

Fall risk assessment in stroke survivors: a machine learning model using detailed motion data from common clinical tests and motor-cognitive dual-tasking

Abdollahi M, Rashedi E, Jahangiri S, Kuber PM, Azadeh-Fard N, Dombovy M. Sensors (Basel) 2024; 24(3): e812.

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PMID: 38339529

Abstract

BACKGROUND: Falls are common and dangerous for stroke survivors. Current fall risk assessment methods rely on subjective scales.

OBJECTIVE sensor-based methods could improve prediction accuracy.

OBJECTIVE: Develop machine learning models using inertial sensors to objectively classify fall risk in stroke survivors. Determine optimal sensor configurations and clinical test protocols.

METHODS: 21 stroke survivors performed balance, Timed Up and Go, 10 Meter Walk, and Sit-to-Stand tests with and without dual-tasking. A total of 8 motion sensors captured lower limb and trunk kinematics, and 92 spatiotemporal gait and clinical features were extracted. Supervised models-Support Vector Machine, Logistic Regression, and Random Forest-were implemented to classify high vs. low fall risk. Sensor setups and test combinations were evaluated.

RESULTS: The Random Forest model achieved 91% accuracy using dual-task balance sway and Timed Up and Go walk time features. Single thorax sensor models performed similarly to multi-sensor models. Balance and Timed Up and Go best-predicted fall risk.

CONCLUSION: Machine learning models using minimal inertial sensors during clinical assessments can accurately quantify fall risk in stroke survivors. Single thorax sensor setups are effective.

FINDINGS demonstrate a feasible objective fall screening approach to assist rehabilitation.

Language: en

Keywords: fall; motion analysis; neurological disorder; neuroscience; TUG; wearable sensors

Development of an exercise therapy referral clinical support tool for patients with osteoporosis at risk for falls

Bullock GS, Duncan P, Chandler AM, Aguilar AA, Latham N, Storer T, Alexander N, McDonough CM. *J. Am. Geriatr. Soc.* 2024; ePub(ePub): ePub.

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Abstract

BACKGROUND: The purpose of this study was to develop a clinical support tool for osteoporosis clinic providers to support risk assessment and referrals for evidence-based exercise therapy programs.

METHODS: A sequential Delphi method was used with a multidisciplinary group of national falls experts, to provide consensus on referral to exercise therapy for patients at risk for falls. The Delphi study included a primary research team, expert panel, and clinical partners to answer the questions: (1) "What patient characteristics are needed to develop a clinical support tool?"; (2) "What are the recommended exercise referrals for patients with osteoporosis at risk for falls?" The consensus process consisted of two rounds with 8 weeks between meetings. Two qualitative researchers analyzed the data using a modified version of a matrix analysis approach.

RESULTS: The following were the most important variables to include when determining exercise therapy referrals for patients with osteoporosis: Patient history and demographics, falls history over the last year, current physical function and balance, caregiver and transportation status, socioeconomic and insurance status, and patient preference. Potential exercise therapy referrals included one-on-one physical therapy, group physical therapy, home health, community-based exercise programs, and not acceptable for exercise therapy.

CONCLUSIONS: Patient characteristics including patient history, physical function and balance performance, socioeconomic and insurance status, and patient preference for exercise therapy are important to inform both the medical provider and patient with osteoporosis to choose the most appropriate exercise therapy referral. Adoption of the algorithmic suggestions may have a significant impact on uptake and adherence to exercise therapy, ultimately improving patient physical function and reducing falls risk.

Language: en

Keywords: community-based exercise; patient preference; physical therapy

Preventable or potentially inappropriate psychotropics and adverse health outcomes in older adults: systematic review and meta-analysis

Corvaisier M, Brangier A, Annweiler C, Spiesser-Robelet L. J. Nutr. Health Aging 2024; 28(4): e100187.

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PMID: 38341965

Abstract

OBJECTIVE: To systematically review and quantitatively synthesize evidence on the use of PIPs linked to adverse health outcomes in older adults.

METHODS: A Medline, Embase® and OpenGrey libraries search was conducted from 2004 to February 2021, using the PICO model: older people, psychotropic drugs, inappropriate prescribing, and adverse drug events. Fixed-effects and random-effects meta-analysis were performed from 3 eligible studies using an inverse-variance method.

RESULTS: Of the 1943 originally identified abstracts, 106 met the inclusion criteria and 7 studies were included in this review. All were of good quality. The number of participants ranged from 318 to 383,150 older adults (54.5-74.4% women). Associations were found between PIPs use and decreased personal care activities of daily living (ADL), unplanned hospitalizations, falls and mortality. In the pooled analysis, association with falls was confirmed (1.23 [95%CI: 1.15;1.32]).

CONCLUSIONS: Participants of 65 years and older treated with PIPs were more at risk of adverse health outcomes than those using no PIPs, including greater risks of falls, functional disabilities, unplanned hospitalizations, and mortality.

RESULTS of the present systematic review and meta-analysis provide additional evidence for an appropriate and safe use of psychotropics in older adults.

Language: en

Keywords: Accidental falls; Aged; Inappropriate; Meta-analysis; Psychotropics

Human-centered design and development of a fall prevention exercise app for older adults in primary care settings

Czuber N, Garabedian P, Rice H, Tejada CJ, Dykes P, Latham NK. *Appl. Clin. Inform.* 2024; ePub(ePub): ePub.

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PMID: 38350643

Abstract

BACKGROUND: Falls in older adults are a serious public health problem that can lead to reduced quality of life or death. Patients often do not receive fall prevention guidance from primary care providers, despite evidence that falls can be prevented. Mobile health technologies may help to address this disparity and promote evidence-based fall prevention.

OBJECTIVE: Our main objective was to use Human-Centered Design (HCD) to develop a user-friendly, fall prevention exercise app using validated user requirements. The app features evidence-based behavior change strategies and exercise content to support older people initiating and adhering to a progressive fall prevention exercise program.

METHODS: We organized our multi-stage, iterative design process into three phases: Gathering User Requirements, Usability Evaluation, and Refining App Features. Our methods include focus groups, usability testing, and subject matter expert meetings.

RESULTS: Focus groups (Total n=6), usability testing (n=30) including a post-test questionnaire [Health-ITUES score: mean (SD)= 4.2 (1.1)], and subject matter expert meetings demonstrate participant satisfaction with the app concept and design. Overall, participants saw value in receiving exercise prescriptions from the app that would be recommended by their PCP and reported satisfaction with the content of the app, but several participants felt that they were not the right user for the app.

CONCLUSIONS: This study demonstrates the development, refinement and usability testing of a fall prevention exercise app and corresponding tools that primary care providers may use to prescribe tailored exercise recommendations to their older patients as an evidence-based fall prevention strategy accessible in the context of busy clinical workflows.

Language: en

Correlation enhanced distribution adaptation for prediction of fall risk

Guo Z, Wu T, Lockhart TE, Soangra R, Yoon H. *Sci. Rep.* 2024; 14(1): e3477.

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Abstract

With technological advancements in diagnostic imaging, smart sensing, and wearables, a multitude of heterogeneous sources or modalities are available to proactively monitor the health of the elderly. Due to the increasing risks of falls among older adults, an early diagnosis tool is crucial to prevent future falls. However, during the early stage of diagnosis, there is often limited or no labeled data (expert-confirmed diagnostic information) available in the target domain (new cohort) to determine the proper treatment for older adults. Instead, there are multiple related but non-identical domain data with labels from the existing cohort or different institutions. Integrating different data sources with labeled and unlabeled samples to predict a patient's condition poses a significant challenge. Traditional machine learning models assume that data for new patients follow a similar distribution. If the data does not satisfy this assumption, the trained models do not achieve the expected accuracy, leading to potential misdiagnosing risks. To address this issue, we utilize domain adaptation (DA) techniques, which employ labeled data from one or more related source domains. These DA techniques promise to tackle discrepancies in multiple data sources and achieve a robust diagnosis for new patients. In our research, we have developed an unsupervised DA model to align two domains by creating a domain-invariant feature representation. Subsequently, we have built a robust fall-risk prediction model based on these new feature representations. The results from simulation studies and real-world applications demonstrate that our proposed approach outperforms existing models.

Language: en

Keywords: Classification; Fall risk; Machine learning; Unsupervised domain adaptation

Graceful gait: virtual ballet classes improve mobility and reduce falls more than wellness classes for older women

Harrison EC, Haussler AM, Tueth LE, Baudendistel ST, Earhart GM. *Front. Aging Neurosci.* 2024; 16: e1289368.

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Abstract

INTRODUCTION: Dance is an effective and motivating form of exercise for older women, but few studies have quantified the benefits of virtual dance classes nor, specifically, ballet. This study tested the effectiveness of virtual ballet compared to virtual wellness classes, with the goal of reaching underserved populations. It is among the first to explore the effects of virtual classical ballet on functional gait mobility, balance, and quality of life measures in older women.

METHODS: Older women were recruited in two waves and randomized to two groups: a ballet class modified for older adults and a wellness-based control class. Both groups received 12 weeks of online classes, meeting twice per week for 45-min sessions. Classes were taught by a local company that offers community-based ballet classes. The same instructor led both the ballet and the wellness classes. Pre- and post-intervention assessments include gait and balance testing using wearable inertial sensors and self-report outcomes including quality of life and mood questionnaires.

RESULTS: Forty-four older women completed the study: Ballet group ($n = 21$, 67.81 ± 7.3 years); Wellness group ($n = 23$, 69.96 ± 6.7 years). Pre- to post-intervention, both groups increased velocity on the two-minute walk test ($F(1,42) = 25.36$, $p < 0.001$) and improved their time on the Timed Up and Go ($F(1,42) = 4.744$, $p = 0.035$). Both groups improved balance on the Mini-BESTest ($F(1,42) = 38.154$, $p < 0.001$), increased their scores on the Activities-Specific Balance Confidence Scale ($F(1,42) = 10.688$, $p < 0.001$), and increased quality of life via the Short Form Health Survey ($F(1,42) = 7.663$, $p = 0.008$). The ballet group improved gait variability in the backward direction ($F(1,42) = 14.577$, $p < 0.001$) and reduced fall rates more than the wellness group [$\chi^2(1) = 5.096$, $p = 0.024$].

DISCUSSION: Both virtual ballet and wellness classes improve select measures of gait, balance, and quality of life. The benefits seen in both groups highlight the importance of considering social interaction as a key component when developing future interventions to target mobility in older women.

Language: en

Keywords: ballet; dance; dual task; kinesthetic empathy; mobility; socialization

The optimal cut-off value of five-time chair stand test for assessing sarcopenia among Chinese community-dwelling older adults

Li YH, Wang XH, Ya S, Jiaoling H, Hua N. J. Cachexia Sarcopenia Muscle 2024; ePub(ePub): ePub.

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Abstract

BACKGROUND: The five-time chair stand test (5CST) as an indicator of muscle strength and physical function is the first step in assessing sarcopenia. We aimed to determine the optimal cut-off value of the 5CST for assessing older adults with sarcopenia in the Chinese community.

METHODS: We used a stratified cluster random sampling method to recruit older adults from Chinese communities. The handgrip strength was assessed using an electronic handgrip dynamometer. The 5CST and gait speed were assessed by the trained researchers. The bioimpedance analysis device was used to evaluate the skeletal muscle index. We used the Asian Working Group for Sarcopenia diagnosis criteria as the gold standard. According to the receiver operating characteristic curve, we determine the optimal cut-off value using the Youden index.

RESULTS: A total of 1027 participants were included in this analysis, including 337 men and 690 women with an average age of 70.35 ± 7.24 years. The prevalence of sarcopenia in total participants was 24.9%. The optimal cut-off value of 5CST in the total population was 10.9 s. Stratified by age and gender, for the older adults aged 60-69 years, the optimal cut-off values were 9.8 s in men and 10.2 s in women; for the older adults aged 70-79 years, cut-off values were 10.2 s in men and 10.9 s in women; and for the older adults over 80 years, cut-off values were 14.0 s in men and 11.5 s in women (all $P < 0.001$). The areas under the curve of 5CST were 0.632 in men and 0.650 in women (both $P < 0.001$). Using the newly defined cut-off values, the prevalence of sarcopenia increased significantly ($P < 0.001$).

CONCLUSIONS: We determined the optimal cut-off value of the 5CST for assessing older adults with sarcopenia in the Chinese community, and this cut-off can significantly improve the detection rate of sarcopenia. The cut-off determined in our study will help community workers detect more people with sarcopenia and benefit from early intervention and management of sarcopenia in practice.

Language: en

Keywords: 5CST; older adults; sarcopenia; the optimal cut-off value

Rasch analysis of Morse Fall Scale among the older adults with cognitive impairment in nursing homes

Liu J, Luo Y, Chai X, Zeng S, Liu Y, Zhao L. *Geriatr. Nurs.* 2024; 56: 94-99.

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PMID: 38340434

Abstract

This is a cross-sectional study to investigate the efficacy of Morse Fall Scale (MFS) in nursing homes for older adults with cognitive impairment. According to Rasch analysis, the person separation index was 0.95 (person reliability 0.48), and the item separation index was 9.23 (item reliability 0.99). Wright map showed all items can be considered appropriately directed to the older adults, but the items mainly located at both ends with the center missing. Each item was accepted with good infit and outfit statistics with positive PTMEA CORR. values from 0.49 to 0.68. Two items could be significant differential item functioning (DIF) between the two groups of different fall experience in the past year (item 1 and item 3). In conclusion, nursing assistant could adopt MFS to evaluate fall risk of older adults with cognitive impairment, but the risk grades are still not precise enough. In the future, MFS should be explored and refined further.

Language: en

Keywords: Cognitive impairment; Fall; Morse fall scale; Nursing assistant; Nursing homes; Older adults; Rasch analysis

Examining the role of attention focus walking training on conscious motor processing during rehabilitation by older adults at risk of falling: a randomized controlled trial

Mak TCT, Ng SSM, Leung MCY, Wong TWL. Arch. Gerontol. Geriatr. 2024; 121: e105352.

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Abstract

This study examined the impact of walking training with different attention focus instructions on real-time conscious motor processing and fall-related rehabilitation outcomes in older adults at risk of falling. A total of 102 community-dwelling older adults (mean age = 75.2 years, SD = 6.8 years) were randomly assigned to three groups: no attention focus walking group (NAFWG), external attention focus walking group (EAFWG), or internal attention focus walking group (IAFWG). All groups underwent 12 training sessions. Assessments were conducted at baseline, post-training, and six months later, measuring real-time conscious motor processing, functional balance and gait, balance ability, functional mobility, walking ability, trait conscious motor processing propensity, fear of falling, and recurrent falls. The EAFWG showed significant reduction on real-time conscious motor processing immediately after training ($p = 0.015$). No changes were observed for the IAFWG and NAFWG. All groups showed significant improvements in functional balance and gait ($p < 0.001$) and balance ability ($p < 0.001$) post-training. Implementing external focus instructions during walking training could be a feasible and beneficial strategy for reducing real-time conscious motor processing, which may improve walking performance and prevent falls in older adults. Further research is needed to examine the sustained benefits of these interventions and determine optimal training dosage for older adults with different risks of falling in fall prevention.

Language: en

Keywords: Attention; Conscious motor processing; Fall prevention; Gait; Rehabilitation

Falls among community-dwelling older adults in the Philippines and Viet Nam: results from nationally representative samples

Mgabhi PS, Chen TY, Cruz G, Vu NC, Saito Y. *Injury* 2024; 55(3): e111336.

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Abstract

Falls are a significant public health issue globally. However, studies with nationally representative samples have yet to be done to understand falls among older adults in the Philippines and Viet Nam. Using a biopsychosocial perspective, this study investigated the prevalence of falls and their associated factors among community-dwelling older adults in these countries. Cross-sectional data were drawn from the baseline survey of the Longitudinal Study of Ageing and Health in the Philippines (2018, N = 4,606) and the Longitudinal Study of Ageing and Health in Viet Nam (2018, N = 4,378). The outcome variables were any falls in the past year. Independent variables included sociodemographic factors (age, sex, education, living in urban areas, living alone, social network size), biophysical factors (vision, chronic conditions, functional impairments, pain locations, insomnia symptoms, sleep medications, grip strength, walking speed, postural control), and psychological factors (depressive symptoms). Descriptive analysis and logistic regression analysis were used to analyze the data. The results showed that 17.7 % and 7.3 % of older Filipino and Vietnamese adults fell in the year before the study. Significant factors associated with the odds of any falls among Filipino older adults were having a higher level of education, living in urban areas, living with others, experiencing more functional impairments, reporting one or more pain locations, and having poor grip strength. In Viet Nam, having more chronic conditions, experiencing more functional impairments, and reporting two or more pain locations were found to be associated with higher odds of any falls. The population in the Philippines and Viet Nam is aging rapidly.

FINDINGS from this study are timely in identifying at-risk individuals and preparing for effective fall prevention strategies.

Language: en

Keywords: Any falls; The Longitudinal Study of Ageing and Health in the Philippines; The Longitudinal Study of Ageing and Health in Viet Nam

**Comments on: Feasibility, safety, and effects of a Nintendo Ring Fit Adventure™
balance and strengthening exercise program in community-dwelling older adults with a
history of falls: A feasibility randomized controlled trial**

Pu FY, Cheng H. *Geriatr. Gerontol. Int.* 2024; ePub(ePub): ePub.

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Abstract

[Abstract unavailable]

Language: en

Circumstances of unintentional fall-related adult deaths: Utah, 2010-2020

Shi Y, Bennion E, Ward C, Nolen LD. *Inj. Prev.* 2024; ePub(ePub): ePub.

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Abstract

OBJECTIVE: Fall-related deaths have been on the rise nationwide. Our objective was to characterise the trend in unintentional fall-related adult deaths in Utah and evaluate the underlying and contributing causes associated with these deaths.

METHODS: We used 2010-2020 Utah death certificate data and included all Utah deaths aged 18 and older with a fall listed on their death records as the underlying or contributing cause of death in the analysis.

RESULTS: From 2010 to 2020, the overall age-adjusted unintentional fall death rate increased 70% from 15.7 to 26.8 per 100 000 person-years, while the overall age-adjusted death rate increase was 12% at the time. On average, the group with falls as one of the contributing causes had 4.9 other contributing causes, while the group with falls as an underlying cause had 3.3; the two averages were statistically different. Incidence of death increased 60% (12.1-19.4 per 100 000) for falls classified as the underlying cause of death and 103% (3.6-7.3 per 100 000) for those with fall as a contributing cause. Coding for the type of fall became more specific with a 30% decrease in unspecified fall (International Classification of Diseases, 10th revision code W19) (5.9-4.1 per 100 000).

CONCLUSION: There was an increasing trend of unintentional fall-related adult deaths in Utah from 2010 to 2020. This increase is consistent with national trends. Our data supports there is more specific reporting of fall deaths, but better reporting alone cannot explain the uptrend. Furthermore, the deaths with falls as contributing causes increased the most, and these individuals have more comorbidities.

Language: en

Keywords: Community Research; Fall; Injury Diagnosis; Mortality; Multiple Injury; Public Health

High-frequency rTMS over bilateral primary motor cortex improves freezing of gait and emotion regulation in patients with Parkinson's disease: a randomized controlled trial

Song W, Zhang Z, Lv B, Li J, Chen H, Zhang S, Zu J, Dong L, Xu C, Zhou M, Zhang T, Xu R, Zhu J, Shen T, Zhou S, Cui C, Huang S, Wang X, Nie Y, Aftab K, Xiao Q, Zhang X, Cui G, Zhang W. *Front. Aging Neurosci.* 2024; 16: e1354455.

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Abstract

BACKGROUND: Freezing of gait (FOG) is a common and disabling phenomenon in patients with Parkinson's disease (PD), but effective treatment approach remains inconclusive. Dysfunctional emotional factors play a key role in FOG. Since primary motor cortex (M1) connects with prefrontal areas via the frontal longitudinal system, where are responsible for emotional regulation, we hypothesized M1 may be a potential neuromodulation target for FOG therapy. The purpose of this study is to explore whether high-frequency rTMS over bilateral M1 could relieve FOG and emotional dysregulation in patients with PD.

METHODS: This study is a single-center, randomized double-blind clinical trial. Forty-eight patients with PD and FOG from the Affiliated Hospital of Xuzhou Medical University were randomly assigned to receive 10 sessions of either active (N = 24) or sham (N = 24) 10 Hz rTMS over the bilateral M1. Patients were evaluated at baseline (T0), after the last session of treatment (T1) and 30 days after the last session (T2). The primary outcomes were Freezing of Gait Questionnaire (FOGQ) scores, with Timed Up and Go Test (TUG) time, Standing-Start 180° Turn (SS-180) time, SS-180 steps, United Parkinson Disease Rating Scales (UPDRS) III, Hamilton Depression scale (HAMD)-24 and Hamilton Anxiety scale (HAMA)-14 as secondary outcomes.

RESULTS: Two patients in each group dropped out at T2 and no serious adverse events were reported by any subject. Two-way repeated ANOVAs revealed significant group × time interactions in FOGQ, TUG, SS-180 turn time, SS-180 turning steps, UPDRS III, HAMD-24 and HAMA-14. Post-hoc analyses showed that compared to T0, the active group exhibited remarkable improvements in FOGQ, TUG, SS-180 turn time, SS-180 turning steps, UPDRS III, HAMD-24 and HAMA-14 at T1 and T2. No significant improvement was found in the sham group. The Spearman correlation analysis revealed a significantly positive association between the changes in HAMD-24 and HAMA-14 scores and FOGQ scores at T1.

CONCLUSION: High-frequency rTMS over bilateral M1 can improve FOG and reduce depression and anxiety in patients with PD.

Language: en

Keywords: emotion regulation; freezing of gait; Parkinson's disease; primary motor cortex; transcranial magnetic stimulation

Validation and improvement of the saga fall risk model: a multicenter retrospective observational study

Tago M, Hirata R, Katsuki NE, Nakatani E, Tokushima M, Nishi T, Shimada H, Yaita S, Saito C, Amari K, Kurogi K, Oda Y, Shikino K, Ono M, Yoshimura M, Yamashita S, Tokushima Y, Aihara H, Fujiwara M, Yamashita SI. *Clin. Interv. Aging* 2024; 19: 175-188.

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PMCID: PMC10859763

Abstract

PURPOSE: We conducted a pilot study in an acute care hospital and developed the Saga Fall Risk Model 2 (SFRM2), a fall prediction model comprising eight items: Bedriddenness rank, age, sex, emergency admission, admission to the neurosurgery department, history of falls, independence of eating, and use of hypnotics. The external validation results from the two hospitals showed that the area under the curve (AUC) of SFRM2 may be lower in other facilities. This study aimed to validate the accuracy of SFRM2 using data from eight hospitals, including chronic care hospitals, and adjust the coefficients to improve the accuracy of SFRM2 and validate it.

PATIENTS AND METHODS: This study included all patients aged ≥ 20 years admitted to eight hospitals, including chronic care, acute care, and tertiary hospitals, from April 1, 2018, to March 31, 2021. In-hospital falls were used as the outcome, and the AUC and shrinkage coefficient of SFRM2 were calculated. Additionally, SFRM2.1, which was modified from the coefficients of SFRM2 using logistic regression with the eight items comprising SFRM2, was developed using two-thirds of the data randomly selected from the entire population, and its accuracy was validated using the remaining one-third portion of the data.

RESULTS: Of the 124,521 inpatients analyzed, 2,986 (2.4%) experienced falls during hospitalization. The median age of all inpatients was 71 years, and 53.2% were men. The AUC of SFRM2 was 0.687 (95% confidence interval [CI]:0.678-0.697), and the shrinkage coefficient was 0.996. SFRM2.1 was created using 81,790 patients, and its accuracy was validated using the remaining 42,731 patients. The AUC of SFRM2.1 was 0.745 (95% CI: 0.731-0.758).

CONCLUSION: SFRM2 showed good accuracy in predicting falls even on validating in diverse populations with significantly different backgrounds. Furthermore, the accuracy can be improved by adjusting the coefficients while keeping the model's parameters fixed.

Language: en

Keywords: Humans; Risk Factors; Aged; Female; Male; accidental falls; Retrospective Studies; Pilot Projects; accident prevention; Risk Assessment/methods; *Hospitalization; *Hospitals; inpatients; validation study

Prediction of early falls using adherence and balance assessments in a convalescent rehabilitation ward

Teranishi T, Suzuki M, Yamada M, Maeda A, Yokota M, Itoh N, Tanimoto M, Osawa A, Kondo I. Fujita medical journal 2024; 10(1): 30-34.

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DOI: 10.20407/fmj.2022-037

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PMCID: PMC10847636

Abstract

OBJECTIVES: To predict falls by adding an adherence assessment to a static balance ability assessment, and to evaluate fall prediction accuracy.

METHODS: This study included 416 patients who were admitted to a 45-bed convalescent rehabilitation ward over a 2-year period. The patients were assessed at the time of admission using the Standing Test for Imbalance and Disequilibrium (SIDE) and three additional, newly developed adherence items. Patients were divided into two groups: a group that experienced falls (fall group) and a group that did not experience falls (non-fall group) within 14 days of admission. The sensitivity and specificity of the assessment items for predicting falls were calculated.

RESULTS: Sensitivity was 0.86 and specificity was 0.42 when the cutoff was between SIDE levels 0-2a and 2b-4. Combining balance assessment using the SIDE with the memory and instruction adherence items improved fall prediction accuracy such that the sensitivity was 0.75 and the specificity was 0.64.

CONCLUSIONS: Our analysis suggested that adherence assessment can improve fall risk prediction accuracy.

Language: en

Keywords: Adherence assessment; Convalescent rehabilitation ward; Fall prediction

The impact of mental state altering medications on preventable falls after total hip or total knee arthroplasty: a systematic review and meta-analysis

Wesselink EJ, van der Vegt M, Remmelzwaal S, Bossers SM, Franssen EJ, Swart EL, Boer C, de Leeuw MA. *Patient Saf. Surg.* 2024; 18(1): e6.

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DOI: 10.1186/s13037-023-00387-4

PMID: 38347630

Abstract

BACKGROUND: Joint replacement surgery of the lower extremities are common procedures in elderly persons who are at increased risk of postoperative falls. The use of mental state altering medications, such as opioids, antidepressants or benzodiazepines, can further contribute to impaired balance and risk of falls. The objective of the current systematic review was to evaluate the risk of the use of mental state altering medications on postoperative falls in patients undergoing total hip arthroplasty (THA) or total knee arthroplasty (TKA).

METHODS: A comprehensive search of Medline, Embase and Cochrane Controlled Trials Register was conducted from 1 October 1975 to 1 September 2021. The search was repeated in May 2023 and conducted from 1 October 1975 to 1 June 2023. Clinical trials that evaluated the risk of medication on postoperative THA and TKA falls were eligible for inclusion. Articles were evaluated independently by two researchers for risk of bias using the Newcastle-Ottawa Scale. A meta-analysis was performed to determine the potential effect of postoperative use of mental state altering medications on the risk of falls. Lastly, a qualitative synthesis was conducted for preoperative mental state altering medications use.

RESULTS: Seven cohort studies were included, of which five studies focussed on the postoperative use of mental state altering medications and two investigated the preoperative use. Meta-analysis was performed for the postoperative mental state altering medications use. The postoperative use of mental state altering medications was associated with fall incidents (OR: 1.81; 95% CI: 1.04; 3.17) ($p < 0.01$) after THA and TKA. The preoperative use of opioids > 6 months was associated with a higher risk of fall incidents, whereas a preoperative opioid prescription up to 3 months before a major arthroplasty had a similar risk as opioid-naïve patients.

CONCLUSIONS: The postoperative use of mental state altering medications increases the risk of postoperative falls after THA and TKA. Prior to surgery, orthopaedic surgeons and anaesthesiologists should be aware of the associated risks in order to prevent postoperative falls and associated injuries.

Language: en

Brain activation during standing balance control in dual-task paradigm and its correlation among older adults with mild cognitive impairment: a fNIRS study

Xu G, Zhou M, Chen Y, Song Q, Sun W, Wang J. BMC Geriatr. 2024; 24(1): e144.

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DOI: 10.1186/s12877-024-04772-1

PMID: 38341561

Abstract

BACKGROUND: This study aimed to compare the balance ability and functional brain oxygenation in the prefrontal cortex (PFC) among older adults with mild cognitive impairment (MCI) under single and dual tasks, and also investigate their relationship. Neural regulatory mechanisms of the brain in the MCI were shed light on in balance control conditions.

METHODS: 21 older adults with MCI (female = 12, age: 71.19 ± 3.36 years) were recruited as the experimental group and 19 healthy older adults (female = 9, age: 70.16 ± 4.54 years) as the control group. Participants completed balance control of single task and dual task respectively. Functional near-infrared spectroscopy (fNIRS) and force measuring platform are used to collect hemodynamic signals of the PFC and center of pressure (COP) data during the balance task, respectively.

RESULTS: The significant Group*Task interaction effect was found in maximal displacement of the COP in the medial-lateral (ML) direction (D-ml), 95% confidence ellipse area (95%AREA), root mean square (RMS), the RMS in the ML direction (RMS-ml), the RMS in the anterior-posterior (AP) direction (RMS-ap), sway path (SP), the sway path in the ML direction (SP-ml), and the sway path in the AP direction (SP-ap). The significant group effect was detected for five regions of interest (ROI), namely the left Brodmann area (BA) 45 (L45), the right BA45 (R45), the right BA10 (R10), the left BA46 (L46), and the right BA11 (R11). Under single task, maximal displacement of the COP in the AP direction (D-ap), RMS, and RMS-ap were significantly negatively correlated with R45, L45, and R11 respectively. Under dual task, both RMS and 95%AREA were correlated positively with L45, and both L10 and R10 were positively correlated with RMS-ap.

CONCLUSION: The MCI demonstrated worse balance control ability as compared to healthy older adults. The greater activation of PFC under dual tasks in MCI may be considered a compensatory strategy for maintaining the standing balance. The brain activation was negatively correlated with balance ability under single task, and positively under dual task. **TRIAL REGISTRATION:** ChiCTR2100044221 , 12/03/2021.

Language: en

Keywords: Balance; Functional near-infrared spectroscopy; MCI; Postural control; Prefrontal cortex

Physical activity, sedentary behavior, and the risk of frailty and falling: a Mendelian randomization study

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Abstract

BACKGROUND: Due to inconclusive evidence from observational studies regarding the impact of physical activity (PA) and sedentary behavior on frailty and falling risk, we conducted a two-sample Mendelian randomization analysis to investigate the causal associations between PA, sedentary behavior, and frailty and falls.

METHODS: We extracted summary data from genome-wide association studies conducted among individuals of European ancestry, encompassing PA ($n = 90\,667\text{--}608\,595$), sedentary behavior ($n = 372\,609\text{--}526\,725$), frailty index ($n = 175\,226$), and falling risk ($n = 451\,179$). Single nucleotide polymorphisms associated with accelerometer assessed fraction >425 milligravities, self-reported vigorous activity, moderate to vigorous physical activity (MVPA), leisure screen time (LST), and sedentary behavior at work were taken as instrumental variables. The causal effects were primarily estimated using inverse variance weighted methods, complemented by several sensitivity and validation analyses.

RESULTS: Genetically predicted higher levels of PA were significantly associated with a reduction in the frailty index (accelerometer assessed fraction >425 milligravities: $\beta = -0.25$, 95% CI = -0.36 to -0.14 , $p = 1.27 \times 10^{-5}$); self-reported vigorous activity: $\beta = -0.13$, 95% CI = -0.20 to -0.05 , $p = 7.9 \times 10^{-4}$); MVPA: $\beta = -0.28$, 95% CI = -0.40 to -0.16 , $p = 9.9 \times 10^{-6}$). Besides, LST was significantly associated with higher frailty index ($\beta = 0.18$, 95% CI = $0.14\text{--}0.22$, $p = 5.2 \times 10^{-20}$) and higher odds of falling (OR = 1.13, CI = 1.07-1.19, $p = 6.9 \times 10^{-6}$). These findings remained consistent throughout sensitivity and validation analyses.

CONCLUSIONS: Our study offers evidence supporting a causal relationship between PA and a reduced risk of frailty. Furthermore, it underscores the association between prolonged LST and an elevated risk of frailty and falls. Therefore, promoting PA and reducing sedentary behavior may be an effective strategy in primary frailty and falls prevention.

Language: en

Keywords: Humans; Accidental Falls; physical activity; frailty; Exercise;

*Frailty/genetics/prevention & control; causal effect; falling; Genome-Wide Association Study; Mendelian randomization; Mendelian Randomization Analysis; sedentary behavior; Sedentary Behavior