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Accelerometry-based assessment and detection of early signs of balance deficits

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Abstract

Falls are the cause for more than half of the injury-related hospitalizations among older people. Accurate assessment of individuals' fall risk could enable targeted interventions to reduce the risk. This paper presents a novel method for using wearable accelerometers to detect early signs of deficits in balance from gait. Gait acceleration data were analyzed from 35 healthy female participants (73.86 ± 5.40 years). The data were collected with waist-mounted accelerometer and the participants performed three supervised balance tests: Berg Balance Scale (BBS), Timed-Up-and-Go (TUG) and 4m walk. The follow-up tests with the same protocol were performed after one year. Altogether 43 features were extracted from the accelerometer signals. Sequential forward floating selection and ten-fold cross-validation were applied to determine models for 1) estimating the outcomes of BBS, TUG and 4m walk tests and 2) predicting decline in balance during one-year follow-up indicated as decline in BBS total score and one leg stance. Normalized root-mean-square errors (RMSE) of the assessment scale result estimates were 0.28 for BBS score, 0.18 for TUG time, and 0.22 for 4m walk test. Area under curve (AUC) was 0.78 for predicting decline in BBS total score and 0.82 for one leg stance, respectively. The results suggest that the gait features can be used to estimate the result of a clinical balance assessment scale and predict decline in balance. A simple walk test with wearable monitoring could be applicable as an initial screening tool to identify people with early signs of balance deficits.

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Activities-specific balance confidence scale for predicting future falls in Indian older adults

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DOI 10.2147/CIA.S133523 **PMID** 28435236 **PMCID** PMC5391867

Abstract

BACKGROUND: Activities-specific balance confidence (ABC) scale is a subjective measure of confidence in performing various ambulatory activities without falling or experiencing a sense of unsteadiness.

OBJECTIVE: This study aimed to examine the ability of the Hindi version of the ABC scale (ABC-H scale) to discriminate between fallers and non-fallers and to examine its predictive validity for prospective falls.

DESIGN: This was a prospective cohort study.

MATERIALS AND METHODS: A total of 125 community-dwelling older adults (88 were men)

completed the ABC-H scale. The occurrence of falls over the follow-up period of 12 months was recorded. Discriminative validity was analyzed by comparing the total ABC-H scale scores between the faller and non-faller groups. A receiver operating characteristic curve analysis and a logistic regression analysis were used to examine the predictive accuracy of the ABC-H scale.

RESULTS: The mean ABC-H scale score of the faller group was significantly lower than that of the non-faller group (52.6 ± 8.1 vs 73.1 ± 12.2 ; $P < 0.001$). The optimal cutoff value for distinguishing faller and non-faller adults was ≤ 58.13 . The sensitivity, specificity, area under the curve, and positive and negative likelihood ratios of the cutoff score were 86.3%, 87.3%, 0.91 ($P < 0.001$), 6.84, and 0.16, respectively. The percentage test accuracy and false-positive and false-negative rates were 86.87%, 12.2%, and 13.6%, respectively. A dichotomized total ABC-H scale score of ≤ 58.13 (adjusted odds ratio = 0.032, 95% confidence interval = 0.004-0.25, $P = 0.001$) was significantly related with future falls.

CONCLUSION: The ABC-H scores were significantly and independently related with future falls in the community-dwelling Indian older adults. The ability of the ABC-H scale to predict future falls was adequate with high sensitivity and specificity values.

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Development of a falls reduction yoga program for older adults-A pilot study

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Complement. Ther. Med. 2017; 31: 118-126.

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Abstract

OBJECTIVES: Work with local rural organizations to develop an evidence-based hatha yoga program intended to improve core strength and balance to reduce falls risk. Feasibility determined by successful recruiting, intervention and evaluation of participants and acceptable frequency of adverse events.

DESIGN: Single-arm pilot study.

SETTING: Rural Wisconsin town of 4200 people.

INTERVENTION: Eight week yoga program with weekly group classes and home yoga practice three times per week.

MAIN OUTCOME MEASURES: The primary outcomes were (1) ability to enroll at least 20 participants, (2) participant completion of intervention and post-intervention evaluation, and (3) adverse event description and frequency.

RESULTS: A convenience sample of 20 adults over age 59 was enrolled and started the program with one drop out. Participants attended a mean of 7.1 (SD 1.47) of the 8 classes and a total of 141 out of 160 (88.1%) classes. Nineteen (95%) completed follow up evaluation. Participants reported 4 falls in the month before the intervention and 1 fall the month before the post-intervention evaluation ($p = 0.34$). No other serious adverse events occurred.

CONCLUSIONS: This project suggests an evidence-based yoga program designed to improve core strength and balance is feasible and acceptable to participants. Future research will include a randomized trial to assess impact on falls risk.

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Effects of a simple home-based exercise program on fall prevention in older adults: a 12-month primary care setting, randomized controlled trial

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Geriatr. Gerontol. Int. 2017; ePub(ePub): ePub.

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DOI 10.1111/ggi.13052 **PMID** 28436154

Abstract

AIM: To investigate the effects of a simple home-based exercise program on falls, physical functioning, fear of falling and quality of life in a primary care setting.

METHODS: Participants (n = 439), aged ≥65 years with mild-to-moderate balance dysfunction were randomly assigned to an exercise (n = 219) or control (n = 220) group. The program consisted of five combined exercises, which progressed in difficulty, and a walking plan. Controls received fall prevention education. Physical functioning and other outcomes were measured at 3- and 6-month follow-up visits. Falls were monitored with fall diaries and phone interviews at 3, 6, 9, and 12 months respectively.

RESULTS: The 12 months of the home-based exercise program showed the incidence of falls was 0.30 falls per person year in the exercise group, compared with 0.40 in the control group. The estimated incidence rate ratio was 0.75 (95% CI 0.55-1.04), which was not statistically significant. The fear of falling (measured by the Thai fall efficacy scale) was significantly lower in the exercise than control group (24.7 vs 27.0, P = 0.003). Also, the trend of program adherence increased in the exercise group. (29.6% to 56.8%).

CONCLUSIONS: This simple home-based exercise program showed a reduction in fear of falling and a positive trend towards exercise adherence. Further studies should focus on factors associated with exercise adherence, the benefits of increased home visits and should follow participants longer in order to evaluate the effects of the program. *Geriatr Gerontol Int* 2017; ••: ••-••.

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Effects of aging on prefrontal brain activation during challenging walking conditions

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Brain Cogn. 2017; 115: 41-46.

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Abstract

BACKGROUND: Deficits in cognitive domains, in particular, those related to the prefrontal cortex, contribute to diminished walking performance in complex conditions in older age. Studies using functional near infra-red spectroscopy (fNIRS) reported inconsistent findings of brain activation age-related changes in response to increased task demands. We aimed to study the effects of aging on

gait and prefrontal activation in complex walking tasks with internal and external task demands.

METHODS: Twenty-three healthy young adults (30.9 ± 3.7 yrs) and 20 healthy older adults (69.7 ± 5.8 yrs) participated in this study. Gait and prefrontal activation were assessed during three walking conditions: (1) usual walking, (2) dual tasking (internal task demands) and, (3) obstacle negotiation (external task demands). fNIRS measured changes in oxygenated hemoglobin concentrations in the prefrontal cortex.

RESULTS: Several gait measures were worse in older compared to younger adults under all walking conditions ($p < 0.005$). Even at the lowest level of challenge, older adults had significant increases in HbO₂ levels during usual walking, relative to standing ($p = 0.006$). Both groups showed increased activation during dual-task ($p < 0.002$) and during obstacle negotiation ($p < 0.003$).

CONCLUSIONS: Prefrontal activation during walking is dependent on age and task properties and that older adults apparently rely more on cognitive resources even during usual walking task.

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Effects of attentional focus on walking stability in elderly

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Gait Posture 2017; 55: 94-99.

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DOI 10.1016/j.gaitpost.2017.03.031 **PMID** 28433868

Abstract

INTRODUCTION: Balance performance in the elderly is related to psychological factors such as attentional focus. We investigated the effects of internal vs. external focus of attention and fall history on walking stability in healthy older adults.

METHOD: Walking stability of twenty-eight healthy older adults was assessed by applying random unilateral decelerations on a split-belt treadmill and analysing the resulting balance recovery movements. The internal focus instruction was: concentrate on the movement of your legs, whereas the external focus instruction was: concentrate on the movement of the treadmill. In both conditions participants were asked to look ahead at a screen. Outcome measures were coefficient of variation of step length and step width, and characteristics of the centre of mass velocity time-series as analysed using statistical parametric mapping. Fall history was assessed using a questionnaire.

RESULTS: After each perturbation participants required two to three strides to regain a normal gait pattern, as determined by the centre of mass velocity response. No effects were found of internal and external focus of attention instructions and fall history on any of the outcome measures.

DISCUSSION: We conclude that, compared to an internal focus of attention instruction, external focus to the walking surface does not lead to improved balance recovery responses to gait perturbations in the elderly.

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Evidence for a selectively regulated prioritization shift depending on walking situations in older adults

Salkovic D, Hobert MA, Bellut C, Funer F, Renno S, Haertner L, Hasmann SE, Staebler J, Geritz J, Suenkel U, Fallgatter AJ, Eschweiler GW, Berg D, Maetzler W.

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DOI 10.3389/fnagi.2017.00075 **PMID** 28420979 **PMCID** PMC5378715

Abstract

BACKGROUND: Older adults have increased risks of balance issues and falls when walking and performing turns in daily situations. Changes of prioritization during different walking situations associated with dual tasking may contribute to these deficits. The objective of this study was therefore to investigate whether older adults demonstrate changes of prioritization during different walking paths.

METHODS: In total, 1,054 subjects with an age range from 50 to 83 years were selected from the first follow-up visit of the TREND (Tuebinger evaluation of Risk factors for Early detection of Neurodegenerative Disorders) study. They were classified according to their performance on the Trail Making Test (TMT) into good and poor TMT performers (based on recent results showing that cognitive flexibility affects prioritization strategies during straight walking). Absolute dual-task performance and relative dual-task costs (DTC, relative performance under dual-task conditions compared with single-task conditions) were assessed in two paradigms: walking while subtracting serial 7 s and walking while checking boxes on a clipboard. Both tasks were performed on straight and curved paths.

RESULTS: Overall, the poor TMT performers group performed worse in all single and dual tasks. Interestingly, the relative change in performance measured by dual-task costs differed in the groups between the two walking paths. On straight paths, poor TMT performers had a similar DTC of walking to that of good performers ($p = 0.10$) but had a significantly lower DTC of subtracting ($p = 0.02$). On curved paths, poor performers had a similar DTC of subtracting ($p = 0.10$), but their DTC of walking was significantly higher ($p < 0.0001$).

CONCLUSION: Given that walking on curved paths is considered more difficult than that on straight paths and that the serial subtracting dual task is more difficult than the box checking dual task, this study in older adults provides evidence for the existence of a (walking) situation-dependent change of prioritization. If confirmed in other studies, situation-dependent change of prioritization should be included as a potential factor contributing to gait and balance impairments, and increased fall risk in older adults.

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Factors affecting mortality in older trauma patients - a systematic review and meta-analysis

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Injury 2017; ePub(ePub): ePub.

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Abstract [Abstract unavailable]

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Falls in people with Parkinson's disease: a prospective comparison of community and home-based falls

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Gait Posture 2017; 55: 62-67.

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DOI 10.1016/j.gaitpost.2017.04.005 **PMID** 28419875

Abstract

BACKGROUND: Falls are common and debilitating in people with Parkinson's disease (PD) and restrict participation in daily activities. Understanding circumstances of falls in the community and at home may assist clinicians to target therapy more effectively.

OBJECTIVE: To compare the characteristics of community and home fallers and the circumstances that contribute to falls in people living with PD.

METHODS: People with mild-moderately severe PD (n=196) used a daily falls diary and telephone hotline to report prospectively the occurrence, location and circumstances of falls over 14 months.

RESULTS: 62% of people with PD fell, with most falling at least once in the community. Compared to people who fell at home, the community-only fallers had shorter durations of PD (p=0.012), less severe disease (p=0.008) and reported fewer falls in the year prior to the study (p=0.003). Most falls occurred while people were ambulant, during postural transitions and when medication was working well. Community-based falls were frequently attributed to environmental factors such as challenging terrains (p<0.001), high attention demands (p=0.029), busy or cluttered areas (p<0.001) and tasks requiring speed (p=0.020). Physical loads were more often present in home than community-based falls (p=0.027).

CONCLUSION: Falls that occur in the community typically affect people with earlier PD and less severe disease than home-based falls. Individuals experiencing community-based falls may benefit from physiotherapy to manage challenging environments and high attention demands.

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Have we been overestimating fall rates in Parkinson's disease?

Beaulieu ML, Müller MLTM, Bohnen NI.

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(Copyright © 2017, Movement Disorders Society, Publisher John Wiley and Sons)

DOI 10.1002/mds.26994 **PMID** 28429881

Abstract [Abstract unavailable]

PDF Endnote

Have we been overestimating fall rates in Parkinson's disease?

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Mov. Disord. 2017; ePub(ePub): ePub.

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(Copyright © 2017, Movement Disorders Society, Publisher John Wiley and Sons)

DOI 10.1002/mds.27009 **PMID** 28429864

Abstract [Abstract unavailable]

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Interrater and test-retest reliability and validity of the Norwegian version of the BESTest and mini-BESTest in people with increased risk of falling

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BMC Geriatr. 2017; 17(1): e92.

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Abstract

BACKGROUND: The Balance Evaluation Systems Test (BESTest) was developed to assess underlying systems for balance control in order to be able to individually tailor rehabilitation interventions to people with balance disorders. A short form, the Mini-BESTest, was developed as a screening test. The study aimed to assess interrater and test-retest reliability of the Norwegian version of the BESTest and the Mini-BESTest in community-dwelling people with increased risk of falling and to assess concurrent validity with the Fall Efficacy Scale-International (FES-I), and it was an observational study with a cross-sectional design.

METHODS: Forty-two persons with increased risk of falling (elderly over 65 years of age, persons with a history of stroke or Multiple Sclerosis) were assessed twice by two raters. Relative reliability was analysed with Intraclass Correlation Coefficient (ICC), and absolute reliability with standard error of measurement (SEM) and smallest detectable change (SDC). Concurrent validity was assessed against the FES-I using Spearman's rho.

RESULTS: The BESTest showed very good interrater reliability (ICC = 0.98, SEM = 1.79, SDC95 = 5.0) and test-retest reliability (rater A/rater B = ICC = 0.89/0.89, SEM = 3.9/4.3, SDC95 = 10.8/11.8). The Mini-BESTest also showed very good interrater reliability (ICC = 0.95, SEM = 1.19, SDC95 = 3.3) and test-retest reliability (rater A/rater B = ICC = 0.85/0.84, SEM = 1.8/1.9, SDC95 = 4.9/5.2). The correlations were moderate between the FES-I and both the BESTest and the Mini-BESTest (Spearman's rho -0.51 and -0.50, $p < 0.01$).

CONCLUSION: The BESTest and its short form, the Mini-BESTest, showed very good interrater and test-retest reliability when assessed in a heterogeneous sample of people with increased risk of falling. The concurrent validity measured against the FES-I showed moderate correlation. The results are comparable with earlier studies and indicate that the Norwegian versions can be used in daily clinic and in research.

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Is it reliable to predict the outcome of elderly patients with severe traumatic brain injury using IMPACT prognostic calculator?

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World Neurosurg. 2017; ePub(ePub): ePub.

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DOI 10.1016/j.wneu.2017.04.069 **PMID** 28433847

Abstract

BACKGROUND: Many investigators endeavor to predict the outcome based on admission characteristics using some established models to determine which management should be applied. However, the efficacy and applicability of the models using in the geriatric severe traumatic brain injury (TBI) patients have not been evaluated yet.

METHODS: 137 geriatric severe TBI patients were enrolled in this retrospective study. Receiver operating characteristics (ROC) curves were constructed to evaluate the efficacy and usability of the IMPACT prognostic model in evaluating the prognosis for these patients.

RESULTS: The observed mortality and unfavorable outcome at 6th month of severe patients were 54.7% and 70.8% respectively, slightly lower than the predicted outcome using IMPACT model. ROC curve analysis showed an area under the curve (AUC) in the Core model for mortality of 0.76 and of unfavorable outcome of 0.80, in the Extended model of 0.76 and 0.79 respectively, and in the Lab model of 0.73 and 0.77 respectively. When expected risk of fatal outcome was greater than 90% in any models, the true positive rate was 100%. Moreover, when the predicted risk >70% for unfavorable outcome in any model, the actual unfavorable outcome was over 80%.

CONCLUSIONS: The IMPACT prognosis calculator just showed fair discrimination when predicting the outcome of the elderly with severe TBI. A management decision should be made on a case-by-case basis rather than relying on the predicted risk of this model, however, conservative treatment might be preferable when expected risk of fatal outcome was >90%.

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Predictors of falls and mortality among elderly adults with traumatic brain injury: a nationwide, population-based study

Fu WW, Fu TS, Jing R, McFaul SR, Cusimano MD.
PLoS One 2017; 12(4): e0175868.

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DOI 10.1371/journal.pone.0175868 **PMID** 28430782

Abstract

BACKGROUND: Elderly adults are at particular risk of sustaining a traumatic brain injury (TBI), and tend to suffer worse outcomes compared to other age groups. Falls are the leading cause of TBI among the elderly.

METHODS: We examined nationwide trends in TBI hospitalizations among elderly adults (ages 65 and older) between April 2006 and March 2011 using a population-based database that is mandatory for all hospitals in Canada. Trends in admission rates were analyzed using linear

regression. Predictors of falls and in-hospital mortality were identified using logistic regression.

RESULTS: Between 2006 and 2011, there were 43,823 TBI hospitalizations resulting in 6,939 deaths among elderly adults in Canada. Over the five-year study period, the overall rate of TBI admissions increased by an average of 6% per year from 173.2 to 214.7 per 100,000, while the rate of fall-related TBI increased by 7% annually from 138.6 to 179.2 per 100,000. There were significant trends towards increasing age and comorbidity level ($p < 0.001$ and $p = 0.002$). Advanced age, comorbidity, and injury severity were independent predictors of both TBI-related falls and mortality on multivariate analysis.

CONCLUSION: Prevention efforts should be targeted towards vulnerable demographics including the "older old" (ages 85 and older) and those with multiple medical comorbidities. Additionally, hospitals and long-term care facilities should be prepared to manage the burgeoning population of older patients with more complex comorbidities.

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Protocol for the home hazards removal program (HARP) study: a pragmatic, randomized clinical trial and implementation study

Stark S, Somerville E, Keglovits M, Conte J, Li M, Hu YL, Yan Y.

BMC Geriatr. 2017; 17(1): e90.

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DOI 10.1186/s12877-017-0478-4 **PMID** 28427336 **PMCID** PMC5397804

Abstract

BACKGROUND: Falls remain the leading cause of injury, long-term disability, premature institutionalization, and injury-related mortality in the older adult population. Home modifications, when delivered by occupational therapists, can reduce falls among high-risk community-dwelling older adults by 39%. However, home-modification implementation is not standard practice in the United States. The goal of the Home Hazard Removal Program (HARP) study is to implement an evidence-based home modification intervention for older adults designed to reduce the incidence of falls through an aging services network.

METHODS: We will conduct a hybrid effectiveness/implementation trial of 300 older adults at risk for a fall who are randomized and followed for 12 months. Participants who are randomized to treatment will receive the home modification intervention provided by an occupational therapist in addition to usual care, defined as continued services from the area agency on aging. We will compare the effectiveness of the program and usual care using survival analysis with the time to the first fall over 12 months as the primary outcome of interest. Secondary outcomes include daily activity performance, fall self-efficacy, and health-related quality of life. Fidelity, dose, adherence, safety, cost, and health care utilization will also be examined in the implementation component of this study.

DISCUSSION: This intervention targets an underserved, difficult to reach population of older adults. The tailored approach of the study intervention is a strength in improving adherence, as each recommendation is individualized to be acceptable to the participant. The effectiveness/implementation design of the study allows for rapid dissemination of results and implementation of the intervention in a United States social services agency.

TRIAL REGISTRATION: Clinicaltrials.gov identifier: NCT02392013. Retrospectively registered on March 5, 2015.

PDF Y Endnote Y

Research Exploring Physical Activity in Care Homes (REACH): study protocol for a randomised controlled trial

Forster A, Airlie J, Birch K, Cicero R, Cundill B, Ellwood A, Godfrey M, Graham L, Green J, Hulme C, Lawton R, McLellan V, McMaster N, Farrin A.

Trials 2017; 18(1): e182.

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DOI 10.1186/s13063-017-1921-8 **PMID** 28424088 **PMCID** PMC5395795

Abstract

BACKGROUND: As life expectancy increases and the number of older people, particularly those aged 85 years and over, expands there is an increase in demand for long-term care. A large proportion of people in a care home setting spend most of their time sedentary, and this is one of the leading preventable causes of death. Encouraging residents to engage in more physical activity could deliver benefits in terms of physical and psychological health, and quality of life. This study is the final stage of a programme of research to develop and preliminarily test an evidence-based intervention designed to enhance opportunities for movement amongst care home residents, thereby increasing levels of physical activity.

METHODS/DESIGN: This is a cluster randomised feasibility trial, aiming to recruit at least 8-12 residents at each of 12 residential care homes across Yorkshire, UK. Care homes will be randomly allocated on a 1:1 basis to receive either the intervention alongside usual care, or to continue to provide usual care alone. Assessment will be undertaken with participating residents at baseline (prior to care home randomisation) and at 3, 6, and 9 months post-randomisation. Data relating to changes in physical activity, physical function, level of cognitive impairment, mood, perceived health and wellbeing, and quality of life will be collected. Data at the level of the home will also be collected and will include staff experience of care, and changes in the numbers and types of adverse events residents experience (for example, hospital admissions, falls). Details of National Health Service (NHS) usage will be collected to inform the economic analysis. An embedded process evaluation will obtain information to test out the theory of change underpinning the intervention and its acceptability to staff and residents.

DISCUSSION: This feasibility trial with embedded process evaluation and collection of health economic data will allow us to undertake detailed feasibility work to inform a future large-scale trial. It will provide valuable information to inform research procedures in this important but challenging area. **TRIAL REGISTRATION:** ISRCTN registry, ISRCTN16076575. Registered on 25 June 2015.

PDF Y Endnote Y

Strategies to improve engagement of 'hard to reach' older people in research on health promotion: a systematic review

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BMC Public Health 2017; 17(1): e349.

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Abstract

BACKGROUND: This systematic review aimed to identify facilitators, barriers and strategies for engaging 'hard to reach' older people in research on health promotion; the oldest old (≥ 80 years), older people from black and minority ethnic groups (BME) and older people living in deprived areas. **METHODS:** Eight databases were searched to identify eligible studies using quantitative, qualitative, and mixed research methods. Using elements of narrative synthesis, engagement strategies, and reported facilitators and barriers were identified, tabulated and analysed thematically for each of the three groups of older people.

RESULTS: Twenty-three studies (3 with oldest-old, 16 with BME older people, 2 within deprived areas, 1 with both oldest-old and BME, 1 with both BME and deprived areas) were included. **METHODS** included 10 quantitative studies (of which 1 was an RCT), 12 qualitative studies and one mixed-methods study. Facilitators for engaging the oldest old included gaining family support and having flexible sessions. Facilitators for BME groups included building trust through known professionals/community leaders, targeting personal interests, and addressing ethnic and cultural characteristics. Among older people in deprived areas, facilitators for engagement included encouragement by peers and providing refreshments. Across all groups, barriers for engagement were deteriorating health, having other priorities and lack of transport/inaccessibility. Feeling too tired and lacking support from family members were additional barriers for the oldest old. Similarly, feeling too tired and too old to participate in research on health promotion were reported by BME groups. Barriers for BME groups included lack of motivation and self-confidence, and cultural and language differences. Barriers identified in deprived areas included use of written recruitment materials. Strategies to successfully engage with the oldest old included home visits and professionals securing consent if needed. Strategies to engage older people from BME groups included developing community connections and organising social group sessions. Strategies to engage with older people in deprived areas included flexibility in timing and location of interventions.

CONCLUSIONS: This review identified facilitators, barriers and strategies for engaging 'hard to reach' older people in health promotion but research has been mainly descriptive and there was no high quality evidence on the effectiveness of different approaches.

PDF Y Endnote Y

The relationship between physical fitness and falling risk and fear of falling in community-dwelling elderly people with different physical activity levels

Duray M, Genç A. Turk. J. Med. Sci. 2017; 47(2): 455-462.

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Abstract

BACKGROUND/AIM: The aim of this research was to determine the effects of physical activity level (PAL) and physical fitness on falling parameters in community-dwelling elderly people.

MATERIALS AND METHODS: Seventy-six elderly people were grouped as low PAL group (group 1, n: 38) and high PAL (group 2, n: 38) according to their PAL scores. PAL was measured by the Physical Activity Scale for the Elderly and muscle strength, muscle endurance, aerobic endurance, and

flexibility tests were applied; body mass index (BMI) was calculated for physical fitness measurement. Fall assessment included falling risk (Berg Balance Scale), dynamic balance (Time Up and Go Test), and fear of falling (FOF) (Falls Efficacy Scale) evaluation.

RESULTS: While physical fitness parameters except flexibility in group 2 were significantly better than they were in group 1 ($P < 0.05$), no significant difference was found between the groups with regard to fall assessments ($P > 0.05$). In both groups, while physical fitness parameters except BMI showed a positive and low or medium significant correlation with falling risk and FOF, the same fitness parameters showed a negative and low or medium significant correlation with dynamic balance.

CONCLUSION: The results show that PAL may have an indirect effect on fall parameters by increasing physical fitness.

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Diagnostic validity of the STRATIFY and Downton instruments for evaluating the risk of falls by hospitalised acute-care patients: a multicentre longitudinal study

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Abstract

BACKGROUND: Falls are major adverse events in hospitals. The appropriateness of using risk assessment instruments for falls in hospitals has recently been questioned, although the research performed in this respect presents some methodological shortcomings. The purpose of the present study is to evaluate the accuracy of the Downton and STRATIFY instruments to determine the risk of falls and to predict their incidence in acute care hospitals in the public health system in Andalusia (Spain).

METHODS: A longitudinal, multicentre prospective study was made of a cohort of patients recruited between May 2014 and March 2016. The risk of falls was assessed using each of the above instruments during the first 24 h after hospital admittance, with later re-evaluations every 72 h until discharge. Descriptive statistics were obtained, bivariate and multivariate analysis were performed. The diagnostic validity of the process was assessed by calculations of sensitivity, specificity, positive and negative predictive values and ratios of positive and negative likelihood. ROC curve analysis was performed for both instruments.

RESULTS: For this study, 1247 patients were recruited, of whom 977 completed all the follow-up assessments. Twenty-three of these patients (2.35%) suffered 24 falls. ROC curve analysis showed that the optimal cut-off point for each assessment instrument was below that described by the authors: AUC STRATIFY = 0.69 (95% CI: 0.57-0.8); AUC Downton = 0.6 (95% CI: 0.48-0.72). With a cut-off point of 1, the sensitivity of STRATIFY was 47.6% and its specificity, 85%. With a cut-off point of 2, Downton presented a sensitivity of 66.7% and a specificity of 55.3%.

CONCLUSIONS: The Downton and STRATIFY falls risk assessment instruments presented little utility as means of detecting the risk of falls among a sample of adult patients admitted to acute care hospitals. Fall prevention in hospitals should be based on the study of individual risk factors.

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Effects of balance-coordination, strengthening and aerobic exercises to prevent falls in postmenopausal patients with osteoporosis: a 6-month randomized parallel prospective study

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J. Aging Phys. Act. 2017; ePub(ePub): ePub.

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Abstract

Osteoporosis is a systemic disease characterized by the increase of bone fragility and fracture risk. Postmenopausal female osteoporotic patients were randomized into 3 groups; balance and coordination, strengthening, and aerobic exercise group. The exercise programs were performed for 12 weeks, one hour each day for three days of the week. Patients were followed-up for 12 weeks after the initial intervention. After the exercise program, patients continued their daily life activities and were called back to the clinic for additional testing after 12 weeks. Static and dynamic balance measurements and pain and life quality assessments were performed at enrollment, 12(th) and 24(th) weeks. Significant improvement in both Timed Up and Go test and Berg Balance Scale values at the 12(th) week was only observed in balance-coordination group. There were statistically significant improvements in night and daytime pain visual analogue scale scores at the 12(th) and 24(th) week in strengthening exercise group. No patient experienced falling during the 24 week follow-up. The strengthening exercises were observed to be more effective in pain reduction, and balance and coordination exercises were found to be more effective in improvement of static and dynamic balance.

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Hip and pelvic fracture patients with fear of falling: development and description of the "Step by Step" treatment protocol

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Clin. Rehabil. 2017; 31(5): 571-581.

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Abstract

OBJECTIVE: Based on a theoretical framework and sound evidence, this article describes a rehabilitation programme for patients with fear of falling after hip and pelvic fracture.

RATIONALE: Based on exercise science principles, current knowledge from fall prevention, emotion regulation, and the Health Action Process Approach we developed a theoretical framework, from which the components of the intervention were derived. Description of the intervention: The intervention consists of 6 components: (1) relaxation, (2) meaningful activities and mobility-based goals, (3) falls related cognitions and emotions, coping with high risk tasks and situations, (4) individual exercise programme, (5) planning and implementing exercises and activities, and (6) fall risks and hazards. The intervention comprises of 8 individual sessions during 3 to 5 weeks of inpatient rehabilitation and 4 telephone calls and 1 home visit over a 2-month post-discharge period. Each session or telephone call takes about 30-60 minutes. It is provided to geriatric hip and pelvic fracture patients with concerns about falling and no cognitive impairment. To ensure completeness of reporting, the Template for Intervention Description and Replication (TIDierR) is used.

RESULTS: Fifty-seven patients were assigned to the intervention group. All 46 completers met all pre-defined criteria for an intervention per protocol.

CONCLUSION: The programme is feasible to administer. We have completed a randomised controlled trial, which will be submitted in due time (for trial protocol: www.isrctn.org ; ISRCTN79191813).

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Impairments of balance, stepping reactions and gait in people with cervical dystonia

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Gait Posture 2017; 55: 55-61.

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Abstract

BACKGROUND: Impaired balance is common in neurological disorders. Cervical dystonia is a neurological movement disorder affecting the neck. The effect of this aberrant head posture on physical function is unknown.

OBJECTIVES: To compare balance, mobility, gait and stepping reactions between ten people with cervical dystonia and ten control adults.

METHODS: Spatiotemporal gait parameters and walking speed were assessed using a computerised walkway. Step length and time, time in double support and gait variability were calculated, then normalised to gait speed. Centre of pressure path length was assessed with eyes open and eyes closed to calculate a Romberg Quotient. Simple and choice reaction times were measured using customised apparatus while mobility was assessed by the timed up and go. Cervical spine range of motion was measured using a head mounted goniometer. Self-reported scales included Falls Self Efficacy Scale and Dystonia Discomfort Scale.

RESULTS: There was a difference between groups for most outcome measures. The timed up-and-go and walking speed was slower (both $P < 0.005$) and the Romberg Quotient lower ($P = 0.046$) in cervical dystonia. People with cervical dystonia had lower falls self-efficacy ($P = 0.0002$). Reduced cervical range of motion was correlated with balance, stepping reaction time and mobility (all $P < 0.05$). Timed up and go was positively associated with stepping reaction time ($P < 0.01$). Dystonia discomfort did not impact function.

CONCLUSIONS: People with cervical dystonia displayed deficits in balance, gait and stepping reactions, and expressed higher fear of falling. Studies to further elucidate functional limitations and their impact on activity and participation in daily life are required.

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Lower physical activity in persons with multiple sclerosis at increased fall risk: a cross-sectional study

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Am. J. Phys. Med. Rehabil. 2017; 96(5): 357-361.

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Abstract

Persons with multiple sclerosis (MS) often report being afraid of falling, and this may have effects on physical activity (PA) engagement. This study investigated PA levels in persons with MS as a function of fall risk categories. Forty-seven persons with MS participated in the study and were categorized into either increased fall risk (IFR; $n = 21$; 55.5 ± 9.0 years) or normal fall risk (NFR; $n = 26$; 51.2 ± 12.9 years) groups based on scores from the Activities-Balance Confidence scale. PA was measured by accelerometer and expressed as average steps per day, and time spent in sedentary behavior, light PA, and moderate to vigorous physical activity over the course of 7 consecutive days. Univariate and covariate analyses were used to compare the differences in PA between fall risk groups. The average steps per day of the NFR group was significantly higher compared with the IFR group (6024 ± 2533.1 vs. 2599 ± 1622.7 steps; $P < 0.001$), and the difference remained after controlling for disability level (5351 ± 2298.6 vs. 3432 ± 2363.6 steps; $P = 0.016$). There were no differences in light PA and moderate to vigorous physical activity between groups after controlling for disability level. Persons with MS at IFR accumulate fewer steps per day compared with those at NFR. This underscores the need for well-designed interventions targeting walking in this population who are far from the recommended 10,000 steps, particularly those with IFR.

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Required friction during overground walking is lower among obese compared to non-obese older men, but does not differ with obesity among women

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Abstract

Obesity and aging have been independently associated with altered required friction during walking, but it is unclear how these factors interact to influence the likelihood of slipping. Therefore, the purpose of this study was to determine whether there are differences related to obesity and aging on required friction during overground walking. Fourteen older non-obese, 11 older obese, 20 younger non-obese, and 20 younger obese adults completed walking trials at both a self-selected and hurried speed. When walking at a hurried speed, older obese men walked at a slower gait speed and exhibited lower frictional demands compared both to older non-obese men and to younger obese men. No differences in required friction were found between non-obese and obese younger adults. These results suggest that the increased rate of falls among obese or older adults is not likely due to a higher risk of slip initiation.

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The tension between promoting mobility and preventing falls in the hospital

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Abstract [Abstract unavailable]

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