Safety Literature 14th November 2021

Assessment of mHealth solutions applied to fall detection for the elderly

de Oliveira FS, da Silva CC, Pinheiro TS, Yokoi LM, Dos Santos PD, Tanaka H, Simões PW. Stud. Health Technol. Inform. 2021; 285: 239-244.

DOI 10.3233/SHTI210606 **PMID** 34734880

Abstract

Mobile Health has been increasingly present in healthcare due to the wide availability of applications for smartphones, however, robust assessment methods must be considered, seeking to provide evidence for clinical practice and mHealth solutions. This research presents the assessment of applications aimed at detecting and preventing falls for the elderly, available for Android and IOS, through the Mobile App Rating Scale. Based on the results presented, it can be concluded that the fall detection and prevention applications for the elderly available for Android and IOS showed good quality after rigorous evaluation.

Language: en

Keywords

Prevention; Falls; Assessment; Digital Health; IoT; Mobile Health

Effect of clinical Pilates training on balance and postural control in patients with Parkinson's disease: a randomized controlled trial

Çoban F, Belgen Kaygısız B, Selcuk F. J. Comp. Eff. Res. 2021; ePub(ePub): ePub.

DOI 10.2217/cer-2021-0091 **PMID** 34726472

Abstract

BACKGROUND: Clinical pilates exercises have been shown to improve balance. Our study aims to compare effects of clinical Pilates and conventional physiotherapy exercises on balance and postural control in Parkinson's disease patients. Materials & methods: Forty patients were randomly assigned into either clinical Pilates (CLP) or conventional physiotherapy (COP) group. Exercises were performed twice a week for 8 weeks. Balance, lower-extremity strength, fall risk and functional mobility were assessed at the beginning and end of the exercise period.

RESULTS: All measurements indicated significant increase in two groups ($p < 0.05$). Compared with the COP group, the CLP group showed significant improvement in dynamic balance values ($p < 0.05$).

CONCLUSION: CLP was as effective as COP, with better dynamic balance results, and could be used in rehabilitation for patients with Parkinson's disease.

Clinical trial registration number: NCT04063605.

Language: en

Keywords

Parkinson’s disease; postural balance; physiotherapy; pilates training

Fall prevention programmes for older adults in the community: impact on rate of falls

Harrison J, Phoong KY, Hill J. Br. J. Community Nurs. 2021; 26(11): 540-543.

DOI 10.12968/bjcn.2021.26.11.540 **PMID** 34731036

Abstract

[The publisher has not provided an abstract for this article.]

Language: en

Falls risk is predictive of dysphagia in Parkinson's disease

Kobylecki C, Shiderova I, Boca M, Michou E. Neurol. Sci. 2021; ePub(ePub): ePub.

DOI 10.1007/s10072-021-05700-6 **PMID** 34731336

Abstract

OBJECTIVE: Evaluate the relationship between falls, freezing of gait, and swallowing disturbance in Parkinson's disease (PD).

BACKGROUND: Dysphagia is a common symptom in PD, and is often thought of as an axial feature along with falls and gait disturbance. It is of interest to examine the relationship between these symptoms in PD, given the possibility of shared pathophysiology due to non-dopaminergic and extranigral dysfunction.

METHODS: We recruited 29 consecutive non-demented patients with idiopathic PD and at least one clinically determined impairment in swallowing, falls, or freezing of gait. Swallow dysfunction was assessed using the Swallowing Disturbance Questionnaire (SDQ). The Falls Efficacy Scale and Freezing-of-gait questionnaire were recorded. Correlation analysis and multiple regression were used to determine the relationship between swallow and gait disturbance.

RESULTS: Total SDQ score correlated strongly with the falls efficacy scale (Spearman's rho = 0.594; P = 0.001), but not with the freezing-of-gait score. Linear regression controlling for other factors associated with dysphagia identified falls efficacy score as a significant predictor of swallow dysfunction.

CONCLUSIONS: The severity of dysphagia in PD is closely related to severity of falls, but not gait freezing. This may be helpful to more precisely determine the anatomical substrate of levodopa-resistant axial symptoms in PD and provide clues to further management.

Language: en

Keywords

Falls; Parkinson’s disease; Dysphagia

Mind the gaps: functional networks disrupted by white matter hyperintensities are associated with greater falls risk

Crockett RA, Hsu CL, Dao E, Tam R, Alkeridy W, Eng JJ, Handy TC, Liu-Ambrose T. Neurobiol. Aging 2021; 109: 166-175.

DOI 10.1016/j.neurobiolaging.2021.09.023 **PMID** 34740078

Abstract

White matter hyperintensities (WMH) are associated with greater falls risk and slow gait speed. Whether these deficits are caused by the disruption of large-scale functional networks remains inconclusive. Further, physical activity moderates the association between WMHs and falls, but whether this extends to the disruption of functional networks remains unknown. One hundred and sixty-four adults (>55 years old) were included in this study. Using lesion network mapping, we identified significant correlations between the percentage of WMH-related disruption of the dorsal attention network and Physiological Profile Assessment (PPA) score ($r = 0.24$, $p < 0.01$); and between disruption of both the sensorimotor ($r = 0.23$, $p < 0.01$) and ventral attention networks ($r = 0.21$, $p = 0.01$) with foam sway. There were no significant associations with floor sway or gait speed. Physical activity moderated the association between the dorsal attention network and PPA score ($p = 0.045$). Thus, future research should investigate whether physical activity should be recommended in the clinical management of older adults with cerebral small vessel disease.

Language: en

Keywords

Physical activity; Cerebral small vessel disease; Falls risk; Functional connectivity; Postural sway; White matter hyperintensities

Protocol for a systematic review and meta-analysis assessing the effectiveness of deprescribing in falls prevention in older people

Seppala LJ, Kamkar N, Ryg J, Masud T, Daams J, Montero-Odasso MM, Hartikainen S, Petrovic M, van der Velde N. BMJ Open 2021; 11(11): e047190.

DOI 10.1136/bmjopen-2020-047190 **PMID** 34732476

Abstract

INTRODUCTION: One of the known risk factors for fall incidents is the use of specific medications, fall-risk-increasing drugs (FRIDs). However, to date, there is uncertainty related to the effectiveness of deprescribing as a single intervention in falls prevention. Thus, a comprehensive update of the literature focusing on all settings in which older people receive healthcare and all deprescribing interventions is warranted to enhance the current knowledge.

METHODS AND ANALYSIS: This systematic review protocol follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. A systematic search was performed in Cochrane Central Register of Controlled Trials, MEDLINE, Embase and PsycINFO (2 November 2020). We will also search in trial registers. We will include randomised controlled trials, in which any deprescribing intervention is compared with usual care and reports falls as an outcome. Both title and abstract screening and full-text screening will be done by two reviewers. The Cochrane Collaboration revised tool of Risk of Bias will be applied to perform risk of bias assessment. We will categorise the results separately for every setting. If a group of sufficiently comparable studies will be identified, we will perform a meta-analysis applying random effects model. We will investigate heterogeneity using a combination of visual inspection of the forest plot along with consideration of the $\chi(2)$ test and the I(2) statistic results. We have prespecified several subgroup and sensitivity analyses. ETHICS AND DISSEMINATION: Ethics approval is not applicable for this study since no original data will be collected. The results will be disseminated through peer-reviewed publication and conference presentations. Furthermore, this systematic review will inform the recommendations of working group of polypharmacy and FRIDs of the anticipated World's Falls Guidelines. PROSPERO REGISTRATION NUMBER: CRD42020218231.

Language: en

Keywords

public health; adverse events; geriatric medicine

Protocol for GET FIT Prostate: a randomized, controlled trial of group exercise training for fall prevention and functional improvements during and after treatment for prostate cancer

Winters-Stone KM, Li F, Horak F, Dieckmann N, Hung A, Amling C, Beer TM. Trials 2021; 22(1): e775.

DOI 10.1186/s13063-021-05687-7 **PMID** 34742325

Abstract

BACKGROUND: Many prostate cancer survivors are treated with androgen deprivation therapy (ADT), but these therapies may increase frailty, worsen physical functioning, and increase fall risk. While exercise may counter functional declines associated with ADT, no studies have tested whether and which type of exercise may reduce falls and frailty. The purpose of this trial is to compare the relative efficacy of strength training versus tai ji quan training against each other and to a stretching control group on falls, frailty, and physical functioning in men expose to ADT for prostate cancer.

METHODS: Prostate cancer survivors treated with ADT (N = 360) who have fallen in the past year or are at risk of a fall based on validated risk factors will be recruited to participate in this single-blind, parallel group, randomized trial. Participants will be randomized to one of three supervised, group training programs: (i) strength training, (ii) tai ji quan training, or (iii) stretching (control), that train 3×/week for 6 months. Outcomes are assessed at baseline, 3 (mid-intervention), 6 (immediately post-intervention), and 12 (follow-up) months. The primary outcome is falls assessed by monthly self-report. Secondary outcomes include the following: frailty (low lean body mass (by bioelectrical impedance analysis), exhaustion (by SF-36 vitality scale), low activity (by CHAMPS physical activity survey), slowness (by 4 m usual walk speed), and weakness (by chair stand time)); objective and subjective measures of physical function will also be collected. Negative binomial regression models will be used to assess differences in falls between groups, while mixed effects modeling will be used to compare the relative efficacy of training group on secondary outcomes.

DISCUSSION: Exercise represents a non-pharmacologic approach to mitigate the problem of falls experienced among men treated with ADT. By engaging in appropriate exercise, men may be able to avoid or delay falls, frailty, and disability associated with their cancer treatment.

FINDINGS of the trial are expected to inform clinical practice about how exercise could be prescribed as part of cancer care for prostate cancer survivors prescribed ADT. TRIAL REGISTRATION: ClinicalTrials.gov NCT03741335. Registered on November 18, 2018. Language: en

Keywords
Physical activity; Falls; Exercise; Frailty; Prostate cancer

The effects of a home-based combined motor control and ergonomic program on functional ability and fear of falling: a randomized controlled trial

Stasi S, Tsekoura M, Gliatis J, Sakellari V. Cureus 2021; 13(9): e18330.

DOI 10.7759/cureus.18330 **PMID** 34725593

Abstract

OBJECTIVEs Physical exercise is a key intervention for improving functional ability and preventing falls in older people. However, the implemented interventions targeted balance, gait, and muscle strength, while little is known regarding motor control exercises in this population. Therefore, this study aimed to investigate the effects of a 12-week home-based motor control exercise program combined with an ergonomic home modification (the McHeELP program). Patients and methods Fifty-two older people (aged ≥65 years), who had experienced at least one fall incident in the past 12 months, were randomly assigned into two groups; the McHeELP group (McHeELP-G) (n=26) that received the McHeELP program and the control group (CG) (n=26). Physical performance measures (PPMs) and patient-reported outcomes (PROs) were used to evaluate participants. At baseline, 3rd month (post-intervention), and again at 6th month (follow up), balance control was assessed using the Tandem stance test (Tandem) and the Functional Reach Test (FRT). Functionality was assessed by the 4 meters walking test (4MWT), Timed Up and Go (TUG) test, 30 seconds-Sit to stand test and the Greek version of Lower Extremity Functional Scale (LEFS-Greek). The Greek version of the Falls Self-efficacy International scale (FES-I_GREEK) was used for the evaluation of "fear-of-falling" (FOF). The home falls and accidents screening tool (HOMEFAST) is used to identify home hazards. Two-way mixed ANOVA model, independent samples t-test, One-factor Repeated Measures ANOVA model and ANCOVA model were used for the statistical analysis of the data.

RESULTS Homogeneity was found between McHeELP-G and CG regarding the demographic and clinical characteristics, and no statistically significant difference was found at baseline measurements of PROs and PPMs, except HOMEFAST (p=0.031). Post-intervention (3rd month), the comparison of the absolute values between groups revealed that the McHeELP-G achieved statistically significant better balance control (longer Tandem stance test and higher values of FRT), better functionality [faster gait speed (4MWT), shorter TUG performance time, and a higher number of repetitions at 30 seconds-Sit to stand] (all p-values <0.05), while no difference was found for LEFS-Greek score (p=0.095), compared to CG. In addition, McHeELP-G reported lesser FOF than CG [lower FES-I_GREEK score (p=0.041)], and fewer home-hazards [lower HOMEFAST score (p=0.041)]. At follow up measurement (6th month), all PPMs scores of McHeELP-G, regarding balance control and functionality, were remained statistically significant (all p-values <0.005), and the FES-I_GREEK score (p=0.034), while no difference was found between groups for LEFS-Greek score (p=0.146) and HOMEFAST score (p=0.185). Sensitivity analysis (from baseline to 3rd and 6th month) revealed similar findings to the "comparison of the absolute values between groups" analysis. The within-group changes from baseline to 3rd month of McHeELP-G were

statistically significant improved for all PPMs and PROs (all p-values <0.05), while in CG, statistical significant difference was found for TUG, FRT-right, and HOMEFAST (p<0.05). Those within-group changes were also preserved until 6th month.

CONCLUSIONS The study's findings provide encouraging evidence that McHeELP program may increase functional ability and decrease FOF of older people. However, further research is required for a thorough understanding of the effect of McHeELP program.

Language: en

Keywords

falls; fear of falling; motor control exercise; older people; physiotherapy interventions

A systematic review of one-legged balance performance and falls risk in community-dwelling adults

Blodgett JM, Ventre JP, Mills R, Hardy R, Cooper R. Ageing Res. Rev. 2021; ePub(ePub): ePub.

DOI 10.1016/j.arr.2021.101501 **PMID** 34748974

Abstract

OBJECTIVE: The aim of this systematic review was to synthesise all published evidence on associations between one-legged balance performance and falls.

METHODS: Medline, EMBASE, CINAHL and Web of Science were systematically searched (to January 2021) to identify peer-reviewed, English language journal articles examining the association between one-legged balance performance and falls in community-dwelling adults.

RESULTS: Of 4 310 records screened, 55 papers were included (n=36 954 participants). There was considerable heterogeneity between studies including differences in study characteristics, ascertainment of balance and falls, and analytical approaches. A meta-analysis of the time that individuals could maintain the one-legged balance position indicated that fallers had worse balance times than non-fallers (standardised mean difference: -0.29(95%CI:-0.38,-0.20) in cross-sectional analyses; -0.19(-0.28,-0.09) in longitudinal analyses), although there was no difference in the pooled median difference. Due to between-study heterogeneity, regression estimates between balance and fall outcomes could not be synthesised. Where assessed, prognostic accuracy indicators suggested that one-legged balance was a poor discriminator of fall risk; for example, 5 of 7 studies demonstrated poor prognostic accuracy (Area Under the Curve <0.6), with most studies demonstrating poor sensitivity.

CONCLUSIONS: This systematic review identified 55 papers that examined associations between balance and fall risk, the majority in older aged adults. However, the evidence was commonly of low quality and results were inconsistent. This contradicts previous perceptions of one-legged balance as a useful fall risk tool and highlights crucial gaps that must be addressed in order to translate such assessments to clinical settings.

Language: en

Keywords

community-dwelling; falls; one-legged balance; systematic review

Anterior load carriage increases the risk of falls in young adults following a slip in gait

Yang F, Ban R, Yang F. Safety Sci. 2022; 145: e105489.

DOI 10.1016/j.ssci.2021.105489 **PMID** unavailable

Abstract

Most workplace musculoskeletal injuries result from slip-related falls while carrying a load. Although prior studies inspected the effects of front load carriage on spatiotemporal gait parameters, it remains unclear how the anterior load carriage alters the risk of falls after a slip. This study sought to inspect the impact of anterior load carriage on slip-falls. Thirty young adults were evenly randomized into three groups, each assigned a different anterior load (0%, 10%, or 20% of the bodyweight). Under the protection of a safety harness, all participants were exposed to an unexpected and standardized gait-slip perturbation while walking on a treadmill and carrying the assigned load. Their body's responses to the slip were gathered using a motion capture system. The primary (the slip outcome: fall vs. recovery) and secondary measurements (dynamic gait stability, angular momentum, and downward velocity of the body-load system's center of mass or COM) were determined. The results revealed that an increase in the weight carried raises the rate of falls after a slip. The poor control over the COM's angular momentum and descent, but not dynamic gait stability, were the factors leading to slip-falls during gait for individuals carrying a front load. The findings from this study could shed light on the mechanisms of front load carriage increasing the risk of slip-falls. This can provide preliminary references for designing and assessing safety standards for occupations in which anterior load carriage is necessary to reduce the risk of slip-falls and the resulting injuries.

Language: en

Keywords

Angular momentum; Anterior load carriage; Injury; Slip, Fall prevention; Stability

Association between physical capacity and occupational falls among middle-aged and older farmers in Thailand: using the self-check risk assessment tool in Japan

Arphorn S, Lertvarayut T, Kiatkitroj K, Theppitak C, Manothum A, Hara K, Ishimaru T. J. Occup. Health 2021; 63(1): e12287.

DOI 10.1002/1348-9585.12287 **PMID** 34734459

Abstract

OBJECTIVES: Declining physical capacity caused by aging increases the risk of occupational falls on the same level and to lower levels. In emerging countries in Asia, the development of a program for older farmers to assess their risk of occupational falls is valuable. The current study aimed to evaluate the relationship between physical capacity and experience of occupational falls among middle-aged and older Thai farmers.

METHODS: We conducted a cross-sectional survey of 419 Thai farmers aged 40 years and over during March and April, 2021. For the assessment of physical capacity, we used the Self-Check Risk Assessment of Falls and Other Accidents in the Workplace tool developed in Japan, consisting of five physical test components. Multiple logistic regression and receiver operating characteristic curves were used to analyze the data.

RESULTS: The results revealed that 25.5% of participants had experienced occupational falls in the past 12 months. For each of the five physical test components, there was no significant association between physical capacity and experience of occupational falls. The area under the receiver operating characteristic curve was less than 0.60 for each of the five physical test components. A similar trend was observed when the analysis was limited to participants aged 50 years and over.

CONCLUSIONS: The current study did not reveal any associations between physical capacity in each test and experience of occupational falls among middle-aged and older Thai farmers. Because the mechanisms underlying occupational falls are complex, multiple intervention approaches may be important for preventing accidents.

Language: en

Keywords

aging; agriculture; fall; farmer; occupational safety

Association between sleep quality and falls: a nationwide population-based study from South Korea

Lee S, Chung JH, Kim JH. Int. J. Gen. Med. 2021; 14: 7423-7433.

DOI 10.2147/IJGM.S331103 **PMID** 34744453

Abstract

PURPOSE: There are few large studies evaluating the association between sleep quality and the risk of falls. We aimed to determine the independent effect of poor sleep quality on an increased risk of falls using a large-sample dataset.

METHODS: We conducted a retrospective, cross-sectional study using population-based data from the 2018 Korean Community Health Survey on 201,700 participants. Sociodemographic, mental health-related, and physical health-related variables as well as sleep quality evaluated by the Pittsburgh Sleep Quality Index (PSQI) were compared between 2499 fallers who have experienced at least one fall during the past 12 months and 199,201 non-fallers. Multivariable logistic regression was performed to identify sleep quality variables significantly associated with an increased risk of falls.

RESULTS: Fallers had poorer sleep quality (PSQI score >5) and higher scores for global PSQI and individual PSQI components than did non-fallers (all $p < 0.001$). Multivariable logistic regression adjusted for potential confounders including socioeconomic, physical health-related, and mental health-related variables showed that an increased risk of falls was associated with poor sleep quality (odds ratio [OR] 1.30, 95% confidence interval [CI] 1.19-1.42). Subgroup analyses by age revealed that poor sleep quality was significantly associated with an increased risk of falls in all three adult age groups. Multivariable logistic regression using the seven PSQI components revealed that an increased risk of falls was associated with short sleep duration (OR 1.14, CI 1.09-1.20), increased sleep disturbances (OR 1.30, CI 1.16-1.46), and increased daytime dysfunctions (OR 1.21, CI 1.08-1.13).

CONCLUSION: Poor sleep quality caused by short sleep duration may be a principal risk factor of falls in adult populations. Increased sleep disturbances and daytime dysfunctions may also contribute to an increased risk of falls. Our results have clinical and public health perspectives that increasing sleep duration and reducing daytime dysfunctions and sleep disturbances could mitigate unintentional falls.

Language: en

Keywords

falls; Pittsburgh sleep quality index; sleep quality

Systematic review and meta-analysis of clinical trials: In-hospital use of sensors for prevention of falls

Cortés OL, Piñeros H, Aya PA, Sarmiento J, Arévalo I. Medicine (Baltimore) 2021; 100(41): e27467.

DOI 10.1097/MD.0000000000027467 **PMID** 34731123

Abstract

BACKGROUND: Intra-hospital falls have become an important public health problem globally. The use of movement sensors with alarms has been studied as elements with predictive capacity for falls at hospital level. However, in spite of their use in some hospitals throughout the world, evidence is lacking about their effectiveness in reducing intra-hospital falls. Therefore, this study aims to develop a systematic review and meta-analysis of existing scientific literature exploring the impact of using sensors for fall prevention in hospitalized adults and the elderly population.

METHODS: We explored literature based on clinical trials in Spanish, English, and Portuguese, assessing the impact of devices used for hospital fall prevention in adult and elderly populations. The search included databases such as IEEE Xplore, the Cochrane Library, Scopus, PubMed, MEDLINE, and Science Direct databases. The critical appraisal was performed independently by two researchers.

METHODological quality was assessed based on the ratings of individual biases. We performed the sum of the results, generating an estimation of the grouped effect (Relative Risk, 95% CI) for the outcome first fall for each patient. We assessed heterogeneity and publication bias. The study followed PRISMA guidelines.

RESULTS: Results were assessed in three randomized controlled clinical trials, including 29,691 patients. A total of 351 (3%) patients fell among 11,769 patients assigned to the intervention group, compared with 426 (2.4%) patients who fell among 17,922 patients assigned to the control group (general estimation RR 1.20, 95% CI 1.04, 1.37, P=.02, I2=0%; Moderate GRADE).

CONCLUSION: Our results show an increase of 19% in falls among elderly patients who are users of sensors located in their bed, bed-chair, or chair among their hospitalizations. Other types of sensors such as wearable sensors can be explored as coadjutants for fall prevention care in hospitals.

Language: en

The role of the US trauma centers in older adult fall prevention: a national survey

Allee L, Faul M, Guntipalli P, Burke PA, Rao SR, Reed DNJ, Gross R, Duncan TK, Palmieri TL, Cooper Z, Bulger EM, Stewart RM, Kuhls DA. Am. Surg. 2021; ePub(ePub): ePub.

DOI 10.1177/00031348211047509 **PMID** 34748452

Abstract

INTRODUCTION: Approximately 27.5% of adults 65 and older fall each year, over 3 million are treated in an emergency department, and 32 000 die. The American College of Surgeons and its Committee on Trauma (ACSCOT) have urged trauma centers (TCs) to screen for fall risk, but information on the role of TC in this opportunity for prevention is largely unknown.

METHODS: A 29-item survey was developed by an ACSCOT Injury Prevention and Control Committee, Older Adult Falls workgroup, and emailed to 1000 trauma directors of the National Trauma Data Bank using Qualtrics. US TCs were surveyed regarding fall prevention, screening, intervention, and hospital discharge practices. Data collected and analyzed included respondent's role, location, population density, state designation or American College of Surgeons (ACS) level, if teaching facility, and patient population.

RESULTS: Of the 266 (27%) respondents, 71% of TCs include fall prevention as part of their mission, but only 16% of TCs use fall risk screening tools. There was no significant difference between geographic location or ACS level. The number of prevention resources ($F = 31.58$, $P < .0001$) followed by the presence of a formal screening tool ($F = 21.47$, $P < .0001$) best predicted the presence of a fall prevention program.

CONCLUSION: Older adult falls remain a major injury risk and injury prevention opportunity. The majority of TCs surveyed include prevention of older adult falls as part of their mission, but few incorporate the components of a fall prevention program. Development of best practices and requiring TCs to screen and offer interventions may prevent falls.

Language: en

Keywords

elderly; trauma; falls; fall injuries; fall prevention