Safety Literature 21st April 2024

Development of artificial intelligence edge computing based wearable device for fall detection and prevention of elderly people

A P, D FDS, M J, T s S, Sankaran S, Pittu PSKR, S V. Heliyon 2024; 10(8): e28688.

DOI: 10.1016/j.heliyon.2024.e28688 **PMID**: 38628753 **PMCID**: PMC11019185

Abstract

Elderly falls are a major concerning threat resulting in over 1.5-2 million elderly people experiencing severe injuries and 1 million deaths yearly. Falls experienced by Elderly people may lead to a long-term negative impact on their physical and psychological health conditions. Major healthcare research had focused on this lately to detect and prevent the fall. In this work, an Artificial Intelligence (AI) edge computing based wearable device is designed and developed for detection and prevention of fall of elderly people. Further, the various deep learning algorithms such as Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU) are utilized for activity recognition of elderly. Also, the CNN-LSTM, RNN-LSTM and GRU-LSTM with and without attention layer respectively are utilized and the performance metrics are analyzed to find the best deep learning model. Furthermore, the three different hardware boards such as Jetson Nano developer board, Raspberry PI 3 and 4 are utilized as an AI edge computing device and the best deep learning model is implemented and the computation time is evaluated.

RESULTS demonstrate that the CNN-LSTM with attention layer exhibits the accuracy, recall, precision and F1_Score of 97%, 98%, 98% and 0.98 respectively which is better when compared to other deep learning models. Also, the computation time of NVIDIA Jetson Nano is less when compared to other edge computing devices. This work appears to be of high societal relevance since the proposed wearable device can be used to monitor the activity of elderly and prevents the elderly falls which improve the quality of life of elderly people.

Language: en

Keywords: Accelerometer sensor; Deep learning models; Fall detection; Internet of things; Secure pairing; Wearables

Physical therapists' attitudes, beliefs, and barriers regarding fall screening and prevention among patients with knee osteoarthritis: a cross-sectional study

Alsobhi M, Gmmash A, Aldhabi R, Almaddah MR, Ameen A, Almotairi F, Basuodan R, Khan F. Healthcare (Basel) 2024; 12(7): e718.

DOI: 10.3390/healthcare12070718 **PMID**: 38610140

Abstract

Falls are commonly associated with knee osteoarthritis and represent a significant financial burden on the healthcare system. Therefore, the discovery of physical therapists' attitudes and practices regarding fall screening and prevention among patients with osteoarthritis should be investigated. Moreover, this study aimed to identify barriers that might limit its implementation among this population. A cross-sectional study design was used to collect the data. The electronic survey targeted licensed physical therapy professionals who currently work in clinical or academic settings in Saudi Arabia. The data were analyzed descriptively and inferentially using chi-square. Two hundred and six licensed physical therapists completed the survey, 119 females (57.8%) and 87 males (42.2%). The results of the structural equation modelling analysis showed that intention to use fall screening and management strategies was positively associated with the history of falls, identifying risk factors of falls, and documentation of risk factors of falls ($p \leq 0.0001$). The most reported barriers to implement fall screening and prevention were lack of knowledge (n = 92, 45%), lack of training/skills (n = 84, 41%), and time constraints (n = 57, 45%), followed by patient compliance with 38% of the responses. The findings highlighted the importance of identifying the key opportunities for knowledge translation in clinical practices to enhance the sufficient implementation of fall screening and management in osteoarthritis care.

Language: en

Keywords: fall; knee; osteoarthritis; prevention; survey

Automated region of interest-based data augmentation for fallen person detection in off-road autonomous agricultural vehicles

Baek H, Yu S, Son S, Seo J, Chung Y. Sensors (Basel) 2024; 24(7): e2371.

DOI: 10.3390/s24072371 **PMID**: 38610583

Abstract

Due to the global population increase and the recovery of agricultural demand after the COVID-19 pandemic, the importance of agricultural automation and autonomous agricultural vehicles is growing. Fallen person detection is critical to preventing fatal accidents during autonomous agricultural vehicle operations. However, there is a challenge due to the relatively limited dataset for fallen persons in off-road environments compared to on-road pedestrian datasets. To enhance the generalization performance of fallen person detection off-road using object detection technology, data augmentation is necessary. This paper proposes a data augmentation technique called Automated Region of Interest Copy-Paste (ARCP) to address the issue of data scarcity. The technique involves copying real fallen person objects obtained from public source datasets and then pasting the objects onto a background off-road dataset. Segmentation annotations for these objects are generated using YOLOv8x-seg and Grounded-Segment-Anything, respectively. The proposed algorithm is then applied to automatically produce augmented data based on the generated segmentation annotations. The technique encompasses segmentation annotation generation, Intersection over Union-based segment setting, and Region of Interest configuration. When the ARCP technique is applied, significant improvements in detection accuracy are observed for two state-of-the-art object detectors: anchor-based YOLOv7x and anchor-free YOLOv8x, showing an increase of 17.8% (from 77.8% to 95.6%) and 12.4% (from 83.8% to 96.2%), respectively. This suggests high applicability for addressing the challenges of limited datasets in off-road environments and is expected to have a significant impact on the advancement of object detection technology in the agricultural industry.

Language: en

Keywords: automated region of interest; autonomous agricultural vehicles; data augmentation; fallen person detection

Effects of medication management in geriatric patients who have fallen: results of the EMMA mixed-methods study

Clemens S, Iglseder B, Alzner R, Kogler M, Rose O, Kutschar P, Krutter S, Kanduth K, Dückelmann C, Flamm M, Pachmayr J. Age Ageing 2024; 53(4): afae070.

DOI: 10.1093/ageing/afae070 **PMID**: 38619121

Abstract

BACKGROUND: comprehensive medication management (CMM) can reduce medication-related risks of falling. However, knowledge about inter-individual treatment effects and patient-related barriers remains scarce.

OBJECTIVE: to gain in-depth insights into how geriatric patients who have fallen view their medication-related risks of falling and to identify effects and barriers of a CMM in preventing falls.

DESIGN: complementary mixed-methods pre-post study, based on an embedded quasi-experimental model.

SETTING: geriatric fracture centre.

METHODS: qualitative, semi-structured interviews framed the CMM intervention, including a follow-up period of 12 weeks. Interviews explored themes of falling, medication-related risks, post-discharge acceptability and sustainability of interventions using qualitative content analysis. Optimisation of pharmacotherapy was assessed via changes in the weighted and summated Medication Appropriateness Index (MAI) score, number of fall-risk-increasing drugs (FRID) and potentially inappropriate medications (PIM) according to the Fit fOR The Aged and PRISCUS lists using parametric testing.

RESULTS: thirty community-dwelling patients aged ≥65 years, taking ≥5 drugs and admitted after an injurious fall were recruited. The MAI was significantly reduced, but number of FRID and PIM remained largely unchanged. Many patients were open to medication reduction/discontinuation, but expressed fear when it came to their personal medication. Psychosocial issues and pain increased the number of indications. Safe alternatives for FRID were frequently not available. Psychosocial burden of living alone, fear, lack of supportive care and insomnia increased after discharge.

CONCLUSION: as patients' individual attitudes towards trauma and medication were not predictable, an individual and longitudinal CMM is required. A standardised approach is not helpful in this population.

Language: en

Keywords: *Accidental Falls/prevention & control; *Fractures, Bone; Aftercare; Aged; fall-risk-increasing drugs; fracture; geriatrics; Humans; medication

management; Medication Therapy Management; older people; Patient Discharge; patient perspectives; qualitative research

Manhattan Vision Screening and Follow-up Study (NYC-SIGHT): a nested cross-sectional assessment of falls risk within a cluster randomised trial

Hark LA, Wang Y, Gorroochurn P, Simon PR, Maruri SC, Henriquez DR, Diamond DF, Horowitz JD, Park L, Wang Q, Auran JD, Carrion J, Friedman DS, Liebmann JL, Cioffi GA, Harizman N. Br. J. Ophthalmol. 2024; ePub(ePub): ePub.

DOI: 10.1136/bjo-2022-323052 **PMID**: 38609163

Abstract

BACKGROUND: To investigate the feasibility of using the Stopping Elderly Accidents, Deaths and Injuries (STEADI) Falls Risk Tool Kit during community-based eye health screenings to assess falls risk of participants enrolled in the Manhattan Vision Screening and Follow-Up Study (NYC-SIGHT).

METHODS: Cross-sectional analysis of data from a 5-year prospective, cluster-randomised clinical trial conducted in affordable housing developments in New York City in adults age 40 years and older. Prescreening questions determined whether participants were at risk of falling. STEADI tests classified participants at low, moderate or high risk of falling. Multivariate logistic regression determined odds of falls risk of all enrolled participants.

RESULTS: 708 participants completed the eye health screening; 351 (49.6%) performed STEADI tests; mean age: 71.0 years (SD±11.3); 72.1% female; 53.6% Black, non-Hispanic, 37.6% Hispanic/Latino. Level of falls risk: 32 (9.1%) low, 188 (53.6%) moderate and 131 (37.3%) high. Individuals age >80 (OR 5.921, 95% CI (2.383 to 14.708), p=0.000), had blurry vision (OR 1.978, 95% CI (1.186 to 3.300), p=0.009), high blood pressure (OR 2.131, 95% CI (1.252 to 3.628), p=0.005), arthritis (OR 2.29876, 95% CI (1.362 to 3.875), p=0.002) or foot problems (OR 5.239, 95% CI (2.947 to 9.314), p=0.000) had significantly higher odds of falling, emergency department visits or hospitalisation due to falling.

CONCLUSION: This study detected a significant amount of falls risk in an underserved population. The STEADI Falls Risk screening questions were easy for eye care providers to ask, were highly predictive of falls risk and may be adequate for referral to occupational health and/or physical therapy.

Language: en

Keywords: Epidemiology; Glaucoma; Public health; Telemedicine

Predictive validity of the Johns Hopkins Fall Risk Assessment Tool for older patients in stroke rehabilitation

Hong S, Kim JS, Choi YA. Healthcare (Basel) 2024; 12(7): e791.

DOI: 10.3390/healthcare12070791 **PMID**: 38610213

Abstract

The aim of this retrospective, cross-sectional, observational study was to assess the frequency of falls and evaluate the predictive validity of the Johns Hopkins Fall Risk Assessment Tool (JHFRAT) among patients aged ≥65 years, transferred to the rehabilitation ward of a university hospital. The predictive ability was assessed using receiver operating characteristic curve analysis, and the optimal threshold was established using the Youden index. We analyzed the overall cohort (N = 175) with subacute stroke and the subgroup with a low unaffected handgrip strength (HGS; men: <28 kg, women: <18 kg). Overall, 135/175 patients (77.1%) had a low HGS. The fall rate was 6.9% overall and 5.9% for patients with a low HGS. The JHFRAT predictive value was higher for patients with a low HGS than that for the overall cohort, but acceptable in both. The optimal cutoff score for the overall cohort was 11 (sensitivity, 67%; specificity, 68%), whereas that for the subgroup was 12 (sensitivity, 75%; specificity: 72%). These results are expected to aid nurses working in rehabilitation wards in more effectively utilizing JHFRAT outcomes for post-stroke older patients with a low HGS and contribute to the development of more appropriate fall prevention strategies for high-risk patients in the future.

Language: en

Keywords: fall; handgrip strength; rehabilitation; stroke

Footwear and falls in long-term residential aged care facilities: an analysis of video capture data

Menz HB, Bergin SM, McClelland JA, Munteanu SE. Gerontology 2024; ePub(ePub): ePub.

DOI: 10.1159/000538731 **PMID**: 38626742

Abstract

INTRODUCTION: Several footwear characteristics have been shown to affect balance and gait patterns and may therefore influence the risk of falling in older adults. However, attributing a link between footwear and falls is inherently difficult as it often relies on self-report which may be inaccurate.

METHODS: Archival video recordings of falls that occurred in two long-term residential aged care facilities were initially screened to determine whether the footwear worn at the time (barefoot, socks, slippers/sandals, or shoes) could be documented. These falls were then independently evaluated by three additional assessors and a meeting was held to obtain consensus in relation to whether the footwear could have potentially contributed to the fall, and what mechanism may have been responsible. Cross-tabulations were performed in relation to footwear type and falls characteristics (proposed mechanism and fall direction).

RESULTS: There were 300 falls experienced by 118 older adults aged 58 years to 98 years (mean age 82.8 years, SD 7.6). Of these falls, footwear could be ascertained in 224 (75%). After the consensus meeting, the proportion of falls considered to be potentially related to footwear was 40 (18%). The likelihood of footwear contributing to the fall was highest when participants were wearing socks (14/19 falls; 74% of all footwear-related falls), followed by being barefoot (2/6 falls; 33%), wearing slippers/sandals (17/100 falls; 17%) and wearing shoes (7/99 falls, 7%).

CONCLUSION: Footwear could be a potential contributor to a substantial number of falls in residential aged care. Wearing socks would appear to place an older person at risk of future falls and should therefore be avoided in this population.

Language: en

A systematic review of reasons and risks for acute service use by older adult residents of long-term care

Merrick E, Bloomfield K, Seplaki C, Shannon K, Wham C, Winnington R, Neville S, Bail K, Fry M, Turner M, MacFarlane J. J. Clin. Nurs. 2024; ePub(ePub): ePub.

DOI: 10.1111/jocn.17165 **PMID**: 38616544

Abstract

AIMS AND OBJECTIVES: To identify the reasons and/or risk factors for hospital admission and/or emergency department attendance for older (≥60 years) residents of long-term care facilities.

BACKGROUND: Older adults' use of acute services is associated with significant financial and social costs. A global understanding of the reasons for the use of acute services may allow for early identification and intervention, avoid clinical deterioration, reduce the demand for health services and improve quality of life.

DESIGN: Systematic review registered in PROSPERO (CRD42022326964) and reported following PRISMA guidelines.

METHODS: The search strategy was developed in consultation with an academic librarian. The strategy used MeSH terms and relevant keywords. Articles published since 2017 in English were eligible for inclusion. CINAHL, MEDLINE, Scopus and Web of Science Core Collection were searched (11/08/22). Title, abstract, and full texts were screened against the inclusion/exclusion criteria; data extraction was performed two blinded reviewers. Quality of evidence was assessed using the NewCastle Ottawa Scale (NOS).

RESULTS: Thirty-nine articles were eligible and included in this review; included research was assessed as high-quality with a low risk of bias. Hospital admission was reported as most likely to occur during the first year of residence in long-term care. Respiratory and cardiovascular diagnoses were frequently associated with acute services use. Frailty, hypotensive medications, falls and inadequate nutrition were associated with unplanned service use.

CONCLUSIONS: Modifiable risks have been identified that may act as a trigger for assessment and be amenable to early intervention. Coordinated intervention may have significant individual, social and economic benefits. RELEVANCE TO CLINICAL PRACTICE: This review has identified several modifiable reasons for acute service use by older adults. Early and coordinated intervention may reduce the risk of hospital admission and/or emergency department. REPORTING METHOD: This systematic review was conducted and reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. PATIENT OR PUBLIC CONTRIBUTION: No patient or public contribution.

Language: en

Keywords: aged; emergency service; hospital; hospitalisation; long-term care

NSW Fall Prevention & Healthy Ageing Network

Effectiveness of deep brain stimulation in improving balance in Parkinson's disease: a systematic review and meta-analysis

Morton A, Fraser H, Green C, Drovandi A. World Neurosurg. 2024; ePub(ePub): ePub.

DOI: 10.1016/j.wneu.2024.04.021 **PMID**: 38608807

Abstract

INTRODUCTION: Balance dysfunction is a debilitating feature of advanced Parkinson's disease (PD), potentially improved by deep brain stimulation (DBS). This systematic review and meta-analysis pooled evidence from randomized controlled trials (RCT) on DBS effectiveness in improving balance in PD.

METHODS: A systematic search was conducted to identify eligible RCTs investigating the effectiveness of DBS on improving balance in people with PD. Meta-analysis was performed using random effects models and reported as mean difference and 95% confidence intervals. Risk of bias was assessed using Cochrane's ROB-2 tool.

RESULTS: Seventeen RCTs were eligible (n=333), utilising a range of stimulation sites, parameters, reporting tools for balance outcomes, and control/comparator groups, making the identification of clear trends and recommendations difficult. Eleven studies were deemed as having some risk of bias, four having low risk of bias and two having high risk of bias. One small meta-analysis was conducted and found no significant difference in balance outcomes. Most studies reported no significant improvement in Timed Up-and-Go scores, Berg Balance Scale scores, frequency of falls, and balance-related items of the Movement Disorder Society's Unified Parkinson's Disease Rating Scales. Some studies reported improvements in the Tinetti balance test, posturography readings, and reduction in falls though these were not supported by other studies due to a lack of reporting on these items or conflicting findings.

CONCLUSION: Current research suggests that DBS results in no significant improvement in balance dysfunction for people with PD, though such assertions require larger RCTs with clear reporting methods using validated reporting tools.

Language: en

Keywords: DBS; GPi; randomised controlled trials; RCT; STN

Predictors of fall protection motivation among older adults in rural communities in a middle-income country: a cross-sectional study using the Protection Motivation Theory

Ong MF, Soh KL, Saimon R, Saidi HI, Tiong IK, Myint WW, Mortell M, Japar S. J. Adv. Nurs. 2024; ePub(ePub): ePub.

DOI: 10.1111/jan.16190 **PMID**: 38606809

Abstract

AIMS: To evaluate factors associated with fall protection motivation to engage in fall preventive behaviour among rural community-dwelling older adults aged 55 and above using the protection motivation theory scale.

DESIGN: A cross-sectional study.

METHODS: The study was conducted in a healthcare clinic in Malaysia, using multistage random sampling from November 2021 to January 2022. Three hundred seventy-five older adults aged 55 and older were included in the final analysis. There were 31 items in the final PMT scale. The analysis was performed within the whole population and grouped into 'faller' and 'non-faller', employing IBM SPSS version 26.0 for descriptive, independent t-test, chi-square, bivariate correlation and linear regressions.

RESULTS: A total of 375 older participants were included in the study. Fallers (n = 82) and non-fallers (n = 293) show statistically significant differences in the characteristics of ethnicity, assistive device users, self-rating of intention and participation in previous fall prevention programmes. The multiple linear regression model revealed fear, coping appraisal and an interaction effect of fear with coping appraisal predicting fall protection motivation among older adults in rural communities.

CONCLUSION: Findings from this study demonstrated that coping appraisal and fear predict the protection motivation of older adults in rural communities. Older adults without a history of falls and attaining higher education had better responses in coping appraisal, contributing to a reduction in perceived rewards and improving protection motivation. Conversely, older adults from lower education backgrounds tend to have higher non-preventive behaviours, leading to a decline in fall protection motivation. IMPLICATIONS FOR THE PROFESSION AND/OR PATIENT CARE: These results contribute important information to nurses working with older adults with inadequate health literacy in rural communities, especially when planning and designing fall prevention interventions. The findings would benefit all nurses, healthcare providers, researchers and academicians who provide care for older adults. PATIENT OR PUBLIC CONTRIBUTION: Participants were briefed about the study, and their consent was obtained. They were only required to answer the questionnaire through interviews. Older individuals aged fifty-five and above in rural communities at the healthcare clinic who could read, write or understand Malay or English were included. Those who were suffering from mental health problems and refused to participate in the study were excluded from the study. Their personal information remained classified and not recorded in the database during the data entry or analysis.

Language: en

Keywords: accidental fall; cross-sectional studies; elderly; falls; motivation; nursing; older adult; rural communities; rural population; slip and fall

Fall prediction in a quiet standing balance test via machine learning: is it possible?

Pennone J, Aguero NF, Martini DM, Mochizuki L, do Passo Suaide AA. PLoS One 2024; 19(4): e0296355.

DOI: 10.1371/journal.pone.0296355 **PMID**: 38625858

Abstract

The elderly population is growing rapidly in the world and falls are becoming a big problem for society. Currently, clinical assessments of gait and posture include functional evaluations, objective, and subjective scales. They are considered the gold standard to indicate optimal mobility and performance individually, but their sensitivity and specificity are not good enough to predict who is at higher risk of falling. An innovative approach for fall prediction is the machine learning. Machine learning is a computer-science area that uses statistics and optimization methods in a large amount of data to make outcome predictions. Thus, to assess the performance of machine learning algorithms in classify participants by age, number of falls and falls frequency based on features extracted from a public database of stabilometric assessments. 163 participants (116 women and 47 men) between 18 and 85 years old, 44.0 to 75.9 kg mass, 140.0 to 189.8 cm tall, and 17.2 to 31.9 kg/m2 body mass index. Six different machine learning algorithms were tested for this classification, which included Logistic Regression, Linear Discriminant Analysis, K Nearest-neighbours, Decision Tree Classifier, Gaussian Naive Bayes and C-Support Vector Classification. The machine learning algorithms were applied in this database which has sociocultural, demographic, and health status information about participants. All algorithm models were able to classify the participants into young or old, but our main goal was not achieved, no model identified participants at high risk of falling. Our conclusion corroborates other works in the biomechanics field, arguing the static posturography, probably due to the low daily living activities specificity, does not have the desired effects in predicting the risk of falling. Further studies should focus on dynamic posturography to assess the risk of falls.

Language: en

Evaluation of outcome after total hip arthroplasty for femoral neck fracture: which factors are relevant for better results?

Schiavi P, Pogliacomi F, Bergamaschi M, Ceccarelli F, Vaienti E. J. Clin. Med. 2024; 13(7): e1849.

DOI: 10.3390/jcm13071849 **PMID**: 38610614

Abstract

BACKGROUND: Femoral neck fractures (FNFs) are frequent orthopedic injuries in elderly patients. Despite improvements in clinical monitoring and advances in surgical procedures, 1-year mortality remains between 15% and 30%. The aim of this study is to identify variables that lead to better outcomes in patients treated with total hip arthroplasty (THA) for FNFs.

METHODS: All patients who underwent cementless THA for FNF from January 2018 to December 2022 were identified. Patients aged more than 80 years old and with other post-traumatic lesions were excluded. Patient data and demographic characteristics were collected. The following data were also registered: time trauma/surgery, surgical approach, operative time, intraoperative complications, surgeon arthroplasty-trained or not, and anesthesia type. In order to search for any predictive factors of better short- and long-term outcomes, we performed different logistic regression analyses.

RESULTS: A total of 92 patients were included. From multivariable logistic regression models, we derived that a direct anterior surgical approach and an American Society of Anesthesiologists (ASA) classification < 3 can predict improved short-term outcomes. Moreover, THAs performed by surgeons with specific training in arthroplasty have a lower probability of revision at 1 year. Mortality at 1 year was ultimately influenced by the ASA classification.

CONCLUSIONS: A direct anterior approach and specific arthroplasty training of the surgeon appear to be able to improve the short- and long-term follow-up of THA after FNF.

Language: en

Keywords: direct anterior approach; femoral neck fracture; outcome; total hip arthroplasty

The effects of plantarflexor weakness and reduced tendon stiffness with aging on gait stability

Smith RE, Shelton AD, Sawicki GS, Franz JR. PLoS One 2024; 19(4): e0302021.

DOI: 10.1371/journal.pone.0302021 **PMID**: 38625839

Abstract

Falls among older adults are a costly public health concern. Such falls can be precipitated by balance disturbances, after which a recovery strategy requiring rapid, high force outputs is necessary. Sarcopenia among older adults likely diminishes their ability to produce the forces necessary to arrest gait instability. Age-related changes to tendon stiffness may also delay muscle stretch and afferent feedback and decrease force transmission, worsening fall outcomes. However, the association between muscle strength, tendon stiffness, and gait instability is not well established. Given the ankle's proximity to the onset of many walking balance disturbances, we examined the relation between both plantarflexor strength and Achilles tendon stiffness with walking-related instability during perturbed gait in older and younger adults-the latter quantified herein using margins of stability and whole-body angular momentum including the application of treadmill-induced slip perturbations. Older and younger adults did not differ in plantarflexor strength, but Achilles tendon stiffness was lower in older adults. Among older adults, plantarflexor weakness associated with greater whole-body angular momentum following treadmill-induced slip perturbations. Weaker older adults also appeared to walk and recover from treadmill-induced slip perturbations with more caution. This study highlights the role of plantarflexor strength and Achilles tendon stiffness in regulating lateral gait stability in older adults, which may be targets for training protocols seeking to minimize fall risk and injury severity.

Home environmental factors associated with falls among elderly in Ubon Ratchathani, Thailand [Letter]

Song J, Wang S. J. Multidiscip. Healthc. 2024; 17: 1587-1588.

DOI: 10.2147/JMDH.S472775 **PMID**: 38623395 **PMCID**: PMC11018135

Abstract

Newly, we have perused the original article entitled "Home Environmental Factors Associated with Falls Among Elderly in Ubon Ratchathani, Thailand" by Boonkhao et al.1 This is a valuable, practical, and interesting study. The advantages of this study are as follows: (1) This is the first study to investigate the environmental factors inside and outside of residential homes associated with falls among rural elderly people living in That Subdistrict, Warin Chamrap District, Ubon Ratchathani, Thailand. Paying attention to the factors related to falls among rural elderly people and providing targeted recommendations and tailored intervention activities are the missions of community health workers. This study provides an empirical evidence for improving the housing conditions of elderly people living in rural areas of Thailand and mitigating the risk of falls. (2) The study employed a formula to calculate the sample size, which was scientific and reliable. The research tool Thai-Home Fall Hazard Assessment Tool (Thai-HFHAT)2,3 used in this study not only reported reliability but also validity, with good quality. (3) The authors conducted in-depth discussion around the research results, compared them thoroughly with previous studies, and carefully analyzed the reasons for these findings.

Nevertheless, there are also some limitations and areas for improvement in this study: (1) The researchers employed incidental sampling to gather data; To ensure the representativeness of the sample and reduce the sampling errors, we suggest that the authors use methods such as random sampling, random cluster sampling, etc. (2) Data collection only took place from August to October 2023; We suggest that the authors consider the seasons of data collection in future research, as the incidence of falls among elderly people and home environmental factors may differ between the rainy and dry seasons. (3) There is one area in the text that need to be corrected: Page 1369, the "25. Insecurely attached carpet to the floor" in Table 2 has incorrect values for "Without Falls". These values need to be checked by the authors. (4) The authors only conducted univariate analysis regarding the relationship between falls and environmental factors among rural elderly people. We kindly suggest that the authors perform multivariate logistic regression analysis in the future, calculate OR values, and assess the risk of falls under different home environmental factors.

Language: en

Radiographic knee osteoarthritis severity has no impact on fall risk: the locomotive syndrome and health outcomes in the aizu cohort study (LOHAS): a cross-sectional study

Sonobe T, Otani K, Sekiguchi M, Otoshi K, Nikaido T, Sato M, Konno S, Matsumoto Y. BMC Musculoskelet. Disord. 2024; 25(1): e298.

DOI: 10.1186/s12891-024-07421-1 **PMID**: 38627744

Abstract

BACKGROUND: To investigate factors that have an impact on the risk of falls and determine whether radiographic knee osteoarthritis (KOA) is a factor involved in falls independent of knee pain, psychological factors, and physical function.

METHODS: A cross-sectional analysis was conducted on 1083 subjects for the 2009 Locomotive Syndrome and Health Outcomes in the Aizu Cohort Study (LOHAS). A logistic regression analysis was performed to examine the relationship between radiographic KOA and fall history.

RESULTS: Fall history was significantly associated with the severity of knee pain. Compared to subjects with no knee pain, the odds ratio (OR) was 1.53 times higher in the subjects with mild knee pain (95% confidence interval [CI]: 1.04-2.25), 1.69 times higher in those with moderate knee pain (95%CI: 1.03-2.79), and 2.98 times higher in those with severe knee pain (95%CI: 1.67-5.30). In subjects with depression, the OR was 1.91 (95%CI: 1.25-2.92), and in those with decreased mobility, the OR was 1.70 (95%CI: 1.08-2.69). Age, gender, knee crepitus, BMI, OLST, and sleeping pill use were not significantly associated with fall risk. In a multivariate analysis, radiographic KOA severity was not significantly associated with fall risk (OR 0.81, 95%CI 0.44-1.50 in mild OA; OR 1.10, 95%CI 0.57-2.14 in severe OA).

CONCLUSION: Knee pain, decreased mobility, and depression, but not the radiographic KOA severity, were significantly associated with a fall risk. Regardless of the individual's radiographic KOA severity, the risk of falls may be reduced by treating his/her knee pain, mobility problems, and/or psychological factors.

Language: en

Keywords: Fall; Knee pain; Mobility; Psychological factor; Radiographic knee osteoarthritis; Timed up and go test

Age-related changes in muscle coordination patterns of stepping responses to recover from loss of balance

Staring W, Zandvliet S, de Kam D, Solis-Escalante T, Geurts A, Weerdesteyn V. Exp. Gerontol. 2024; ePub(ePub): ePub.

DOI: 10.1016/j.exger.2024.112424 **PMID**: 38604252

Abstract

INTRODUCTION: Reactive stepping capacity to recover from a loss of balance declines with aging, which increases the risk of falling. To gain insight into the underlying mechanisms, we investigated whether muscle coordination patterns of reactive stepping differed between healthy young and older individuals.

METHODS: We performed a cross-sectional study between 15 healthy young and 14 healthy older adults. They recovered from 200 multidirectional platform translations that evoked reactive stepping responses. We determined spatiotemporal step variables and used muscle synergy analysis to characterize stance- and swing-leg muscle coordination patterns from the start of perturbation until foot landing.

RESULTS: We observed delayed step onsets in older individuals, without further spatiotemporal differences. Muscle synergy structure was not different between young and older individuals, but age-related differences were observed in the time-varying synergy activation patterns. In anterior-posterior directions, the older individuals demonstrated significantly enhanced early swing-leg synergy activation consistent with non-stepping behavior. In addition, around step onset they demonstrated increased levels of synergy coactivation (mainly around the ankle) in lateral and anterior directions, which did not appear to hamper foot clearance.

CONCLUSION: Although synergy structure was not affected by age, the delayed step onsets and the enhanced early synergy recruitment point at a relative bias towards non-stepping behavior in older adults. They may need more time for accumulating information on the direction of perturbation and making the corresponding sensorimotor transformations before initiating the step. Future work may investigate whether perturbation-based training improves these age-related deficits.

Language: en

Keywords: Aging; Fall recovery; Muscle synergies; Reactive stepping

A 10-year study of the trend of accidental falls in the elderly in a Japanese hospital

Takekawa T, Obuchi K, Watanabe S, Yamada N, Abo M. Z. Orthop. Unfall. 2024; ePub(ePub): ePub.

DOI: 10.1055/a-2276-0011 **PMID**: 38604232

Abstract

Elderly people are prone to falls. We established the Falls Prevention Working Group (FPWG) at our hospital in 2015 to reduce the number of falls during hospitalization. This study compared the trend of in-hospital falls in the elderly in two time periods (2008/9 and 2018/9) and determined the effects of FPWG-implemented measures. Using medical records, we counted the monthly number of falls suffered by patients during hospitalization in April 2008-March 2009 and April 2018-March 2019. We also categorized the falls according to the severity of fall-related complications.A total of 3609 hospital falls were recorded during the 2008-2019 period (2008/9: n = 433, 2018/9: n = 324). Falls were more common in patients aged 70-79 in 2008/9 but were noted in those aged ≥ 80 in 2018/9. The mean number of falls/month (27.3 ± 6.4, range: 12-45) was stable throughout the year. The incidence of falls in 2018/9 (1.90/1000 per persons per day) was significantly lower than in 2008/9 (2.30/1000, p = 0.006). Level ≥ 3b accidents, reflecting serious accidents with complications, were encountered in 12 of 433 accidents in 2008/9 compared with significantly fewer accidents (2 of the same severity among 324 accidents) in 2018/9 (p = 0.030).Our results showed a decrease in in-hospital falls in 2018/9 and that the sufferers were older relative to 10 years earlier. A multidisciplinary team should recommend measures to prevent falls and an environment "resilient" to falls, and encourage patients to be aware of possible falls.

Language: en

Effects of intermittent overload doses of oral vitamin D3 on serum 25(OH)D concentrations and the incidence rates of fractures, falls, and mortality in elderly individuals: a systematic review and meta-analysis

Tao X, Yang W, Zhang Q, Wang Y, Gao F, Wang Y, Zhang T, Liu H, Chen J. Biomol. Biomed. 2024; ePub(ePub): ePub.

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Abstract

Vitamin D is commonly used to prevent and treat osteoporosis, with studies indicating its potential to reduce fractures, falls, and mortality. However, meta-analyses present inconsistent findings regarding its efficacy, particularly reflecting significant variability in data and outcomes related to various dosing regimens. In this meta-analysis, we assessed the impact of high-dose intermittent oral administration of vitamin D3 on serum 25(OH)D levels, fractures, falls, and mortality among elderly individuals. We included 14 randomized controlled trials (RCTs) and employed Review Manager 5.4 for statistical analysis. Our findings indicate that intermittent monthly administration of vitamin D3 (over 800 IU per day) significantly raised serum 25(OH)D levels at all timepoints after six months, maintaining levels above 75 nmol/L throughout the year. This regimen showed no increase in all-cause mortality, with a risk ratio (95% CI) of 0.95 (0.87-1.04). Likewise, it did not significantly reduce the risks of falls and fractures, with risk ratios of 1.02 (0.98-1.05) and 0.95 (0.87-1.04) respectively. Although one-year intermittent administration significantly increased the concentration of 25(OH)D in serum, further research is needed to determine if this method would increase the incidence of falls. Therefore, it is not recommended at this stage due to the lack of demonstrated safety in additional relevant RCTs. This study had been registered on PROSPERO (CRD42022363229).

Language: en

Age-related dysfunction in balance: a comprehensive review of causes, consequences, and interventions

Wang J, Li Y, Yang GY, Jin K. Aging Dis. 2024; ePub(ePub): ePub.

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Abstract

This review delves into the multifaceted aspects of age-related balance changes, highlighting their prevalence, underlying causes, and the impact they have on the elderly population. Central to this discussion is the exploration of various physiological changes that occur with aging, such as alterations in the vestibular, visual, proprioceptive systems, and musculoskeletal degeneration. We examine the role of neurological disorders, cognitive decline, and medication side effects in exacerbating balance issues. The review underscores the significance of early detection and effective intervention strategies in mitigating the risks associated with balance problems, such as falls and reduced mobility. It discusses the effectiveness of diverse intervention strategies, including exercise programs, rehabilitation techniques, and technological advancements like virtual reality, wearable devices, and telemedicine. Additionally, the review stresses the importance of a holistic approach in managing balance disorders, encompassing medication review, addressing comorbidities, and environmental modifications. The paper also presents future research directions, emphasizing the need for a deeper understanding of the complex mechanisms underlying balance changes with aging and the potential of emerging technologies and interdisciplinary approaches in enhancing assessment and intervention methods. This comprehensive review aims to provide valuable insights for healthcare providers, researchers, and policymakers in developing targeted strategies to improve the quality of life and ensure the well-being of the aging population.

Language: en