Neurological Conditions

This document contains all abstracts for publications relating to neurological conditions and falls from October 2019 through to December 2019. These abstracts have been sourced from SafetyLit.org and include only those relevant to falls prevention.

SafetyLit provides weekly abstracts of peer reviewed articles from researchers who work in the more than 30 distinct professional disciplines relevant to preventing and researching unintentional injuries, violence, and self-harm. Each week citations and summaries of about 400 articles and reports are included in a PDF document or through an RSS subscription.

Contents:

Parkinson's Disease

Falls when standing, falls when walking: different mechanisms, different outcomes in Parkinson disease

Lieberman A, Deep A, Olson MC, Smith Hussain V, Frames CW, McCauley M, Lockhart TE. Cureus 2019; 11(8): e5329.

Affiliation

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Abstract

Our retrospective study of falls and resultant trauma in consecutive Parkinson disease (PD) patients seen in one year at the Muhammad Ali Parkinson Clinic found that multiple-fallers could be divided into patients who fell mainly when walking or those who fell mainly when standing. Patients who fell when walking were more likely to visit an emergency room or be admitted to a hospital. Of 455 consecutive patients who were evaluated over a one-year period, 51 were excluded because they had atypical Parkinson disorders, had multiple risk factors for falling, or were demented. Unified Parkinson Disease Rating Scales and Zeno Walkway results were compared among non-fallers, single-fallers, and multiple-fallers.

Among multiple-fallers, comparisons were made between patients who fell mainly when standing and those who fell mainly when walking. Most patients (197, 49%) did not fall, 142 (35%) fell once, and 65 (16%) fell more than once. Multiple-fallers differed significantly from single-fallers and non-fallers: they had PD significantly longer (p<0.001), were more severely affected (p<0.001), and took shorter steps (p<0.001). Of 65 multiple-fallers, 26 (40%) fell mainly when standing, 28 (43%) fell mainly when walking, and 11 (17%) fell equally often when standing or walking. Falls when walking resulted in more severe injuries. Patients who fell mainly when standing did not realize they could fall when standing; engaged in inappropriate weight shifting, bending, reaching, and multitasking; and failed to use their assistive devices. Such patients would benefit from being counseled about falling when standing. Patients who fell mainly when walking were aware they could fall, despite using an assisted device, and were more likely to have freezing of gait (FOG). They were more likely to sustain a severe injury, and were more likely to be admitted to an emergency room or hospital. Such patients would benefit from reducing, if possible, FOG.

Fractures in Parkinson's Disease: injury patterns, hospitalization, and therapeutic aspects

Mühlenfeld N, Söhling N, Marzi I, Pieper M, Paule E, Reif PS, Strzelczyk A, Verboket RD, Willems LM. Eur. J. Trauma Emerg. Surg. 2019; ePub(ePub): ePub.

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Abstract

AIM: The primary aim of this study was to analyze the frequency and characteristic patterns of fall-related fractures as well as consecutive hospitalization and management relating to such fractures. In addition, important pathognomonic and therapeutic aspects are discussed.

METHODS: This retrospective mono-center study was conducted at the University Hospital Frankfurt am Main, Germany. Between 2007 and 2017, a total of 145 PD patients with fall-related fractures were identified via a retrospective systematic query in the hospital information system using the ICD-10 German modification codes G20.0-G20.9. Patients with unclear or falsely coded PD were strictly excluded.

RESULTS: The mean age of the cohort was 77.7 years ($\pm$ 7.5, median 77.) and 57.9% of the cohort were females (n = 84). A total number of 151 fractures were reported, with 140 patients (96.6%) suffering from one, four patients from two (2.8%), and one patient from three fractures (0.6%) at a time. For 43.9% (n = 65) of the cohort, fractures concerned lower extremities (LE) followed by trunk (38.1%, n = 58) and upper extremities (UE, 17.9%, n = 27). Most common fracture types in LE were femoral neck fractures (52.3%, n = 34). Mean length of hospital stay (LOS) was 13.6 days (95% CI 12.4-14.7). In 43.4% (n = 63) of cases, an interim admission to an intensive-care unit (ICU) was necessary. Mean ICU LOS was 2.3 days (95% CI 1.5-3.0), and mean LOS for normal care unit was 10.5 days (95% CI 10.3-12.4). Surgical treatment was necessary in 75.9% of the cases (n = 110). Patients undergoing surgical treatment showed significantly longer LOS compared to conservatively treated patients (p < 0.001). Moreover, fractures of the LE (p = 0.018) and UE (p = 0.010) were associated with a significant longer LOS.

CONCLUSION: Fall-related fractures are a common and relevant complication in PD patients leading to increased immobility, frequent hospitalization, and immediate surgical care. Fractures of the lower extremities and trunk were the most common in the cohort for this study. A PD patient presenting to the emergency room or at the general practitioner with a fracture should always be checked for osteoporosis and a fall-related injury should be seen as a red flag for reviewing a patient's individual therapeutic regime.

Language: en

Measures of balance and falls risk prediction in people with Parkinson's disease: a systematic review of psychometric properties

Winser SJ, Kannan P, Bello UM, Whitney SL. Clin. Rehabil. 2019; ePub(ePub): ePub.

Affiliation

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Abstract

OBJECTIVE: To investigate the psychometric properties of measures of balance and falls risk prediction in people with Parkinson's disease (PD). DATA SOURCES: PubMed, Embase, CINAHL, Ovid Medline, Scopus, and Web of Science were searched from inception to August 2019. REVIEW METHOD: Studies testing psychometric properties of measures of balance and falls risk prediction in PD were included. The four-point COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) assessed quality.

RESULTS: Eighty studies testing 68 outcome measures were reviewed; 43 measures assessed balance, 9 assessed falls risk prediction, and 16 assessed both. The measures with robust psychometric estimation with acceptable properties were the (1) Mini-Balance Evaluation Systems Test (Mini-BEST), (2) Berg Balance Scale, (3) Timed Up and Go test, (4) Falls Efficacy Scale International, and (5) Activities-Specific Balance Confidence scale. These measures assess balance and falls risk prediction at the body, structure and function level, falls risk and balance, and falls risk at the activity level. The motor examination of the Unified Parkinson's Disease Rating Scale (UPDRS-ME) with robust psychometric analysis is a condition-specific measure with acceptable properties. Except the UPDRS-ME and Mini-BESTest, the responsiveness of the other four measures has yet to be established.

CONCLUSION: Six of the 68 outcome measures have strong psychometric properties for the assessment of balance and falls risk prediction in PD. Measures assessing balance and falls risk prediction at the participatory level are limited in number with a lack of psychometric validation.

Language: en

Economic evaluation of exercise-based fall prevention programs for people with Parkinson's disease: a systematic review

Winser SJ, Paul LF, Magnus LKL, Yan S, Shenug TP, Sing YM, Cheing G. J. Altern. Complement. Med. 2019; ePub(ePub): ePub.

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Abstract

Objectives: Falls are common in Parkinson's disease (PD). Exercise interventions can prevent falls. This review aims to (1) explore the existing evidence regarding the cost-effectiveness of exercise-based fall prevention programs for people with PD and (2) discuss the implications of the review findings for future research and clinical practice.

Design: Databases AMED Allied and Complementary Medicine, CINAHL, CRD, EBSCO, EMBASE, MEDLINE, PubMed, Scopus, and Web of Science were searched from their inception until June 2019. Randomized and nonrandomized trials that included an economic evaluation of fall prevention programs for people with PD were considered. Quality of the economic evaluation was assessed using the Consensus on Health Economic Criteria list (CHEC-list), and the methodological quality was assessed using the Physiotherapy Evidence Database (PEDro) and Cochrane risk of bias tool.

Results: Nine hundred and sixty-five studies were screened to include three studies involving 556 participants. Quality of economic evaluation assessed using CHEC-list was high. The methodological quality was high for two studies and low for one study. Tested interventions included Tai Ji Quan, physiotherapist-led, supervised, weekly and monthly balance, and strengthening exercises. The duration of the interventions ranged from 10 weeks to 6 months, while the intervention frequency ranged from two sessions per week to one session per month. Treatment sessions lasted for 60 min in all three studies. One high economic and methodological quality study comparing Tai Ji Quan with resistance and stretching exercises reported least cost resource use among Tai Ji Quan group (USD 80,441) and greater incremental number of falls prevented. All three tested interventions had an 80% probability of being cost-effective with the corresponding country-specific threshold incremental cost-effectiveness ratio values.

Conclusions: The findings provide some evidence for exercise-based intervention as a cost-effective treatment option for preventing falls in PD; however, due to the limited number of available studies, heterogeneity of the interventions, and diversity of assessment settings, a firm conclusion cannot be established. Additional studies evaluating the cost-effectiveness of fall prevention programs involving larger samples and using different treatment parameters in various settings are warranted.

Multimodal training reduces fall frequency as physical activity increases in individuals with Parkinson's disease

DOI

PMID

Abstract

BACKGROUND: Parkinson's disease (PD) results in a global decrease in information processing, ultimately resulting in dysfunction executing motor-cognitive tasks. Motor-cognitive impairments contribute to postural instability, often leading to falls and decreased physical activity. The aim of this study was to determine the effects of a multimodal training (MMT) versus single-modal (SMT) training on motor symptoms, fall frequency, and physical activity in patients with PD classified as fallers.

METHODS: Individuals with PD were randomized into SMT (n = 11) or MMT (n = 10) and completed training 3 times per week for 8 weeks. The SMT completed gait and cognitive training separately, whereas MMT completed gait and cognitive training simultaneously during each 45-minute session. Physical activity, 30-day fall frequency, and PD motor symptoms were assessed at baseline, posttreatment, and during a 4-week follow-up.

RESULTS: Both groups exhibited significant (P <.05) improvements in clinical ratings of motor function, as symptoms improved by 8% and 15% for SMT and MMT, respectively. Physical activity significantly increased (P <.05) for both groups from baseline (mean steps 4942 [4415]) to posttreatment (mean steps 5914 [5425]). The MMT resulted in a significant 60% reduction in falls.

CONCLUSIONS: Although SMT and MMT approaches are both effective in improving physical activity and motor symptoms of PD, only MMT reduced fall frequency after the intervention.

Language: en

Keywords

Parkinson's disease and symptomatic osteoarthritis are independent risk factors of falls in the elderly

Teder-Braschinsky A, Märtson A, Rosenthal M, Taba P. Clin. Med. Insights Arthritis Musculoskelet. Disord. 2019; 12: e1179544119884936.

Abstract

OBJECTIVES: Deteriorating functionality and loss of mobility, resulting from Parkinson's disease, may be worsened by osteoarthritis, which is the most common form of joint disease causing pain and functional impairment. We assessed the association between symptomatic hip or knee osteoarthritis, falls, and the ability to walk among patients with Parkinson's disease compared to a control group.

METHODS: A total of 136 patients with Parkinson's disease in Southern Estonia and 142 controls with an average age of 76.8 and 76.3 years, respectively, were enrolled in a retrospective case-control study. Information on falls and related fractures during the previous year was collected from the patients with Parkinson's disease and controls. Covariates included gender, age, mobility, duration of Parkinson's disease, and fractures.

RESULTS: Patients with Parkinson's disease were at an increased risk of falls compared to the control group, and for the higher risk of fractures. Symptomatic knee or hip osteoarthritis was a significant independent predictor of falls in both patients with Parkinson's disease and controls. The higher risk for fractures during the previous year was demonstrated in symptomatic osteoarthritis. Risk factors for falls included also female gender, use of sleep pills, and the inability to walk 500 m.

CONCLUSIONS: Symptomatic hip and knee osteoarthritis are risk factors for falls and related fractures among the elderly population with and without Parkinson's disease. The inability to walk 500 m could be used as a simple predictive factor for the increased risk of falls among elderly populations.

Towards a wearable system for predicting the freezing of gait in people affected by Parkinson's disease

DOI

PMID

Abstract

Some wearable solutions exploiting on-body acceleration sensors have been proposed to recognize Freezing of Gait (FoG) in people affected by Parkinson Disease (PD). Once a FoG event is detected, these systems generate a sequence of rhythmic stimuli to allow the patient restarting the march. While these solutions are effective in detecting FoG events, they are unable to predict FoG to prevent its occurrence. This paper fills in the gap by presenting a machine learning-based approach that classifies accelerometer data from PD patients, recognizing a pre-FOG phase to further anticipate FoG occurrence in advance. Gait was monitored by three tri-axial accelerometer sensors worn on the back, hip and ankle. Gait features were then extracted from the accelerometer's raw data through data windowing and non-linear dimensionality reduction. A k-nearest neighbor algorithm (k-NN) was used to classify gait in three classes of events: pre-FoG, no-FoG and FoG. The accuracy of the proposed solution was compared to state of-the-art approaches. Our study showed that: (i) we achieved performances overcoming the state-of-the-art approaches in terms of FoG detection, (ii) we were able, for the very first time in the literature, to predict FoG by identifying the pre-FoG events with an average sensitivity and specificity of, respectively, 94.1% and 97.1%, and (iii) our algorithm can be executed on resource-constrained devices. Future applications include the implementation on a mobile device, and the administration of rhythmic stimuli by a wearable device to help the patient overcome the FoG.

Language: en

Does a sway-based mobile application predict future falls in people with Parkinson disease?

Fiems CL, Combs-Miller SA, Buchanan N, Knowles E, Larson E, Snow R, Moore ES. Arch. Phys. Med. Rehabil. 2019; ePub(ePub): ePub.

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Abstract

OBJECTIVE: To determine whether a sway-based mobile application (SWAY) predicts falls and to evaluate its discriminatory sensitivity and specificity relative to other clinical measures in identifying fallers in individuals with Parkinson disease (PD).

DESIGN: Observational cross-sectional study SETTING: Community PARTICIPANTS: A convenience sample of 59 subjects with idiopathic PD in Hoehn & Yahr levels I-III. INTERVENTIONS: Participants completed a balance assessment using SWAY, the Movement Disorders Systems-Unified PD Rating Scale motor exam, Mini-BESTest, Activities-specific Balance Confidence (ABC) Scale and reported 6 month fall history. Participants also reported falls for each of the following 6 months. Binomial logistic regression was used to identify significant predictors of future fall status. Cutoff scores, sensitivity and specificity were based on receiver operating characteristic plots. MAIN OUTCOME MEASURES: SWAY score RESULTS: The most predictive logistic regression model included fall history, ABC, and SWAY (P <.001). This model explained 61% (Nagelkerke R2) of the variance in fall prediction and correctly classified 85% of fallers. However, only fall history and ABC were statistically significant (P <.02). Using this model, participants were 32 times more likely to fall in the future if they fell in the past. The ABC and Mini-BESTest demonstrated greater accuracy than SWAY (AUC =.76,.72 and.65 respectively). Cutoff scores to identify fallers were 85% for the ABC and 21/28 for the Mini-BESTest.

CONCLUSION: SWAY did not improve the accuracy of predicting future fallers beyond common clinical measures and fall history.

Language: en

A turn for the worse: turning performance in Parkinson's disease and Essential tremor

Baudendistel ST, Schmitt AC, Rodriguez AV, McFarland NR, Hass CJ. Clin. Biomech. 2019; 70: 245-248.

Affiliation

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Abstract

BACKGROUND: Turning is an activity of daily living known to elicit falls in older adults and particularly in persons with movement disorders. Specifically, those with Parkinson's disease have marked impairments in forward walking and turning. Although recent work has identified gait impairment in those with Essential tremor, turning has not been extensively evaluated. As the cerebellum is key in the pathophysiology of Essential tremor, complex tasks like turning, may be impaired for this population. The purpose of this study was to investigate turning behavior and falls in those with Essential tremor and Parkinson's disease.

METHODS: 15 persons with Essential tremor and 15 persons with Parkinson's disease performed forward walking and turns on an instrumented walkway. t-tests compared groups and a regression was performed to predict fall frequency.

FINDINGS: During turning, those with Essential tremor had lower cadence (p = .042) and took more time (p = .05). No other variables, including forward walking variables, differed between groups. When pooling groups, the significant fall frequency predictor model (p = .003) included decreased forward cadence, increased turning cadence, and female sex. Overall, the model explained 40.7% of the variance.

INTERPRETATION: While forward gait performance was similar between groups, those with Essential tremor had increased turn time, a measure often associated with turning impairment. Together, these results suggest overall gait impairment in Essential tremor is more prevalent than recognized. Walking performance, both turning and forward, and sex were predictive of fall frequency. Therapeutic interventions in these populations should include both forward walking and turns to mitigate fall risk.

Language: en

Keywords

Essential tremor; Falls; Gait; Parkinson's disease; Turns

Perception of whole-body motion during balance perturbations is impaired in Parkinson's disease and is associated with balance impairment

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Abstract

BACKGROUND: In addition to motor deficits, Parkinson's disease (PD) may cause perceptual impairments. The role of perceptual impairments in sensorimotor function is unclear, and has typically been studied in single-joint motions. RESEARCH QUESTION: We hypothesized that perception of whole-body motion is impaired in PD and contributes to balance impairments. We tested (1) whether directional acuity to whole body perturbations during standing was worse in people with PD compared to neurotypical older adults (NOA), and (2) whether balance ability, as assessed by the MiniBESTest, was associated with poor directional acuity in either group.

METHODS: Participants were exposed to pairs of support-surface translation perturbations in a two-alternative forced choice testing paradigm developed previously in a young healthy population. The first perturbation of each pair that was to be judged by participants was directly backward, and the second perturbation deviated from the left or right from the backward direction by 1°-44°. Participants reported whether the perturbations in each pair were in the "same" or "different" direction. Judgements from 24 to 67 perturbation pairs were used to calculate directional acuity thresholds corresponding to "just-noticeable differences" in perturbation direction. Linear mixed models determined associations between directional thresholds and clinical variables including MDS-UPDRS-III score, age, and MiniBESTest score.

RESULTS: 20 PD (64 ± 7 y, 12 male, ≥12 h since last intake of antiparkinsonian medications) and 12 NOA (64 ± 8, 6 male) were assessed. Directional thresholds were higher (worse) among PD participants (17.6 ± 5.9° vs. 12.8 ± 3.3°, $P < 0.01$). Linear mixed models further showed that higher thresholds were associated with MDS-UPDRS-III score ($P < 0.01$), and were associated with poorer balance ability among PD participants ($P < 0.01$), but not among NOA participants ($P = 0.40$). SIGNIFICANCE: Perception of whole-body motion is impaired in PD and may contribute to impaired balance and falls.

Argentine tango reduces fall risk in Parkinson's patients

Peter S, Crock ND, Billings BJ, Wu R, Sterling S, Koul S, Taber WF, Pique K, Golan R, Maitland G. J. Am. Med. Dir. Assoc. 2019; ePub(ePub): ePub.

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DOI

PMID

Abstract

Argentine tango (tango) is a partnered dance focused on walking and balance dynamics. Partners learn correct posture and the ability to use the floor as a walking aid. For example, a forward step is broken down into multiple aspects: weight shifting, knee and hip positions, torso dissociation from hips, and gradual foot placement onto the floor again. Literature reports that tango significantly improves Unified Parkinson Disease Rating Scale (UPDRS) motor scores in patients with Parkinson's disease (PD) compared to no intervention ...

Language: en

Falling among people with Parkinson's disease: motor, non-motor, or both?

Silva de Lima AL, Borm C, Vries NM, Bloem BR. Arq. Neuropsiquiatr. 2019; 77(11): 759-760.

Affiliation

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Abstract

Falling is common among people with Parkinson's disease (PD). Because of a common amnesia for falls, capturing falls in real-life is challenging. Despite this challenge, we estimate that about 70% of PD patients experience at least one fall per year, which - according to objective measurements using wearable falls detectors - is about 1.8 times more often than age matched controls. Established risk factors for falling in PD include particularly motor features, such as freezing of gait or balance impairment. The contribution of non-motor symptoms, such as autonomic failure, ophthalmological problems or depression, can be suspected, but is to date much less clear.

In this current edition, Alvarado-Bolaños and colleagues report on the association between non-motor symptoms and fall risk in people with PD. Using a cross-sectional design, they collected retrospective data from a convenience sample of 179 people with PD attending a Movement Disorders clinic in Mexico City. Thirty of these were self-reported fallers (16 of whom were recurrent fallers), and their profile was fairly representative (19 men; mean age 66.7 years), although 13 were surprisingly mildly affected (Hoehn & Yahr stage 1 or 2). Baseline data included presence and severity of motor symptoms (Movement Disorder Society – Unified Parkinson's Disease Rating Scale - MDS-UPDRS) and non-motor symptoms (non-motor symptoms scale - NMSS; and relevant sections of the UPDRS). Bivariate analyses showed that fallers had more non-motor symptoms (mainly in the urinary and miscellaneous domains of the NMSS) compared to non-fallers. However, in a multivariate analysis, non-motor symptoms were no longer predictive of falling; only disease duration and the Postural Imbalance and Gait Disorder (PIGD) type of PD persisted as predictors of falls ...

Language: en

Falls in persons with Parkinson's disease: do non-motor symptoms matter as much as motor symptoms?

Alvarado-Bolaños A, Cervantes-Arriaga A, Arredondo-Blanco K, Salinas-Barboza K, Isais-Millán S, Rodríguez-Violante M. Arq. Neuropsiquiatr. 2019; 77(11): 761-767.

Affiliation

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Abstract

INTRODUCTION: Falls are common among persons with Parkinson's disease (PD). On the other hand, predicting falls is complex as there are both generic and PD-specific contributors. In particular, the role of non-motor symptoms has been less studied.

OBJECTIVE: The objective of this study was to identify the role of non-motor predictors of falling in persons with PD (PwP).

METHODS: A cross-sectional study was carried out in PwP recruited from a movement disorders clinic. Clinical and demographical data were collected. All PwP were assessed using the Movement Disorders Society Unified Parkinson's Disease Rating Scale (MDS-UPDRS) and the Non-Motor Symptoms Scale (NMSS). Variables were assessed at the bivariate level. Significant variables were put into a logistic regression model.

RESULTS: A total of 179 PwP were included. Overall, 16.8% of PwP had fallen in the past 12 months, with 53.3% of them being recurrent fallers. The mean number of monthly falls was 2.5 ± 3.3. Factors associated with falling in the bivariate analysis included the disease duration, Hoehn and Yahr stage, MDS-UPDRS part I and II, postural instability/gait disturbance (PIGD) subtype, NMSS urinary domain, NMSS miscellaneous domain, and non-motor severity burden (all p-values < 0.05). After multivariate analysis, only the disease duration (p = 0.03) and PIGD (p = 0.03) remained as independent risk factors.

CONCLUSION: Disease duration and the PIGD subtype were identified as relevant risk factors for falls in PwP Non-motor symptoms appear to have a less important role as risk factors for falls.

Language: en

Multiple Sclerosis

The association between gait variability with the energy cost of walking depends on the fall status in people with multiple sclerosis without mobility aids

Kalron A, Frid L, Menascu S, Givon U. Gait Posture 2019; 74: 231-235.

Affiliation

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Abstract

BACKGROUND: Falls, gait variability and increased energy cost of walking are common in people with multiple sclerosis (PwMS). However, no studies have as yet examined this triple association in PwMS or in other neurological populations. RESEARCH QUESTION: Does a relationship exist between gait variability, falls and the energy cost of gait in PwMS? METHODS: This cross sectional study included 88 PwMS (50 women), mean age 39.8 (S.D = 13.0) and mean disease duration of 6.2 (SD = 8.2) years since diagnosis. Energy expenditure during walking was collected via a portable metabolic device (COSMED K5, COSMED Srl, Roma, Italy). Gait variability was measured by an electronic walkway (GAITRite™). Participants were divided into groups based on fall history (fallers and non-fallers). Differences between groups in terms of energy expenditure measures and gait variability metrics were determined by the analysis of variance test. The relationship between gait variability and energy cost of walking was examined by the Pearson's correlation coefficient test.

RESULTS: Thirty-three PwMS were classified as fallers and 55 as non-fallers. Non-significant differences between groups were observed in the energy expenditure measures, including cost of walking. Fallers demonstrated higher step length variability compared with non-fallers (4.58 (S.D. = 2.42 vs. 3.40 (S.D. = 1.40); p-value = 0.005). According to the Pearson's correlation coefficient analysis, a significant relationship was found between step length variability and energy cost of walking in the non-fallers group (Rho = 0.372, P-value = 0.006) and the total group (Rho = 0.296, p-value = 0.005), but not in those PwMS with a history of falls. SIGNIFICANCE: We demonstrated a significant relationship between increased gait variability and energy expenditure while walking only in MS patients without a history of falls. This is important as there is evidence of the clinical relevance of increased gait variability, poor fitness level and high risk of falling in the MS population.

Language: en

Keywords Energy cost of walking; Falls; Gait variability; Multiple sclerosis

Critically appraised paper: Task-oriented gait training that focuses on the safe and correct use of a walking aid may reduce falls in people with multiple sclerosis [commentary]

Affiliation

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Abstract

Falls and falls-related injuries are commonly seen by clinicians who treat multiple sclerosis. Therefore, developing intervention strategies specifically targeting falls in this population should be a priority. Approaches specifically targeting people with greater multiple sclerosis-related disability and who are still walking should receive particular attention, as this population is more likely to fall or stop walking due to fear of falls.[1] The authors describe an intervention program combining assistive device training with task-oriented gait training with assistive devices, finding that participants who received this training had fewer falls and spent less time sitting than controls. However, there was no between-group difference in mobility scores.

Two clinically important messages emerged from this study. First, using task-specific programs, as opposed to more generalised programs (eg, aerobic fitness, resistance training), indicates that clinicians working with patients with multiple sclerosis should focus on tailoring treatments to the specific gait problems of the patient. Multiple sclerosis has a very specific clinical presentation, and clinicians who work with this population should be mindful that interventions are targeted to their patient's specific impairments and functional limitations. Second, despite the fact that the participants in this study were fairly disabled and required constant use of an assistive device, improvements in mobility were still evident after intervention, indicating that even patients with greater disability may improve mobility in meaningful ways with appropriate intervention.

Language: en

Fall risk prediction in multiple sclerosis using postural sway measures: a machine learning approach

Affiliation

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DOI

PMID

Abstract

Numerous postural sway metrics have been shown to be sensitive to balance impairment and fall risk in individuals with MS. Yet, there are no guidelines concerning the most appropriate postural sway metrics to monitor impairment. This investigation implemented a machine learning approach to assess the accuracy and feature importance of various postural sway metrics to differentiate individuals with MS from healthy controls as a function of physiological fall risk. 153 participants (50 controls and 103 individuals with MS) underwent a static posturography assessment and a physiological fall risk assessment. Participants were further classified into four subgroups based on fall risk: controls, low-risk MS (n = 34), moderate-risk MS (n = 27), high-risk MS (n = 42). Twenty common sway metrics were derived following standard procedures and subsequently used to train a machine learning algorithm (random forest - RF, with 10-fold cross validation) to predict individuals' fall risk grouping. The sway-metric based RF classifier had high accuracy in discriminating controls from MS individuals (>86%). Sway sample entropy was identified as the strongest feature for classification of low-risk MS individuals from healthy controls. Whereas for all other comparisons, mediolateral sway amplitude was identified as the strongest predictor for fall risk groupings.

Language: en

Stroke

Interventions for preventing falls in people after stroke

Denissen S, Staring W, Kunkel D, Pickering RM, Lennon S, Geurts AC, Weerdesteyn V, Verheyden GS. Cochrane Database Syst. Rev. 2019; 10: CD008728.

Affiliation

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DOI

PMID

Abstract

BACKGROUND: Falls are one of the most common complications after stroke, with a reported incidence ranging between 7% in the first week and 73% in the first year post stroke. This is an updated version of the original Cochrane Review published in 2013.

OBJECTIVES: To evaluate the effectiveness of interventions aimed at preventing falls in people after stroke. Our primary objective was to determine the effect of interventions on the rate of falls (number of falls per person-year) and the number of fallers. Our secondary objectives were to determine the effects of interventions aimed at preventing falls on 1) the number of fall-related fractures; 2) the number of fall-related hospital admissions; 3) near-fall events; 4) economic evaluation; 5) quality of life; and 6) adverse effects of the interventions. SEARCH METHODS: We searched the trials registers of the Cochrane Stroke Group (September 2018) and the Cochrane Bone, Joint and Muscle Trauma Group (October 2018); the Cochrane Central Register of Controlled Trials (CENTRAL; 2018, Issue 9) in the Cochrane Library; MEDLINE (1950 to September 2018); Embase (1980 to September 2018); CINAHL (1982 to September 2018); PsycINFO (1806 to August 2018); AMED (1985 to December 2017); and PEDro (September 2018). We also searched trials registers and checked reference lists. SELECTION CRITERIA: Randomised controlled trials of interventions where the primary or secondary aim was to prevent falls in people after stroke. DATA COLLECTION AND ANALYSIS: Two review authors (SD and WS) independently selected studies for inclusion, assessed trial quality and risk of bias, and extracted data. We resolved disagreements through discussion, and contacted study authors for additional information where required. We used a rate ratio and 95% confidence interval (CI) to compare the rate of falls (e.g. falls per person-year) between intervention and control groups. For risk of falling we used a risk ratio and 95% CI based on the number of people falling (fallers) in each group. We pooled results where appropriate and applied GRADE to assess the quality of the evidence. MAIN RESULTS: We included 14 studies (of which six have been published since the first version of this review in 2013), with a total of 1358

participants. We found studies that investigated exercises, predischarge home visits for hospitalised patients, the provision of single lens distance vision glasses instead of multifocal glasses, a servo-assistive rollator and non-invasive brain stimulation for preventing falls.Exercise compared to control for preventing falls in people after strokeThe pooled result of eight studies showed that exercise may reduce the rate of falls but we are uncertain about this result (rate ratio 0.72, 95% CI 0.54 to 0.94, 765 participants, low-quality evidence). Sensitivity analysis for single exercise interventions, omitting studies using multiple/multifactorial interventions, also found that exercise may reduce the rate of falls (rate ratio 0.66, 95% CI 0.50 to 0.87, 626 participants). Sensitivity analysis for the effect in the chronic phase post stroke resulted in little or no difference in rate of falls (rate ratio 0.58, 95% CI 0.31 to 1.12, 205 participants). A sensitivity analysis including only studies with low risk of bias found little or no difference in rate of falls (rate ratio 0.88, 95% CI 0.65 to 1.20, 462 participants).

METHODological limitations mean that we have very low confidence in the results of these sensitivity analyses.For the outcome of number of fallers, we are very uncertain of the effect of exercises compared to the control condition, based on the pooled result of 10 studies (risk ratio 1.03, 95% CI 0.90 to 1.19, 969 participants, very low quality evidence). The same sensitivity analyses as described above gives us very low certainty that there are little or no differences in number of fallers (single interventions: risk ratio 1.09, 95% CI 0.93 to 1.28, 796 participants; chronic phase post stroke: risk ratio 0.94, 95% CI 0.73 to 1.22, 375 participants; low risk of bias studies: risk ratio 0.96, 95% CI 0.77 to 1.21, 462 participants).Other interventions for preventing falls in people after strokeWe are very uncertain whether interventions other than exercise reduce the rate of falls or number of fallers. We identified very low certainty evidence when investigating the effect of predischarge home visits (rate ratio 0.85, 95% CI 0.43 to 1.69; risk ratio 1.48, 95% CI 0.71 to 3.09; 85 participants), provision of single lens distance glasses to regular wearers of multifocal glasses (rate ratio 1.08, 95% CI 0.52 to 2.25; risk ratio 0.74, 95% CI 0.47 to 1.18; 46 participants) and a servo-assistive rollator (rate ratio 0.44, 95% CI 0.16 to 1.21; risk ratio 0.44, 95% CI 0.16 to 1.22; 42 participants).Finally, transcranial direct current stimulation (tDCS) was used in one study to examine the effect on falls post stroke. We have low certainty that active tDCS may reduce the number of fallers compared to sham tDCS (risk ratio 0.30, 95% CI 0.14 to 0.63; 60 participants). AUTHORS' CONCLUSIONS: At present there exists very little evidence about interventions other than exercises to reduce falling post stroke. Low to very low quality evidence exists that this population benefits from exercises to prevent falls, but not to reduce number of fallers.Fall research does not in general or consistently follow methodological gold standards, especially with regard to fall definition and time post stroke. More well-reported, adequately-powered research should further establish the value of exercises in reducing falling, in particular per phase, post stroke.

Language: en

Effectiveness of Wii Fit Balance board in comparison with other interventions for post-stroke balance rehabilitation. Systematic review and meta-analysis

Garcia-Munoz C, Casuso-Holgado MJ. Rev. Neurol. 2019; 69(7): 271-279.

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Abstract

INTRODUCTION: Virtual reality is a booming therapeutic tool within the neurorehabilitation field. Among the different non-inmersive virtual reality systems, the most outstanding is the platform, Wii Fit Balance.

AIM: To review the scientific literature published in recent years about the effectiveness of Wii Fit Balance tool. The use of this platform for balance training in patients who have suffered a stroke compared to conventional therapies is going to be analyzed from a quantitative and qualitative point of view.

SUBJECTS AND METHODS: A search of the databases has been carried out: PubMed, Lilacs, PEDro, Scopus, Web of Science and Cochrane Library. Descriptors employed were "Wii Fit Balance", "Wii", "stroke", "ictus" and "balance". Studies were analyzed methodologically by PEDro Scale. For those possible variables a meta-analysis was elaborated.

RESULTS: Sixteen randomized clinical trials were selected for the systematic review and six of them were included in the meta-analysis.

RESULTS for the descriptive analysis were heterogeneous. This situation is confirmed through the meta-analysis results, because the analyzed variables for static and dynamic balance show intra-group improvement and no significant differences between groups post-intervention.

CONCLUSION: Wii Fit Balance, virtual reality platform, is an available therapeutic tool which has been shown at least as effective as conventional balance training in post-stroke patients.

Language: es

Effects of visual feedback training and visual targets on muscle activation, balancing, and walking ability in adults after hemiplegic stroke: a preliminary, randomized, controlled study

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Abstract

The aim of this randomized, controlled study was to investigate the effect of visual feedback through visual targets on muscle activity, balance, and gait in stroke patients. Patients were recruited from the inpatient unit of a rehabilitation hospital. Twenty-one patients who had experienced hemiplegic stroke were randomly assigned to two groups: an experimental group (visual feedback training with visual targets on gradual weight shifting), and a control group (visual feedback training on gradual weight shifting). All patients performed 30 minutes of comprehensive rehabilitation therapy followed by an additional 20 minutes of gradual weight shifting using visual feedback training with or without visual targets: three sets per day, five times a week, for 4 weeks. Significantly larger gains were identified in the experimental group compared to the control group due to gluteus medius muscle activation and the weight-bearing ability of the paretic side. Visual feedback training with visual targets during gradual weight bearing on the paretic side appears to improve the muscle activation and balancing abilities of hemiplegic stroke patients compared to visual feedback training alone.

Language: en

The six-minute walk test as a fall risk screening tool in community programs for persons with stroke: a cross-sectional analysis

Regan E, Middleton A, Stewart JC, Wilcox S, Pearson JL, Fritz S. Top. Stroke Rehabil. 2019; ePub(ePub): ePub.

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Copyright

DOI

PMID

Abstract

Background and Purpose
: Persons with stroke have increased risk for recurrent stroke. Group exercise programs like cardiac rehabilitation might reduce this risk. These programs commonly use the six-minute walk test to measure aerobic capacity. However, failure to assess fall risk may compromise safety for persons with stroke. The study aim was to determine the association between the six-minute walk test and fall risk in persons with stroke.
Methods
: Cross-sectional analysis measured the association between the six-minute walk test and fall risk in 66 persons with stroke with a mean age of 66 years (SD 12) and median stroke chronicity of 60.9 months (range 6.0-272.1). The six-minute walk test was evaluated using logistic regression. The best fit model was used in Receiver Operating Characteristic analysis. Likelihood ratios and post-test probabilities were calculated.
Results
: Lower six-minute walk test distance was associated with increased fall risk in logistic regression (p =.002). The area under the curve for the univariate six-minute walk test model (best fit) was 0.701 (p =.006). The cutoff for increased fall risk was six-minute walk test <331.65 m. The post-test probability of fall risk increased to 74.3% from a pre-test probability of 59.1%.
Discussion
: The moderate association between fall risk and six-minute walk test suggests that in addition to assessing capacity, the six-minute walk test provides insight into fall risk/balance confidence.
Conclusion
: Using the six-minute walk test cutoff to screen fall risk in community exercise programs may enhance safety for persons with stroke without additional testing required.

Keywords

Efficacy of dual-task training with two different priorities instructional sets on gait parameters in patients with chronic stroke

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Abstract

PURPOSE: Balance is controlled through a complex process involving sensory, visual, vestibular and cerebral functioning which get affected by various neurological disorders such as in stroke. Various types of exercises are designed to address the imbalance that is developed due to these neurological disorders. This study aimed to compare the efficacy of dual-task training using two different priority instructional sets in improving gait parameters in patients with chronic stroke.

METHODS: This study was a randomized, pretest-posttest experimental group design that compared between two different priority instructional sets (fixed versus variable) of the dual-task training. A convenience sample of thirty patients with chronic stroke due to ruptured middle cerebral artery (mean age±SD = 55.76±5.23; range 48-65 years) was recruited and equally allocated into two groups. Group 1 received dual-task training with fixed priority instructional sets and group 2 received dual-task training with variable priority instructional sets. Both groups were trained for a period of 45 mins each session, 3-sessions per week for 4 weeks. The timed 10-m walk test and foot prints on walkway paper were used to assess the gait parameters (walking speed, stride length and step length) before and after the training session.

RESULTS: Within-group analysis revealed a significant improvement ($p<0.05$) on gait parameters for both the groups. Furthermore, Cohen's d calculation for the treatment effect size revealed highly larger effect size on gait parameters in group 2 (Cohen's d>2 SD) than group 1 (Cohen's d<2 SD) for the all variables.

CONCLUSION: The dual-task training with variable priority instructional sets (group 2) was more effective than dual-task training with fixed priority instructional sets (group 1) in improving gait parameters such as gait speed, stride length, and step length in patients with chronic stroke. Physiotherapists should spread awareness and use this specific set of exercises

Effects of visual feedback training using transient Fresnel prism glasses on balance ability in stroke patients without hemispatial neglect

Ha SY, Kim SY, Sung YH. J. Exerc. Rehabil. 2019; 15(5): 683-687.

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Abstract

The center of mass of the body in patients with stroke was oriented toward the nonparetic side. Abnormal weight shift increases the risk of falls. Therefore, many therapists make an effort to help their functional recovery through balance training. Our aim was to investigate the effect of visual feedback intervention using a Fresnel prism on static and dynamic balance in stroke patients without hemispatial neglect. Participants were assigned to control group (n=10) and experimental group (n=9). In the control group, neurodevelopmental therapy was performance for 30 min. In the experimental group, Fresnel prism glasses were applied with neurodevelopmental therapy for 30 min. We executed motor-free visual perception test for visual perception, balancia for static balance ability, and functional reach test and Berg balance test for dynamic balance ability, respectively. All tests were measured immediately after intervention. The visual perception function showed significant difference between unaffected side performance behaviors and visual perceptual processing time (P<0.05). In the static balance, there was a significant difference in sway velocity and sway distances (P<0.05). Dynamic balance was also significant different between groups (P<0.05). Visual feedback using Fresnel prism helps to control the static and dynamic balance ability by inducing weight shift toward the affected side in stroke patients. Therefore, a Fresnel prism may be suggested as an intervention tool to assist weight training for patients with stroke.

Language: en

Can the wii fit balance board be used as a fall risk assessment tool among poststroke patients?

Beato MC, Morton E, Iadarola C, Winterberger L, Dawson N. J. Stroke Cerebrovasc. Dis. 2019; ePub(ePub): ePub.

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Abstract

BACKGROUND: The prevalence of falls can be as high as 73% in the stroke population. Falls occur as a result of multiple factors. Factors such as balance impairments can be improved through physical therapy intervention. However, insurance payers limit the number of visits per patient. It is crucial to find other ways to assess balance after discharge from rehabilitation.

PURPOSE: The purpose of this study is to determine if the Nintendo Wii Fit can be used as a fall risk assessment tool among the poststroke population.

METHODOLOGY: A sample of 11 stroke survivors were recruited (mean age 63.36 years). Each participant completed a balance and fall risk assessment using the Berg Balance Scale, Timed Up & Go, Four Square Step Test, Five Times Sit-to-Stand and 8-Foot Walk Test. Bivariate correlation will examine the validity of the Nintendo Wii Fit as a fall risk assessment tool in this population.

RESULTS: The Nintendo Wii Fit Balance Test was found to be correlated with gait speed measured by the 8-Foot Walk Test. There is no correlation between the Wii Fit Balance Tests and most common standardized fall risk measures. Standardized fall risk outcome measures also significantly correlate with each other.

CONCLUSIONS: The study suggests that while there is a potential utility of the game system to be used at home by patient and caregivers, the Wii Fit Balance Test may not be an appropriate substitute to the standardized fall risk assessment tool for stroke patients in the clinical setting.

Language: en

Effects of hydrokinesitherapy on balance and walking ability in stroke survivors: a systematic review and meta-analysis of randomized controlled studies

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Abstract

BACKGROUND: Balance and walking impairment are common dysfunctions after stroke. Emerging data has demonstrated that hydrokinesitherapy may have a positive influence on improvement of balance and walking ability. However, there is no firm evidence to support these results. Therefore, the aim of this review is to evaluate the effects of hydrokinesitherapy in stroke survivors systematically.

METHODS: Medline, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL) in the Cochrane Library, CINAHL and SPORTDiscus were systemic searched from their inception to Septemter 30, 2018. RevMan 5.3 software was used to perform data synthesis. The fixed-effect model or random-effect model was employed according to the results of heterogeneity test. The mean differences (MD) or standardized mean difference (SMD) was used to evaluate the pooled effect of hydrokinesitherapy on balance function, walking ability and activty of daily life (ADL).

RESULTS: A total of 13 studies were included involving 381 stroke survivors. Meta-analysis results indicated that hydrokinesitherapy could improve balance ability based on three test: Berg balance scale (BBS: MD = 3.84, 95% confidence interval (95% CI) 2.84 to 4.86, $P < 0.001$), Time Up To Go Test (TUGT: MD = - 1.22, 95% CI - 2.25 to - 0.18, $P = 0.02$, fixed-effect model), Functional Reach Test (FRT: MD = 2.41, 95% CI 1.49 to 3.33, $P < 0.001$). Additionally, we found a weakly positive effect on walking speed (SMD = 0.75, 95% CI 0.26 to 1.25, $P = 0.003$) and walking ability test (SMD = 0.36, 95% CI 0.04 to 0.68, $P = 0.03$). There was no significant difference between experimental group and control group in terms of ADL. SHORT CONCLUSION: Hydrokinesitherapy can improve balance function and had a weakly positive effect on walking ability in stroke survivors. We did not find sufficient evidence to indicate that hydrokinesitherapy could improve the ADL of stroke survivors. However, due to the methodological shortcoming and small number of included studies, caution is needed when interpreting these results. Due to imprecision and publication bias, the quality of the evidence was downgraded to "low-quality" for the primary outcomes of balance and walking ability. TRIAL REGISTRATION: CRD42018110787.

Language: en

Cerebral Palsy

Construct validity of the early clinical assessment of balance in toddlers with cerebral palsy: brief report

Pierce SR, Kornafel T, Skorup J, Paremski AC, Prosser LA. Dev. Neurorehabil. 2019; ePub(ePub): ePub.

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Abstract

Purpose: The purpose of this research was to investigate differences in Early Clinical Assessment of Balance (ECAB) scores within children with cerebral palsy (CP) with different Gross Motor Function Classification System (GMFCS) levels and between children with CP and typical development (TD) who are under three years of age.Methods: The ECAB was administered to fifty children (13 with TD, 16 with GMFCS level II, 11 with GMFCS level III, 10 with GMFCS level III).Results: The group of children of TD had significantly higher scores than all groups of children with CP. There were significant differences in ECAB within the groups of children with CP with different GMFCS levels.Conclusion: The results of this study support the construct validity of the ECAB as a measure of postural control in children under three years of age with CP.

Language: en

Gait deficits and dynamic stability in children and adolescents with cerebral palsy: a systematic review and meta-analysis

Affiliation

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Abstract

BACKGROUND: Studies have demonstrated that ambulatory children and adolescents with cerebral palsy demonstrate atypical gait patterns. Out of numerous gait variables, identification of the most deteriorated gait parameters is important for targeted and effective gait rehabilitation. Therefore, this study aimed to identify the gait parameters with the most discriminating nature to distinguish cerebral palsy gait from normal gait.

METHODS: Multiple databases were searched to include studies on ambulatory children and adolescents with cerebral palsy that included gait (spatio-temporal, kinematic, and kinetic) and dynamic stability variables.

FINDINGS: Of 68 studies that met the inclusion criteria, 35 studies were included in the meta analysis. Effect size was used to assess the discriminative strength of each variable. A large effect (≥ 0.8) of cerebral palsy on double limb support time (Standardized Mean Difference = 0.98), step length (Standardized Mean Difference = 1.65), step width (Standardized Mean Difference = 1.21), stride length (Standardized Mean Difference = 1.75), and velocity (Standardized Mean Difference = 1.42) was observed at preferred-walking speed. At fast-walking speed, some gait variables (i.e. velocity and stride length) exhibited larger effect size compared to preferred-walking speed. For some kinematic variables (e.g. range of motion of pelvis), the effect size varied across the body planes.

INTERPRETATION: Our systematic review detects the most discriminative features of cerebral palsy gait. Non-uniform effects on joint kinematics across the anatomical planes support the importance of 3D gait analysis. Differential effects at fast versus preferred speeds emphasize the importance of measuring gait at a range of speeds.

Language: en