability. These predictions were reinforced when the level of difficulty of the conditions increased.

Furthermore, grey matter predicted balance instability beyond age and at least as consistently as age across conditions. In other words, for balance stability, the level of whole-brain grey matter density is at least as decisive as being young or old. Finally, brain grey matter appeared to be protective against falls in older adults as age increased the probability of losing balance in older adults with low, but not moderate or high grey matter density. No such results were observed for white matter microstructural organisation, thereby reinforcing the specificity of our grey matter findings.

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Balance impairment limits ability to increase walking speed in individuals with chronic stroke

Middleton A, Braun CH, Lewek MD, Fritz SL.

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Affiliation: Division of Rehabilitation Sciences, Department of Exercise Science, University of South Carolina, Columbia, SC, USA.

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Abstract

PURPOSE Determine the relationship between balance impairments and the ability to increase walking speed (WS) on demand in individuals with chronic stroke.

METHODS WS and Berg Balance Scale (BBS) data were collected on 124 individuals with chronic stroke (>6 months). The ability to increase WS on demand (walking speed reserve, WSR) was quantified as the difference between participants' self-selected (SSWS) and maximal (MWS) walking speeds. Correlation, regression and receiver operating characteristic (ROC) analyses were performed to investigate the relationship between balance and the ability to increase WS.

RESULTS Of sample, 58.9% were unable to increase WS on demand (WSR < 0.2 m/s). BBS scores were associated with WSR values ($r_s=0.74$, 0.65-0.81) and were predictive of 'able/unable' to increase WS [odds ratio (OR) = 0.75, 0.67-0.84]. The AUC for the ROC curve constructed to assess the accuracy of BBS to discriminate between able/unable to increase WS was 0.85 (0.78-0.92). A BBS cutscore of 47 points was identified [sensitivity: 72.6%, specificity: 90.2%, +likelihood ratio (LR): 7.41, -LR: 0.30].

CONCLUSIONS The inability to increase WS on demand is common in individuals with chronic stroke, and balance appears to be a significant contributor to this difficulty. A BBS cutscore of 47 points can identify individuals who may benefit from balance interventions to improve the ability to increase their WS. Implications for Rehabilitation A majority of individuals with chronic stroke may be unable to increase their walking speed beyond their self-selected speed on demand. This may limit functional ambulation, as these individuals are walking "at capacity". Balance impairments contribute to the inability to increase walking speed. A Berg Balance Scale score <47 points can be used to identify individuals with chronic stroke walking "at capacity" due to balance impairments.

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Biomechanical risk factors for tripping during obstacle-crossing with the trailing limb in patients with type II diabetes mellitus

Hsu WC, Liu MW, Lu TW.

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Affiliation: Institute of Biomedical Engineering, National Taiwan University, Taipei, Taiwan; Department of Orthopaedic Surgery, National Taiwan University Hospital, Taipei, Taiwan. Electronic address: twlu@ntu.edu.tw.

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Abstract

People with type II diabetes mellitus (DM) are at a high risk of falling especially during more challenging locomotor tasks such as obstacle-crossing. The current study aimed to identify the risk factors for tripping in these patients during trailing-limb obstacle-crossing. Fourteen patients with type II DM with or without mild peripheral neuropathy (PN) and 14 healthy controls walked and crossed obstacles of three different heights while their motion data were measured using a motion capture system and two forceplates. The DM group was found to cross obstacles with significantly reduced trailing toe clearance ($p<0.05$), increasing the probability of the foot hitting the obstacle, and thus the risk of tripping. This altered end-point control was associated with significantly reduced knee flexion and hip adduction of the trailing swing limb ($p<0.05$), as well as significantly increased ankle plantarflexor moments in the leading stance limb ($p<0.05$). Therefore, reduced knee flexion and hip adduction of the swing limb are identified as risk factors for tripping during obstacle-crossing. Increased mechanical demands on the ankle plantarflexors suggest that weakness of these

muscles may further reduce the already compromised performance of obstacle-crossing in these patients. The current results showed that obstacle-crossing can be used to detect gait deviations and to identify the associated risk of tripping in patients with type II DM without or at an early stage of PN.

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Could in-home sensors surpass human observation of people with Parkinson's at high risk of falling? An ethnographic study

Stack E, King R, Janko B, Burnett M, Hammersley N, Agarwal V, Hannuna S, Burrows A, Ashburn A. *Biomed. Res. Int.* 2016; 2016: e3703745.

Affiliation: Faculty of Health Sciences, University of Southampton, Southampton SO17 1BJ, UK.

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Abstract

Self-report underpins our understanding of falls among people with Parkinson's (PwP) as they largely happen unwitnessed at home. In this qualitative study, we used an ethnographic approach to investigate which in-home sensors, in which locations, could gather useful data about fall risk. Over six weeks, we observed five independently mobile PwP at high risk of falling, at home. We made field notes about falls (prior events and concerns) and recorded movement with video, Kinect, and wearable sensors. The three women and two men (aged 71 to 79 years) having moderate or severe Parkinson's were dependent on others and highly sedentary. We most commonly noted balance protection, loss, and restoration during chair transfers, walks across open spaces and through gaps, turns, steps up and down, and tasks in standing (all evident walking between chair and stairs, e.g.). Our unobtrusive sensors were acceptable to participants: they could detect instability during everyday activity at home and potentially guide intervention. Monitoring the route between chair and stairs is likely to give information without invading the privacy of people at high risk of falling, with very limited mobility, who spend most of the day in their sitting rooms.

PDF Y Endnote Y

Dual task cost of cognition is related to fall risk in patients with multiple sclerosis: a prospective study

Etemadi Y.

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Affiliation: Department of Rehabilitation Science, Mazandaran University of Medical Sciences, Sari, Iran etemadiy@gmail.com.

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DOI 10.1177/0269215516637201 **PMID** 26951347

Abstract

OBJECTIVE: To examine whether change in cognitive performance during dual task condition compared with a task in isolation, known as dual task cost, is related to fall risk of patients with multiple sclerosis.

DESIGN: Prospective cohort. During baseline assessment, data about balance, walking and cognitive performance of patients with multiple sclerosis were collected under a single and dual task condition. The dual task cost was calculated as a percentage of change in parameters from single to

dual task conditions. Falls were recorded prospectively for six months and participants were classified as none/one time fallers and recurrent fallers (≥ 2 falls). The association between dual task costs and fall status was evaluated by logistic regression.

SETTING: Balance research lab of university hospital.

PARTICIPANTS: A total of 60 patients with relapsing-remitting multiple sclerosis. INTERVENTIONS: Not applicable.

MAIN OUTCOME MEASURES: The dual task cost of the center of pressure sway area, walking velocity and correct response rate were outcome measures for balance, walking and cognitive performance, respectively.

RESULTS: A total of 79 falls were reported by 38 of the participants who experienced one or more falls; 26 (43.3%) of them had recurrent falls. Dual tasking resulted in increased sway area and decreased walking velocity and correct response rate during walking (all p values < 0.05). Logistic regressions showed that the dual task cost of the correct response rate during walking and walking velocity were associated with increased risk of recurrent falls ($P = 0.02$, odds ratio = 1.34; confidence interval (CI) 1.04-3.74; $P = 0.05$, odds ratio = 1.23, CI = 1.02-4.45, respectively).

CONCLUSIONS: The dual task cost of cognition was related to fall, which should be considered as a target for falls evaluation and prevention strategies.

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The effect of enhanced trunk control on balance and falls through bilateral upper extremity exercises among chronic stroke patients in a standing position

Shin JW, Don Kim K.

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Affiliation: Department of Physical Therapy, Daegu Fatima Hospital, Republic of Korea.

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Abstract

PURPOSE: This study examined the effects of bilateral upper extremity exercises on trunk control, balance, and risk of falls in stroke patients.

SUBJECTS AND METHODS: A total of 30 study subjects were selected and randomly divided into experimental and control groups containing 15 subjects each, who received bilateral upper extremity activities and conventional rehabilitation treatment, respectively.

RESULTS: There were statistically significant differences between groups in all sub-items and total trunk impairment and Berg Balance scale scores. Significant differences between groups were also observed in all sub-items of the trunk impairment scale, except for static sitting balance.

CONCLUSION: Bilateral upper extremity exercises are effective for trunk control and balance as well as for fall prevention.

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