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A home program of strength training, movement strategy training and education did not prevent falls in people with Parkinson's disease: a randomised trial

Morris ME, Taylor NF, Watts J, Evans A, Horne M, Kempster P, Danoudis M, McGinley JJ, Martin C, Menz HB.

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Abstract

QUESTIONS: For people with idiopathic Parkinson's disease, does a 6-week, comprehensive, home exercise program reduce falls and disability and improve health-related quality of life? Is the program cost-effective?

DESIGN: Randomised, controlled trial with concealed allocation and assessor blinding.

PARTICIPANTS: One hundred and thirty-three community-dwelling adults with Parkinson's disease.

INTERVENTION: The experimental group completed a 6-week home program comprising progressive resistance strength training, movement strategy training and falls education. The control group completed 6 weeks of non-specific life skills training. Participants in both groups received weekly therapist-guided sessions for 6 consecutive weeks and a weekly self-directed home program.

OUTCOME MEASURES: The primary outcome was the rate of falls, documented for the 12-month period immediately after therapy. Secondary outcomes were disability and health-related quality of life, assessed before and after intervention and at a 12-month follow-up.

RESULTS: A total of 2255 falls were reported by the 12-month follow-up. The proportion of fallers in the experimental and control groups was 61 and 72%, respectively, which was not statistically significantly different (RR=0.85, 95% CI 0.66 to 1.09). There was no significant between-group difference in the rate of falls (incidence rate ratio=1.58, 95% CI 0.73 to 3.43). A survival analysis of participant time to first fall did not show a significant between-group difference (log-rank test $\chi(2)=0.79$, $p=0.37$). No significant between-group differences occurred for mobility, disability or quality of life. The mean cost of delivering the experimental intervention was AUD1596.

CONCLUSION: A home program of strength and movement strategy training and falls education does not prevent falls when applied at the dose used in this study. Arguably, the dosage of therapy was insufficient. Future trials need to explore further therapy content, repetitions and duration, in order to optimise outcomes and cost-effectiveness. Crown Copyright © 2017. Published by Elsevier B.V. All rights reserved.

PDF Y Endnote Y

After total knee replacement younger patients demonstrate superior balance control compared to older patients when recovering from a forward fall

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Abstract

BACKGROUND: National joint replacement registries have reported a substantial growth in younger knee osteoarthritic patients (<55years old) undergoing total knee replacement, however this younger population is generally understudied. Importantly, studies examining experimentally controlled perturbation have shown age-related differences between younger and older healthy adults, whether similar age-related differences exist among total knee replacement patients is unknown.

METHODS: A total of 59 participants, including 29 unilateral total knee replacement patients (six-months post-surgery) made up the four experimental groups: 1) younger patient (54.3 (SD 7.9) years), 2) younger control (55.2 (SD 4.0) years), 3) older patient (76.9 (SD 4.7) years), and 4) older control (77.7 (SD 4.1) years). Using a tether-release method to perturb balance and simulate a forward fall, center of mass and stepping characteristics were analyzed.

FINDINGS: Younger patients recovered following the perturbation with a significantly smaller center of mass displacement compared to the older patients (14.85 (SD 0.01) v. 18.13 (SD 0.02) %ht, $p=0.02$); utilizing a longer (0.43 (SD 0.02) v. 0.39 (SD 0.03) m, $p<0.001$) and higher velocity (2.01 (SD 0.2) v. 1.59 (SD 0.2) m/s, $p=0.001$) recovery step. Importantly, younger patients did not differ significantly from the younger controls in center of mass displacement or recovery step characteristics ($p>0.05$).

INTERPRETATION: The younger patients demonstrated superior center of mass control in response to a forward perturbation, suggesting that younger patients would be at a reduced risk of falling when recovering from a forward-directed postural perturbation compared to older patients.

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Effect of square stepping exercise for older adults to prevent fall and injury related to fall: systematic review and meta-analysis of current evidences

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J. Exerc. Rehabil. 2017; 13(1): 23-29.

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(Copyright © 2017, Korean Society of Exercise Rehabilitation)

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Abstract

Falls and fall related injuries become an emerging health problem among older adults. As a result a review of the recent evidences is needed to design a prevention strategy. The aim of this review was to determine the effect of square stepping exercise (SSE) for fall down injury among older adults compared with walking training or other exercises. An electronic database search for relevant randomized control trials published in English from 2005 to 2016 was conducted. Articles with outcome measures of functional reach, perceived health status, fear of fall were included. Quality of the included articles was rated using Physiotherapy Evidence Database (PEDro) scale and the pooled effect of SSE was obtained by Review Manager (RevMan5) software. Significant effect of SSE was detected over walking or no treatment to improve balance as well to prevent fear of fall and

improve perceived health status. The results of this systematic review proposed that SSE significantly better than walking or no treatment to prevent fall, prevent fear of fall and improve perceived health status.

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Fall risk score at the time of discharge predicts readmission following total joint arthroplasty

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DOI 10.1016/j.arth.2017.02.035 **PMID** 28343830

Abstract

BACKGROUND: Readmission among Medicare recipients is a leading driver of healthcare expenditure. To date, most predictive tools are too coarse for direct clinical application. Our objective in this study is to determine if a pre-existing tool to identify patients at increased risk for inpatient falls, the Hendrich Fall Risk Score, could be used to accurately identify Medicare patients at increased risk for readmission following arthroplasty, regardless of whether the readmission was due to a fall.

METHODS: This study is a retrospective cohort study. We identified 2437 Medicare patients who underwent a primary elective total joint arthroplasty (TJA) of the hip or knee for osteoarthritis between 2011 and 2014. The Hendrich Fall Risk score was recorded for each patient preoperatively and postoperatively. Our main outcome measure was hospital readmission within 30 days of discharge.

RESULTS: Of 2437 eligible TJA recipients, there were 226 (9.3%) patients who had a score ≥ 6 . These patients were more likely to have an unplanned readmission (unadjusted odds ratio 2.84, 95% confidence interval 1.70-4.76, $P < .0001$), were more likely to have a length of stay >3 days (49.6% vs 36.6%, $P = .0001$), and were less likely to be sent home after discharge (20.8% vs 35.8%, $P < .0001$). The effect of a score ≥ 6 on readmission remained significant (adjusted odds ratio 2.44, 95% confidence interval 1.44-4.13, $P = .0009$) after controlling for age, paralysis, and the presence of a major psychiatric disorder.

CONCLUSION: Increased Hendrich fall risk score after TJA is strongly associated with unplanned readmission. Application of this tool will allow hospitals to identify these patients and plan their discharge.

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Head and trunk control while walking in older adults with diabetes: effects of balance confidence

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J. Mot. Behav. 2017; ePub(ePub): ePub.

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DOI 10.1080/00222895.2017.1283291 **PMID** 28350286

Abstract

Investigations of gait in older adults with diabetes mellitus (DM) have been primarily focused on lower limb biomechanical parameters. Yet, the upper body accounts for two thirds of the body's mass, and head and trunk control are critical for balance. The authors examined head and trunk

control during self-selected comfortable, fast, and dual-task walking and the relationship between balance confidence and potential head-trunk stiffening strategies in older adults with DM without diagnosed diabetic peripheral neuropathy (DPN). Twelve older adults with DM without diagnosed DPN (DM group) and 12 without DM (no-DM group) were recruited. Walking speed, peak-to-peak head and trunk roll displacement, head and trunk roll velocity, and head-trunk correlation were measured while walking at a self-selected comfortable or fastest possible speed with or without a secondary cognitive task. The Activities-specific Balance Confidence scale measured balance confidence. Subtle group differences in axial segmental control (lower trunk roll velocity; higher head-trunk correlation) were apparent in older adults with DM even in the absence of DPN. Balance confidence was 19% lower in the DM group than in the no-DM group, and partially explained (34%) the group difference in head-trunk stiffening. These results emphasize the need for proactive monitoring of postural control and balance confidence before the onset of DPN.

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Prospective fall-risk prediction models for older adults based on wearable sensors

Howcroft J, Kofman J, Lemaire E.

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Abstract

Wearable sensors can provide quantitative, gait-based assessments that can translate to point-of-care environments. This investigation generated elderly fall-risk predictive models based on wearable-sensor-derived gait data and prospective fall occurrence; and identified the optimal sensor type, location, and combination for single and dual-task walking. 75 individuals who reported six month prospective fall occurrence (75.2 ± 6.6 years; 47 non-fallers, 28 fallers) walked 7.62 m under single-task and dual-task conditions while wearing pressure-sensing insoles and tri-axial accelerometers at the head, pelvis, and left and right shanks. Fall-risk classification models were assessed for all sensor combinations and three model types: neural network, naïve Bayesian, and support vector machine. The best performing model used a neural network, dual-task gait data, and input parameters from head, pelvis, and left shank accelerometers (accuracy = 57%, sensitivity = 43%, specificity = 65%). The best single-sensor model used a neural network, dual-task gait data, and pelvis accelerometer parameters (accuracy = 54%, sensitivity = 35%, specificity = 67%). Single-task and dual-task gait assessments provided similar fall-risk model performance. Fall-risk predictive models developed for point-of-care environments should use multi-sensor dual-task gait assessment with the pelvis location considered if assessment is limited to a single sensor.

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Risk assessment and falls prevention in the older adult: Asian experience with the Falls Risk for Older People in the Community tool

Lee SM, Loo G, Long W, Lock JZ, Soh SY, Seetharaman SK, Merchant RA.

Geriatr. Gerontol. Int. 2017; 17(3): 518-519.

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Abstract [Abstract unavailable] Letter to the Editor

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Sleep apnea and lateral balance instability in older adults

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Geriatr. Gerontol. Int. 2017; 17(3): 511-513.

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Abstract [Abstract unavailable] Letter to the Editor

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Taiji (tai chi) for fall prevention in the elderly: training the trainers evaluation project

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Explore (NY) 2017; ePub(ePub): ePub.

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Abstract

Falls in the elderly are common and a major, costly health problem. Taiji addresses many issues related to fall risk. We determined whether intensive weekend training can sufficiently train persons who have baseline familiarity with Taiji to model and teach fundamentals of Taiji to the elderly. Prior to training, registrants received a manual, video and online links for review and practice.

Assessments were completed pre-/post-training. Training occurred in four cities of one state. 34 adults completed training, two did not complete evaluations (ns = 12, 13, 4, and 5 at the four sites). Each training course consisted of two 9-hour days that educated prospective instructors on issues pertinent to the elderly, evaluation techniques, warm-up and cool-down movements and seated and standing Taiji postures. Assessments included pre-/post-knowledge test, Timed Up, and Go and Functional Reach Assessment. Nearly all participants with pre-/post-assessments (30/32, 94%) demonstrated adequate skills post-training. Knowledge of Taiji increased significantly from pre- to post-training ($P < .01$). Brief, intensive weekend training can increase the available workforce to train the elderly in fundamentals of Taiji for fall prevention.

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The association between sleep duration and physical performance in Chinese community-dwelling elderly

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(Copyright © 2017, Public Library of Science)

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Abstract

BACKGROUND: Physical performance is an important healthy factor in elder people. Good living habits, which include sleep, can maintain physical strength and physical performance. The aim of the present study was to conduct a cross-sectional study to determine the association between total sleep duration and physical performance.

METHODS: Our study population comprised residents of the township central hospital in the suburban of Tianjin, China. We measured muscle strength, walk speed and balance function by grip, 4-m walk test and timed up and go test (TUGT). We divided sleep duration into four groups <7h, 7-8h, >8-9h, >9h.

RESULTS: A total 898 participants had completed data (392 men and 506 women, mean age 67.71 years). In man, adjusted sleep duration was associated with lower grip in > 9 h group, the mean value (95% CI) was 0.429 (0.409, 0.448), and longer TUGT time was also associated with long sleep duration, 10.46s (9.97 s, 10.95 s). In women, adjusted slower 4-m walk speed present an inverse U-shaped relation with sleep duration, by 0.93 m/s (0.86 m/s, 0.98 m/s), 0.97 m/s (0.96 m/s, 1.00 m/s), 0.97 m/s (0.95 m/s, 0.99 m/s) and 0.92 m/s (0.89 m/s, 0.96 m/s); longer TUGT time were associated with long sleep duration (> 9 h), by 11.23 s (10.70 s, 11.77 s).

CONCLUSION: In Chinese community-dwelling elderly, lower muscle strength and lower balance function were associated with long sleep duration in men. Slower walk speed and lower balance function were associated with long sleep duration in women.

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The effect of intervening hospitalizations on the benefit of structured physical activity in promoting independent mobility among community-living older persons: secondary analysis of a randomized controlled trial

Gill TM, Beavers DP, Guralnik JM, Pahor M, Fielding RA, Hauser M, Manini TM, Marsh AP, McDermott MM, Newman AB, Allore HG, Miller ME.

BMC Med. 2017; 15(1): e65.

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DOI 10.1186/s12916-017-0824-6 **PMID** 28347337

Abstract

BACKGROUND: Among older persons, disability is often precipitated by intervening illnesses and injuries leading to hospitalization. In the Lifestyle Interventions and Independence for Elders (LIFE) Study, a structured moderate-intensity physical activity program, compared with a health education program, was shown to significantly reduce the amount of time spent with major mobility disability (MMD) over the course of 3.5 years. We aimed to determine whether the benefit of the physical activity program in promoting independent mobility was diminished in the setting of intervening hospitalizations.

METHODS: We analyzed data from a single-blinded, parallel group randomized trial (ClinicalTrials.gov: NCT01072500). In this trial, 1635 sedentary persons, aged 70-89 years, who had functional limitations but were able to walk 400 m, were randomized from eight US centers between February 2010 and December 2013: 818 to physical activity (800 received intervention) and 817 to health education (805 received intervention). Intervening hospitalizations and MMD, defined as the inability to walk 400 m, were assessed every 6 months for up to 3.5 years.

RESULTS: For both the physical activity and health education groups, intervening hospitalizations were strongly associated with the initial onset of MMD and inversely associated with recovery from MMD, defined as a transition from initial MMD onset to no MMD. The benefit of the physical activity intervention did not differ significantly based on hospital exposure. For onset of MMD, the hazard ratios (HR) were 0.79 (95% confidence interval [CI] 0.58-1.1) and 0.77 (0.62-0.95) in the presence and absence of intervening hospitalizations, respectively (P-interaction, 0.903). For recovery of MMD, the magnitude of effect was modestly greater among participants who were hospitalized (HR 1.5, 95% CI 0.71-3.0) than in those who were not hospitalized (HR 1.2, 95% CI 0.88-1.7), but this difference did not achieve statistical significance (P-interaction, 0.670).

CONCLUSIONS: Intervening hospitalizations had strong deleterious effects on the onset of MMD and recovery from MMD, but did not diminish the beneficial effect of the LIFE physical activity intervention in promoting independent mobility. To achieve sustained benefits over time, structured physical activity programs should be designed to accommodate acute illnesses and injuries leading to hospitalizations given their high frequency in older persons with functional limitations. **TRIAL REGISTRATION:** ClinicalTrials.gov identifier NCT01072500.

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The growing challenge of major trauma in older people: a role for comprehensive geriatric assessment?

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Age Ageing 2017; ePub(ePub): ePub.

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(Copyright © 2017, Oxford University Press)

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Abstract

In this commentary article, we describe the impact that an ageing population is having on the nature of major trauma seen in emergency departments. The proportion of major trauma victims who are older people is rapidly increasing and a fall from standing is now the most common mechanism of injury in major trauma. Potential barriers to effective care of this patient group are highlighted, including: a lack of consensus regarding triage criteria; potentially misleading physiological parameters within triage criteria; non-linear patient presentations and diagnostic nihilism. We argue that the complex ongoing care and rehabilitation needs of older patients with major trauma may be best met through Comprehensive Geriatric Assessment (CGA). Furthermore, the use of frailty screening tools may facilitate more informed early decision-making in relation to treatment interventions in older trauma victims. We call for geriatric medicine and emergency medicine departments to collaborate-equipping urgent care staff with the basic competencies necessary to initiate CGA should be a priority, and geriatricians have a key role to play in delivery of such educational interventions.

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The severity and number of musculoskeletal pain associated with gait in community-dwelling elderly individuals

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Gait Posture 2017; 54: 242-247.

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(Copyright © 2017, Elsevier Publishing)

DOI 10.1016/j.gaitpost.2017.03.013 **PMID** 28351745

Abstract

BACKGROUND: The association of quantitative gait characteristics, such as gait variability with musculoskeletal pain is poorly understood. We aimed to examine whether gait speed and gait variability are associated with musculoskeletal pain assessed by the severity and the number of sites in community-dwelling elderly individuals.

METHODS: A total of 176 elderly individuals participated in this study. The wireless motion-recording sensor units were attached to the lower trunk and heel during gait, and an autocorrelation coefficient was calculated in three directions as parameters of gait variability of trunk movement. Musculoskeletal pain was assessed in two aspects: severity and the number of sites.

RESULTS: Moderate/severe pain intensity was significantly associated with slow gait speed and low AC in a mediolateral direction ($P=0.024$ and 0.026 , respectively). Participants with musculoskeletal pain in multiple sites had significantly lower autocorrelation coefficient in mediolateral direction than did those without pain ($P=0.003$).

CONCLUSIONS: Presence of moderate/severe pain intensity in at least one site or any-intensity pain in multiple sites is associated with slower gait speed and higher gait variability of trunk movement in well-functioning elderly individuals living in the community. Additional studies are necessary to elucidate the causal relationships between musculoskeletal pain and gait.

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Factors inducing falling in schizophrenia patients

Tsuji Y, Akezaki Y, Mori K, Yuri Y, Katsumura H, Hara T, Usui Y, Fujino Y, Nomura T, Hirao F.

J. Phys. Ther. Sci. 2017; 29(3): 448-451.

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(Copyright © 2017, Society of Physical Therapy Science)

DOI 10.1589/jpts.29.448 **PMID** 28356628 **PMCID** PMC5361007

Abstract

PURPOSE: The purpose of this study is to investigate the factors causing falling among patients with schizophrenia hospitalized in psychiatric hospitals.

SUBJECTS AND METHODS: The study subjects were divided into either those having experienced a fall within the past one year (Fall group, 12 patients) and those not having experienced a fall (Non-fall group, 7 patients), and we examined differences between the two groups. Assessment items measured included muscle strength, balance ability, flexibility, body composition assessment, Global Assessment of Functioning scale (GAF), the antipsychotic drug intake, and Drug Induced Extra-Pyramidal Symptoms Scale (DIEPSS).

RESULTS: As a result, significant differences were observed in regard to One leg standing time with eyes open, Time Up and Go Test (TUGT), and DIEPSS Sialorrhea between the Fall group and the Non-fall group.

CONCLUSION: These results suggest that a decrease in balance ability was significantly correlated with falling in schizophrenia patients.

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Falls and fear of falling predict future falls and related injuries in ambulatory people with spinal cord injury: a longitudinal observational study

Jørgensen V, Butler Forslund E, Opheim A, Franzén E, Wahman K, Hultling C, Seiger Å, Ståhle A, Stanghelle JK, Skavberg Roaldsen K.

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Abstract

QUESTION: What is the 1-year incidence of falls and injurious falls in a representative cohort of community-dwelling ambulatory people with chronic spinal cord injury? What are the predictors of recurrent falls (more than two/year) and injurious falls in this population?

DESIGN: One-year longitudinal observational multi-centre study.

PARTICIPANTS: A representative sample of 68 (of 73 included) community-dwelling ambulatory people with traumatic spinal cord injury attending regular follow-up programs at rehabilitation centres.

OUTCOME MEASURES: Primary outcome measures were incidence and predictors of recurrent falls (more than two/year) and injurious falls reported every 2 weeks for 1year.

RESULTS: A total of 48% of participants reported recurrent falls. Of the 272 reported falls, 41% were injurious. Serious injuries were experienced by 4% of participants, all of whom were women.

Multivariate logistic regression analysis showed that recurrent falls in the previous year (OR 111, 95% CI 8.6 to 1425), fear of falling (OR 6.1, 95% CI 1.43 to 26) and longer time taken to walk 10m (OR 1.3, 95% CI 1.0 to 1.7) were predictors of recurrent falls. Fear of falling (OR 4.3, 95% CI 1.3 to 14) and recurrent falls in the previous year (OR 4.2, 95% CI 1.2 to 14) were predictors of injurious falls.

CONCLUSION: Ambulatory people with a spinal cord injury have a high risk of falling and of fall-related injuries. Fall history, fear of falling and walking speed could predict recurrent falls and injurious falls. Further studies with larger samples are needed to validate these findings. [Jørgensen V, Butler Forslund E, Opheim A, Franzén E, Wahman K, Hultling C, Seiger Å, Ståhle A, Stanghelle JK, Skavberg Roaldsen K (2017) Falls and fear of falling predict future falls and related injuries in ambulatory people with spinal cord injury: a longitudinal observational study.

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Is there a relationship between postural alignment and mobility for adults after acquired brain injury? A systematic review

Mills SJ, McDonnell MN, Thewlis D, Mackintosh S.

Brain Inj. 2017; ePub(ePub): ePub.

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Abstract

PRIMARY OBJECTIVE: To examine the relationship between postural alignment and mobility skills for adults after acquired brain injury (ABI).

METHODS: Systematic review of the literature. Seven electronic databases, grey literature and reference lists of the shortlisted publications were searched. Studies were included if participants were adults with ABI, both postural alignment and mobility were measured and analysis included a relationship between alignment and mobility. Those that met the inclusion criteria were assessed with a critical appraisal tool. The review was registered with PROSPERO, registration number CRD42015019867.

RESULTS: Seven observational studies were included that had examined a relationship between postural alignment and mobility after ABI. Critical appraisal scores were moderate to strong. While some studies reported that improved postural alignment was related to improved mobility after ABI, results varied and there was insufficient evidence to answer the primary question. Heterogeneous study designs did not allow meta-regression.

CONCLUSIONS: A small amount of observational evidence exists for a relationship between postural alignment and mobility after ABI. Results vary, with some studies reporting that a more stable, upright trunk correlates with better mobility, and others providing conflicting or ambiguous results. Further research is needed to establish the relationship between postural alignment and mobility skills after ABI.

PDF Y Endnote Y

On the estimation accuracy of the 3D body center of mass trajectory during human locomotion: inverse vs. Forward dynamics

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Front. Physiol. 2017; 8: e129.

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DOI 10.3389/fphys.2017.00129 **PMID** 28337148 **PMCID** PMC5340980

Abstract

The dynamics of body center of mass (BCoM) 3D trajectory during locomotion is crucial to the mechanical understanding of the different gaits. Forward Dynamics (FD) obtains BCoM motion from ground reaction forces while Inverse Dynamics (ID) estimates BCoM position and speed from motion capture of body segments. These two techniques are widely used by the literature on the estimation of BCoM. Despite the specific pros and cons of both methods, FD is less biased and considered as the golden standard, while ID estimates strongly depend on the segmental model adopted to schematically represent the moving body. In these experiments a single subject walked, ran, (uni-

and bi-laterally) skipped, and race-walked at a wide range of speeds on a treadmill with force sensors underneath. In all conditions a simultaneous motion capture (8 cameras, 36 markers) took place. 3D BCoM trajectories computed according to five marker set models of ID have been compared to the one obtained by FD on the same (about 2,700) strides. Such a comparison aims to check the validity of the investigated models to capture the "true" dynamics of gaits in terms of distance between paths, mechanical external work and energy recovery.

RESULTS allow to conclude that: (1) among gaits, race walking is the most critical in being described by ID, (2) among the investigated segmental models, those capturing the motion of four limbs and trunk more closely reproduce the subtle temporal and spatial changes of BCoM trajectory within the strides of most gaits, (3) FD-ID discrepancy in external work is speed dependent within a gait in the most unsuccessful models, and (4) the internal work is not affected by the difference in BCoM estimates.

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