

**SafetyLit 26<sup>th</sup> August****'Around the edges': using behaviour change techniques to characterise a multilevel implementation strategy for a fall prevention programme**

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*Implement. Sci.* 2018; 13(1): 113.

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**DOI** 10.1186/s13012-018-0798-6 **PMID** 30126418

**Abstract**

**BACKGROUND:** Implementation strategies are needed to ensure that evidence-based healthcare interventions are adopted successfully. However, strategies are generally poorly described and those used in everyday practice are seldom reported formally or fully understood. Characterising the active ingredients of existing strategies is necessary to test and refine implementation. We examined whether an implementation strategy, delivered across multiple settings targeting different stakeholders to support a fall prevention programme, could be characterised using the Behaviour Change Technique (BCT) Taxonomy.

**METHODS:** Data sources included project plans, promotional material, interviews with a purposive sample of stakeholders involved in the strategy's design and delivery and observations of staff training and information meetings. Data were analysed using TIDieR to describe the strategy and determine the levels at which it operated (organisational, professional, patient). The BCT Taxonomy identified BCTs which were mapped to intervention functions. Data were coded by three researchers and finalised through consensus.

**RESULTS:** We analysed 22 documents, 6 interviews and 4 observation sessions. Overall, 21 out of a possible 93 BCTs were identified across the three levels. At an organisational level, identifiable techniques tended to be broadly defined; the most common BCT was restructuring the social environment. While some activities were intended to encourage implementation, they did not have an immediate behavioural target and could not be coded using BCTs. The largest number and variety of BCTs were used at the professional level to target the multidisciplinary teams delivering the programme and professionals referring to the programme. The main BCTs targeting the multidisciplinary team were instruction on how to perform the (assessment) behaviour and demonstration of (assessment) behaviour; the main BCT targeting referrers was adding objects to the environment. At the patient level, few BCTs were used to target attendance.

**CONCLUSION:** In this study, several behaviour change techniques were evident at the individual professional level; however, fewer techniques were identifiable at an organisational level. The BCT Taxonomy was useful for describing components of a multilevel implementation strategy that specifically target behaviour change. To fully and completely describe an implementation strategy, including components that involve organisational or systems level change, other frameworks may be needed.

**PDF Y Endnote Y**



### **Association between time to surgery and 90-day mortality after hip fracture: a retrospective cohort study of 1734 cases**

Kawai M, Tanji A, Nishijima T, Tateyama K, Yoda Y, Iizuka A, Kamata Y, Urabe T.

*J. Orthop. Sci.* 2018; ePub(ePub): ePub.

**Affiliation:** Department of Orthopedic Surgery, Ashikaga Red Cross Hospital, Tochigi, Japan.

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**DOI** 10.1016/j.jos.2018.07.016 **PMID** 30119928

#### **Abstract**

**BACKGROUND:** It remains unclear whether early surgical intervention can reduce mortality after surgery in hip fracture patients. The aim of this study was to investigate the association between time from injury to surgery and mortality rate within 90 days after hip fracture surgery.

**METHODS:** We retrospectively identified 1827 patients who underwent hip fracture surgery in a tertiary care center in Japan between April 2007 and March 2017. After applying exclusion criteria (patients with spontaneous fracture, multiple fractures, revision surgery, total hip arthroplasty, or a refusal to participate), 1734 patients were included. We extracted data concerning patients' age, race, sex, operative procedure, American Society of Anesthesiologists (ASA) score, days from injury to surgery (injury-surgery days), and days from admission to surgery (admission-surgery days), which could affect 90-day mortality after surgery. Variables associated with 90-day mortality were determined using multivariate logistic regression analysis.

**RESULTS:** The 90-day postoperative mortality rate was 3.5% (60 of 1734). Multivariable analysis showed that injury-surgery days were not associated with 90-day mortality (odds ratio [OR], 0.91; 95% confidence interval [CI], 0.80 to 1.05;  $P = 0.19$ ), and that older age (OR, 1.06; 95% CI, 1.02 to 1.10;  $P = 0.005$ ), male sex (OR, 3.62; 95% CI, 1.86 to 7.03;  $P < 0.001$ ) and high ASA score (OR, 2.10; 95% CI, 1.06 to 4.18;  $P = 0.034$ ) significantly increased 90-day mortality. In addition, admission-surgery days were not associated with 90-day mortality (OR, 0.95; 95% CI, 0.83 to 1.09;  $P = 0.45$ ).  
**CONCLUSION:** Our results demonstrated that time from injury to surgery was not associated with mortality within 90 days after surgery after adjusting for age, sex, operative procedure, and ASA score.

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

### **Association of fear of falling with acceleration-derived gait indices in older adults with knee osteoarthritis**

Oka T, Asai T, Kubo H, Fukumoto Y. *Aging Clin. Exp. Res.* 2018; ePub(ePub): ePub.

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**DOI** 10.1007/s40520-018-1022-x **PMID** 30128664

#### **Abstract**

**BACKGROUND:** Knee osteoarthritis (OA) and fear of falling (FoF) are important factors contributing to trunk oscillation during walking. It is of a clinical importance to clarify the association of FoF with



trunk oscillation during walking in older adults with knee OA (knee OA adults).

**AIM:** The purpose of this study was to investigate the association of FoF with trunk oscillation during walking in knee OA adults.

**METHODS:** Forty-one patients who met the criteria participated in the study and were classified into two groups based on their answer to a question on FoF. An accelerometer was attached at the level of the third lumbar vertebra (L3) and the seventh cervical vertebra (C7), and the accelerations at L3 and C7 were measured during a 10-m gait test. Using these data, the acceleration-derived gait indices, such as stride time variability (STV), root mean square (RMS), and autocorrelation at the trunk in the anteroposterior (AP) and mediolateral (ML) directions, were computed.

**RESULTS:** FoF was associated with a higher STV value and a smaller RMS value in the ML direction at L3.

**DISCUSSION:** The decreased trunk oscillation in the ML direction in knee OA adults with FoF may reflect a positive, compensatory adaptation for trunk control.

**CONCLUSION:** Knee OA adults with FoF decreased trunk oscillation during walking than those without FoF.

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

#### **Designing interiors to mitigate physical and cognitive deficits related to aging and to promote longevity in older adults: a review**

Engineer A, Sternberg EM, Najafi B. *Gerontology* 2018; ePub(ePub): ePub.

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#### **Abstract**

**BACKGROUND:** With the increasing global population of older adults, there is a need for environmental interventions that directly affect their physical, psychological, and emotional well-being to help them maintain or regain their independence and autonomy - all of which promote longevity.

**METHODS:** To better understand potential opportunities and challenges associated with interior design and "future homes" that may promote well-being, aging in place, and independent living in older adults, the authors reviewed relevant literature and included their own expert opinions from a multidisciplinary point of view including interior design, wellness, and engineering.

**RESULTS:** After summarizing existing environmental interventions for the aging population and their effectiveness, this review reveals knowledge gaps in interior design for the well-being and longevity of older adults followed by a discussion of opportunities for future research that may fill these gaps. Some of these opportunities include finding habilitative design strategies that identify and address unique situational needs of each user, advancing multidisciplinary fields such as environmental gerontology that recreate security and independence for older adults even outside of their homes, implementing technically advanced design strategies, which are flexible and adaptive to individual needs; and integrating the Internet of things (IoT) into living environments, including voice-activated command technologies to improve seniors' central role in enabling an optimized healthcare

ecosystem.

**CONCLUSIONS:** Knowledge of current evidence regarding the impact of different environmental factors may hasten adaptation of well-designed innovations that can provide optimal healing and living environments for the aging population. By effectively addressing older adults' unique and specialized needs, design practitioners can become an indispensable part of their medical, social, and environmental team. One of the rapidly developing infrastructures promising to revolutionize the design of "future homes" is the IoT. While it is at an early stage of development, ultimately we envisage a connected home using voice-controlled technology and Bluetooth-radio-connected add-ons, to augment much of what home health does today. Bringing these approaches together into an effective strategy for a model of effective geriatric care is important and needs to become an integral part of both design education and practice.

#### PDF Y Endnote Y

#### **Does perturbation-based balance training prevent falls among individuals with chronic stroke? A randomised controlled trial**

Mansfield A, Aquilino A, Danells CJ, Knorr S, Centen A, DePaul VG, Schinkel-Ivy A, Brooks D, Inness EL, Mochizuki G.

*BMJ Open* 2018; 8(8): e021510.

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**DOI** 10.1136/bmjopen-2018-021510 **PMID** 30121600

#### **Abstract**

**OBJECTIVES:** No intervention has been shown to prevent falls poststroke. We aimed to determine if perturbation-based balance training (PBT) can reduce falls in daily life among individuals with chronic stroke.

**DESIGN:** Assessor-blinded randomised controlled trial.

**SETTING:** Two academic hospitals in an urban area.

**INTERVENTIONS:** Participants were allocated using stratified blocked randomisation to either 'traditional' balance training (control) or PBT. PBT focused on improving responses to instability, whereas traditional balance training focused on maintaining stability during functional tasks. Training sessions were 1 hour twice/week for 6 weeks. Participants were also invited to complete 2 'booster' training sessions during the follow-up. **PARTICIPANTS:** Eighty-eight participants with chronic stroke (>6 months poststroke) were recruited and randomly allocated one of the two interventions. Five participants withdrew; 42 (control) and 41 (PBT group) were included in the analysis.

**PRIMARY AND SECONDARY OUTCOME MEASURES:** The primary outcome was rate of falls in the 12 months post-training. Negative binomial regression was used to compare fall rates between groups. Secondary outcomes were measures of balance, mobility, balance confidence, physical activity and social integration.

**RESULTS:** PBT participants reported 53 falls (1.45 falls/person-year) and control participants reported 64 falls (1.72 falls/person-year; rate ratio: 0.85(0.42 to 1.69); p=0.63). Per-protocol analysis included 32 PBT and 34 control participants who completed at least 10/12 initial training sessions

and 1 booster session. Within this subset, PBT participants reported 32 falls (1.07 falls/person-year) and control participants reported 57 falls (1.75 falls/person-year; rate ratio: 0.62(0.29 to 1.30);  $p=0.20$ ). PBT participants had greater improvement in reactive balance control than the control group, and these improvements were sustained 12 months post-training. There were no intervention-related serious adverse effects.

**CONCLUSIONS:** The results are inconclusive. PBT may help to prevent falls in daily life poststroke, but ongoing training may be required to maintain the benefits. TRIAL REGISTRATION NUMBER: ISRCTN05434601; Results.

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### **Effectiveness of Lafiska exercise on risk of fall, balance, and health status in the elderly**

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*Enferm. Clin.* 2018; 28(Suppl 1): 337-342.

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#### **Abstract**

This study aims to investigate the effectiveness of Latihan Fisik Lansia "elderly physical exercise" on the balance status, risk of fall, and health status of institutionalized older adults. A quasi-experimental design was applied measuring pre-test and post-test outcomes in a control group to determine the effectiveness of the intervention in the interventional group. Eighty participants from Panti Sosial Tresna Werdha Budi Mulia 1 Cipayung were divided into an inter-ventional group with 39 older adults ( $70.3 \pm 8.13$  years) and a control group with 41 older adults ( $69.88 \pm 8.71$  years). Trained facilitators guided the exercise during 16 sessions over eight weeks, each having duration of 50 min, with a small group consisting of 10-12 participants. This study used Morse Fall Scale to measure risk of fall, Berg Balance Scale to measure balance status, and SF-12 to measure health status. Lafiska had an impact on lowering risk of fall, enhancing balance status, and enhancing health status ( $P$  value  $<.0001$ ). Lafiska is a viable exercise option for older adults with independent mobility, as well as older adults with assistive devices.

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### **Environmental and physical factors predisposing middle-aged and older Japanese adults to falls and fall-related fractures in the home**

Tanaka T, Matsumoto H, Son BK, Imaeda S, Uchiyama E, Taniguchi S, Nishino A, Miura T, Tanaka T, Otsuki T, Nishide K, Iijima K, Okata J.

*Geriatr. Gerontol. Int.* 2018; ePub(ePub): ePub.

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### Abstract

**AIM:** To identify environmental and physical factors that predispose middle-aged and older Japanese adults to falls and fall-related fractures in the home.

**METHODS:** A cross-sectional survey was carried out in 2014. Self-administered questionnaires were distributed to 15 000 community-dwelling adults in Japan. The overall crude response rate was 13%. Response data were analyzed from 1561 individuals aged  $\geq 40$  years using multiple imputation to analyze missing data. We evaluated falls without fractures and fall-related fractures during the previous 3 years according to demographic, physical and environmental factors, including age, sex, long-term care insurance certification, type of house and barrier-free housing.

**RESULTS:** Of the 1561 adults (mean age  $68.1 \pm 13.0$  years), 28% experienced a fall in the home. Among the individuals who experienced a fall, 11% experienced fall-related fractures. These individuals were more likely to be women (OR 2.4, 95.0% CI 1.1-5.1), have LTCI certification (OR 3.9, 95.0% CI 1.6-9.4) and be living in a barrier home (OR 4.0, 95.0% CI 1.6-9.8), after adjustment for covariates.

**CONCLUSIONS:** Environmental factors, such as living in a barrier home, are critical for fall-related fractures, in addition to demographic and physical factors. A multidisciplinary approach that considers both physical and environmental factors is necessary for reducing the incidence of fall-related fractures among middle-aged and older Japanese adults.

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PDF Y Endnote Y

### Examining the relationships between walkability and physical activity among older persons: what about stairs?

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*BMC Public Health* 2018; 18(1): e1025.

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### Abstract

**BACKGROUND:** Walkability is considered an important dimension of healthy communities. However, variable associations between measures of walkability and physical activity have been observed, particularly among older persons. Given the challenges older persons may have navigating stairs on walking routes, the presence of stairs may be an explanatory factor for these mixed associations. The purposes of this scoping review were to determine whether studies examining the relationship between walkability and physical activity included items that assessed stairs and what relationships were found.

**METHODS:** Systematic reviews were identified by entering search terms into five database search engines. Eligibility criteria were: a) published between 2008 and 2017, b) examined the relationship between walkability and physical activity, c) included a focus on persons aged 65 years and older,

and d) written in English. The full articles for all primary studies included in eligible systematic reviews were then retrieved. Duplicates were removed. Information about where the study took place, walkability measures used, types of walkability data obtained (objective and/or subjective) and questions asked about stairs were extracted from the full text articles.

**RESULTS:** Eleven systematic reviews were identified; seven were eligible. After removing duplicates, 289 primary studies remained for review. Measures of neighborhood walkability were present in 205 studies; a minority ( $n = 5$ , 2.4%) included items about stairs. No information was obtained on the structural features of the stairs.

**CONCLUSIONS:** The presence of stairs may deter older persons (and others) from walking outdoors. Standard measures to document the presence and characteristics of stairs, and sampling approaches to select stairs for assessment are needed. The inclusion of these measures would augment the utility and comparability of studies examining relationships between walkability and physical activity and better inform planning and policy decisions.

#### PDF Y Endnote Y

#### Factors associated with falls in older adults with cataracts

Paz LPDS, Borges LL, Marães VRFDS, Gomes MMF, Bachion MM, Menezes RL.

*Cien. Saude Colet.* 2018; 23(8): 2503-2514.

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**DOI** 10.1590/1413-81232018238.14622016 **PMID** 30137120

#### Abstract

The aim of the present study was to evaluate factors associated with falls in community-dwelling older adults diagnosed with cataracts. An analytical, cross-sectional study was conducted with a sample of community-dwelling older adults residing in the Federal District of Brazil. Interviews and assessment tools were administered, such as the Timed Up and Go test, Short Physical Performance Battery (SPPB), Biodex Balance System, Katz Index, Lawton Scale, Minnesota Leisure Time Physical Activity Questionnaire and Mini Mental State Examination. Statistical analysis involved binary logistic regression. One hundred forty-two older adults (85 with cataracts) participated in the study (mean age:  $69.39 \pm 5.67$  years). Falls were associated with the female sex (OR: 4.45) and sub-maximum score on the SPPB (OR: 3.53) among patients with cataracts, whereas multimorbidity (OR: 5.10) was the risk factor risk for older adults without cataracts. The data suggest different risk factors for falls among older adults diagnosed with cataracts.

#### PDF Y Endnote Y

#### Individual- and state-level factors associated with functional limitation prevalence among Colombian elderly: a multilevel analysis

Ballesteros SM, Moreno-Montoya J.

*Cad. Saude Publica* 2018; 34(8): e00163717.

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### Abstract

This study aimed to identify the main regional factors associated with variations in the prevalence of functional limitation on the older adult in Colombia adjusted by individual characteristics. This multilevel study used cross-sectional data from 23,694 adults over 60 years of age in the SABE, Colombia nationwide survey. State-level factors (poverty, development, inequity, violence, health coverage, and access to improved water sources), as well as individual health related, socioeconomic and demographic characteristics, were analyzed. The overall prevalence of functional impairment for the basic activities of daily living (ADL) was 22%. The presence of comorbidities, low educational level, physical inactivity, no participation in social groups, mistreatment and being over 75 years old were associated with functional limitation. At the group level, the analysis showed significant differences in the functional limitation prevalence across states, particularly regarding the socioeconomic status measured according to the Human Development Index (median OR = 1.22; 95%CI: 1.13-1.30;  $p = 0.011$ ). This study provides evidence on the impact of socioeconomic variation across states on FL prevalence in the Colombian elderly once adjusted for individual characteristics. The findings of this study, through a multilevel approach methodology, provide information to effectively address the conditions that affect the functionality in this population through the identification and prioritization of public health care in groups with economic and health vulnerability.

### PDF Y Endnote Y

#### **Influence of energy cost and physical fitness on the preferred walking speed and gait variability in elderly women**

Ciprandi D, Zago M, Bertozzi F, Sforza C, Galvani C.

*J. Electromyogr. Kinesiol.* 2018; 43: 1-6.

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### Abstract

Typically gait speed decreases and gait variability increases in elderly. The aim of this study was to define the influence of energy cost of walking on gait speed and of health-related physical fitness on gait variability. Thirty healthy young and older women were recruited in the study. Energy cost of walking ( $Net_{cw}$ ) was analyzed with indirect calorimetry while a kinematic analysis was performed with an optoelectronic system to calculate gait variability (GV) during treadmill walking at different speeds. Gait speed was defined as the preferred walking speed (PWS) of the subject and health related physical fitness (HRPF) comprised body fat, strength, flexibility, and cardiorespiratory fitness. In healthy elderly women, the coefficient of variation of step width was found to be a better indicator of GV than stride time, stride length and double support coefficients of variation. GV was not affected by age allowing a high PWS. Furthermore, significant associations, adjusted for age, body mass index and number of falls, were identified neither between  $Net_{cw}$  and the PWS, nor between HRPF and GV; only a significant association was found between hand-grip strength and gait



stability.

FINDINGS highlighted the importance to evaluate hand-grip strength as an indicator of gait efficiency.

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### **Item distribution in the Berg balance scale: a problem for use with community-living older adults**

Chen H, Smith SS.

*J. Geriatr. Phys. Ther.* 2018; ePub(ePub): ePub.

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#### **Abstract**

**BACKGROUND AND PURPOSE:** The Berg Balance Scale (BBS) is a commonly used clinical test measure to determine balance performance and fall risk. However, a ceiling effect of the BBS has been reported in studies of older adults with relatively higher levels of physical performance. The underlying reason for this ceiling effect may be that the task items in the BBS are insufficiently challenging to discriminate individuals with less severe balance limitations. The purpose of this study was to investigate the unidimensional construct, item difficulty hierarchy, and item distribution of the BBS in order to determine its usefulness among community-living older adults (CLOAs).

**METHODS:** CLOA volunteers (N = 112; 34 men, 78 women), mean age 82.4 years (SD = 7.9) (range, 65-99 years), were tested with the BBS by physical therapy faculty and students from Drexel University. Rasch principal component analysis (PCA) was used to investigate the dimensionality of the BBS, and the Rasch rating scale model was used to determine the item difficulty hierarchy and distribution.

**RESULTS:** Rasch PCA confirmed the unidimensional construct of the BBS as a balance ability test. Two items failed to fit the Rasch model, "sitting unsupported" and "standing unsupported with eyes closed." Item difficulty hierarchy indicated that the most difficult test item was "stand on one leg" and the easiest was "sitting unsupported." Item and person measures ranged from -4.35 to 2.66 and -1.77 to 6.58 logits, respectively. Person and item separation indexes were 2.10 and 6.41 (reliabilities of 0.82 and 0.98, respectively).

**CONCLUSIONS:** Comparing the item difficulty and person ability, the balance ability of the CLOAs exceeded the difficulty of the test items, rendering it less useful for detecting balance ability and fall risk in CLOAs. More challenging test items, or selection of a different balance test, are recommended for use with this population.

**PDF Y Endnote Y**

### **Knee osteoarthritis and the risk of medically treated injurious falls among older adults: the Health ABC Study**

Barbour KE, Sagawa N, Boudreau RM, Winger ME, Cauley JA, Nevitt MC, Fujii T, Patel KV, Strotmeyer ES.



*Arthritis Care Res.* (2010) 2018; ePub(ePub): ePub.

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### Abstract

**BACKGROUND:** The risk of falls among adults with knee osteoarthritis (OA) has been documented, yet, to our knowledge no studies have examined knee OA and medically treated injurious falls (hereafter injurious falls) (overall and by sex), an outcome of substantial clinical and public health relevance.

**METHODS:** Using data from the Health ABC Knee Osteoarthritis Substudy, a community-based study of white and black older adults, we tested associations between knee OA status and the risk of injurious falls among 734 participants with a mean (SD) age of 74.7 (2.9) years. Knee radiographic osteoarthritis (ROA) was defined as having a Kellgren-Lawrence grade of  $\geq 2$  in at least one knee. Knee symptomatic ROA (sROA) was defined as having both ROA and pain symptoms in the same knee. Injurious falls were defined using a validated diagnoses code algorithm from linked Medicare Fee-for-Service claims. Cox regression modeling was used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs).

**RESULTS:** The mean (SD) follow-up time was 6.59 (3.12) years. Of the 734 participants, 255 (34.7%) had an incident injurious fall over the entire study period. In the multivariate model, compared with those without ROA or pain, individuals with sROA (HR=1.09; 95% CI: 0.73, 1.65) did not have a significantly increased risk of injurious falls. Compared with men without ROA or pain, men with sROA (HR=2.57; 95% CI: 1.12, 5.91) had a significantly higher risk of injurious falls. No associations were found for women or by injurious fall type.

**CONCLUSION:** Knee sROA was independently associated with an increased risk of injurious falls in older men, but not in older women. This article is protected by copyright. All rights reserved.

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### Objectively measured neighborhood walkability and change in physical activity in older Japanese adults: a five-year cohort study

Kikuchi H, Nakaya T, Hanibuchi T, Fukushima N, Amagasa S, Oka K, Sallis JF, Inoue S.

*Int. J. Environ. Res. Public Health* 2018; 15(9): e15091814.

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### Abstract

**OBJECTIVES:** This study investigated the longitudinal association between changes in older adults' physical activity and neighborhood walkability measured by geographic information systems (GISs, (ArcGIS, ESRI Inc., Redlands, CA, USA)).

**METHODS:** A mail survey was conducted for Japanese older adults who were randomly selected from three different settlement types. Data on walking, total moderate to vigorous physical activity

(MVPA), and sociodemographic characteristics were collected at baseline (in 2010) and follow-up (in 2015). Multiple linear regression analyses were employed to assess the association between MVPA change and neighborhood walkability, adjusted for potential confounders. Effect sizes for independent variables on MVPA change were estimated.

**RESULTS:** Data from 731 community-dwelling older adults (43.7% women) were analyzed. During the follow-up, older adults' MVPA was reduced by 94.4 min/week (-14.2%) on average (675.5 and 579.9 min/week in 2010 and 2015, respectively). Overall, older adults living in highly walkable areas showed a smaller reduction than those in low walkable areas (beta: 99.7 min/week, 95% confidence interval: 28.5-171.0). Similar associations were observed among those in the urban and suburban area, but not in the rural area. Walkability had larger effect sizes for explaining MVPA change than demographic characteristics. In addition, the findings for walking were similar to MVPA.

**CONCLUSION:** Neighborhood walkability mitigated the 5-year reduction of walking and total MVPA among older adults, especially in urban areas.

**PDF Y Endnote Y**

**Rationale and design of the Study to Understand Fall Reduction and vitamin D in You (STURDY): a randomized clinical trial of vitamin D supplement doses for the prevention of falls in older adults**

Michos ED, Mitchell CM, Miller ER, Sternberg AL, et al

*Contemp. Clin. Trials* 2018; ePub(ePub): ePub.

**Affiliation:** Creighton University School of Medicine, United States.

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**DOI** 10.1016/j.cct.2018.08.004 **PMID** 30138718

**Abstract**

Prior evidence suggests that vitamin D supplementation may reduce fall risk, but existing data are inconsistent and insufficient to guide policy. We designed a two-stage Bayesian response-adaptive dose-finding and seamless confirmatory randomized trial of vitamin D supplementation to prevent falls. Up to 1200 community-dwelling persons, aged  $\geq 70$  years, of predominantly white and African-American race, with serum 25(OH)D concentrations of 10-29 ng/mL and at elevated fall risk, will be randomized to one of four vitamin D3 (cholecalciferol) supplement doses: 200 (control), 1000, 2000, or 4000 IU/day and treated for up to 2 years. Stage 1 is designed to identify the best of the non-control doses for fall prevention. If a best dose is selected, Stage 2 will start seamlessly, with enrollees assigned to control or the best dose in Stage 1 continuing on that dose unchanged, enrollees assigned to the two non-control, non-best doses in Stage 1 switched to the best dose, and new enrollees randomly assigned 1:1 to control or the best dose. In Stage 2, we will compare the control dose group to the best dose group to potentially confirm the efficacy of that dose for fall prevention. The primary outcome measure in both stages is time to first fall or death, whichever comes first. Falls are ascertained from calendars, scheduled interviews, or interim self-reports. Secondary outcome measures include time to each component of the composite primary outcome and gait speed. Additional outcomes include the Short Physical Performance Battery score, physical activity level (assessed by accelerometry), and frailty score. **CLINICAL TRIAL REGISTRATION:**

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**PDF Y Endnote Y**



## The epidemiology of elderly falls attended by emergency medical services in Victoria, Australia

Cox S, Roggenkamp R, Bernard S, Smith K.

*Injury* 2018; 49(9): 1712-1719.

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**DOI** 10.1016/j.injury.2018.06.038 **PMID** 30126534

### Abstract

**BACKGROUND:** With an increase in the proportion of older people in the community comes an increase in the demand on emergency medical services (EMS) by elderly patients who have fallen.

**OBJECTIVE:** To describe the epidemiology of elderly falls patients attended by EMS in Victoria, Australia and identify predictors of transport and repeat falls.

**METHODS:** A retrospective review included all elderly (age  $\geq 65$  years) falls patients attended by EMS between 2010 and 2017. Patient characteristics are described using descriptive statistics. Predictors of transport to hospital and repeat falls were identified using multivariable logistic regression analyses.

**RESULTS:** Between 2010 and 2017 EMS attended 324,060 elderly falls patients, which represents 9.7% of EMS attended workload in Victoria. The median age of patients was 83 years (IQR: 76-88) and 60.2% were female. Comorbidities and medication use were common, while private residence (64.3%) and nursing home (20.0%) were common scene locations. Overall, 78.8% of falls events resulted in transport to hospital by EMS. Predictors of transport to hospital included female gender, one or more pre-existing medical conditions or current medications and meeting the pre-hospital trauma triage criteria or hospital major trauma criteria. To investigate predictors of repeat falls, the follow-up period was restricted to 12-months post initial fall, which resulted in 30,997 patients and 42,873 (13.2%) repeat fall incidents. The median number of days between the initial fall and a second fall was 98 (IQR: 27-206). Predictors of repeat falls included living at a nursing home, one or more pre-existing medical conditions and one or more current medications.

**CONCLUSIONS:** Older falls patients place significant demand on EMS resources in Victoria, Australia, accounting for 9.7% of EMS attendances. Despite high demand, just 3.8% of elderly falls patients received a 'lights and sirens' emergency transport response to hospital. Furthermore, a large number of falls incidents recorded during the study period were repeat falls. Access to alternative pathways of care like GP referral, allied and community health services may benefit this patient group. Development and enrolment into such programs may improve patient outcomes by minimising falls risk and decrease demand on EMS and hospital resources.

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**PDFY Endnote Y**



### **The motor repertoire of older adult fallers may constrain their response to balance perturbations**

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(Copyright © 2018, American Physiological Society)

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#### **Abstract**

Older adults are at a high risk of falls, and most falls occur during locomotor activities like walking. This study aimed to improve our understanding of changes in neuromuscular control associated with increased falls risk in older adults in the presence of dynamic balance challenges during walking. Motor module (a.k.a. muscle synergy) analyses identified changes in the neuromuscular recruitment of leg muscles during walking with and without perturbations designed to elicit the visual perception of lateral instability. During normal walking we found that falls history (but not age) was associated with reduced motor module complexity, and that age (but not falls history) was associated with increased step-to-step variability of module recruitment timing. Further, motor module complexity was unaltered in the presence of optical flow perturbations. The specific effects of falls history on leg muscle recruitment included an absence and/or inability to independently recruit motor modules normally recruited to perform biomechanical functions important for walking balance control. These results suggest that fallers do not recruit the appropriate motor modules necessary for well-coordinated walking balance control even in the presence of perturbations. The identified changes in the modular control of walking balance in older fallers may either represent a neural deficit that leads to poor balance control, or a prior history of falls results in a compensatory motor adaptation. In either case, our study provides initial evidence that a reduced motor repertoire in older adult fallers may be a constraint on their ability to appropriately respond to balance challenges during walking.

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

### **The potential to reduce falls and avert costs by clinically managing fall risk**

Stevens JA, Lee R.

*Am. J. Prev. Med.* 2018; 55(3): 290-297.

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#### **Abstract**

**INTRODUCTION:** Falls often cause severe injuries and are one of the most costly health conditions among older adults. Yet, many falls are preventable. The number of preventable medically treated falls and associated costs averted were estimated by applying evidence-based fall interventions in clinical settings.

**METHODS:** A review of peer-reviewed literature was conducted in 2017 using literature published between 1994 and 2017, the authors estimated the prevalence of seven fall risk factors and the

effectiveness of seven evidence-based fall interventions. Then authors estimated the number of older adults (aged  $\geq 65$  years) who would be eligible to receive one of seven fall interventions (e.g., Tai Chi, Otago, medication management, vitamin D supplementation, expedited first eye cataract surgery, single-vision distance lenses for outdoor activities, and home modifications led by an occupational therapist). Using the reported effectiveness of each intervention, the number of medically treated falls that could be prevented and the associated direct medical costs averted were calculated.

**RESULTS:** Depending on the size of the eligible population, implementing a single intervention could prevent between 9,563 and 45,164 medically treated falls and avert \$94-\$442 million in direct medical costs annually. The interventions with the potential to help the greatest number of older adults were those that provided home modification delivered by an occupational therapist (38.2 million), and recommended daily vitamin D supplements (16.7 million).

**CONCLUSIONS:** This report is the first to estimate the number of medically treated falls that could be prevented and the direct medical costs that could be averted. Preventing falls can benefit older adults substantially by improving their health, independence, and quality of life.

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#### PDF Y Endnote Y

#### The prevalence and the risk of falls among institutionalised elderly in Penang, Malaysia

Kioh SH, Rashid A.

*Med. J. Malaysia* 2018; 73(4): 212-219.

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(Copyright © 2018, Malaysian Medical Association)

**DOI** unavailable **PMID** 30121683

#### Abstract

**INTRODUCTION AND OBJECTIVES:** Over the years, falls has been increasingly the most common public health issue worldwide that affects all age groups. However, the risk is nine times higher in older persons especially among those residing in nursing homes. The objective of this study is to determine the prevalence and the risk of falls and their associated factors among elderly living in nursing homes in Penang, Malaysia.

**METHODOLOGY:** Data were obtained from a cross-sectional survey in ten different nursing homes in the state of Penang, Malaysia. Participants were selected through convenience sampling were interviewed face-to-face using a questionnaire. Information concerning demographic characteristics, fall risk and depression status were collected.

**RESULTS:** Of the 357-elderly aged 60 years and above interviewed in the nursing homes, 32.8% (n=354) reported having one or more falls in the past 12 months whereas 13.3% were at moderate/high risk of fall. Depression (Adjusted Odds Ratio (aOR)=1.71, 95%CI: 1.00 to 2.91) and respiratory illnesses (aOR=3.38, 95%CI: 1.11 to 10.30) were shown to be associated with prevalence of falls. Depression (aOR=2.12, 95%CI: 1.06 to 4.23) and history of fall more than once in the past 12 months (aOR=3.90, 95%CI: 1.72 to 8.8) were found to be associated with moderate/high risk of falls.

**CONCLUSION:** This study showed that the prevalence of fall was higher among depressed elderly

and those with respiratory illness. Elderly with higher history of falls were also at higher risk of falls. These findings suggest the importance of screening the elderly for the risk factors of falls as a preventive measure.

**PDF Y Endnote Y**

**The role of quadriceps muscle strength in the development of falls in the elderly people, a cross-sectional study**

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**DOI** 10.1186/s12998-018-0195-x **PMID** 30128111 **PMCID** PMC6091154

**Abstract**

**BACKGROUND:** Falls are a major health issue in the elderly people and an important cause of bone fracture. The aim of this study was to determine the association between quadriceps muscle strength (QMS) and falls in the elderly subjects.

**METHODS:** All eligible participants of the Amirkola Cohort Study entered the study. Data regarding demographic characteristics, clinical and laboratory examinations were provided between 2011 to 2014. Occurrence of falls during previous year was determined by interview and review of the medical records. The study patients were divided into low, moderate and high muscle strength groups according to QMS values  $\geq 30$ , 15-30, and  $< 15$  kg respectively). Association between muscle strength and falls was determined by using multiple logistic regression analysis with calculation of odds ratio (OR).

**RESULTS:** A total 1028 participants (females, 44.3%) were analyzed and 178(17.3%) subjects experienced a fall. Individuals with falls had higher age ( $p = 0.001$ ) and lower QMS value ( $p = 0.001$ ). After adjustment for all clinical and demographic variables, occurrence of falls was negatively associated with QMS and positively associated with age  $> 70$  years old. Compared to group with QMS  $\geq 30$  kg, the prevalence of falls in low and moderate QMS groups increased by OR = 3(95% CI, 1.78-5.05) and 2.18 (95% CI, 1.22-3.42) respectively.

**CONCLUSION:** These findings indicate that older subjects with lower QMS are at greater risk of falls. These findings provide a rational for muscle strengthening exercise in older people.

**PDF Y Endnote Y**

**Utilization of Chinese herbal medicine and its association with the risk of fracture in patients with Parkinson's disease in Taiwan**

Chen KY, Wu MY, Yang PS, Chiang JH, Hsu CY, Chen CY, Yen HR.

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

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#### **Abstract**

**ETHNOPHARMACOLOGICAL RELEVANCE:** Traditional Chinese medicine (TCM) has been used for over two thousand years to treat motor impairments corresponding to the clinical manifestations of Parkinson's disease (PD).

**AIM OF THE STUDY:** This study aimed to investigate the prescription of Chinese herbal medicine (CHM) for the management of PD and further determine whether CHM can improve motor function and decrease the risk of incident fracture.

**MATERIALS AND METHODS:** Patients older than 40 years newly diagnosed with PD between January 1997 and December 2010 were selected from the National Health Insurance Research Database (NHIRD) and followed up until the end of 2013. We used 1:1 frequency matching by age, sex, index year, and initial diagnostic year to compare the TCM users and non-TCM users. We used a Cox regression model and the Kaplan-Meier method to estimate the risk of developing fracture among the TCM and non-TCM users.

**RESULTS:** In total, 7197 patients older than 40 years were newly diagnosed with PD between 1997 and 2010 in Taiwan. Among these patients, 3,456 were TCM users, and 3,730 were non-TCM users. We compared 2,007 PD patients with comparable demographic characteristics and comorbidity profiles between the two cohorts. During the follow-up period, compared with the non-TCM cohort, fewer patients in the TCM cohort had incident fractures (adjusted hazard ratio: 0.5, 95% CI: 0.44-0.56). The cumulative incidence of fracture was lower in the TCM cohort (log-rank test,  $p < 0.0001$ ). Shi-Chang-Pu (*Acorus gramineus* Aiton), Yuan-Zhi (*Polygala tenuifolia* Willd), Bei-Mu (*Fritillaria cirrhosa* D. Don), Hai-Piao-Xiao (*Sepiella maindronide* Rochebrune; *Sepia esculenta* Hoyle), and Tian-Ma (*Gastrodia elata* Blume) constituted the core Chinese herbal medicine prescriptions used to treat PD patients.

**CONCLUSIONS:** The present study identified the core prescription pattern for the management of PD in Taiwan. Complementary CHM therapy was associated with a reduced risk of fracture in PD patients.

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**PDF Y Endnote Y**

#### **Forecasting post-flight hip fracture probability using probabilistic modeling**

Lewandowski BE, Myers JG.

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

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(Copyright © 2018, American Society of Mechanical Engineers)

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#### **Abstract**





A probabilistic model predicts hip fracture probability for post-flight male astronauts during lateral fall scenarios from various heights. A biomechanical representation of the hip provides impact load. Correlations relate spaceflight bone mineral density (BMD) loss and post-flight BMD recovery to bone strength. Translations convert fracture risk index, the ratio of applied load to bone strength, to fracture probability. Parameter distributions capture uncertainty and Monte Carlo simulations provide probability outcomes. The fracture probability for a 1 m fall 0 days post-flight is 15% greater than preflight and remains 6% greater than pre-flight at 365 days post-flight. Probability quantification provides insight into how spaceflight induced BMD loss affects fracture probability. A bone loss rate reflecting improved exercise countermeasures and dietary intake further reduces the post-flight fracture probability to 6% greater than preflight at 0 days post-flight and 2% greater at 365 days post-flight. Quantification informs assessments of countermeasure effectiveness. When preflight BMD is one standard deviation below mean astronaut preflight BMD, fracture probability at 0 days post-flight is 34% greater than the preflight fracture probability calculated with mean BMD and 28% greater at 365 days post-flight. Quantification aids review of astronaut BMD fitness for duty standards. Increases in post-flight fracture probability are associated with an estimated 18% reduction in post-flight bone strength. Therefore, a 0.82 deconditioning coefficient modifies force application limits for crew vehicles.

#### PDF Y Endnote Y

#### Patient-reported and performance-based measures of walking in mild-moderate Parkinson's disease

Leavy B, Löfgren N, Nilsson M, Franzén E.

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

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(Copyright © 2018, John Wiley and Sons)

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#### Abstract

**BACKGROUND:** Knowledge of the relationships between patient-reported and performance-based walking measures in Parkinson's disease (PD) should inform clinical decision-making. The Walk-12G reliably captures perceived walking difficulties but has not been compared to performance-based walking in laboratory or free-living settings or across different groups.

**OBJECTIVES:** To investigate the relationship between patient-reported walking difficulties (Walk-12G) and performance-based walking in laboratory and free-living conditions and to determine whether the Walk-12G can distinguish between the subgroups, (i) people with/without PD and (ii) mild/moderate disease stages.

**METHODS:** Forty-seven people without and 49 people with PD (Hoehn and Yahr stage II and III) were assessed in relation to patient-reported walking difficulties (Walk-12G scale); spatiotemporal gait characteristics (Pace; Rhythm; Asymmetry; Variability; and Postural control) using a laboratory-based electronic walkway; and walking behavior (mean steps/day and minutes of brisk walking/day) using accelerometers in free-living conditions.

**RESULTS:** The Walk-12G correlated moderately with the spatiotemporal domain step velocity ( $r = -0.46$ ) and walking behavior, measured as mean steps/day ( $r = -0.46$ ). Weaker correlations were observed for step length and minutes spent in brisk walking ( $r = -0.36$  and  $r = -0.35$ , respectively). Poor correlations were observed for all other spatiotemporal domains. The Walk-12G could distinguish between people with and without PD (Effect size,  $r = 0.82$ ) and between those at mild/moderate disease stages ( $r = 0.34$ ).

**CONCLUSIONS:** Perceived walking difficulties showed weak to moderate associations with performance-based measures of walking in mild-moderate PD. As the strongest associations were observed for step velocity and walking behavior, targeting these specific gait aspects could improve perceived walking difficulties in daily life.

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#### PDF Y Endnote Y

#### **Postural threat influences the conscious perception of body position during voluntary leaning**

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*Gait Posture* 2018; 66: 21-25.

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**DOI** 10.1016/j.gaitpost.2018.08.003 **PMID** 30138743

#### **Abstract**

**BACKGROUND:** Height-related changes in postural control can alter feedback used to control balance, which may lead to a mismatch in perceived and actual sway changes during quiet stance. However, there is still a need to examine how these changes affect the ability to detect limits of stability (and movements related to base of support limits). **RESEARCH QUESTION:** The aim of this study was to examine how changes in height-related threat influence conscious perceptions of body position during voluntary balance tasks.

**METHODS:** Twenty young healthy adults, fitted with kinematic markers on the right side of the body, stood on a forceplate mounted to a hydraulic lift placed at two heights (0.8 m and 3.2 m). At height (completed first), participants leaned as far forward as possible, at the ankle joint, while trying to remain as an inverted pendulum. Then, at each height, participants stood with eyes open, and voluntarily leaned to one of ten targets (10%-100% maximum lean) displayed visually as angular displacement of body segments on a screen. Once on target, participants reported a perceived position relative to their maximum lean. Balance confidence, fear and anxiety, and physiological arousal (hand electrodermal activity, EDA) were recorded and statistically tested using paired sample t-tests. Actual and perceived body positions were tested using repeated measures ANOVAs (height x target).

**RESULTS:** Height significantly increased EDA, fear and anxiety, and decreased balance confidence. Participants voluntarily leaned to all target positions equally across heights. However, at any given target position, the perceived lean changed with height. When participants are asked to lean to a

target in at height, their amount of perceived lean was larger by 4.9%, on average (range: 1.8%-9.7%). SIGNIFICANCE: This modulation in perceived limits of stability may increase the risk of falls in those who have an increased fear of falling.

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**PDF Y Endnote Y**

**Wearables for gait and balance assessment in the neurological ward - study design and first results of a prospective cross-sectional feasibility study with 384 inpatients**

Bernhard FP, Sartor J, Bettecken K, Hobert MA, Arnold C, Weber YG, Poli S, Margraf NG, Schlenstedt C, Hansen C, Maetzler W.

*BMC Neurol.* 2018; 18(1): e114.

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**Abstract**

**BACKGROUND:** Deficits in gait and balance are common among neurological inpatients. Currently, assessment of these patients is mainly subjective. New assessment options using wearables may provide complementary and more objective information.

**METHODS:** In this prospective cross-sectional feasibility study performed over a four-month period, all patients referred to a normal neurology ward of a university hospital and aged between 40 and 89 years were asked to participate. Gait and balance deficits were assessed with wearables at the ankles and the lower back. Frailty, sarcopenia, Parkinsonism, depression, quality of life, fall history, fear of falling, physical activity, and cognition were evaluated with questionnaires and surveys.

**RESULTS:** Eighty-two percent (n = 384) of all eligible patients participated. Of those, 39% (n = 151) had no gait and balance deficit, 21% (n = 79) had gait deficits, 11% (n = 44) had balance deficits and 29% (n = 110) had gait and balance deficits. Parkinson's disease, stroke, epilepsy, pain syndromes, and multiple sclerosis were the most common diseases. The assessment was well accepted.

**CONCLUSIONS:** Our study suggests that the use of wearables for the assessment of gait and balance features in a clinical setting is feasible. Moreover, preliminary results confirm previous epidemiological data about gait and balance deficits among neurological inpatients. Evaluation of neurological inpatients with novel wearable technology opens new opportunities for the assessment of predictive, progression and treatment response markers.

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