

## SafetyLit February 26 2017

### **A comprehensive investigation of comorbidities, mechanisms, injury patterns, and outcomes in geriatric blunt trauma patients**

Brown CV, Rix K, Klein AL, Ford B, Teixeira PG, Aydelotte J, Coopwood B, Ali S.

*Am. Surg.* 2016; 82(11): 1055-1062.

**Affiliation:** Dell Medical School, University of Texas at Austin, Austin, Texas, USA.

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**DOI** unavailable **PMID** 28206931

#### **Abstract**

The geriatric population is growing and trauma providers are often tasked with caring for injuries in the elderly. There is limited information regarding injury patterns in geriatric trauma patients stratified by mechanism of injury. This study intends to investigate the comorbidities, mechanisms, injury patterns, and outcomes in geriatric blunt trauma patients. A retrospective study of the 2012 National Trauma Databank was performed. Adult blunt trauma patients were identified; geriatric ( $\geq 65$ ) patients were compared with younger ( $< 65$ ) patients regarding admission demographics and vital signs, mechanism and severity of injury, and comorbidities. The primary outcome was injuries sustained and secondary outcomes included mortality, length of stay in the intensive care unit and hospital, and ventilator days. There were 589,830 blunt trauma patients who met the inclusion criteria, including 183,209 (31%) geriatric and 406,621 (69%) nongeriatric patients. Falls were more common in geriatric patients (79 vs 29%,  $P < 0.0001$ ). Geriatric patients less often had an Injury Severity Score  $\geq 16$  (18 vs 20%,  $P < 0.0001$ ) but more often a head Abbreviated Injury Scale  $\geq 3$  (24 vs 18%,  $P < 0.0001$ ) and lower extremity Abbreviated Injury Scale  $\geq 3$  (24% vs 8%,  $P < 0.0001$ ). After logistic regression older age was an independent risk factor for mortality for the overall population and across all mechanisms. Falls are the most common mechanism for geriatric trauma patients. Geriatric patients overall present with a lower Injury Severity Score, but more often sustain severe injuries to the head and lower extremities. Injury patterns vary significantly between older and younger patients when stratified by mechanism. Mortality is significantly higher for geriatric trauma patients and older age is independently associated with mortality across all mechanisms.

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

### **A randomized controlled trial of screening, risk modification and physical therapy to prevent falls among the elderly recently discharged from the emergency department to the community: the Steps to Avoid Falls in the Elderly Study**

Matchar DB, Duncan PW, Lien CT, Hock Ong ME, Lee M, Gao F, Sim R, Eom K.

*Arch. Phys. Med. Rehabil.* 2017; ePub(ePub): ePub.

**Affiliation:** Program in Health Services and Systems Research, Duke-NUS Medical School, 8 College Road, Singapore 169857.

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#### **Abstract**

**OBJECTIVE:** To evaluate the effectiveness of a multifactorial, tailored program of physical therapy to reduce the occurrence of falls among a heterogeneous group of high-risk elderly Singaporeans recently discharged from the Emergency Department (ED).

**DESIGN:** Randomized controlled trial.

**SETTING:** Communities in Central and East regions in Singapore.

**PARTICIPANTS:** 354 adults aged at least 65 years who were seen at ED for a fall or fall-related injuries and discharged home.

**INTERVENTIONS:** The intervention primarily consisted of a tailored program of physical therapy focused on progressive training in strength, balance, and gait for a period of three months. Participants in the intervention group also received screening and follow up for vision, polypharmacy, and environmental hazards. Participants in the control group received usual care prescribed by a physician and educational materials on falls prevention. **MAIN OUTCOME**

**MEASURES:** The primary outcome measure was experiencing at least one fall during the nine-month study period (a three-month active intervention phase and a six-month maintenance phase). Secondary outcome measures were the occurrence of at least one injurious fall during the study period and a change in the Short Physical Performance Battery (SPPB) score. Participants were assessed both after three and nine months.

**RESULTS:** During the nine-month study period, 37.9% of the control group and 30.5% of the intervention group fell at least once, which was not statistically significantly different (odds ratio 0.72 [0.46, 1.12],  $p=0.146$ ). The intervention group had statistically significantly fewer individuals with injurious falls (odds ratio 0.56 [0.32, 0.98],  $p=0.041$ ) and less deterioration in physical performance, reflected by a mean difference of 0.6 in SPPB scores ( $p=0.029$ ). Multivariate analyses indicated a strong interaction effect between the intervention and the presence of two or more major comorbidities; after accounting for this effect, the intervention program reduced the number of people experiencing at least one fall (odds ratio 0.34 [0.17 - 0.67],  $p=0.002$ ).

**CONCLUSION:** We observed that, in this heterogeneous population, the proportion of participants experiencing at least one fall during the study period was not statistically significantly lower in the intervention group compared to the control group. Secondary analyses strongly suggest that individuals with two or more major comorbidities do not benefit from a tailored physical therapy program; however, individuals with less comorbidity may substantially benefit.

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

#### **Advancing community-based falls prevention programs for older adults-the work of the administration for community living/administration on aging**

Kulinski K, DiCocco C, Skowronski S, Sprowls P.

*Front. Public Health* 2017; 5: e4.

**Affiliation:** Administration for Community Living, Washington, DC, USA.

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#### **Abstract**

The mission of the Administration for Community Living (ACL) is to maximize the independence, well-being, and health of older adults, people with disabilities across the lifespan, and their families and caregivers. In direct alignment with this mission is ACL's support of evidence-based falls prevention programs in communities throughout the United States. Since 2014, the Administration on Aging (AoA), part of ACL, has invested nearly \$14 million in entities such as state agencies,

nonprofits, and universities to expand access to proven community-based falls prevention programs. The initiatives supported by ACL/AoA bring to bear two primary goals-(1) to significantly increase the number of older adults and older adults with disabilities at risk for falls who participate in evidence-based community programs to reduce falls and falls risks; and (2) to implement innovative funding arrangements, including contracts, partnerships, and collaborations with one or more sustainability partners to support these programs during and beyond the grant period. Support from ACL/AoA has significantly increased the availability of evidence-based falls prevention programs in funded communities, as well as enhanced the network's sustainable delivery infrastructure to promote continued access to these critical programs beyond the scope of grant funding. This article highlights the successful rollout of ACL/AoA's falls prevention initiative.

#### PDF Y Endnote Y

#### Association between perceived built environmental attributes and physical activity among adults in South Africa

Malambo P, Kengne AP, Lambert EV, De Villiers A, Puoane T.

*BMC Public Health* 2017; 17(1): e213.

**Affiliation:** Faculty of Community and Health Sciences School of Public Health, University of Western Cape, Cape Town, South Africa.

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**DOI** 10.1186/s12889-017-4128-8 **PMID** 28219427

#### Abstract

**BACKGROUND:** To investigate the association between perceived environmental attributes and leisure-time and transport-related physical activity.

**METHODS:** This was a cross-sectional survey involving 671 South Africans aged  $\geq 35$  years from urban and rural settings. International Physical Activity Questionnaire and Neighbourhood Walkability Scale were used to collect data. Multivariable logistic regressions were used to investigate the associations.

**RESULTS:** Significant urban vs. rural differences were apparent in the distribution of most attributes of neighborhood environment. After adjusting for gender, age, setting and relevant interaction terms, proximity to local stores was significantly associated with leisure-time physical activity (OR: 4.26; 95% CI, 1.00-18.08); while proximity to transit stops (2.44; 1.48-4.02), pleasant scenery (1.93; 1.07-3.46), sidewalks (2.36; 1.25-4.44), shade from trees (2.14; 1.19-3.85), traffic (2.17; 91.21-3.91) and well-lit streets (2.01; 1.04-3.89) were significantly associated with walking for leisure. Four-way intersections (4.54; 1.54-13.43), pleasant scenery (3.84; 1.35-10.99), traffic (0.28; 0.09-0.89), sidewalks (3.75; 1.06-13.27) and crosswalks were associated with transport related physical activity. Proximity to transit stops (2.12; 1.17-3.84) and well maintained sidewalks (2.69; 2.20-10.02) were significantly associated with total physical activity. Significant interactions by setting were apparent in some of the associations.

**CONCLUSION:** Some, but not all attributes of a neighborhood environment were significantly associated in expected directions with the three physical activity domains in this mixed urban and rural population. This study highlights the need for policy strategies aimed at improving or maintaining these perceived environmental attributes to promote physical activity.

#### PDF Y Endnote Y

### **Atypical antipsychotics and the risk of falls and fractures among older adults: an emulation analysis and an evaluation of additional confounding control strategies**

Ramcharran D, Qiu H, Schuemie MJ, Ryan PB.

*J. Clin. Psychopharmacol.* 2017; 37(2): 162-168.

**Affiliation:** From Global Research & Development Epidemiology, Janssen Research & Development, LLC, Titusville, NJ.

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**DOI** 10.1097/JCP.0000000000000647 **PMID** 28225746

#### **Abstract**

**PURPOSE:** The aim of this study was to investigate the risk of falls and fractures among older adults receiving atypical antipsychotics.

**METHODS:** An emulation analysis of a previously published study was performed using the US Truven MarketScan Medicare Supplemental database (MDCR). In addition, modified analyses were implemented to evaluate alternative confounding control strategies that (1) included all covariates used to fit propensity score models in outcome models and (2) required patients to have a mental health condition diagnosis and a health care visit within 90 days prior to the index date.

**FINDINGS:** The MDCR emulation analyses yielded similar results as the previous study. For the previous study and our emulation analysis, the results were: nonvertebral osteoporotic fractures (odds ratio [OR], 1.51; 95% confidence interval [CI], 1.41-1.60; and OR, 1.49; 95% CI, 1.37-1.63, respectively), hip fractures (OR, 1.67; 95% CI, 1.53-1.81; and OR, 1.59; 95% CI, 1.43-1.77, respectively), any fracture (OR, 1.29; 95% CI, 1.24-1.34; and OR, 1.32; 95% CI, 1.23-1.41, respectively), and falls (OR, 1.54; 95% CI, 1.47-1.61; and OR, 1.45; 95% CI, 1.11-1.89, respectively). However, in modified analyses, no associations were significant. The primary change that resulted in the attenuation of associations was the requirement for patients to have a mental health condition diagnosis and a health care visit prior to the index date.

**CONCLUSIONS:** Our MDCR emulation analysis yielded similar results as a previous study; however, in modified analyses, the associations between fractures and falls and atypical antipsychotics were no longer significant. The contrast of results between the emulation and modified analyses may be due to the analytic approach used to compare patients (and potential confounding by indication).

Further research is warranted to evaluate these associations.

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

### **Balance quality assessment as an early indicator of physical frailty in older people**

Chkeir A, Safieddine D, Bera D, Collart M, Novella JL, Dramé M, Hewson DJ, Duchene J, Chkeir A, Safieddine D, Bera D, Collart M, Novella JL, Dramé M, Hewson DJ, Duchene J, Novella JL, Hewson DJ, Duchene J, Collart M, Chkeir A, Bera D, Dramé M, Safieddine D.

*Conf. Proc. IEEE Eng. Med. Biol. Soc.* 2016; 2016: 5368-5371.

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#### **Abstract**

Frailty is an increasingly common geriatric condition that results in an increased risk of adverse health outcomes such as falls. The most widely-used means of detecting frailty is the Fried phenotype, which includes several objective measures such as grip strength and gait velocity. One method of screening for falls is to measure balance, which can be done by a range of techniques including the assessment of the Centre of Pressure (CoP) during a balance assessment. The Balance

Quality Tester (BQT) is a device based on a commercial bathroom scale that can evaluate balance quality. The BQT provides instantaneously the position of the CoP (stabilogram) in both anteroposterior (AP) and mediolateral (ML) directions and can estimate the vertical ground reaction force. The purpose of this study was to examine the relationship between balance quality assessment and physical frailty. Balance quality was compared to physical frailty in 186 older subjects. Rising rate (RR) was slower and trajectory velocity (TV) was higher in subjects classified as frail for both grip strength and gait velocity ( $p < 0.05$ ). Balance assessment could be used in conjunction with functional tests of grip strength and gait velocity as a means of screening for frailty.

#### PDF Y Endnote Y

#### Can we make a carpet smart enough to detect falls?

Muheidat F, Tyrer HW, Muheidat F, Tyrer HW, Tyrer HW, Muheidat F.

*Conf. Proc. IEEE Eng. Med. Biol. Soc.* 2016; 2016: 5356-5359.

(Copyright © 2016, IEEE (Institute of Electrical and Electronics Engineers))

DOI 10.1109/EMBC.2016.7591937 PMID 28227720

#### Abstract

In this paper, we have enhanced smart carpet, which is a floor based personnel detector system, to detect falls using a faster but low cost processor. Our hardware front end reads 128 sensors, with sensors output a voltage due to a person walking or falling on the carpet. The processor is Jetson TK1, which provides more computing power than before. We generated a dataset with volunteers who walked and fell to test our algorithms. Data obtained allowed examining data frames (a frame is a single scan of the carpet sensors) read from the data acquisition system. We used different algorithms and techniques, and varied the windows size of number of frames ( $WS \geq 1$ ) and threshold (TH) to build our data set, which later used machine learning to help decide a fall or no fall. We then used the dataset obtained from applying a set of fall detection algorithms and the video recorded for the fall pattern experiments to train a set of classifiers using multiple test options using the Weka framework. We measured the sensitivity and specificity of the system and other metrics for intelligent detection of falls.

RESULTS showed that Computational Intelligence techniques detect falls with 96.2% accuracy and 81% sensitivity and 97.8% specificity. In addition to fall detection, we developed a database system and web applications to retain these data for years. We can display this data in realtime and for all activities in the carpet for extensive data analysis any time in the future.

#### PDF Y Endnote Y

#### Collaborative leadership and the implementation of community-based fall prevention initiatives: a multiple case study of public health practice within community groups

Markle-Reid M, Dykeman C, Ploeg J, Kelly Stradiotto C, Andrews A, Bonomo S, Orr-Shaw S, Salker N. *BMC Health Serv. Res.* 2017; 17(1): e141.

**Affiliation:** Brant County Health Unit, Brantford, ON, N3R 1G7, Canada.

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#### Abstract

BACKGROUND: Falls among community-dwelling older adults are a serious public health concern. While evidence-based fall prevention strategies are available, their effective implementation

requires broad cross-sector coordination that is beyond the capacity of any single institution or organization. Community groups comprised of diverse stakeholders that include public health, care providers from the public and private sectors and citizen volunteers are working to deliver locally-based fall prevention. These groups are examples of collective impact and are important venues for public health professionals (PHPs) to deliver their mandate to work collaboratively towards achieving improved health outcomes. This study explores the process of community-based group work directed towards fall prevention, and it focuses particular attention on the collaborative leadership practices of PHPs, in order to advance understanding of the competencies required for collective impact.

**METHODS:** Four community groups, located in Ontario, Canada, were studied using an exploratory, retrospective, multiple case study design. The criteria for inclusion were presence of a PHP, a diverse membership and the completion of an initiative that fit within the scope of the World Health Organization Fall Prevention Model. Data were collected using interviews (n = 26), focus groups (n = 4), and documents. Cross-case synthesis was conducted by a collaborative team of researchers.

**RESULTS:** The community groups differed by membership, the role of the PHP and the type of fall prevention initiatives. Seven practice themes emerged: (1) tailoring to address context; (2) making connections; (3) enabling communication; (4) shaping a vision; (5) skill-building to mobilize and take action; (6) orchestrating people and projects; and (7) contributing information and experience. The value of recognized leadership competencies was underscored and the vital role of institutional supports was highlighted.

**CONCLUSION:** To align stakeholders working towards fall prevention for community-dwelling older adults and establish a foundation for collective impact, public health professionals employed practices that reflected a collaborative leadership style. Looking ahead, public health professionals will want to shift their focus to evaluating the effectiveness of their group work within communities. They will also need to assess outcomes and evaluate whether the anticipated reductions in fall rates among community-dwelling older adults is being achieved.

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

#### **Context-aware fall detection using inertial sensors and time-of-flight transceivers**

Shastry MC, Asgari M, Wan EA, Leitschuh J, Preiser N, Folsom J, Condon J, Cameron M, Jacobs PG, Shastry MC, Asgari M, Wan EA, Leitschuh J, Preiser N, Folsom J, Condon J, Cameron M, Jacobs PG, Cameron M, Folsom J, Asgari M, Condon J, Preiser N, Leitschuh J, Jacobs PG, Shastry MC, Wan EA. *Conf. Proc. IEEE Eng. Med. Biol. Soc.* 2016; 2016: 570-573.

(Copyright © 2016, IEEE (Institute of Electrical and Electronics Engineers))

**DOI** 10.1109/EMBC.2016.7590766 **PMID** 28226562

#### **Abstract**

Automatic detection of falls is important for enabling people who are older to safely live independently longer within their homes. Current automated fall detection systems are typically designed using inertial sensors positioned on the body that generate an alert if there is an abrupt change in motion. These inertial sensors provide no information about the context of the person being monitored and are prone to false positives that can limit their ongoing usage. We describe a fall-detection system consisting of a wearable inertial measurement unit (IMU) and an RF time-of-flight (ToF) transceiver that ranges with other ToF beacons positioned throughout a home. The ToF ranging enables the system to track the position of the person as they move around a home. We describe and show results from three machine learning algorithms that integrate context-related



position information with IMU based fall detection to enable a deeper understanding of where falls are occurring and also to improve the specificity of fall detection. The beacons used to localize the falls were able to accurately track to within 0.39 meters of specific waypoints in a simulated home environment. Each of the three algorithms was evaluated with and without the context-based false alarm detection on simulated falls done by 3 volunteer subjects in a simulated home. False positive rates were reduced by 50% when including context.

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### **Detection of compensatory balance responses using wearable electromyography sensors for fall-risk assessment**

Nouredanesh M, Kukreja SL, Tung J, Nouredanesh M, Kukreja SL, Tung J, Nouredanesh M, Kukreja SL, Tung J.

*Conf. Proc. IEEE Eng. Med. Biol. Soc.* 2016; 2016: 1680-1683.

(Copyright © 2016, IEEE (Institute of Electrical and Electronics Engineers))

**DOI** 10.1109/EMBC.2016.7591038 **PMID** 28226832

#### **Abstract**

Loss of balance is prevalent in older adults and populations with gait and balance impairments. The present paper aims to develop a method to automatically distinguish compensatory balance responses (CBRs) from normal gait, based on activity patterns of muscles involved in maintaining balance. In this study, subjects were perturbed by lateral pushes while walking and surface electromyography (sEMG) signals were recorded from four muscles in their right leg. To extract sEMG time domain features, several filtering characteristics and segmentation approaches are examined. The performance of three classification methods, i.e., k-nearest neighbor, support vector machines, and random forests, were investigated for accurate detection of CBRs. Our results show that features extracted in the 50-200Hz band, segmented using peak sEMG amplitudes, and a random forest classifier detected CBRs with an accuracy of 92.35%. Moreover, our results support the important role of biceps femoris and rectus femoris muscles in stabilization and consequently discerning CBRs. This study contributes towards the development of wearable sensor systems to accurately and reliably monitor gait and balance control behavior in at-home settings (unsupervised conditions), over long periods of time, towards personalized fall risk assessment tools.

**PDF Y Endnote Y**

### **Effect of experimentally-induced trunk muscular tensions on the sit-to-stand task performance and associated postural adjustments**

Hamaoui A, Alamini-Rodrigues C.

*Front. Hum. Neurosci.* 2017; 11: e32.

**Affiliation:** Laboratoire Mouvement, Equilibre, Performance, Santé (EA 4445), Université de Pau et des Pays de l'Adour Tarbes, France.

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#### **Abstract**

It has been shown that increased muscular activity along the trunk is likely to impair body balance, but there is little knowledge about its consequences on more dynamic tasks. The purpose of this study was to determine the effect of unilateral and bilateral increases of muscular tension along the trunk on the sit-to-stand task (STS) performance and associated anticipatory postural adjustments

(APAs). Twelve healthy females ( $23 \pm 3$  years,  $163 \pm 0.06$  cm,  $56 \pm 9$  kg), free of any neurological or musculoskeletal disorders, performed six trials of the STS at maximum speed, in seven experimental conditions varying the muscular tension along each side of the trunk, using a specific bimanual compressive load paradigm. A six-channel force plate was used to calculate the coordinates of the center of pressure (CP) along the anterior-posterior and medial-lateral axes, and the kinematics of the head, spine and pelvis, were estimated using three pairs of uni-axial accelerometers. The postural and focal components of the task were assessed using three biomechanical parameters calculated from CP signals: the duration and magnitude of APAs, and the duration of focal movement (dFM).

RESULTS showed that beyond a given level, higher muscular tension along the trunk results in longer APAs, but with a stable duration of the focal movement. In addition, no significant variation of APAs and FM parameters was found between bilateral and unilateral increases of muscular tension. It was suggested that restricted mobility due to higher muscular tension along the trunk requires an adaptation of the programming of APAs to keep the same level of performance in the STS task. These findings may have implications in treatment strategies aimed at preserving functional autonomy in pathologies including a rise of muscular tension.

#### PDF Y Endnote Y

#### Effect of indoor temperature on physical performance in older adults during days with normal temperature and heat waves

Lindemann U, Stotz A, Beyer N, Oksa J, Skelton DA, Becker C, Rapp K, Klenk J.

*Int. J. Environ. Res. Public Health* 2017; 14(2): e14020186.

**Affiliation:** Institute of Epidemiology and Medical Biometry, Ulm University, 89081 Ulm, Germany. jochen.klenk@rbk.de.

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**DOI** 10.3390/ijerph14020186 **PMID** 28216585

#### Abstract

Indoor temperature is relevant with regard to mortality and heat-related self-perceived health problems. The aim of this study was to describe the association between indoor temperature and physical performance in older adults. Eighty-one older adults (84% women, mean age 80.9 years, standard deviation 6.53) were visited every four weeks from May to October 2015 and additionally during two heat waves in July and August 2015. Indoor temperature, habitual gait speed, chair-rise performance and balance were assessed. Baseline assessment of gait speed was used to create two subgroups (lower versus higher gait speed) based on frailty criteria. The strongest effect of increasing temperature on habitual gait speed was observed in the subgroup of adults with higher gait speed ( $-0.087$  m/s per increase of  $10$  °C; 95% confidence interval (CI):  $-0.136$ ;  $-0.038$ ). The strongest effects on timed chair-rise and balance performance were observed in the subgroup of adults with lower gait speed ( $2.03$  s per increase of  $10$  °C (95% CI:  $0.79$ ;  $3.28$ ) and  $-3.92$  s per increase of  $10$  °C (95% CI:  $-7.31$ ;  $-0.52$ ), respectively). Comparing results of physical performance in absence of a heat wave and during a heat wave, habitual gait speed was negatively affected by heat in the total group and subgroup of adults with higher gait speed, chair-rise performance was negatively affected in all groups and balance was not affected.



The study provides arguments for exercise interventions in general for older adults, because a better physical fitness might alleviate impediments of physical capacity and might provide resources for adequate adaptation in older adults during heat stress.

#### PDF Y Endnote Y

##### **Elderly fall risk prediction using static posturography**

Howcroft J, Lemaire ED, Kofman J, McIlroy WE.

*PLoS One* 2017; 12(2): e0172398.

**Affiliation:** Department of Kinesiology, University of Waterloo, Waterloo, Canada.

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##### **Abstract**

Maintaining and controlling postural balance is important for activities of daily living, with poor postural balance being predictive of future falls. This study investigated eyes open and eyes closed standing posturography with elderly adults to identify differences and determine appropriate outcome measure cut-off scores for prospective faller, single-faller, multi-faller, and non-faller classifications. 100 older adults ( $75.5 \pm 6.7$  years) stood quietly with eyes open and then eyes closed while Wii Balance Board data were collected. Range in anterior-posterior (AP) and medial-lateral (ML) center of pressure (CoP) motion; AP and ML CoP root mean square distance from mean (RMS); and AP, ML, and vector sum magnitude (VSM) CoP velocity were calculated. Romberg Quotients (RQ) were calculated for all parameters. Participants reported six-month fall history and six-month post-assessment fall occurrence. Groups were retrospective fallers (24), prospective all fallers (42), prospective fallers (22 single, 6 multiple), and prospective non-fallers (47). Non-faller RQ AP range and RQ AP RMS differed from prospective all fallers, fallers, and single fallers. Non-faller eyes closed AP velocity, eyes closed VSM velocity, RQ AP velocity, and RQ VSM velocity differed from multi-fallers. RQ calculations were particularly relevant for elderly fall risk assessments. Cut-off scores from Clinical Cut-off Score, ROC curves, and discriminant functions were clinically viable for multi-faller classification and provided better accuracy than single-faller classification. RQ AP range with cut-off score 1.64 could be used to screen for older people who may fall once. Prospective multi-faller classification with a discriminant function ( $-1.481 + 0.146 \times \text{Eyes Closed AP Velocity} - 0.114 \times \text{Eyes Closed Vector Sum Magnitude Velocity} - 2.027 \times \text{RQ AP Velocity} + 2.877 \times \text{RQ Vector Sum Magnitude Velocity}$ ) and cut-off score 0.541 achieved an accuracy of 84.9% and is viable as a screening tool for older people at risk of multiple falls.

#### PDF Y Endnote Y

##### **Emergency department utilisation by older people in metropolitan Melbourne, 2008?12: findings from the Reducing Older Patient**

Mazza D, Pearce C, Joe A, Turner LR, Brijnath B, Browning C, Shearer M, Lowthian J.

*Aust. Health Rev.* 2017; ePub(ePub): ePub.

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**DOI** 10.1071/AH16191 **PMID** 28214474

##### **Abstract**

**OBJECTIVE** Older patients are over-represented in emergency departments (ED), with many presenting for conditions that could potentially be managed in general practice. The aims of the present study were to examine the characteristics of ED presentations by older patients and to

identify patient factors contributing to potentially avoidable general practitioner (PAGP)-type presentations.

**METHODS** A retrospective analysis was performed of routinely collected data comprising ED presentations by patients aged  $\geq 70$  years at public hospitals across metropolitan Melbourne from January 2008 to December 2012. Presentations were classified according to the National Healthcare Agreement definition for PAGP-type presentations. Presentations were characterised according to patient demographic and clinical factors and were compared across PAGP-type and non-PAGP-type groups.

**RESULTS** There were 74,4519 presentations to the ED by older people, of which 103471 (13.9%) were classified as PAGP-type presentations. The volume of such presentations declined over the study period from 20,893 (14.9%) in 2008 to 20346 (12.8%) in 2012. External injuries were the most common diagnoses (13,761; 13.3%) associated with PAGP-type presentations. Sixty-one per cent of PAGP-type presentations did not involve either an investigation or a procedure. Patients were referred back to a medical officer (including a general practitioner (GP)) in 58.7% of cases.

**CONCLUSION** Older people made a significant number of PAGP-type presentations to the ED during the period 2008-12. A low rate of referral back to the primary care setting implies a potential lost opportunity to redirect older patients from ED services back to their GPs for ongoing care. What is known about the topic? Older patients are increasingly attending EDs, with a proportion attending for problems that could potentially be managed in the general practice setting (termed PAGP-type presentations). What does this paper add? This study found that PAGP-type presentations, although declining, remain an important component of ED demand. Patients presented for a wide array of conditions and during periods that may indicate difficulty accessing a GP. What are the implications for practitioners? Strategies to redirect PAGP-type presentations to the GP setting are required at both the primary and acute care levels. These include increasing out-of-hours GP services, better triaging and appointment management in GP clinics and improved communication between ED clinicians and patients' GPs. Although some strategies have been implemented, further examination is required to assess their ongoing effectiveness.

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

#### **Enhance(®) Fitness dissemination and implementation,: 2010-2015: a scoping review**

Petrescu-Prahova MG, Eagen TJ, Fishleder SL, Belza B.

*Am. J. Prev. Med.* 2017; 52(3S3): S295-S299.

**Affiliation:** Health Promotion Research Center, University of Washington, Seattle, Washington; School of Nursing, University of Washington, Seattle, Washington.

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#### **Abstract**

**INTRODUCTION:** Physical activity has many benefits for older adult physical and mental health. Enhance(®)Fitness (EF) is an evidence-based group exercise program delivered by community-based organizations. The purpose of this study was to review recent evidence on the dissemination and implementation of EF.

**METHODS:** A scoping review of qualitative and quantitative studies with EF as main focus was conducted. CINAHL, PubMed, PubMed Central, SCOPUS, Web of Science, PsycINFO, and Google Scholar were searched between October and November 2015 for data-based studies on EF published in 2010-2015. Two team members abstracted each paper independently using a data

abstraction tool. Results were summarized using the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework.

**RESULTS:** Seventeen publications met inclusion criteria. EF has reached and is effective across a broad population base, including individuals with low SES and diverse ethnic/racial backgrounds. EF participation may be associated with reduced risk for falls requiring medical care, and is associated with fewer hospital admissions. Analyses of medical cost savings from EF participation and program implementation costs suggest economic benefits of EF implementation for communities.

Organization-level maintenance is facilitated by program-specific and organizational factors, such as instructor training and funding. Individual-level maintenance is facilitated by program structure, absence of pain, and increased quality of life.

**CONCLUSIONS:** More-rigorous evidence is needed about the association between participation in EF and conditions such as falls. Evaluation of program fidelity, adaptations, and sustainability is limited; more-systematic examination across population groups and types of organizations would help ensure older adults continue to benefit from EF participation.

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

#### **Health team for the elderly: a feasibility study for preventive home visits**

Seiger Cronfalk B, Fjell A, Carstens N, Rosseland LM, Rongve A, Rønnevik DH, Seiger Å, Skaug K, Ugland Vae KJ, Hauge Wennersberg M, Boström AM.

*Prim. Health Care Res. Dev.* 2017; ePub(ePub): 1-11.

**Affiliation:** Department of Nursing, Western Norway University of Applied Sciences, Haugesund, Norway.

(Copyright © 2017, Cambridge University Press)

**DOI** 10.1017/S1463423617000019 **PMID** 28215200

#### **Abstract**

The aim was to describe the development, utilization and feasibility of a model of preventive home visits, in an urban and a rural municipality in Norway.

**BACKGROUND:** Older people >65 years will rise significantly in coming years. Increased age is associated with risk of disability, illness and need for public health services. Preventive home visits is assumed to help older people to maintain their functional level longer, delaying disease and thus delaying the need for health care.

**METHOD:** Descriptive explorative design describing the development, utilization and feasibility of preventive home visits in two different settings. All 77-year-old persons living at home in an urban municipality and all 75 years and older in a rural municipality were invited to participate. A questionnaire including a substantial number of tests concerning; fall, nutrition, polypharmacy and cognitive impairment was used by Health Team Nurses as base for a risk assessment. Pilot studies were conducted to validate the questionnaire including an inter-rater reliability study of the risk assessment tool. A multiprofessional team, Health Team for the Elderly met each week to evaluate risk assessments and make recommendations to be sent to each respective general practitioner. Data were analysed using descriptive and inferential statistics. In total, 167 persons (109 from the urban municipality and 58 from the rural municipality) participated, corresponding to 60% of the approached individuals. The mean time for the visits was 108 minutes (SD 20). Missing data were identified for; Do you feel safe in your municipality (17.5%) and Are you looking forward to ageing

(11.4%). In total, 36 persons (21.7%) were identified with increased risk for developing illness. We suggest that a structured model of preventive home visits and collaboration between highly specialized health care professionals are important factors for reliable health promoting risk assessments of elderly home dwellers.

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

#### **Neighborhood factors and fall-related injuries among older adults seen by emergency medical service providers**

Lee S, Lee C, Rodiek S.

*Int. J. Environ. Res. Public Health* 2017; 14(2): e14020163.

**Affiliation:** Department of Architecture, College of Architecture, Texas A&M University, College Station, TX 77843, USA. rodiek@tamu.edu.

(Copyright © 2017, Multidisciplinary Digital Publishing Institute)

**DOI** 10.3390/ijerph14020163 **PMID** 28208748

#### **Abstract**

Falls are serious health problems among older adults, and are the leading cause of fatal and nonfatal injuries treated by emergency medical services (EMS). Although considerable research has examined the risk factors of falls at the individual level, relatively few studies have addressed the risk factors at the neighborhood level. This study examines the characteristics of neighborhood environments associated with fall injuries reported to EMS providers. A total of 13,163 EMS records from 2011 to 2014 involving adults aged 65 and older in the city of San Antonio (TX, USA) were analyzed at the census tract level (n = 264). Negative binomial regression was used to identify significant census tract-based neighborhood environmental variables associated with the count of fall injuries in each census tract. Adjusting for exposure variable and the size of the census tract, neighborhoods with higher residential stability, captured as the percent of those who lived in the same house as the previous year were associated with decreased count of fall injuries. Neighborhoods with higher residential density and having a higher vacancy rate were associated with increased count of fall injuries. The study highlights the importance of stable and safe neighborhoods in reducing fall risks among older adults, which should be considered a prerequisite for promoting age-friendly environments.

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

#### **Non-emergency medical transportation needs of middle-aged and older adults: a rural-urban comparison in Delaware, USA**

Smith ML, Prohaska TR, Macleod KE, Ory MG, Eisenstein AR, Ragland DR, Irmiter C, Towne SD, Satariano WA.

*Int. J. Environ. Res. Public Health* 2017; 14(2): e14020174.

**Affiliation:** School of Public Health, University of California, Berkeley, CA 92521, USA. bills@berkeley.edu.

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**DOI** 10.3390/ijerph14020174 **PMID** 28208610

#### **Abstract**

**BACKGROUND:** Older adults in rural areas have unique transportation barriers to accessing medical care, which include a lack of mass transit options and considerable distances to health-related services. This study contrasts non-emergency medical transportation (NEMT) service utilization

patterns and associated costs for Medicaid middle-aged and older adults in rural versus urban areas.

**METHODS:** Data were analyzed from 39,194 NEMT users of LogistiCare-brokered services in Delaware residing in rural (68.3%) and urban (30.9%) areas. Multivariable logistic analyses compared trip characteristics by rurality designation.

**RESULTS:** Rural (37.2%) and urban (41.2%) participants used services more frequently for dialysis than for any other medical concern. Older age and personal accompaniment were more common and wheel chair use was less common for rural trips. The mean cost per trip was greater for rural users (difference of \$2910 per trip), which was attributed to the greater distance per trip in rural areas.

**CONCLUSIONS:** Among a sample who were eligible for subsidized NEMT and who utilized this service, rural trips tended to be longer and, therefore, higher in cost. Over 50% of trips were made for dialysis highlighting the need to address prevention and, potentially, health service improvements for rural dialysis patients.

**PDF Y Endnote Y**

### **Novel hierarchical fall detection algorithm using a multiphase fall model**

Hsieh CY, Liu KC, Huang CN, Chu WC, Chan CT.

*Sensors (Basel)* 2017; 17(2): ePub.

**Affiliation:** Department of Biomedical Engineering, National Yang-Ming University, Taipei 112, Taiwan. ctchan@ym.edu.tw.

(Copyright © 2017, Multidisciplinary Digital Publishing Institute)

**DOI** 10.3390/s17020307 **PMID** 28208694

#### **Abstract**

Falls are the primary cause of accidents for the elderly in the living environment. Reducing hazards in the living environment and performing exercises for training balance and muscles are the common strategies for fall prevention. However, falls cannot be avoided completely; fall detection provides an alarm that can decrease injuries or death caused by the lack of rescue. The automatic fall detection system has opportunities to provide real-time emergency alarms for improving the safety and quality of home healthcare services. Two common technical challenges are also tackled in order to provide a reliable fall detection algorithm, including variability and ambiguity. We propose a novel hierarchical fall detection algorithm involving threshold-based and knowledge-based approaches to detect a fall event. The threshold-based approach efficiently supports the detection and identification of fall events from continuous sensor data. A multiphase fall model is utilized, including free fall, impact, and rest phases for the knowledge-based approach, which identifies fall events and has the potential to deal with the aforementioned technical challenges of a fall detection system. Seven kinds of falls and seven types of daily activities arranged in an experiment are used to explore the performance of the proposed fall detection algorithm. The overall performances of the sensitivity, specificity, precision, and accuracy using a knowledge-based algorithm are 99.79%, 98.74%, 99.05% and 99.33%, respectively. The results show that the proposed novel hierarchical fall detection algorithm can cope with the variability and ambiguity of the technical challenges and fulfill the reliability, adaptability, and flexibility requirements of an automatic fall detection system with respect to the individual differences.

**PDF Y Endnote Y**

### **Recurrent falls and its risk factors among older men living in the veterans retirement communities: a cross-sectional study**

Hung CH, Wang CJ, Tang TC, Chen LY, Peng LN, Hsiao FY, Chen LK.

*Arch. Gerontol. Geriatr.* 2017; 70: 214-218.

**Affiliation:** Center for Geriatrics and Gerontology, Taipei Veterans General Hospital, Taipei, Taiwan; Aging and Health Research Center, National Yang Ming University, Taipei, Taiwan. Electronic address: lkchen2@vghtpe.gov.tw.

(Copyright © 2017, Elsevier Publishing)

**DOI** 10.1016/j.archger.2017.02.001 **PMID** 28214764

#### **Abstract**

**AIM:** To evaluate the prevalence of recurrent falls and their risk factors among older men living in the Veterans Homes in Taiwan.

**METHODS:** This cross-sectional study enrolled 871 residents and all participants received the comprehensive geriatric assessment, including Barthel Index, Mini-Mental Status Examination (MMSE), Geriatric Depression Scale-5 questions (GDS-5), Mini-Nutrition Assessment Short Form (MNA-SF), the status of urinary incontinence, stool incontinence, polypharmacy, past history of falls, multimorbidity, and medication history.

**RESULTS:** Overall, 871 subjects (mean age: 85.5±5.2years, all males) participated in this study, whereas 222(25.5%) of them had experienced falls in the past year, and 91 were recurrent fallers. Comparisons between non-fallers, single fallers and recurrent fallers disclosed that they were significantly different in the following characteristics: diabetes mellitus, chronic kidney disease, coronary artery disease, Charlson Comorbidity Index (CCI), Barthel Index, GDS-5, MNA-SF, polypharmacy, use of hypnotics, urinary incontinence, and stool incontinence (P for trend all <0.05). Multiple regression analysis identified that GDS-5 was significantly associated with single falls and recurrent falls (OR 1.256, 95% CI 1.094-1.441, P=0.001 for single fallers; OR 1.480, 95% CI 1.269-1.727, P<0.001 for recurrent fallers). Besides, urinary incontinence was the independently associated with recurrent fallers only (OR 2.369, 95% CI 1.449-3.817, P<0.001), but not single fallers.

**CONCLUSION:** Urinary incontinence and depressive symptoms were independent associated factors for falls among older men living in the retirement communities. However, urinary incontinence was associated with recurrent falls, but not single falls. Intervention study is needed to reduce recurrent falls through management of urinary incontinence.

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

### **Reducing fall risk with combined motor and cognitive training in elderly fallers**

Barban F, Annicchiarico R, Melideo M, Federici A, Lombardi MG, Giuli S, Ricci C, Adriano F, Griffini I, Silvestri M, Chiusso M, Neglia S, Ariño-Blasco S, Cuevas Perez R, Dionyssiotis Y, Koumanakos G, Kovačević M, Montero-Fernández N, Pino O, Boye N, Cortés U, Barrué C, Cortés A, Levene P, Pantelopoulos S, Rosso R, Serra-Rexach JA, Sabatini AM, Caltagirone C.

*Brain Sci.* 2017; 7(2): e7020019.

**Affiliation:** Systems Medicine Department, University of Rome "Tor Vergata", Rome 00173, Italy. c.caltagirone@hsantalucia.it.

(Copyright © 2017, Switzerland Molecular Diversity Preservation International (MDPI) AG)

**DOI** 10.3390/brainsci7020019 **PMID** 28208604



### Abstract

**BACKGROUND:** Falling is a major clinical problem in elderly people, demanding effective solutions. At present, the only effective intervention is motor training of balance and strength. Executive function-based training (EFt) might be effective at preventing falls according to evidence showing a relationship between executive functions and gait abnormalities. The aim was to assess the effectiveness of a motor and a cognitive treatment developed within the EU co-funded project I-DONT-FALL.

**METHODS:** In a sample of 481 elderly people at risk of falls recruited in this multicenter randomised controlled trial, the effectiveness of a motor treatment (pure motor or mixed with EFt) of 24 one-hour sessions delivered through an i-Walker with a non-motor treatment (pure EFt or control condition) was evaluated. Similarly, a 24 one-hour session cognitive treatment (pure EFt or mixed with motor training), delivered through a touch-screen computer was compared with a non-cognitive treatment (pure motor or control condition).

**RESULTS:** Motor treatment, particularly when mixed with EFt, reduced significantly fear of falling ( $F(1,478) = 6.786, p = 0.009$ ) although to a limited extent ( $ES -0.25$ ) restricted to the period after intervention.

**CONCLUSIONS:** This study suggests the effectiveness of motor treatment empowered by EFt in reducing fear of falling.

### PDF Y Endnote Y

#### **Sagittal plane spinal mobility is associated with dynamic balance ability of community-dwelling elderly people**

Takeuchi Y.

*J. Phys. Ther. Sci.* 2017; 29(1): 112-114.

**Affiliation:** Department of Rehabilitation Science, Faculty of Health Care Science, Chiba Prefectural University of Health Sciences, Japan.

(Copyright © 2017, Society of Physical Therapy Science)

**DOI** 10.1589/jpts.29.112 **PMID** 28210054 **PMCID** PMC5300820

### Abstract

**PURPOSE:** The purpose of this study was to clarify the correlation between the range of spinal mobility on the sagittal plane and the dynamic balance ability of elderly people living in communities.

**SUBJECTS AND METHODS:** The persons studied were 31 healthy elderly people living in the community (16 females and 15 males). The range of mobility of the participants' spines in the sagittal plane was measured by using a spinal mouse<sup>®</sup>. Balance ability was evaluated by using Functional reach (FR), Timed up and go (TUG), and Maximum walking speed (MWS).

**RESULTS:** A significant positive correlation between the flexion range of the lumbar vertebrae and the FR distance was identified, and a significant negative correlation between the extension range of the thoracic vertebrae and the time required for TUG was also identified. In addition, a significant positive correlation between the extension range of the entire spine and MWS, was identified.

**CONCLUSION:** The result of this study have clarified that mobility of the spine in the sagittal plane is associated with dynamic balance ability, which is related to falling.

### PDF Y Endnote Y

### **Selecting power-efficient signal features for a low-power fall detector**

Wang C, Redmond S, Lu W, Stevens M, Lord S, Lovell N.

*IEEE Trans. Biomed. Eng.* 2017; ePub(ePub): ePub.

(Copyright © 2017, Institute of Electrical and Electronic Engineers)

**DOI** 10.1109/TBME.2017.2669338 **PMID** 28212076

#### **Abstract**

Falls are a serious threat to the health of older people. A wearable fall detector can automatically detect the occurrence of a fall and alert a caregiver or an emergency response service so they may deliver immediate assistance, improving the chances of recovering from fall-related injuries. One constraint of such a wearable technology is its limited battery life. Thus, minimization of power consumption is an important design concern, all the while maintaining satisfactory accuracy of the fall detection algorithms implemented on the wearable device. This paper proposes an approach for selecting power-efficient signal features such that the minimum desirable fall detection accuracy is assured. Using data collected in simulated falls, simulated activities of daily living, and real free-living trials, all using young volunteers, the proposed approach selects three features from a set of ten commonly-used features, providing a power saving of 75.3%, while limiting the error rate of a binary classification decision tree fall detection algorithm to 7.1%.

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

### **Telephone care management of fall risk: a feasibility study**

Phelan EA, Pence M, Williams B, MacCornack FA.

*Am. J. Prev. Med.* 2017; 52(3S3): S290-S294.

**Affiliation:** Northwest Physicians Network of Washington, Tacoma, Washington.

(Copyright © 2017, Elsevier Publishing)

**DOI** 10.1016/j.amepre.2016.08.020 **PMID** 28215383

#### **Abstract**

**INTRODUCTION:** Care management has been found to be more effective than usual care for some chronic conditions, but few studies have tested care management for prevention of elder falls. This study aimed to assess the feasibility and preliminary efficacy of telephone care management of older adults presenting for medical attention due to a fall.

**METHODS:** The setting was an independent practice association in western Washington serving 1,300 Medicare Advantage-insured patients. Patients aged  $\geq 65$  years treated for a fall in an emergency department or their primary care provider's office were contacted via telephone by a care manager within 48 hours of their fall-related visit and invited to participate in a telephone-administered interview to identify modifiable fall risk factors and receive recommendations and follow-up to address identified risk factors. Data from care manager records, patient medical records, and healthcare claims for the first 6 months (November 2009-April 2010) of program implementation were analyzed in 2011. The feasibility of screening and management of fall risk factors over the telephone and the effect on medically attended falls were assessed.

**RESULTS:** Twenty-two patients eligible for fall care management were reached and administered the protocol. Administration took 15-20 minutes and integrated easily with the care manager's other responsibilities. Follow-through on recommendations varied, from 45% for those for whom exercise participation was recommended to 100% for other recommendations. No medically attended falls occurred over 6 months of follow-up.

**CONCLUSIONS:** Telephone care management of fall risk appears feasible and may reduce falls

requiring medical attention.

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#### PDF Y Endnote Y

### **The efficacy of fall-risk-increasing drug (FRID) withdrawal for the prevention of falls and fall-related complications: protocol for a systematic review and meta-analysis**

Lee JY, Holbrook A.

*Syst. Rev.* 2017; 6(1): e33.

**Affiliation:** Division of Clinical Pharmacology and Toxicology, Department of Medicine, McMaster University, St. Joseph's Healthcare Hamilton, 50 Charlton Avenue East, Hamilton, Ontario, L8N 4A6, Canada.

(Copyright © 2017, BioMed Central)

**DOI** 10.1186/s13643-017-0426-6 **PMID** 28219422

#### **Abstract**

**BACKGROUND:** Despite limited evidence of effectiveness, withdrawal (discontinuation or dose reduction) of high risk medications known as "fall-risk increasing drugs" (FRIDs) is typically conducted as a fall prevention strategy based on presumptive benefit. Our objective is to determine the efficacy of fall-risk increasing drugs (FRIDs) withdrawal on the prevention of falls and fall-related complications.

**METHODS/DESIGN:** We will search for all published and unpublished randomized controlled trials evaluating the effect of FRID withdrawal compared to usual care on the rate of falls, incidence of falls, fall-related injuries, fall-related fractures, fall-related hospitalizations, or adverse effects related to the intervention in adults aged 65 years or older. Electronic database searches will be conducted in MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL), and CINAHL. A grey literature search will be conducted including clinical trial registries and conference proceedings and abstracts. Two reviewers will independently perform in duplicate citation screening, full-text review, data abstraction, and risk of bias assessment. Conflicts will be resolved through team discussion or by a third reviewer if no consensus can be reached. The Grades of Recommendation, Assessment, Development and Evaluation (GRADE) criteria will be used to independently rate overall confidence in effect estimates for each outcome.

**RESULTS** will be synthesized descriptively, and a random effects meta-analysis will be conducted for each outcome if studies are deemed similar methodologically, clinically, and statistically.

**DISCUSSION:** We will attempt to determine whether a FRID withdrawal strategy alone is effective at preventing falls in older adults. Our results will be used to optimize and focus fall prevention strategies and initiatives internationally with a goal of improving the health of older adults.

**SYSTEMATIC REVIEW REGISTRATION:** PROSPERO CRD42016040203.

#### PDF Y Endnote Y

### **The uncommon impact of common environmental details on walking in older adults**

Brookfield K, Ward Thompson C, Scott I.

*Int. J. Environ. Res. Public Health* 2017; 14(2): e14020190.

**Affiliation:** Edinburgh College of Art, University of Edinburgh, Edinburgh EH3 9DF, UK. iain.scott@ed.ac.uk.

(Copyright © 2017, Multidisciplinary Digital Publishing Institute)

DOI 10.3390/ijerph14020190 PMID 28216597

### Abstract

Walking is the most common form of physical activity amongst older adults. Older adults' walking behaviors have been linked to objective and perceived neighborhood and street-level environmental attributes, such as pavement quality and mixed land uses. To help identify components of walkable environments, this paper examines some of these environmental attributes and explores their influence on this population's walking behaviors. It draws on focus group and interview data collected from 22 purposively sampled older adults aged 60 years and over. These participants presented a range of functional and cognitive impairments including stroke and dementia. In line with past research, we detail how various everyday aspects of urban environments, such as steps, curbs and uneven pavements, can, in combination with person-related factors, complicate older adults' outdoor mobility while others, such as handrails and benches, seem to support and even encourage movement. Importantly, we delineate the influence of perceptions on mobility choices. We found that, in some instances, it is the meanings and possibilities that older adults derive from aspects of the environment, such as street cameras and underpasses, rather than the aspects per se, which shape behavior. The implications for policy and practice are considered.

**PDF Y Endnote Y**

### Toe functions have little effect on dynamic balance ability in elderly people

Yoshimoto Y, Oyama Y, Tanaka M, Sakamoto A.

*J. Phys. Ther. Sci.* 2017; 29(1): 158-162.

**Affiliation:** Department of Physical Therapy, School of Rehabilitation Sciences, Seirei Christopher University, Japan.

(Copyright © 2017, Society of Physical Therapy Science)

DOI 10.1589/jpts.29.158 PMID 28210064 PMCID PMC5300830

### Abstract

**PURPOSE:** The purpose of this study was to examine the toe function of elderly people and the association with the dynamic balance ability for the developing effective fall-prevention measures. **SUBJECTS AND METHODS:** Seventy-eight participants in a community health service were included in this cross-sectional study. The Timed Up and Go Test and Four Square Step Test were used to test dynamic balance ability. The toe functions related to dynamic balance ability were toe flexion strength, presence or absence of restricted range of motion of the hallux, presence or absence of hallux pain, and hallux valgus angle.

**RESULTS:** Factors related to the Timed Up and Go Test results were toe flexion strength, age, and presence or absence of hallux pain. Their standard partial regression coefficients were -0.400, 0.277, and -0.218, respectively. Factors related to the Four Square Step Test results were toe flexion strength and age. Their standard partial regression coefficients were -0.334 and 0.277, respectively.

**CONCLUSION:** Toe functions appear to have little impact on dynamic balance ability in elderly people who have mild toe dysfunction. Approaches that address not only the toes, but trunk functions, and other leg joints should be investigated for improving the dynamic balance ability.

**PDF Y Endnote Y**

### **Walking in fully immersive virtual environments: an evaluation of potential adverse effects in older adults and individuals with Parkinson's disease**

Kim A, Darakjian N, Finley JM.

*J. Neuroengineering Rehabil.* 2017; 14(1): 16.

**Affiliation:** Division of Biokinesiology and Physical Therapy, University of Southern California, 1540 E. Alcazar St, CHP 155, Los Angeles, CA, 90033, USA. [jmfinley@usc.edu](mailto:jmfinley@usc.edu).

(Copyright © 2017, BioMed Central)

**DOI** 10.1186/s12984-017-0225-2 **PMID** 28222783

#### **Abstract**

**BACKGROUND:** Virtual reality (VR) has recently been explored as a tool for neurorehabilitation to enable individuals with Parkinson's disease (PD) to practice challenging skills in a safe environment. Current technological advances have enabled the use of affordable, fully immersive head-mounted displays (HMDs) for potential therapeutic applications. However, while previous studies have used HMDs in individuals with PD, these were only used for short bouts of walking. Clinical applications of VR for gait training would likely involve an extended exposure to the virtual environment, which has the potential to cause individuals with PD to experience simulator-related adverse effects due to their age or pathology. Thus, our objective was to evaluate the safety of using an HMD for longer bouts of walking in fully immersive VR for older adults and individuals with PD.

**METHODS:** Thirty-three participants (11 healthy young, 11 healthy older adults, and 11 individuals with PD) were recruited for this study. Participants walked for 20 min while viewing a virtual city scene through an HMD (Oculus Rift DK2). Safety was evaluated using the mini-BESTest, measures of center of pressure (CoP) excursion, and questionnaires addressing symptoms of simulator sickness (SSQ) and measures of stress and arousal.

**RESULTS:** Most participants successfully completed all trials without any discomfort. There were no significant changes for any of our groups in symptoms of simulator sickness or measures of static and dynamic balance after exposure to the virtual environment. Surprisingly, measures of stress decreased in all groups while the PD group also increased the level of arousal after exposure.

**CONCLUSIONS:** Older adults and individuals with PD were able to successfully use immersive VR during walking without adverse effects. This provides systematic evidence supporting the safety of immersive VR for gait training in these populations.

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

### **A wrist sensor and algorithm to determine instantaneous walking cadence and speed in daily life walking**

Fasel B, Duc C, Dadashi F, Bardyn F, Savary M, Farine PA, Aminian K.

*Med. Biol. Eng. Comput.* 2017; ePub(ePub): ePub.

**Affiliation:** Laboratory of Movement Analysis and Measurement, Ecole Polytechnique Fédérale de Lausanne, EPFL STI IBI LMAM, Station 11, 1015, Lausanne, Switzerland. [kamiar.amian@epfl.ch](mailto:kamiar.amian@epfl.ch).

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**DOI** 10.1007/s11517-017-1621-2 **PMID** 28197810

#### **Abstract**

In daily life, a person's gait-an important marker for his/her health status-is usually assessed using inertial sensors fixed to lower limbs or trunk. Such sensor locations are not well suited for continuous and long duration measurements. A better location would be the wrist but with the

drawback of the presence of perturbative movements independent of walking. The aim of this study was to devise and validate an algorithm able to accurately estimate walking cadence and speed for daily life walking in various environments based on acceleration measured at the wrist. To this end, a cadence likelihood measure was designed, automatically filtering out perturbative movements and amplifying the periodic wrist movement characteristic of walking. Speed was estimated using a piecewise linear model. The algorithm was validated for outdoor walking in various and challenging environments (e.g., trail, uphill, downhill). Cadence and speed were successfully estimated for all conditions. Overall median (interquartile range) relative errors were -0.13% (-1.72 2.04%) for instantaneous cadence and -0.67% (-6.52 6.23%) for instantaneous speed. The performance was comparable to existing algorithms for trunk- or lower limb-fixed sensors. The algorithm's low complexity would also allow a real-time implementation in a watch.

**PDF Y Endnote Y**

**Acceptability of the 6-PACK falls prevention program: a pre-implementation study in hospitals participating in a cluster randomized controlled trial**

Barker AL, Morello RT, Ayton DR, Hill KD, Brand CA, Livingston PM, Botti M.

*PLoS One* 2017; 12(2): e0172005.

**Affiliation:** School of Nursing and Midwifery, Deakin University, Burwood, Victoria, Australia.

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**DOI** 10.1371/journal.pone.0172005 **PMID** 8199376

**Abstract**

There is limited evidence to support the effectiveness of falls prevention interventions in the acute hospital setting. The 6-PACK falls prevention program includes a fall-risk tool; 'falls alert' signs; supervision of patients in the bathroom; ensuring patients' walking aids are within reach; toileting regimes; low-low beds; and bed/chair alarms. This study explored the acceptability of the 6-PACK program from the perspective of nurses and senior staff prior to its implementation in a randomised controlled trial. A mixed-methods approach was applied involving 24 acute wards from six Australian hospitals. Participants were nurses working on participating wards and senior hospital staff including: Nurse Unit Managers; senior physicians; Directors of Nursing; and senior personnel involved in quality and safety or falls prevention. Information on program acceptability (suitability, practicality and benefits) was obtained by surveys, focus groups and interviews. Survey data were analysed descriptively, and focus group and interview data thematically. The survey response rate was 60%. Twelve focus groups (n = 96 nurses) and 24 interviews with senior staff were conducted. Falls were identified as a priority patient safety issue and nurses as key players in falls prevention. The 6-PACK program was perceived to offer practical benefits compared to current practice. Nurses agreed fall-risk tools, low-low beds and alert signs were useful for preventing falls (>70%). Views were mixed regarding positioning patients' walking aid within reach. Practical issues raised included access to equipment; and risk of staff injury with low-low bed use. Bathroom supervision was seen to be beneficial, however not always practical. Views on the program appropriateness and benefits were consistent across nurses and senior staff. Staff perceived the 6-PACK program as suitable, practical and beneficial, and were open to adopting the program. Some practical concerns were raised highlighting issues to be addressed by the implementation plan.

**PDF Y Endnote Y**



### **An adaptive and robust online method to predict gait events**

Schrade SO, Bader Y, Tucker MR, Shirota C, Gassert R, Schrade SO, Bader Y, Tucker MR, Shirota C, Gassert R, Shirota C, Schrade SO, Gassert R, Bader Y, Tucker MR.

*Conf. Proc. IEEE Eng. Med. Biol. Soc.* 2016; 2016: 6277-6281.

(Copyright © 2016, IEEE (Institute of Electrical and Electronics Engineers))

**DOI** 10.1109/EMBC.2016.7592163 **PMID** 28227945

#### **Abstract**

Accurate timing of interventions during the gait cycle are critical for optimal efficacy of assistive devices, e.g., to reduce the metabolic cost of walking. However, timing control generally relies on methods that can neither account for changes in the stride duration over time due to different walking speeds, nor reject isolated abnormal strides, which could be caused by stumbling or obstacle avoidance for example. In order to address these issues, a method, named the Gait Phase Estimator (GPE), is proposed to predict temporal gait events and stride duration. Predictions are based on the weighted forward moving-average of stride duration. Prediction performance in steady-state walking, robustness to stride disturbances, and adaptation to speed changes were evaluated in an experiment with three subjects walking on a treadmill at three different speeds.

RESULTS suggest that, on average, the GPE produces better predictions than a predefined estimate. On top, it automatically adapts to changes in speed, while offering the benefit of robustness to irregular strides unlike a conventional moving-average. Thus, the proposed GPE has the potential to improve and greatly simplify the process of obtaining stride duration estimates, which could benefit gait-assistive devices and experimental protocols.

**PDF Y Endnote Y**

### **Automated assessment of postural stability system**

Napoli A, Ward CR, Glassd SM, Tucker C, Obeid I, Napoli A, Ward CR, Glass SM, Tucker C, Obeid I, Ward CR, Tucker C, Napoli A, Obeid I, Glass SM.

*Conf. Proc. IEEE Eng. Med. Biol. Soc.* 2016; 2016: 6090-6093.

(Copyright © 2016, IEEE (Institute of Electrical and Electronics Engineers))

**DOI** 10.1109/EMBC.2016.7592118 **PMID** 28227900

#### **Abstract**

The Balance Error Scoring System (BESS) is one of the most commonly used clinical tests to evaluate static postural stability deficits resulting from traumatic brain events and musculoskeletal injury. This test requires a trained operator to visually assess balance and give the subject a performance score based on the number of balance "errors" they committed. Despite being regularly used in several real-world situations, the BESS test is scored by clinician observation and is therefore (a) potentially susceptible to biased and inaccurate test scores and (b) cannot be administered in the absence of a trained provider. The purpose of this research is to develop, calibrate and field test a computerized version of the BESS test using low-cost commodity motion tracking technology. This 'Automated Assessment of Postural Stability' (AAPS) system will quantify balance control in field conditions. This research goal is to overcome the main limitations of both the commercially available motion capture systems and the standard BESS test. The AAPS system has been designed to be operated by a minimally trained user and it requires little set-up time with no sensor calibration necessary. These features make the proposed automated system a valuable balance assessment tool to be utilized in the field.

**PDF Y Endnote Y**

### **Axial rigidity is related to the risk of falls in patients with Parkinson's disease**

Cano-de-la-Cuerda R, Vela-Desojo L, Miangolarra-Page JC, Macías-Maías Y.

*NeuroRehabilitation* 2017; ePub(ePub): ePub.

**Affiliation:** Neurology Service, Division of Movements Disorders, Hospital Universitario Fundación Alcorcón (HUFA), Alcorcón, Madrid, Spain.

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#### **Abstract**

**BACKGROUND:** Rigidity is a cardinal symptom of Parkinson's disease (PD) and is often clinically assessed by passively flexing and extending a patient's limb. Objective measurements had been employed to examine rigidity in PD subjects, including wrist, elbow or knee.

**OBJECTIVE:** This study aimed to investigate the relationship between an objective measurement of trunk rigidity and risk of falls in patients with mild to moderate PD.

**METHODS:** An isokinetic dynamometer Biodex System 3 was employed to assess trunk rigidity in 36 patients with mild to moderate PD at a University Department in a cross-sectional study. Risk of falls was measured by the Get Up & Go test (GU&G). Disease severity (Hoehn and Yahr staging score and the Unified Parkinson's Disease Rating Scale III), disease duration and functional status (Schwab & England activities of daily living scale) were also evaluated.

**RESULTS:** Significant correlations between trunk extensors rigidity at 45°/s and 60°/s and risk of falls were obtained. A correlation between trunk extensors tone at 30°/s and the GU&G test almost reached significant almost reached statistical significance ( $r=0.306$ ;  $p=0,066$ ). Significant correlations between trunk flexors-extensors tone and clinical status, disease duration and functional status at 30°/s, 45°/s and 60°/s were also obtained.

**CONCLUSION:** The results from this study suggest that the axial rigidity is related to the risk of falls in patients with mild to moderate PD. Further studies are needed with quantitative devices for axial rigidity assessment to determine the relationship between trunk rigidity in PD patients with higher disease severity and risk of falls.

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

### **Barriers and enablers to the implementation of the 6-PACK falls prevention program: a pre-implementation study in hospitals participating in a cluster randomised controlled trial**

Ayton DR, Barker AL, Morello RT, Brand CA, Talevski J, Landgren FS, Melhem MM, Bian E, Brauer SG, Hill KD, Livingston PM, Botti M.

*PLoS One* 2017; 12(2): e0171932.

**Affiliation:** School of Nursing and Midwifery, Deakin University, Burwood, Victoria, Australia.

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#### **Abstract**

Evidence for effective falls prevention interventions in acute wards is limited. One reason for this may be suboptimal program implementation. This study aimed to identify perceived barriers and enablers of the implementation of the 6-PACK falls prevention program to inform the implementation in a randomised controlled trial. Strategies to optimise successful implementation of 6-PACK were also sought. A mixed-methods approach was applied in 24 acute wards from 6 Australian hospitals. Participants were nurses working on participating wards and senior hospital staff including Nurse Unit Managers; senior physicians; Directors of Nursing; and senior personnel

involved in quality and safety or falls prevention. Information on barriers and enablers of 6-PACK implementation was obtained through surveys, focus groups and interviews. Questions reflected the COM-B framework that includes three behaviour change constructs of: capability, opportunity and motivation. Focus group and interview data were analysed thematically, and survey data descriptively. The survey response rate was 60% (420/702), and 12 focus groups (n = 96 nurses) and 24 interviews with senior staff were conducted. Capability barriers included beliefs that falls could not be prevented; and limited knowledge on falls prevention in patients with complex care needs (e.g. cognitive impairment). Capability enablers included education and training, particularly face to face case study based approaches. Lack of resources was identified as an opportunity barrier. Leadership, champions and using data to drive practice change were recognised as opportunity enablers. Motivation barriers included complacency and lack of ownership in falls prevention efforts. Motivation enablers included senior staff articulating clear goals and a commitment to falls prevention; and use of reminders, audits and feedback. The information gained from this study suggests that regular practical face-to-face education and training for nurses; provision of equipment; audit, reminders and feedback; leadership and champions; and the provision of falls data is key to successful falls prevention program implementation in acute hospitals.

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

#### **Evaluation of the turning characteristics according to the severity of Parkinson disease during the timed up and go test**

Son M, Youm C, Cheon S, Kim J, Lee M, Kim Y, Kim J, Sung H.

*Ageing Clin. Exp. Res.* 2017; ePub(ePub): ePub.

**Affiliation:** Biomechanics Laboratory, College of Health Sciences, Dong-A University, Hadan 2-dong, Saha-gu, Busan, Republic of Korea.

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#### **Abstract**

**BACKGROUND:** Patients with Parkinson disease (PD) experience problems such as falls and freezing of gait during walking and turning in daily activities. However, few studies have examined the relationship between simultaneous turning tasks and the severity of PD.

**AIM:** To investigate turning characteristics in patients with PD using three-dimensional (3D) analysis during the timed up and go (TUG) test.

**METHODS:** Thirty individuals performed the TUG test under 3D motion analysis: 10 patients with Hoehn and Yahr (H&Y) stages 2.5 and 3.0 PD (group I), 10 patients with H&Y stage 2.0 PD (group II), and 10 healthy older adult controls. Spatiotemporal and kinematic variables were analyzed during the TUG test with a Vicon 3-D motion analysis system.

**RESULTS:** The walking speed, step length, step length asymmetry index, range of motion of the hip, knee, and shoulder joints, and foot clearance height significantly differed between patients with PD and the controls. The step length and foot clearance height were significantly different between groups I and II.

**DISCUSSION:** The step length and foot clearance are different between the severity levels of PD, and the TUG test may be useful for identifying turning characteristics in patients with PD.

**CONCLUSIONS:** Patients with PD exhibited significant differences in all variables of interest compared to the controls. The step length and foot clearance height as well as the TUG test during

the turning phase may be helpful for measuring turning in patients with different severity levels of PD.

#### PDF Y Endnote Y

### Increased postural sway in persons with multiple sclerosis during short-term exposure to warm ambient temperatures

Poh PY, Adams AN, Huang M, Allen DR, Davis SL, Tseng AS, Crandall CG.

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**Affiliation:** Institute for Exercise and Environmental Medicine, Texas Health Presbyterian Hospital and UT Southwestern Medical Center, Dallas, TX, USA. Electronic address:

craigcrandall@texashealth.org.

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#### Abstract

**BACKGROUND:** Multiple sclerosis (MS) is a neurological disease marked by demyelination and axonal loss. Individuals with MS experience increases in clinical signs and symptoms during heat exposure.

**OBJECTIVE:** To test the hypothesis that moderate heat exposure adversely affects postural sway in individuals with MS.

**METHODS:** Ten individuals with relapsing-remitting MS (50±8y) and nine controls (47±10y) were examined under a Thermal and a Time Control trial. Following a 30min thermoneutral baseline (25°C, 30% relative humidity (RH)), stand tests randomized with eyes open and closed, were performed. For Thermal, subjects were first exposed to 60min of heating (40°C, 30%RH) followed by 60min of cooling (20°C, 30%RH). For Time Control, subjects remained in a thermoneutral environment throughout. Stand tests were repeated at consistent times in both trials.

**RESULTS:** No difference in skin and core temperatures between groups were observed for any trial ( $P>0.05$ ). During heating, postural sway was higher in MS relative to control subjects (eyes open,  $P=0.03$ ; eyes closed,  $P=0.011$ ). No differences in postural sway, regardless of eye status, were observed during the Time Control trial for either group ( $P>0.05$ ).

**CONCLUSION:** These data demonstrate that exposure to a moderate heating environment increases postural sway in patients with MS.

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#### PDF Y Endnote Y

### Shared and task-specific muscle synergies during normal walking and slipping

Nazifi MM, Yoon HU, Beschorner K, Hur P.

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**Affiliation:** Human Rehabilitation Group, Department of Mechanical Engineering, Texas A&M University College Station, TX, USA.

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#### Abstract

Falling accidents are costly due to their prevalence in the workplace. Slipping has been known to be the main cause of falling. Understanding the motor response used to regain balance after slipping is crucial to developing intervention strategies for effective recovery. Interestingly, studies on spinalized animals and studies on animals subjected to electrical microstimulation have provided

major evidence that the Central Nervous System (CNS) uses motor primitives, such as muscle synergies, to control motor tasks. Muscle synergies are thought to be a critical mechanism used by the CNS to control complex motor tasks by reducing the dimensional complexity of the system. Even though synergies have demonstrated potential for indicating how the body responds to balance perturbations by accounting for majority of the data set's variability, this concept has not been applied to slipping. To address this gap, data from 11 healthy young adults were collected and analyzed during both unperturbed walking and slipping. Applying an iterative non-negative matrix decomposition technique, four muscle synergies and the corresponding time-series activation coefficients were extracted. The synergies and the activation coefficients were then compared between baseline walking and slipping to determine shared vs. task-specific synergies. Correlation analyses found that among four synergies, two synergies were shared between normal walking and slipping. However, the other two synergies were task-specific. Both limbs were contributing to each of the four synergies, suggesting substantial inter-limb coordination during gait and slip. These findings stay consistent with previous unilateral studies that reported similar synergies between unperturbed and perturbed walking. Activation coefficients corresponding to the two shared synergies were similar between normal walking and slipping for the first 200 ms after heel contact and differed later in stance, suggesting the activation of muscle synergies in response to a slip. A muscle synergy approach would reveal the used sub-tasks during slipping, facilitating identification of impaired sub-tasks, and potentially leading to a purposeful rehabilitation based on damaged sub-functions.

#### PDF Y Endnote Y

#### **Sleep duration and falls: a systemic review and meta-analysis of observational studies**

Wu L, Sun D.

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**Affiliation:** Department of Nanomedicine, Houston Methodist Research Institute, Houston, USA.

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#### **Abstract**

Several epidemiological studies have linked sleep duration with falls; however, the findings yielded inconsistent results. No quantitative analysis has specifically assessed the influence of sleep duration on falls. PubMed and Embase were screened for observational studies from inception to 13 September 2016. A generic inverse-variance method was used to pool the outcome data for sleep duration categories of the lowest category versus reference, and the highest category versus reference with a random-effects model. Dose-response analysis was performed to evaluate the potential relationship of sleep duration with falls. Finally, seven eligible observational studies involving a total of 212 829 participants were included in the present meta-analysis. Compared with the reference category, both short and long sleep duration were significantly associated with falls, and the pooled odds ratios (95% confidence intervals) were 1.32 (1.21, 1.46) and 1.35 (1.17, 1.56), respectively, both with evidence of significant heterogeneity. An approximately 'U-shaped' curve was observed, and the lowest risk of falls was shown at 7-8 h day(-1) of sleep duration. Further subgroup analysis found that the association of long sleep duration and falls was more pronounced among Caucasians. The present study is limited to its small number of included studies, considerable heterogeneity, observational study design and the large contribution of a single article. Further

researches are still needed to confirm the causal association between sleep duration and falls in populations with different gender, age and ethnicity.

**PDF Y Endnote Y**

**The mystery of unexplained traumatic sudden falls. A clinical case that adds a new feasible cause**

Bruni A, Martino I, Borzi G, Gambardella A, De Fazio P, Labate A.

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**Affiliation:** Department of Medical Sciences, Institute of Neurology, University "Magna Graecia", Viale Europa, 88100, Catanzaro, Italy. labate@unicz.it.

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**Abstract** [Abstract unavailable]

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