Proprioceptive and strength exercise guidelines to prevent falls in the elderly related to biomechanical movement characteristics

Abstract

Falls are a major concern in the elderly and walking is an important daily activity in which falls occur, with tripping and slipping being the most frequent causes. Gait biomechanical parameters have been related to the occurrence of falls in the elderly. Moreover, there is evidence that falls can be prevented through exercise programs, which have been shown to be also effective in improving gait biomechanical parameters. However, a question remains: "What types of exercises must be included in exercise programs to prevent falls?". The purpose of this manuscript was to present guidelines for a fall prevention exercise program for the elderly, which was created with the aim of improving the gait biomechanical parameters related to falls. The critical review performed during the preparation of this manuscript collected important evidence and knowledge in order to create a structural basis for the development of a fall prevention exercise program. This type of program should last 6 or more weeks and be prescribed based on four movement pillars (locomotion, level changes, pulling and pushing, and rotations); however, the locomotion pillar must be the focus of the program. Proprioceptive and functional strength exercises should be included in this program. Based on the theoretical rationale, a proposal for a fall prevention exercise program is presented.

Patient self-assessment of walking ability and fracture risk in older Australian adults

Bliuc D, Tran T, Alarkawi D, Chen W, Alajlouni DA, Blyth F, March L, Blank RD, Center JR. JAMA Netw. Open 2024; 7(1): e2352675.

Abstract

IMPORTANCE: The relationship between self-reported walking limitation, a proxy of muscle function, and fracture risk has not been investigated.

OBJECTIVE: To examine the association between a self-reported walking limitation of 1000 m or less and 5-year risk of fracture. DESIGN, SETTING, AND PARTICIPANTS: This prospective cohort study compared individuals with various degrees of walking ability limitation at 1000 m (a little limitation and a lot of limitation) and those without limitation (no limitation) accounting for age, falls, prior fractures, and weight. Participants from the ongoing population-based Sax Institute 45 and Up Study were followed from recruitment (2005-2008) for 5 years (2010-2013). Data analysis was conducted from July 2020 to September 2023. EXPOSURE: Self-reported walking limitation.

MAIN OUTCOMES AND MEASURES: Incident fracture and site-specific fractures (hip, vertebral, and nonhip nonvertebral [NHNV] fractures).

RESULTS: Among the 266 912 participants enrolled in the 45 and Up Study, 238 969 were included, with 126 015 (53%) women (mean [SD] age, 63 [11] years) and 112 954 (47%) men (mean [SD] age, 61 [11] years). Approximately 20% reported a degree of limitation in walking 1000 m or less at baseline (39 324 women [24%]; 23 191 men [21%]). During a mean (SD) follow-up of 4.1 (0.8) years, 7190 women and 4267 men experienced an incident fracture. Compared with participants who reported no walking limitations, a little limitation and a lot of limitation were associated with higher risk of fracture (a little limitation among women: hazard ratio [HR], 1.32; 95% CI, 1.23-1.41; a little limitation among men: HR, 1.46; 95% CI, 1.34-1.60; a lot of limitation among women: HR, 1.60; 95% CI, 1.49-1.71; a lot of limitation among men: HR, 2.03; 95% CI, 1.86-2.22). Approximately 60% of fractures were attributable to walking limitation. The association was significant for hip, vertebral, and NHNV fracture and ranged between a 21% increase to a greater than 219% increase.

CONCLUSIONS AND RELEVANCE: In this cohort study of 238 969 participants, self-reported walking limitations were associated with increased risk of fracture. These findings suggest that walking ability should be sought by clinicians to identify high-risk candidates for further assessment.

Perceived balance and self-reported falls: a retrospective cross-sectional study using the National Health and Aging Trend Study

Dolan H, Pohl J, Pituch K, Coon DW. J. Clin. Nurs. 2024; ePub(ePub): ePub.

Abstract

AIMS: To examine how perceived balance problems are associated with self-reported falls in the past month after controlling for known correlates of falls among older adults.

BACKGROUND: Approximately 30% of adults age 65 and older fall each year. Most accidental falls are preventable, and older adults' engagement in fall prevention is imperative. Limited research suggest that older adults do not use the term 'fall risk' to describe their risk for falls. Instead, they commonly use the term 'balance problems'. Yet, commonly used fall risk assessment tools in both primary and acute care do not assess older adults' perceived balance. DESIGN AND METHOD: The Health Belief Model and the concept of perceived susceptibility served as the theoretical framework. A retrospective, cross-sectional secondary analysis using data from the National Health and Aging Trends Study from year 2015 was conducted. The outcome variable was self-reported falls in the last month.

RESULTS: A subsample of independently living participants (N = 7499) was selected, and 10.3% of the sample reported a fall. Multiple logistic regression analysis revealed that the odds of reporting a fall in the past month was 3.4 times (p < .001) greater for participants who self-reported having a balance problem compared to those who did not. In contrast, fear of falling and perceived memory problems were not uniquely associated with falls. Using a mobility device, reporting pain, poor self-rated health status, depression and anxiety scores were also associated with falling.

CONCLUSION AND IMPLICATIONS: Older adults' perceived balance problem is strongly associated with their fall risk. Perceived balance may be important to discuss with older adults to increase identification of fall risk. Older adults' perceived balance should be included in nursing fall risk assessments and fall prevention interventions. A focus on balance may increase older adults' engagement in fall prevention.

Is there an association between self-reported dual-task performance and fear of falling in older adults?

Abstract

INTRODUCTION: Is there an association between self-reported dual-task performance and fear of falling in older adults? BACKGROUND/OBJECTIVES: Fear of falling tends to increase with age and can negatively impact dual-task abilities, leading to potential declines in overall quality of life. Therefore, it becomes crucial to evaluate dual-task performance in older adults, particularly prior to the onset of fear of falling. This study aims to investigate the potential association between self-reported dual-task performance and fear of falling in older adults.

METHODS: A total of 51 individuals (19 females and 32 males) were recruited. The participants met the inclusion criteria were administered the Dual-Task Questionnaire (DTQ), Falls Efficiency Scale International, and Physical Activity Scale for the Elderly. Multiple linear regression was performed to predict DTQ scores based on age, body mass index, and Physical Activity Scale for the Elderly.

RESULTS: A moderate positive correlation was found between Falls Efficiency Scale International scores and self-reported DTQ scores (r:.448, p:.001). Age, body mass index, and Physical Activity Scale for the Elderly were not found to be significant predictors of DTQ scores

CONCLUSIONS: Our study reveals a moderate positive association between fear of falling and self-reported dual-task performance in older adults. A direct relationship between physical activity performance, fear of falling, and self-reported dual-task performance was observed among older adults. Significance/Implications: Integrating self-reported measures like the DTQ in clinical evaluations can provide valuable insights into dual-task abilities of older adults.

Association of impaired cognitive function with balance confidence, static balance, dynamic balance, functional mobility, and risk of falls in older adults with depression

Abstract

OBJECTIVES: Increased depression severity has been linked to cognitive impairment (CI). Importantly, CI is a known risk factor for impaired balance and falls. Therefore, this study aims to explore the relationship between CI and neuromuscular functions and secondarily it aims to find out if CI is a potential predictor for neuromuscular functions deficits in depressed elderly.

METHODS: Eighty-four depressed elderly participated in the study. Assessment for CI symptoms were done using Mini Mental Status Examination (MMSE) in subjects having confirmed depression. Neuromuscular functions such as balance confidence, static and dynamic balance, functional mobility, and fall risk were subjectively assessed using Activities-specific Balance Confidence (ABC) Scale, Berg Balance Scale (BBS), Timed Up and Go (TUG) Test, and Performance Oriented Mobility Assessment (POMA), respectively.

RESULTS: Pearson's analysis revealed that there was moderate positive linear-correlation between MMSE and BBS ($R = 0.382$, $p = <0.001$) and between MMSE and ABC ($R = 0.229$, $p = 0.036*$). Further, regression analysis (R^2) revealed that MMSE significantly predicted the neuromuscular functions using BBS [$F_{(1, 82)} = 14.013$, $p < 0.001$, with an R^2 of 0.146] and ABC [$F_{(1, 82)} = 4.545$, $p = 0.036*$, with an R^2 of 0.053].

CONCLUSION: Results of this study points to an impaired CI as a possible factor in development of neuromuscular function impairment in depressed elderly.

Enhancing footwear safety for fall prevention in older adults: a comprehensive review of design features

Abstract

BACKGROUND: Falls are a global concern affecting people of all ages; however, older adults are particularly vulnerable to age-related factors and foot-related issues. Footwear is critical for preventing falls, as it provides stability and protection against slips and falls (STFs). However, a significant gap exists in the systematic exploration of the safety aspects of footwear design for fall prevention in older adults.

METHODS: This comprehensive review applied a meticulous search strategy encompassing prominent databases, including Google Scholar, ScienceDirect, SCOPUS, MEDLINE, ResearchGate, and PubMed. This review synthesized and analyzed existing research to bridge knowledge gaps and provide insights into optimal footwear choices for older adults in terms of design features such as fit, fixation, heel height, collar height, slip resistance, and sole/insole hardness.

RESULTS: The results underscore the importance of specific design features for preventing falls among older adults. A proper fit, secure fixation, appropriate heel and collar heights, slip resistance, and sole/insole hardness significantly contributed to fall prevention. These findings offer valuable guidance for optimizing footwear designs to enhance comfort, stability, and safety in the daily lives of older individuals.

CONCLUSION: This comprehensive review fills a critical knowledge gap regarding the safety of footwear designs for fall prevention in older adults. The identified design features play a vital role in reducing the risk of falls and offer practical recommendations for the development of safer footwear. Ultimately, this study contributes to the existing knowledge base and supports efforts to prevent STFs in older adults through improved footwear design.

Risk assessment of falls among older adults based on probe reaction time during water-carrying walking [letter]

Abstract

I have read a research article entitled "Risk Assessment of Falls Among Older Adults Based on Probe Reaction Time During Water-Carrying Walking" by Liu et al.1 I congratulate the authors on this successful article and make some contributions. There are three strengths of this study: 1) Use of Water Carrying Walking Probe Reaction Time (WCWP-RT) as a fast and convenient assessment method that can effectively predict the risk of falls in older adults in the community. This method is advantageous because it incorporates dual-task scenarios that more closely reflect real-life situations, where cognitive and motor tasks are often performed simultaneously. 2) Practical application of the findings of this research, which can be converted into intervention measures to improve the ability of older people to handle dual tasks, thereby potentially preventing cognitive decline and reducing the occurrence of falls through dual-task training. 3) The research methodology, which involved testing in an outdoor community environment to simulate daily walking activities, ensured that the data and conclusions were closer to real-life situations, thereby increasing the ecological validity of the findings. This approach is beneficial because it assesses fall risk using data obtained in realistic settings, indicating that the more realistic the environment, the better an older person's ability to handle the multiple tasks of daily life. This is very important because this research provides clinically meaningful information for the care and rehabilitation of older adults.

However, I identified two limitations of this study that need to be addressed in future research: 1) Measuring response time involves a degree of subjectivity because the researcher must independently choose the time difference between the stimulus sound and the subject's response. This can cause deviations in time measurements. To reduce subjectivity, future research could use automated timing systems that trigger and record response times electronically, thereby minimizing human error and increasing measurement precision.2,3 2) This study did not assess gait changes during walking, which is an important aspect of fall risk. Incorporating gait analysis into future research may provide a more comprehensive understanding of fall risk. This may involve the use of motion capture technology or wearable sensors to measure gait parameters objectively.

The relationship between social frailty and loneliness in community-dwelling older adults: a cross-sectional study

Abstract

BACKGROUND: Social frailty (SF) is associated with multiple adverse health outcomes, yet there has been an inadequate focus on social frailty. The convoy model portrays the social networks through the perspective of the life course, thus providing a framework to explain the occurrence of social frailty. This study aimd to figure out the prevalence of social frailty and loneliness among community-dwelling older adults and to explore their correlations based on convoy model.

METHODS: This was a cross-sectional study, and 295 older adults from 10 communities of Zhengzhou in Henan Province participated in the study. Social frailty and loneliness were assessed separately with the Social Frailty Scale and University of California at Los Angeles-Loneliness Scale. The scores of social frailty of the older adults in different characteristic communities were compared by independent sample t-test and single factor analysis of variance. The influencing factors of social frailty were analysed by multiple stepwise linear regression and the structural equation model. The correlation between social frailty and loneliness was analysed by Pearson correlation analysis.

RESULTS: The total scores of social frailty and loneliness of the older adults in the community were (2.09 ± 1.53) and (43.19 ± 8.91), respectively. There was a moderate positive correlation between social frailty and loneliness ($r = 0.621$, $P < 0.01$). The results of multiple stepwise linear regression analysis showed that age, living styles, balance of payments, and loneliness were the main influencing factors of the social frailty of older adults in the community ($F = 27.180$, $P < 0.001$). The structural equation model of social frailty fitted well ($\chi(2) = 47.292$, df $= 26$, $\chi(2)/\text{df} = 1.819$, $P = 0.007$; RMSEA $= 0.053$, 95%CI (0.028, 0.076), $P = 0.359$; GFI $= 0.971$; AGFI $= 0.939$; NFI $= 0.904$; IFI $= 0.955$; TLI $= 0.918$; CFI $= 0.953$; SRMR $= 0.0466$).

CONCLUSIONS: The convoy model had certain applicability in explanation of the relationship between loneliness and social frailty among older adults in community. The incidence of social frailty among the older adults in the community was high, and loneliness was at a medium level. It is necessary to strengthen the intervention of social frailty and loneliness of the older adults in the community, improve the quality of life of the older adults, and promote the development of healthy aging.

Effect of a lifestyle-integrated functional exercise (LiFE) group intervention (sLiFE) to falls prevention in non-institutionalized older adults. Protocol of a randomised clinical trial

Llamas-Ramos I, Llamas-Ramos R, Lugones-Sánchez C, González-García S, Tamayo-Morales O, Alvarado-Omenat JJ, Pablos-Hernández C, Gómez-Marcos MA, Garcia-Ortiz L, Rodríguez-Sánchez E. Front. Public Health 2023; 11: e1304982.

Abstract

INTRODUCTION: Personalized programs of integrated strength and balance activities have been shown their effectiveness in falls reduction in the older adults.

OBJECTIVE: To measure whether a group intervention with the strength and balance principles of the sLiFE program is more effective than standard health advice in reducing the incidence of falls.

METHODS: The study will comprise 650 participants with more than 65 years who live at home, observing established inclusion and exclusion criteria. Participants will be randomly assigned in two groups: group intervention (n = 325) and standard health advice (n = 325). The intervention group will follow the balance and strength activities described in the LiFE program manual. The group intervention will be carried out in groups of 12-14 and will consist of seven one-hour sessions over 12 weeks in health centres. Incidence of falls and quality of life will be assessed as primary outcome variables. Fear of falling and exercise adherence will be analysed as secondary outcome variables.

DISCUSSION: Physical activity has been put forward as an effective treatment technique for these patients; however, long-term adherence to these programs remains a challenge. Group interventions could reduce dropout rates.

CONCLUSION: Falls represent a major health problem globally due to the disability they cause in older people. Prevention would help reduce not only their incidence but also the health costs derived from their treatment. Group intervention helps clinicians to save resources and time, being able to attend more people with the same quality of care.
CLINICAL TRIAL REGISTRATION: https://clinicaltrials.gov/study/NCT05912088?distance=50&term=NCT05912088&rank=1, identifier NCT05912088.

Effectiveness of fall prevention interventions in residential aged care and community settings: an umbrella review

Meulenbroeks I, Mercado C, Gates P, Nguyen A, Seaman K, Wabe N, Silva SM, Zheng WY, Debono D, Westbrook J. BMC Geriatr. 2024; 24(1): e75.

Abstract

INTRODUCTION: Preventing falls is a priority for aged care providers. Research to date has focused on fall prevention strategies in single settings (e.g., residential aged care (RAC) or community settings). However, some aged care providers deliver care, including fall prevention interventions, across RAC and community settings. We conducted an umbrella review to identify what type of fall prevention interventions had the greatest impact on falls outcomes in RAC and community settings.

METHODS: Five databases were searched for systematic reviews of falls prevention randomised control trials in older adults living in the community or RAC. Data extracted included systematic review methods, population characteristics, intervention characteristics, setting details (RAC or community), and fall-related outcomes (falls, people who have had a fall, fall-related hospitalisations, and fall-related fractures). Review quality was appraised using the Assessment of Multiple Systematic Reviews-2 tool.

RESULTS: One-hundred and six systematic reviews were included; 63 and 19 of these stratified results by community and RAC settings respectively, the remainder looked at both settings. The most common intervention types discussed in reviews included 'exercise' (61%, n = 65), 'multifactorial' (two or more intervention types delivered together) (26%, n = 28), and 'vitamin D' (18%, n = 19). In RAC and community settings, 'exercise' interventions demonstrated the most consistent reduction in falls and people who have had a fall compared to other intervention types. 'Multifactorial' interventions were also beneficial in both settings however demonstrated more consistent reduction in falls and people who fall in RAC settings compared to community settings. 'Vitamin D' interventions may be beneficial in community-dwelling populations but not in RAC settings. It was not possible to stratify fall-related hospitalisation and fall-related fracture outcomes by setting due to limited number of RAC-specific reviews (n = 3 and 0 respectively).

CONCLUSION: 'Exercise' interventions may be the most appropriate falls prevention intervention for older adults in RAC and community settings as it is beneficial for multiple fall-related outcomes (falls, fall-related fractures, and people who have had a fall). Augmenting 'exercise' interventions to become 'multifactorial' interventions may also improve the incidence of falls in both settings.

Language: en

Cardiovascular disease and the risk of incident falls and mortality among adults aged ≥ 65 years presenting to the emergency department: a cohort study from national registry data in Denmark

O'Halloran AM, Cremers J, Vrangbæk K, Roe L, Bourke R, Mortensen LH, Westendorp RGJ, Kenny RA. BMC Geriatr. 2024; 24(1): e93.

Abstract

BACKGROUND: Falls cause 58% of injury-related Emergency Department (ED) attendances. Previous research has highlighted the potential role of cardiovascular risk factors for falls. This study investigated the impact of cardiovascular disease (CVD) risk on three-year incident falls, with presentation to the ED, and mortality.

METHODS: A matched cohort study design was employed using national registry data from 82,292 adults (33% male) aged ≥ 65 years living in Denmark who attended the ED in 2013. We compared age and gender matched ED attendees presenting with a fall versus another reason. The cohort was followed for three-year incident falls, with presentation to the ED, and mortality. The impact of falls-related CVDs was also examined.

RESULTS: Three-year incident falls was twofold higher among age and gender matched ED attendees aged ≥ 65 years presenting with a fall versus another reason at baseline. A presentation of falls with hip fracture had the highest percentage of incident falls in the 65-74 age group (22%) and the highest percentage mortality in all age groups (27-62%). CVD was not a significant factor in presenting with a fall at the ED, nor did it contribute significantly to the prediction of three-year incident falls. CVD was strongly associated with mortality risk among the ED fall group (RR = 1.81, 95% CI: 1.67-1.97) and showed interactions with both age and fall history.

CONCLUSION: In this large study of adults aged ≥ 65 years attending the ED utilising data from national administrative registers in Denmark, we confirm that older adults attending the ED with a fall, including those with hip fracture, were at greatest risk for future falls. While CVD did not predict incident falls, it increased the risk of mortality in the three-year follow up with advancing age. This may be informative for the provision of care pathways for older adults attending the ED due to a fall.

Effect of a coaching intervention to enhance physical activity and prevent falls in community-dwelling people aged 60+ years: a cluster randomised controlled trial

Oliveira JS, Sherrington C, Rissel C, Howard K, Tong A, Merom D, Wickham J, Bauman AE, Lord SR, Lindley RI, Simpson JM, Allman-Farinelli M, Kirkham C, Ramsay E, O'Rourke S, Tiedemann A. Br. J. Sports Med. 2024; ePub(ePub): ePub.

Abstract

OBJECTIVES: To evaluate the effect of a coaching intervention compared with control on physical activity and falls rate at 12 months in community-dwelling people aged 60+ years.

DESIGN: Cluster randomised controlled trial. SETTING: Community-dwelling older people. PARTICIPANTS: 72 clusters (605 participants): 37 clusters (290 participants) randomised to the intervention and 35 (315 participants) to control. INTERVENTION: Intervention group received written information, fall risk assessment and prevention advice by a physiotherapist, activity tracker and telephone-based coaching from a physiotherapist focused on safe physical activity. Control group received written information and telephone-based dietary coaching. Both groups received up to 19 sessions of telephone coaching over 12 months. OUTCOMES: The co-primary outcomes were device-measured physical activity expressed in counts per minute at 12 months and falls rate over 12 months. Secondary outcomes included the proportion of fallers, device-measured daily steps and moderate-to-vigorous physical activity (MVPA), self-reported hours per week of physical activity, body mass index, eating habits, goal attainment, mobility-related confidence, quality of life, fear of falling, risk-taking behaviour, mood, well-being and disability.

RESULTS: The mean age of participants was 74 (SD 8) years, and 70% (n=425) were women. There was no significant effect of the intervention on device-measured physical activity counts per minute (mean difference 5 counts/min/day, 95% CI -21 to 31), or falls at 12 months (0.71 falls/person/year in intervention group and 0.87 falls/person/year in control group; incidence rate ratio 0.86, 95% CI 0.65 to 1.14). The intervention had a positive significant effect on device-measured daily steps and MVPA, and self-reported hours per week of walking, well-being, quality of life, and disability. No significant between-group differences were identified in other secondary outcomes.

CONCLUSION: A physical activity and fall prevention programme including fall risk assessment and prevention advice, plus telephone-based health coaching, did not lead to significant differences in physical activity counts per minute or falls rate at 12 months. However, this programme improved other physical activity measures (ie, daily steps, MVPA, hours per week of walking), overall well-being, quality of life and disability. TRIAL REGISTRATION NUMBER: ACTRN12615001190594.

Falls at home: hospital admissions in a health region of Aotearoa New Zealand

Abstract

AIM: To report on the descriptive epidemiology and costs of trauma admissions to the Te Manawa Taki Trauma System (TMT) hospitals in Aotearoa New Zealand following falls at home.

METHODS: A retrospective, observational study was conducted using data from the TMT trauma registry to identify patients of all ages who presented following falls at home from 2012 to 2022. This study reports on incidence of Fall Related Injuries (FRIs) that occurred at home with regard to age, gender, ethnicity, Injury Severity Score (ISS), injury characteristics and direct cost to TMT facilities.

RESULTS: Searches identified 13,142 events to the TMT trauma system following falls at home. Most events were classified as non-major trauma. There were statistically significant relationships between gender, ethnicity and district, and ISS category. There were two distinctive age band incidence peaks: ≤9 years and 60+ years. Males were more likely to sustain major trauma. The most common cause was fall on the same level from slipping, tripping and stumbling. The average length of stay per event was 5.5 days. The average cost per event was NZ$9,792.

CONCLUSIONS: The study has identified the demography, injury types, risk factors and outcomes for FRIs that occurred in the TMT region of Aotearoa New Zealand. The volumes and costs of injury represent a significant burden on the health system, individuals and communities. More detailed understanding of causative factors will allow targeting of prevention strategies to address high risk activities and demographic groups.

Predictors of real-world adherence to prescribed home exercise in older patients with a risk of falling: a prospective observational study

Abstract

OBJECTIVES: Using a multi-ethnic Asian population, this study assessed adherence to prescribed home exercise programs, explored factors predicting adherence, and evaluated whether home exercise adherence was associated with physical activity.

METHODS: A prospective cohort study was conducted in 68 older adults (aged ≥65 years) from two geriatric outpatient clinics in Singapore, who were receiving tailored home exercises while undergoing 6 weeks of outpatient physical therapy for falls prevention. Adherence was measured as the percentage of prescribed sessions completed. Predictor variables included sociodemographic factors, clinical characteristics, intervention-specific factors, and physical and psychosocial measures. Multivariable linear regressions were performed to develop a model that best predicted adherence to prescribed exercise. Physical activity levels, measured by accelerometry, were analyzed by cross-sectional univariate analysis at 6 weeks.

RESULTS: The mean adherence rate was 65% (SD 34.3%). In the regression model, the number of medications [B = 0.360, 95% CI (0.098-0.630)], social support for exercising [B = 0.080, 95% CI (0.015-0.145)], and self-efficacy for exercising [B = -0.034, 95% CI (-0.068-0.000)] significantly explained 31% (R (2) = 0.312) of the variance in exercise adherence. Older adults with better adherence took more steps/day at 6 weeks [B = 0.001, 95% CI (0.000-0.001)].

CONCLUSIONS: Low adherence to home exercise programs among older adults in Singapore, emphasizing the need for improvement. Counterintuitively, older adults with more medications, lower exercise self-efficacy, but with greater social support demonstrated higher adherence. Addressing unmet social support needs is crucial for enhancing adherence rates and reducing fall risks.

A wearable device for fall detection in elderly

Abstract

In this study, fall detection was developed for the elderly or patients with balance problems who require monitoring all the time to reduce the impact of a greater fall. The system tracks the movement of the human body, identifies falls from normal daily activities by calculating acceleration and orientation, and then sends requests for help to nurses or their families via. Telegram messages and fall locations using the Blynk application. The results show that the system can distinguish between normal activities and falls. The system can detect falls forward, backward, and sideways to the left and right with an accuracy of 95%, 80%, 100%, and 75%, respectively.

Language: en

"Mind the gap": An exploratory qualitative study of paramedics' experiences attending older adults who fall in Western Australia

Watkins P, Buzzacott P, Tohira H, Finn J, Brink D, Brits R, Hill AM. Australas. Emerg. Care 2024; ePub(ePub): ePub.

Abstract

PURPOSE: To explore paramedics' experiences and perspectives about attending and managing older adults who had fallen.

PROCEDURES: This qualitative, exploratory study used a purposive sample of paramedics in Western Australia. Participants had at least one year of clinical experience. Semi-structured interviews were undertaken. Data were analysed via an inductive thematic approach.

FINDINGS: Fourteen paramedics were interviewed (Median age: 38 years, n = 5 females). The main theme identified that experiences were positive when attending patients with high-acuity medical problems or injuries following falls because binary decision-making (transport vs non-transport) was appropriate. Themes highlighted that decision-making for low-acuity falls attendances was a complex balance between 1) patient context, 2) risk management, 3) paramedic reactions, and 4) the lack of alternate referral pathways available. Experiences could be stressful and frustrating when attending falls call-outs for older adults with no injuries or medical problems. Participants concurred that when transport to hospital was not required there were no available, alternative pathways to refer onwards for appropriate health or social care.

CONCLUSION: Attending low-acuity call-outs for falls was often frustrating and required complex decision-making, with gaps in services identified. Further exploration of alternative referral pathways for health care for pre-hospital management of adults who fall is required.

Analysis of the relation between balance control subsystems: a structural equation modeling approach

Wu K, Zhang J, Mohsen AWA, Wang Z, Jin Y, Wang W, Peng X, Yao D, Valdes-Sosa PA, Ren P. IEEE Trans. Neural Syst. Rehabil. Eng. 2024; ePub(ePub): ePub.

Abstract

OBJECTIVE: Balance plays a crucial role in human life and social activities. Maintaining balance is a relatively complex process that requires the participation of various balance control subsystems (BCSes). However, previous studies have primarily focused on evaluating an individual's overall balance ability or the ability of each BCS in isolation, without considering how they influence (or interact with) each other.

METHODS: The first study used clinical scales to evaluate the functions of the four BCSes, namely Reactive Postural Control (RPC), Anticipatory Postural Adjustment (APA), Dynamic Gait (DG), and Sensory Orientation (SO), and psychological factors such as fear of falling (FOF). A hierarchical structural equation modeling (SEM) was used to investigate the relationship between the BCSes and their association with FOF. The second study involved using posturography to measure and extract parameters from the center of pressure (COP) signal. SEM with sparsity constraint was used to analyze the relationship between vision, proprioception, and vestibular sense on balance based on the extracted COP parameters.

RESULTS: The first study revealed that the RPC, APA, DG and SO indirectly influenced each other through their overall balance ability, and their association with FOF was not the same. APA has the strongest association with FOF, while RPC has the least association with FOF. The second study revealed that sensory inputs, such as vision, proprioception, and vestibular sensing, directly affected each other, but their associations were not identical. Among them, proprioception plays the most important role in the three sensory subsystems.

CONCLUSION: This study provides the first numerical evidence that the BCSes are not independent of each other and exist in direct or indirect interplay. SIGNIFICANCE: This approach has important implications for the diagnosis and management of balance-related disorders in clinical settings and improving our understanding of the underlying mechanisms of balance control.

Language: en