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Analysis of gait (walking) with patients with hemiplegia following stroke and the re-education/ treatment of gait.

Date requested: 21st May 2020
Date completed: 26th May 2020
Completed by: Mary Smith

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Mary Smith
Clinical Support Librarian mary.smith30@nhs.net

SUMMARY

Systematic Reviews

- Interventions that yielded gains in propulsion appeared to have in common that they challenged and/or enabled the utilization of latent propulsive capacity of the paretic leg during walking. [4]
- The scale that demonstrated a higher methodological quality was Visual Gait Assessment Scale, followed by CHAGS, Salford Gait Tool, and Edinburgh Visual Gait Score [7]
- The use of Motor Imagery combined with conventional rehabilitation is an effective method for the recovery of functionality after stroke. [9]
- MOTOmed movement therapy combined with standard rehabilitation improves mobility and activities of daily living in stroke patients with hemiplegia. [27]
- NMES combined with or without other interventions has beneficial effects in lower limb motor function in chronic stroke survivors. These data suggest that NMES should be a promising therapy to apply in chronic stroke rehabilitation to improve the capability of lower extremity in performing activities. [35]
- Aquatic exercises may be effective at improving balance impairment in patients with hemiplegia [70]
Although evidence is limited, it suggests that VR intervention (more than 10 sessions) in stroke patients may have a positive impact on balance, and gait recovery [85].

RCTs

- Conventional physical therapy and dual task training effectively improved gait ability of chronic stroke patients, and the latter showed significant improvement in all spatial and temporal gait variables compared to former. [6]
- Activity-based Mirror Therapy facilitates motor recovery of the lower limb as well as reduces gait deviations among chronic poststroke hemiparetic subjects. [12]
- High-intensity stepping training resulted in greater improvements in walking ability and gait symmetry than low-intensity training in individuals with chronic stroke, with potential greater improvements in balance confidence [13]
- Gait training using GEAR for 4 weeks improved walking ability of subacute stroke patients. GEAR contributes to early improvement of walking ability probably by the knee flexion assist during swing phase on the paralyzed side thereby increasing the volume of training, and by the finely adjustable stance/swing assist mechanism for the paralyzed limb which optimizes the training difficulty level [14]
- Mirror therapy with afferent electrical stimulation may effectively improve muscle strength and gait and balance abilities in hemiplegic stroke survivors [15]
- Compared with conventional physiotherapy alone, our results suggest that voluntary strength and balance of stroke patients with hemiparesis might be improved with Morning Walk®-assisted gait training combined with conventional physiotherapy. [17]
- Functional Action Observation is an effective and easy method for improvement of gait ability in chronic stroke patients. [18]
- Ten days of Robot Assisted Gait Training (RAGT) with the Stride Management Assist was effective for improving gait disorders of subacute stroke patients. [20]
- Cerebellar intermittent θ-burst stimulation promotes gait and balance recovery in patients with stroke by acting on cerebello-cortical plasticity. These results are important to increase the level of independent walking and reduce the risk of falling. [22]
- Self-ankle mobilization with movement with a 10° inclined board combined with standard rehabilitation was superior to self-ankle mobilization with movement combined with standard rehabilitation with respect to the improvement in motor function in the patients with chronic stroke. [29]
- Application of the assist-as-needed training mode for the unaffected limb helped improve step length asymmetry in chronic stroke patients. [30]
- Prowling along with proprioceptive training is effective in reducing knee hyperextension, increasing dorsiflexion range and improving spatio-temporal gait parameters. [39]
- Novel Functional Electrical Stimulation therapy combined with conventional rehabilitation is more effective on walking speed, mobility of the lower extremity, balance disability and activities of daily living compared to a conventional rehabilitation program only. [43]
- Positive effects of providing ankle-foot orthoses in (sub)acute stroke subjects that had not used these orthoses before. [52]
- The hemiplegic arm support with an arm sling may be beneficial for gait efficiency in hemiplegic patients using a single cane, which lead to decreased oxygen use at a given speed. [53]
- Although the proposal gait training program has provided better gait parameters for these subacute stroke patients, our data indicate that load addition used as a restraint may not provide additional benefits to gait training. [56]
- Treadmill Training provides better gait performance of subacute stroke patients [59], [60]
• Talocrural Mobilisation With Movement has an augmented effect on ankle strength, mobility, and weight-bearing ability in chronic stroke patients with limited ankle motion when added to conventional therapy [65]
• Full-movement neuromuscular electrical stimulation with a stimulus intensity capable of generating full movement can significantly reduce plantar flexor spasticity and improve ankle active dorsiflexion, but cannot decrease walking time in the Timed Up and Go Test in sub-acute stroke patients. [75]
• Smartphone-based visual feedback trunk control training (SPVFTCT) is a feasible method of improving balance and trunk performance in stroke patients [77]
• Both RAGT and conventional gait training were effective in the improvement of gait performances, [80]
• At 12 months, both FES and AFOs continue to demonstrate equivalent gains in gait speed. Results suggest that long-term FES use may lead to additional improvements in walking endurance and functional ambulation; further research is needed to confirm these findings. [89]
• Gait training with peroneal nerve stimulation and usual care was associated with improvements in peak hip power in pre-swing and peak ankle power at push-off, which may have resulted in improved cadence, stride length, and walking speed [99]

Outcome measures
6-minute walk test [35], [44], [52], [53], [80], [86], [105]
10-metre walk test (10-MWT) [12], [17], [32], [43],[52], [53], [80]
Barthel Index [17], [22], [27], [43], [52]
Berg Balance Scale scores [17], [22], [27],[35],[43], [44], [52], [54], [67], [86]
Brunnstrom recovery stages (BRS) [12]
Fugl-Meyer assessment (FMA) [1], [22], [27], [43]
Fugl-Meyer assessment lower extremity (FMA-LE) [12]
Functional ambulation category (FAC) [1], [17], [27], [52], [67], [86]
Functional Independence Measure (FIM)-walk score [14], [80]
GAITRite [92]
knee joint range of motion [54]
manual muscle test [54]
Modified Ashworth Scale [35], [54]
modified functional reach test [77]
Motricity Index-Lower [17]
modified Rankin scale (mRS) [1]
range of motion [35]
Rivermead Mobility Index [17], [52]
Rivermead visual gait assessment (RVGA) [1], [12]
Sensory tests [54]
SF-36 [80]
stairs test [52]
static balance assessment [77]
Timed Up and Go (TUG) [21], [35], [52], [77], [86]
Tinetti scale [80]
trunk impairment scale [77]

SEARCH RESULTS
1. Interlimb coupling in poststroke rehabilitation: a pilot randomized controlled trial.
Author(s): Arya, Kamal Narayan; Pandian, Shanta; Sharma, Abhishek; Kumar, Vikas; Kashyap, Varun Kumar

Source: Topics in Stroke Rehabilitation; May 2020; vol. 27 (no. 4); p. 272-289

Publication Date: May 2020

Publication Type(s): Academic Journal

Abstract: Background: The interlimb coupling, coordination between the limbs, gets hampered in post-stroke hemiparesis. Most of the poststroke motor regimes primarily focus on the more affected limb. Objectives: To develop an interlimb coupling protocol and assess its feasibility and effect on motor recovery, gait and disability among post-stroke subjects. Design: A pilot randomized controlled, doubled blinded trial Setting: A rehabilitation institute Methods: 50 post-stroke (> 6 months) hemiparetic subjects (Brunnstrom recovery stage ≥ 3) were randomly divided into experimental (n=26) and control (n=24) groups. The 8-week experimental intervention (3 sessions of 1 hour each, per week) comprised activities demanding coordinated, alternate, and rhythmic use of the affected as well as the less-affected limbs. The outcome measures were feasibility of activities, Fugl-Meyer assessment (FMA), Rivermead visual gait assessment (RVGA), Functional ambulation category (FAC) and modified Rankin scale (mRS). Results: The experimental protocol was found to be feasible by the participants. Post intervention, the experimental group exhibited highly significant difference for FMA (mean difference = 7.12, 95% CI = 5.71 – 8.53, p < 0.001), RVGA reduction (mean difference = -6.32, 95% CI = 7.51 – 5.13, p < 0.001), and median FAC enhancement (p < 0.001) in comparison to the controls. However, the median mRS level of experimental group did not change significantly (p = 0.056) when compared with the controls. Conclusions: The interlimb coupling training, a feasible program may enhance recovery of the upper and lower limbs and gait in stroke. Further definitive randomized trials are warranted to validate the present findings.

Database: CINAHL

2. Trunk biomechanics during walking after sub-acute stroke and its relation to lower limb impairments

Author(s): Tamaya V.C.; Wim S.; Herssens N.; Van de Walle P.; Willem D.H.; Steven T.; Ann H.

Source: Clinical Biomechanics; May 2020; vol. 75

Publication Date: May 2020

Publication Type(s): Article

Abstract: Background: Trunk function and lower limb strength seem to be the primary predictors for functional independence in acute stroke patients. Gaining a better understanding of their relationship during walking aids in the identification of intrinsic trunk control deficits and underlying lower limb deficits resulting in compensatory trunk movements. Method(s): Fifty-seven subjects with stroke and 57 age- and gender-matched subjects without disability were included. Participants underwent an instrumented gait analysis with a standard total body Plug-In-Gait model, a clinical examination of the lower limbs based on range of motion, strength, muscle tone and several clinical assessment scales such as the Trunk Impairment Scale, Tinetti test and Functional Ambulation Categories. Spatiotemporal parameters and joint angular time profiles were compared between healthy adults and stroke survivors with severe and mild to moderate lower limb impairments. Spm1d was used to compare the joint angular time profiles between groups. Finding(s): Truncal deviations are present during hemiplegic walking, sub-acute stroke survivors walked with increased thoracic tilt, a neutral frontal position of the pelvis during stance, a pelvic hike during swing, and a more rotated position without crossing of the midline. Patients with more severe lower limb impairments had more pronounced deficits in truncal motion. Interpretation(s): Setting accurate rehabilitation goals is of major importance during stroke, as well as understanding the underlying
mechanisms and causes of the truncal impairments. Although more compensatory trunk deviations were seen in participants with severe lower limb impairments, they should not be considered as the sole contributor of trunk impairments during walking. Results of this study suggest that intrinsic trunk deficits during walking are also present after stroke. Copyright © 2020 Elsevier Ltd

**Database:** EMCARE

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### 3. Gait analysis in hemiplegic stroke survivors who used the one-arm motorized walker.

**Author(s):** Pyo, Seunghyeon; Cho, Kihun; Kwon, Suncheol; Lee, Donggeon; Song, Sunhae; Lee, Gyuchang

**Source:** Technology & Health Care; Mar 2020; vol. 28 (no. 2); p. 135-142

**Publication Date:** Mar 2020

**Publication Type(s):** Academic Journal

**PubMedID:** NLM31306144

**Abstract:**

Objective: A high number of stroke survivors experience limitations in balance and gait abilities. Thus, an improvement in gait ability is an important goal in the rehabilitation of hemiplegic stroke survivors. This study aimed to investigate the effect of using the one-arm motorized walker, a hemi-walker developed to assist hemiplegic stroke survivors in gait training and activities of daily living, on the improvement in gait ability in hemiplegic stroke survivors.

Methods: Eleven hemiplegic stroke survivors who met the inclusion criteria were included. The participants were instructed to walk thrice using traditional walking aids on a gait mat and then to walk thrice using the one-arm motorized walker. During each walk, spatiotemporal gait parameters, including velocity, cadence, step length, stride length, single support time, and double support time, were evaluated using a gait analysis system.

Results: Velocity and cadence significantly increased when the participants walked using the one-arm motorized walker compared to those who used traditional walking aids (p< 0.05), whereas double support time significantly decreased for both the more affected and less affected sides (p< 0.05). However, no significant difference was observed in terms of step length and single support time.

Conclusion: The one-arm motorized walker may have a positive effect on the improvement of gait ability in hemiplegic stroke survivors. It can be an effective walking aid for hemiplegic stroke survivors who experience difficulties in independent walking.

**Database:** CINAHL

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### 4. Effectiveness of rehabilitation interventions to improve paretic propulsion in individuals with stroke – A systematic review.

**Author(s):** Alingh, J.F.; Groen, B.E.; Van Asseldonk, E.H.F.; Geurts, A.C.H.; Weerdesteyn, V.

**Source:** Clinical Biomechanics; Jan 2020; vol. 71 ; p. 176-188

**Publication Date:** Jan 2020

**Publication Type(s):** Academic Journal

**Abstract:**

Stroke survivors often show reduced walking velocity and gait asymmetry. These gait abnormalities are associated with reduced propulsion of the paretic leg. This review aimed to provide an overview of the potential effectiveness of post-stroke rehabilitation interventions to improve paretic propulsion, ankle kinetics and walking velocity. A systematic search was performed in Pubmed, Web of Science, Embase, and Pedro. Studies were eligible if they reported changes in propulsion measures (impulse, peak value and symmetry ratios) or ankle kinetics (moment and power) following intervention in stroke survivors (group size ≥10). Study selection, data extraction and quality assessment were performed independently by two authors. A total of 28 studies were
included, of which 25 studies applied exercise interventions, two studies focused on surgical interventions, and one on non-invasive brain stimulation. The number of high-quality trials was limited (N = 6; score Downs and Black scale ≥19). Propulsion measures were the primary outcome in eight studies. In general, mixed results were reported with 14 interventions yielding improvements in propulsion and ankle kinetics. In contrast, gains in walking velocity were observed in the vast majority of studies (N = 20 out of 23). Interventions that yielded gains in propulsion appeared to have in common that they challenged and/or enabled the utilization of latent propulsive capacity of the paretic leg during walking. Walking speed generally increased, regardless of the observed change in propulsion, suggesting the use of compensatory mechanisms. Findings should, however, be interpreted with some caution, as the evidence base for this emerging focus of rehabilitation is limited. • This paper reviews the effects of interventions on paretic propulsion post stroke. • Out of 28 included studies, only 6 studies were of high methodological quality. • Interventions concerned exercise therapy (with or without technology) and surgery. • Intervention effects on propulsion measures and ankle kinetics were mixed. • Interventions that challenge or enable latent propulsive capacity show promise.

Database: CINAHL

5. Fugl-Meyer Assessment Scores Are Related With Kinematic Measures in People with Chronic Hemiparesis after Stroke.

Author(s): Rech, Katia Daniele; Salazar, Ana Paula; Marchese, Ritchele Redivo; Schifino, Giulia; Cimolin, Veronica; Pagnussat, Aline Souza

Source: Journal of Stroke & Cerebrovascular Diseases; Jan 2020; vol. 29 (no. 1)

Publication Date: Jan 2020

Publication Type(s): Academic Journal

PubMedID: NLM31740027

Abstract: Background: Stroke often results in motor impairment and limited functional capacity. This study aimed to verify the relationship between widely used clinical scales and instrumented measurements to evaluate poststroke individuals with mild, moderate, and severe motor impairment. Methods: This cross-sectional study included 34 participants with chronic hemiparesis after stroke. Fugl-Meyer Assessment and Modified Ashworth Scale were used to quantify upper and lower limb motor impairment and the resistance to passive movement (i.e., spasticity), respectively. Upper limb Motor performance (movement time and velocities) and movement quality (range of motion, smoothness and trunk displacement) were analyzed during a reaching forward task using an optoelectronic system (instrumented measurement). Lower limb motor performance (gait and functional mobility parameters) was assessed by using an inertial measurement unit system. Findings: Fugl-Meyer Assessment correlated with motor performance (upper and lower limbs) and with movement quality (upper limb). Modified Ashworth scale correlated with movement quality (upper limb). Cutoff values of 9.0 cm in trunk anterior displacement and .57 m/s in gait velocity were estimated to differentiate participants with mild/moderate and severe compromise according to the Fugl-Meyer Assessment. Conclusions: These results suggest that the Fugl-Meyer Assessment can be used to infer about motor performance and movement quality in chronic poststroke individuals with different levels of impairment.

Database: CINAHL

6. Comparison of dual task specific training and conventional physical therapy in ambulation of hemiplegic stroke patients: A randomized controlled trial.
**Author(s):** Iqbal, Muhammad; Arsh, Aatik; Hammad, Syed Muhammad; Haq, Ijaz Ul; Darain, Haider

**Source:** JPMA. The Journal of the Pakistan Medical Association; Jan 2020; vol. 70 (no. 1); p. 7-10

**Publication Date:** Jan 2020

**Publication Type(s):** Journal Article

**PubMedID:** 31954014

**Abstract:**

OBJECTIVETo compare the effectiveness of dual task specific training and conventional physical therapy in ambulation of patients with chronic stroke.

METHODS The randomised controlled trial was conducted at the Habib Physiotherapy Complex, Peshawar, Pakistan, from January to August 2017, and comprised patients with chronic stroke. The patients were randomly assigned to two treatment groups. Group A received dual task training, while Group B received conventional physiotherapy. Dual task training included activities such as slowly walking backward, sideways, and forward on a smooth surface while holding a 100gm sandbag. The conventional physiotherapy included mat activities, stretching and strengthening exercises and gait training. Pre-test and post-test data was taken for both spatial and temporal variables for both groups using Time Up and Go Test and 10-meter walk test. Step length, stride length, cycle time and cadence were also calculated before and after treatment. SPSS 23 was used to analyse the data.

RESULTS Of the 64 patients, there were 32(50%) in each of the two groups that both had 17(53%) males and 15(47%) females. Mean age in Group A was 58.28 ± 7.13 years, while in Group B it was 58.87 ± 6.13 years. Baseline parameters had no significant differences between the groups (p>0.05). Post-treatments scores revealed significant improvement of spatial and temporal variable of gait, 10-meter walk, cadence, step length, stride and cycle time in Group A compared to Group B (p<0.05 each).

CONCLUSIONS: Conventional physical therapy and dual task training effectively improved gait ability of chronic stroke patients, and the latter showed significant improvement in all spatial and temporal gait variables compared to former.

**Database:** Medline

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**7. Observational Gait Assessment Scales in Patients with Walking Disorders: Systematic Review**

**Author(s):** Ridao-Fernandez C.; Pinero-Pinto E.; Chamorro-Moriana G.

**Source:** BioMed Research International; 2019; vol. 2019

**Publication Date:** 2019

**Publication Type(s):** Review

**Abstract:** Objective. To compile and analyze the characteristics and methodological quality of observational gait assessment scales validated to date. Methods. PubMed, Scopus, the Cochrane Library, Physiotherapy Evidence Database, Web of Science, Cumulative Index to Nursing and Allied Health Literature, Dialnet, Spanish Medical Index, and Nursing, Physiotherapy, and Podiatry databases were searched up to August 2019. The main inclusion criteria were validated tools based on a conceptual framework developed to evaluate gait, validation design studies of observational scales in their entirety, and articles written in English or Spanish. Evaluators extracted descriptive information of the scales and the metric properties of the studies, which were further analyzed with Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) and COnsensus-based Standards for the selection of health Measurement Instruments (COSMIN checklist). Results. Eighteen articles based on 14 scales were included. The populations were neurological patients (72.22%), musculoskeletal disorders (11.11%), and other areas such as vestibular disorders (11.11%). The most addressed items were orthopedic aids (64.29%); phases of the gait cycle and kinematics of the leg and trunk (57.14% each one); and spatial and temporal parameters (50%). All studies analyzed criterion validity, and five included content or structural validity (27.78%). Fifteen articles considered...
reliability (83.33%). Regarding the seven-item scale QUADAS-2, five studies obtained six results on "low" risk of bias or "low" concerns regarding applicability. Nine articles obtained at least a "fair" result on COSMIN checklist. Conclusions. A necessary compilation of the observational gait assessment scales validated to date was conducted. Besides, their characteristics and methodological quality were analyzed. Most scales were applied in neurological signs. The most approached topics were orthopedic aids, phases of the gait cycle, and kinematics of the leg and trunk. The scale that demonstrated a higher methodological quality was Visual Gait Assessment Scale, followed by CHAGS, Salford Gait Tool, and Edinburgh Visual Gait Score. Copyright © 2019 Carmen Ridao-Fernandez et al.

**Database:** EMCARE

8. The kinematics of paretic lower limb in aquatic gait with equipment in people with post-stroke hemiparesis.

**Author(s):** Pereira, Juliana Aparecida; de Souza, Karine Külkamp; Pereira, Suzana Matheus; Ruschel, Caroline; Hubert, Marcel; Michaelsen, Stella Maris

**Source:** Clinical Biomechanics; Dec 2019; vol. 70 ; p. 16-22

**Publication Date:** Dec 2019

**Publication Type(s):** Academic Journal

**Abstract:** Devices are commonly used in aquatic gait rehabilitation; therefore, investigating the effect of these devices is important. We evaluated the combined use of buoyancy cuffs and ankle weights during aquatic gait on paretic leg kinematics in people with hemiparesis. Fifteen adults (58.6 ± 4.8 years) in the chronic phase post-stroke walked on a 4.5 m walkway with underwater immersion at the height of the xiphoid process in five conditions: (1) without equipment; (2) with ankle weights or (3) buoyancy cuffs on both legs; (4) with a buoyancy leg cuff on the non-paretic leg and an ankle weight on the paretic leg; (5) with an ankle weight on the non-paretic leg and a buoyancy leg cuff on the paretic leg. Five trials were performed for each condition for a total of 25 trials and the kinematic data were recorded. Analysis of covariance was used with walking velocity as a covariate to analyze spatiotemporal and angular variables of the paretic leg. The condition with buoyancy cuff on the paretic leg increased (~20°) the maximum angle of knee flexion in the mid-swing phase compared to that seen with weights on both legs or weight on the paretic leg. Buoyancy cuffs on the paretic leg increased the step length by 5.6 cm. The ankle weights on the paretic leg condition increased the total (6%) and single support (4%) duration compared to that seen with a buoyancy cuff on the paretic leg. Aquatic gait with buoyancy cuffs on both legs or on the paretic leg can modify gait kinematics compared to that with weight on both legs or on the paretic leg. Long term effects of training with those conditions needs further research. • The use of equipment affects paretic leg gait kinematics in the aquatic environment. • The use of buoyancy cuffs and/or ankle weights affects kinematics differently. • Using buoyancy cuffs in the paretic leg can improve aquatic gait kinematics. • Walking with equipment is an alternative form of training for poststroke patients.

**Database:** CINAHL


**Author(s):** López, Noelia Díaz; Monge Pereira, Esther; Centeno, Estefanía Jodra; Miangolarra Page, Juan Carlos

**Source:** Topics in Stroke Rehabilitation; Dec 2019; vol. 26 (no. 8); p. 576-587

**Publication Date:** Dec 2019
**Publication Type(s):** Academic Journal

**Abstract:** Background: Stroke is the leading cause of disability in adults, producing a major personal and economic impact on those affected. The scientific evidence regarding the use of Motor Imagery (MI) as a preparatory process for motor control reinforces the need to explore this method as a complement to physical therapy. Objectives: The objectives of this systematic review were to determine the effectiveness of MI for functional recovery after stroke and to identify a possible intervention protocol, according to the level of existing scientific evidence. Methods: A comprehensive literature search was performed using Medline, Cochrane Library and PEDro databases. Studies were limited to those published between 2007 and 2017, and restricted to English and/or Spanish language publications. Results: Thirteen randomized clinical trials that met the inclusion criteria were included. The methodological quality of studies was determined using the Critical Review Form for Quantitative Studies, obtaining scores of 9–13 points out of 15. The level of evidence and strength of recommendations were assessed using the U.S. Preventive Services Task Force (USPSTF) assessment, obtaining levels IA and II-B1. Significant improvements were found in outcome measures evaluating upper limb functionality, balance and kinematic gait parameters. Conclusions: The use of MI combined with conventional rehabilitation is an effective method for the recovery of functionality after stroke. Due to the great heterogeneity in the scientific literature available, new lines of research are necessary, in order to include well-designed studies of good methodological quality and to establish a consensus regarding the most appropriate protocols.

**Database:** CINAHL

10. **Difference in gait recovery rate of hemiparetic stroke patients according to paralyzed side: A cross-sectional study based on a retrospective chart review.**

**Author(s):** Kim, Cheol-Hyun; Chu, Hongmin; Kang, Geon-Hui; et al.

**Source:** Medicine; Nov 2019; vol. 98 (no. 46); p. e18023

**Publication Date:** Nov 2019

**Publication Type(s):** Journal Article

**PubMedID:** 31725678

Available at Medicine - from Europe PubMed Central - Open Access

**Abstract:** In Donguibogam, a representative encyclopedic source of knowledge on traditional Korean medicine, left-sided hemiparesis due to stroke is called "Tan" as a sort of "Heyol-Byeong," while right-sided hemiparesis due to stroke is called "Tan" as a sort of "Gi-Byeong." According to the theory of Donguibogam, diseases on the left or right side of the human body must be treated differently. Clinically, the symptoms caused by left and right hemisphere lesions in stroke patients differ, as the functions of the left and right hemispheres differ. Considering these facts, when treating patients in clinical practice, it may be useful to distinguish between diseases on the left or right side according to Donguibogam. This study set out to confirm whether side-dependent gait rehabilitation could be used to treat hemiparetic stroke patients. Gait was selected for analysis, as it is the most important factor in returning stroke patients to daily life. This study conducted a retrospective chart review of stroke patients who satisfied the following criteria: outpatient or inpatient at the Wonkwang University Korean Medicine Hospital in Gwangju (WKUGH) with hemiparesis due to stroke; aged between 19 and 85 years old; with a stroke onset within the past 6 months; having undergone gait analysis (GAITRite) more than twice between September 1, 2017 and June 30, 2018 at the WKUGH, with a minimum 2-week interval between the first and next gait analysis; right-handed stroke patient; able to walk unaided. The spatio-temporal parameters for analysis included the FAP, walking velocity, step length, stance time, and swing time as obtained with GAITRite. In the initial gait analysis, there was no significant difference between the 2 groups in all spatio-temporal parameters. However, in the follow-up gait analysis, the left hemiparesis group
showed a significantly higher FAP and faster walking velocity than the right hemiparesis group. This study found a difference in the recovery rate between the left and right hemiparesis groups. Based on this, we suggest that a different treatment strategy for gait rehabilitation can be used according to the paralyzed side. This study was approved by the Institutional Review Board (IRB) of the Wonkwang University Korean Medicine Hospital in Gwangju (WKUGH), Republic of Korea (WKIRB 2018 - 25, November 28, 2018). This trial was registered with the Clinical Research Information Service (CRIS) of the Korea National Institute of Health (NIH), Republic of Korea (KCT0002984).

**Database:** Medline

11. **Co-Contraction of Lower Limb Muscles Contributes to Knee Stability During Stance Phase in Hemiplegic Stroke Patients.**

**Author(s):** Yuan, Hai; Ge, Pingping; Du, Lingling; Xia, Qing

**Source:** Medical science monitor : international medical journal of experimental and clinical research; Oct 2019; vol. 25 ; p. 7443-7450

**Publication Date:** Oct 2019

**Publication Type(s):** Journal Article

**PubMedID:** 31584038

Available at Medical science monitor : international medical journal of experimental and clinical research - from Europe PubMed Central - Open Access

**Abstract:** BACKGROUND Knee stability has an important role in the gait of hemiplegic stroke patients. However, factors affecting knee stability have not been assessed concerning gait. The purpose of this study was to explore whether co-contraction of the lower limb muscles contributes to the knee stability during the stance phase of the gait cycle in hemiplegic stroke patients. MATERIAL AND METHODS A total of 30 hemiplegic stroke patients, ages 36-79 years, were instructed to walk at their natural speed. The root mean square of surface electromyography was used to measure activities of the biceps femoris and rectus femoris muscles, while the co-contraction ratio was computed based on the root mean squares. The peak angle of knee extension was acquired in the stance phase by 3D kinematic analyses. Lower limb function was evaluated using the Fugl-Meyer scale for lower limb motor assessment. RESULTS A statistically significant increase of the muscle co-contraction ratio of the involved extremity was observed compared with that of the uninvolved extremity (t= -4.066, P<0.05). The muscle co-contraction ratio was significantly correlated with the peak angle of knee extension (r= -0.387, P= 0.035), Fugl-Meyer scale (r= -0.522, P= 0.003), and Modified Ashworth Scale (r= -0.404, P= 0.027) during the stance phase of the gait cycle. CONCLUSIONS Our results showed that co-contraction of the rectus femoris muscle contributes to the stability of the knee and lower limb function in hemiplegic stroke patients, and suggests that co-contraction should be considered in the rehabilitation of knee stability during gait in hemiplegic stroke patients. Appropriate rehabilitation assessment planning with hemiplegic stroke patients, such as muscle co-contraction or knee stability of, might be created based on our results.

**Database:** Medline

12. **Effect of activity-based mirror therapy on lower limb motor-recovery and gait in stroke: A randomised controlled trial.**

**Author(s):** Arya, Kamal Narayan; Pandian, Shanta; Kumar, Vikas

**Source:** Neuropsychological Rehabilitation; Sep 2019; vol. 29 (no. 8); p. 1193-1210

**Publication Date:** Sep 2019
Abstract: Objective: To determine the effect of activity-based mirror therapy (MT) on motor recovery and gait in chronic poststroke hemiparetic subjects. Design: A randomised, controlled, assessor-blinded trial. Setting: Rehabilitation institute. Participants: Thirty-six chronic poststroke (15.89 ± 9.01 months) hemiparetic subjects (age: 46.44 ± 7.89 years, 30 men and functional ambulation classification of median level 3). Interventions: Activity-based MT comprised movements such as ball-rolling, rocker-board, and pedalling. The activities were provided on the less-affected side in front of the mirror while hiding the affected limb. The movement of the less-affected lower limb was projected as over the affected limb. Conventional motor therapy based on neurophysiological approaches was also provided to the experimental group. The control group received only conventional management. Main outcome measures: Brunnstrom recovery stages (BRS), Fugl-Meyer assessment lower extremity (FMA-LE), Rivermead visual gait assessment (RVGA), and 10-metre walk test (10-MWT). Results: Postintervention, the experimental group exhibited significant and favourable changes for FMA-LE (mean difference = 3.29, 95% CI = 1.23-5.35, p = .003) and RVGA (mean difference = 5.41, 95% CI = 1.12-9.71, p = .015) in comparison to the control group. No considerable changes were observed on 10-MWT. Conclusions: Activity-based MT facilitates motor recovery of the lower limb as well as reduces gait deviations among chronic poststroke hemiparetic subjects.

Database: CINAHL

13. Contributions of Stepping Intensity and Variability to Mobility in Individuals Poststroke.

Author(s): Hornby, T. George; Henderson, Christopher E.; Plawecki, Abbey; Lucas, Emily; Lotter, Jennifer; Holthus, Molly; Brazg, Gabrielle; Fahey, Meghan; Woodward, Jane; Ardestani, Marzieh; Roth, Elliot J.

Source: Stroke (00392499); Sep 2019; vol. 50 (no. 9); p. 2492-2499

Abstract: Background and Purpose- The amount of task-specific stepping practice provided during rehabilitation poststroke can influence locomotor recovery and reflects one aspect of exercise dose that can affect the efficacy of specific interventions. Emerging data suggest that markedly increasing the intensity and variability of stepping practice may also be critical, although such strategies are discouraged during traditional rehabilitation. The goal of this study was to determine the individual and combined contributions of intensity and variability of stepping practice to improving walking speed and distance in individuals poststroke. Methods- This phase 2, randomized, blinded assessor clinical trial was performed between May 2015 and November 2018. Individuals between 18 and 85 years old with hemiparesis poststroke of >6 months duration were recruited. Of the 152 individuals screened, 97 were randomly assigned to 1 of 3 training groups, with 90 completing >10 sessions. Interventions consisted of either high-intensity stepping (70%-80% heart rate reserve) of variable, difficult stepping tasks (high variable), high-intensity stepping performing only forward walking (high forward), and low-intensity stepping in variable contexts at 30% to 40% heart rate reserve (low variable). Participants received up to 30 sessions over 2 months, with testing at baseline, post-training, and a 3-month follow-up. Primary outcomes included walking speeds and timed distance, with secondary measures of dynamic balance, transfers, spatiotemporal kinematics, and metabolic measures. Results- All walking gains were significantly greater following either high-intensity group versus low-variable training (all P<0.001) with significant correlations with stepping amount and rate (r=0.48-60; P<0.01). Additional gains in spatiotemporal symmetry were observed with high-intensity
training, and balance confidence increased only following high-variable training in individuals with severe impairments. Conclusions- High-intensity stepping training resulted in greater improvements in walking ability and gait symmetry than low-intensity training in individuals with chronic stroke, with potential greater improvements in balance confidence. Clinical Trial Registration- URL: https://www.clinicaltrials.gov. Unique identifier: NCT02507466.

Database: CINAHL

14. Randomized Controlled Trial of Gait Training Using Gait Exercise Assist Robot (GEAR) in Stroke Patients with Hemiplegia

Author(s): Tomida K.; Sonoda S.; Suzuki A.; Kawakami K.; Hirano S.; Saitoh E.; Kagaya H.; Tanino G.

Source: Journal of Stroke and Cerebrovascular Diseases; Sep 2019; vol. 28 (no. 9); p. 2421-2428

Publication Date: Sep 2019

Publication Type(s): Article

Abstract: Purpose: This trial aimed to validate the effectiveness of using the Gait Exercise Assist Robot (GEAR) in patients with hemiplegia after primary stroke. Method(s): The study design was open-label randomized controlled trial. Twenty-six patients with hemiplegia after primary stroke admitted to the comprehensive inpatient rehabilitation wards were enrolled and randomized to a group using GEAR in gait training and a control group. The intervention period was 4 weeks. Evaluations were conducted at admission, during intervention period, 8 weeks from start of intervention, and at discharge. Primary outcome measure was improvement efficiency of Functional Independence Measure (FIM)-walk score (FIM-walk improvement efficiency) that was calculated at the time of achieving FIM-walk score 5 (supervision level) during the intervention period or as weekly gain in FIM-walk score during 4 weeks for those who did not achieve score 5. Result(s): FIM-walk improvement efficiency was .7 +/- .4 in GEAR group and .4 +/- .3 in control group, and was significantly higher in GEAR group (P = .01). The FIM-walk score gain after 4 weeks was significantly higher in the GEAR group (P = .01), but there were no significant differences between 2 groups after 8 weeks and at discharge. Conclusion(s): Gait training using GEAR for 4 weeks improved walking ability of subacute stroke patients. GEAR contributes to early improvement of walking ability probably by the knee flexion assist during swing phase on the paralyzed side thereby increasing the volume of training, and by the finely adjustable stance/swing assist mechanism for the paralyzed limb which optimizes the training difficulty level. Copyright © 2019 Elsevier Inc.

Database: EMCARE

15. Effect of afferent electrical stimulation with mirror therapy on motor function, balance, and gait in chronic stroke survivors: a randomized controlled trial.

Author(s): Lee, Donggeon; Lee, Gyuchang

Source: European journal of physical and rehabilitation medicine; Aug 2019; vol. 55 (no. 4); p. 442-449

Publication Date: Aug 2019

Publication Type(s): Randomized Controlled Trial Journal Article

PubMedID: 30916531

Abstract: BACKGROUND When solely mirror therapy is applied for a long period of time, spatial perception and attention to the damaged side may decrease, and the effect of mirror therapy may be limited. To overcome this limitation, it has recently been suggested that the combination of mirror therapy with mirror treatment is effective. AIM The aim of this study was to investigate the
effects of afferent electrical stimulation with mirror therapy on motor function, balance, and gait in chronic stroke survivors.

**DESIGN**
A randomized controlled trial.

**SETTING**
Rehabilitation center.

**POPULATION**
Thirty stroke survivors were randomly assigned to two groups: the experimental group (N=15) and the control group (N=15).

**METHODS**
Participants of the experimental group received afferent electrical stimulation with mirror therapy, and participants of the control group received sham afferent electrical stimulation with sham mirror therapy for 60 minutes per day, 5 days per week, for 4 weeks. Motor function was measured using a handheld dynamometer and the Modified Ashworth Scale, balance was measured using the Berg Balance Scale, and gait was assessed using the GAITRite® (GAITRite, CIR System Inc., Franklin, NJ, USA) pressure-sensitive walkway at baseline and after 4 weeks.

**RESULTS**
The experimental group showed significant differences in muscle strength, Modified Ashworth Scale, and Berg Balance Scale results, and velocity, cadence, step length, stride length, and double support time of their gait (P<0.05) in the pre-post intervention comparison. Significant differences between the two groups in muscle strength, Berg Balance Scale, gait velocity, step length, and stride length (P<0.05) were found.

**CONCLUSIONS**:
Mirror therapy with afferent electrical stimulation may effectively improve muscle strength and gait and balance abilities in hemiplegic stroke survivors.

**CLINICAL REHABILITATION IMPACT**
Afferent electrical stimulation combined with mirror therapy can be used as an effective intervention to improve lower limb motor function, balance, and gait in chronic stroke survivors in clinical settings.

**Database**: Medline

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16. Minimal detectable change of kinematic and spatiotemporal parameters in patients with chronic stroke across three sessions of gait analysis.

**Author(s)**: Geiger, M.; Supiot, A.; Pradon, D.; Do, M.-C.; Zory, R.; Roche, N.

**Source**: Human Movement Science; Apr 2019; vol. 64 ; p. 101-107

**Publication Date**: Apr 2019

**Publication Type(s)**: Academic Journal

**PubMedID**: NLM30710860

**Abstract**: Three-dimensional gait analysis is the gold standard for gait-assessment in patients with stroke. This technique is commonly used to assess the effect of treatment on gait parameters. In clinical practice, three gait analyses are usually carried out (baseline, after treatment and follow-up), the objectives were to define the reproducibility and the Minimum Detectable Change (MDC) for gait parameters in stance and swing measured using 3D-gait analysis, and to assess changes in MDC across three repeated 3D-gait analyses. Three gait analyses (V1, V2 and V3) were performed at 7-day intervals in twenty-six patients with chronic stroke. Kinematic data (in the sagittal plane, during swing and stance) and spatiotemporal data were evaluated for the paretic limb. Reliability was tested using repeated measures ANOVA with a Tukey post hoc test, and the MDC values were calculated for each parameter. Only the range of hip motion during swing changed significantly between V1 and V2, but no other kinematic parameters changed. No significant differences were observed for the spatiotemporal parameters. MDC values were always higher during the V1vsV2 comparison for both kinematic and spatiotemporal parameters. This is the first study to evaluate the MDC for kinematic and spatiotemporal parameters during stance and swing. Reliability of kinematic and spatiotemporal data across sessions was very good over the three sessions. MDC values were the lowest between V2 and V3 for most parameters. Use of the MDC will allow clinicians to more accurately determine the effect of treatments.

**Database**: CINAHL
17. Effects of robot-(Morning Walk®) assisted gait training for patients after stroke: a randomized controlled trial.

**Author(s):** Kim, JaYoung; Kim, Dae Yul; Chun, Min Ho; Kim, Seong Woo; Jeon, Ha Ra; Hwang, Chang Ho; Choi, Jong Kyoung; Bae, Suhwan

**Source:** Clinical Rehabilitation; Mar 2019; vol. 33 (no. 3); p. 516-523

**Publication Date:** Mar 2019

**Publication Type(s):** Academic Journal

**Abstract:** Objective: To investigate the effects of Morning Walk®-assisted gait training for patients with stroke. Design: Prospective randomized controlled trial. Setting: Three hospital rehabilitation departments (two tertiary and one secondary). Patients: We enrolled 58 patients with hemiparesis following a first-time stroke within the preceding year and with Functional Ambulation Category scores ≥2. Intervention: The patients were randomly assigned to one of two treatment groups: 30 minutes of training with Morning Walk®, a lower limb rehabilitation robot, plus 1 hour of conventional physiotherapy (Morning Walk® group; n = 28); or 1.5 hour of conventional physiotherapy (control group; n = 30). All received treatment five times per week for three weeks. Main outcome measurements: The primary outcomes were walking ability, assessed using the Functional Ambulation Category scale, and lower limb function, assessed using the Motricity Index-Lower. Secondary outcomes included the 10 Meter Walk Test, Modified Barthel Index, Rivermead Mobility Index, and Berg Balance Scale scores. Results: A total of 10 patients were lost to follow-up, leaving a cohort of 48 for the final analyses. After training, all outcome measures significantly improved in both groups. In Motricity Index-Lower of the affected limb, the Morning Walk® group (Δmean ± SD; 19.68 ± 14.06) showed greater improvement (p = .034) than the control group (Δmean ± SD; 11.70 ± 10.65). And Berg Balance Scale scores improved more (p = .047) in the Morning Walk® group (Δmean ± SD; 14.36 ± 9.01) than the control group (Δmean ± SD; 9.65 ± 8.14). Conclusion: Compared with conventional physiotherapy alone, our results suggest that voluntary strength and balance of stroke patients with hemiparesis might be improved with Morning Walk®-assisted gait training combined with conventional physiotherapy.

**Database:** CINAHL


**Author(s):** Oh, Seung-Jun; Lee, Je-Hyeok; Kim, Do-Hyun

**Source:** Technology & Health Care; Mar 2019; vol. 27 (no. 2); p. 159-165

**Publication Date:** Mar 2019

**Publication Type(s):** Academic Journal

**PubMedID:** NLM30664512

**Abstract:** Background: Functional action observation (FAO) is likely to activate the corticospinal tract and is likely to increase the potential ability of a functional task. Objective: The purpose of this study was to investigate the effects of FAO training on gait ability in patients with post-stroke hemiparesis. Methods: Thirty-five patients with hemiparesis caused by stroke participated in this study. All subjects had suffered from stroke for more than 6 months. Subjects received either a FAO or a general action observation (GAO) training for 30 minutes each time, five times per week, for four weeks. The GAITRite was used to measure walking velocities and spatio-temporal variables. The functional gait assessment (FGA) was used to assess gait ability. The independent t-test was used to analyze whether there were significant differences of all dependent variables between groups. Results: After four weeks of training, the step length, stride length, cadence, velocity, and FGA score in FAO group were statistically different from GAO group (p< 0.05). Conclusion: The results
of this study suggest that FAO is an effective and easy method for improvement of gait ability in chronic stroke patients.

**Database:** CINAHL


**Author(s):** Roelker, Sarah A.; Bowden, Mark G.; Kautz, Steven A.; Neptune, Richard R.

**Source:** Gait & Posture; Feb 2019; vol. 68; p. 6-14

**Publication Date:** Feb 2019

**Publication Type(s):** Academic Journal

**PubMedID:** NLM30408710

**Abstract:** Background: Although walking speed is the most common measure of gait performance post-stroke, improved walking speed following rehabilitation does not always indicate the recovery of paretic limb function. Over the last decade, the measure paretic propulsion (Pp, defined as the propulsive impulse generated by the paretic leg divided by the sum of the propulsive impulses of both legs) has been established as a measure of paretic limb output and recently targeted in post-stroke rehabilitation paradigms. However, the literature lacks a detailed synthesis of how paretic propulsion, walking speed, and other biomechanical and neuromuscular measures collectively relate to post-stroke walking performance and motor recovery. Objective: The aim of this review was to assess factors associated with the ability to generate Pp and identify rehabilitation targets aimed at improving Pp and paretic limb function. Methods: Relevant literature was collected in which paretic propulsion was used to quantify and assess propulsion symmetry and function in hemiparetic gait. Results: Paretic leg extension during terminal stance is strongly associated with Pp. Both paretic leg extension and propulsion are related to step length asymmetry, revealing an interaction between spatiotemporal, kinematic and kinetic metrics that underlies hemiparetic walking performance. The importance of plantarflexor function in producing propulsion is highlighted by the association of an independent plantarflexor excitation module with increased Pp. Furthermore, the literature suggests that although current rehabilitation techniques can improve Pp, these improvements depend on the patient’s baseline plantarflexor function. Significance: Pp provides a quantitative measure of propulsion symmetry and should be a primary target of post-stroke gait rehabilitation. The current literature suggests rehabilitation techniques that target both plantarflexor function and leg extension may restore paretic limb function and improve gait asymmetries in individuals post-stroke.

**Database:** CINAHL


**Author(s):** Tanaka, Naojiro; Matsushita, Shinro; Sonoda, Yasushi; Maruta, Yoshikatsu; Fujitaka, Yuta; Sato, Masashi; Simomori, Miki; Onaka, Ryuki; Harada, Keiji; Hirata, Takashi; Kinoshita, Shoji; Okamoto, Takatsugu; Okamura, Hitoshi

**Source:** Journal of Stroke & Cerebrovascular Diseases; Feb 2019; vol. 28 (no. 2); p. 477-486

**Publication Date:** Feb 2019

**Publication Type(s):** Academic Journal

**PubMedID:** NLM30420315
Abstract: Background: Poststroke gait disorders negatively impact activities of daily living. Rehabilitation for stroke patients is aimed at improving their walking ability, balance, and quality of life. Robot-assisted gait training (RAGT) is associated with an increased number of task-specific exercises, which may benefit poststroke motor learning. We investigated the effects of RAGT using Stride Management Assist (SMA, which increases walk ratio by inducing hip-joint flexion and extension) in subacute stroke patients with hemiplegia. Methods: We conducted a single center, open-label randomized controlled trial in hemiplegia patients who experienced a first-ever stroke and were admitted to the convalescent rehabilitation ward. A total of 41 were divided into the control (20 patients) and experimental group (21 patients). A 10-day, conventional gait training program was carried out for the control group; and RAGT with SMA was used for the experimental group. The maximum walking speed and other gait parameters were compared preintervention and postintervention. The intergroup differences in the improvement ratio were compared using an intention-to-treat analysis. Results: Ten-day intervention was completed by 36 patients. There was no difference between the 2 groups regarding gait parameters at intervention initiation. The improvement ratio of the maximum walking speed was significantly higher for the experimental group. Significant improvements were observed postintervention for maximum walking speed, paralysis-side step length, symmetry, and cadence in the experimental group. No adverse events attributable to the SMA were observed. Conclusions: Ten days of RAGT with the SMA was effective for improving gait disorders of subacute stroke patients.

Database: CINAHL

21. Effect of turning direction on Timed Up and Go test results in stroke patients.

Author(s): Son, Hohee; Park, Chanhyun

Source: European journal of physical and rehabilitation medicine; Feb 2019; vol. 55 (no. 1); p. 35-39

Publication Date: Feb 2019

Publication Type(s): Journal Article Observational Study

PubMedID: 29984566

Abstract: BACKGROUND The Timed Up and Go (TUG) test is an assessment tool for measuring mobility in stroke patients. In stroke patients, the turning direction of the affected and unaffected sides may influence turning time. AIM The aim of this study is to investigate the effects of the turning direction according to the affected and unaffected sides of stroke patients during their Timed Up and Go (TUG) test and to define clinically salient outcomes during TUG tests performed in the clinic. DESIGN Observational design. SETTING Department of Physical Therapy in a rehabilitation center. POPULATION One hundred thirteen hemiparetic stroke patients. METHODS Stroke patients were asked to perform the TUG test by turning toward their affected and unaffected sides. Patients were divided according to gait speed, with their gait speed from the 10mWT being used. Those with a gait speed <48 m/min were assigned to the severe ambulatory dysfunction (SAD) group, whereas those with a gait speed ≥48 m/min were assigned to the moderate ambulatory dysfunction (MAD) group. RESULTS The TUG test results showed a longer turning time when turning with the unaffected side as the turning axis (17.10±5.69 s) than with the affected side as the turning axis (17.52±5.90 s). When the patients were divided into the MAD and SAD groups based on the 10mWT results, patients in the SAD group exhibited slightly longer times (0.55±1.11 s) than those in the MAD group (0.29±1.03 s); however, this difference was not significant. CONCLUSIONS The present study found that stroke patients showed differences in the TUG test results based on their turning direction, and less time was required when turning in the direction of the affected side than when turning in the
direction of the unaffected side. CLINICAL REHABILITATION IMPACT Turning direction can affect the results of the TUG test; it should be controlled in the execution of the TUG test in clinical settings.

Database: Medline


Author(s) Koch G

Source: JAMA Neurol 2019 Feb 1;76(2):170-178

Abstract: Importance: Gait and balance impairment is associated with poorer functional recovery after stroke. The cerebellum is known to be strongly implicated in the functional reorganization of motor networks in patients with stroke, especially for gait and balance functions. Objective: To determine whether cerebellar intermittent θ-burst stimulation (CRB-iTBS) can improve balance and gait functions in patients with hemiparesis due to stroke. Design, setting, participants: This randomized, double-blind, sham-controlled phase IIa trial investigated efficacy and safety of a 3-week treatment of CRB-iTBS coupled with physiotherapy in promoting gait and balance recovery in patients with stroke. Thirty-six patients with consecutive ischemic chronic stroke in the territory of the contralateral middle cerebral artery with hemiparesis were recruited from a neuro-rehabilitation hospital. Participants were screened and enrolled from March 2013 to June 2017. Intention-to-treat analysis was performed. Interventions: Patients were randomly assigned to treatment with CRB-iTBS or sham iTBS applied over the cerebellar hemisphere ipsilateral to the affected body side immediately before physiotherapy daily during 3 weeks. Main outcomes and measures: The primary outcome was the between-group difference in change from baseline in the Berg Balance Scale. Secondary exploratory measures included the between-group difference in change from baseline in Fugl-Meyer Assessment scale, Barthel Index, and locomotion assessment with gait analysis and cortical activity measured by transcranial magnetic stimulation in combination with electroencephalogram. Results: A total of 34 patients (mean [SD] age, 64 [11.3] years; 13 women [38.2%]) completed the study. Patients treated with CRB-iTBS, but not with sham iTBS, showed an improvement of gait and balance functions, as revealed by a pronounced increase in the mean (SE) Berg Balance Scale score (baseline: 34.5 [3.4]; 3 weeks after treatment: 43.4 [2.6]; 3 weeks after the end of treatment: 47.5 [1.8]; P < .001). No overall treatment-associated differences were noted in the Fugl-Meyer Assessment (mean [SE], baseline: 163.8 [6.8]; 3 weeks after treatment: 171.1 [7.2]; 3 weeks after the end of treatment: 173.5 [6.9]; P > .05) and Barthel Index scores (mean [SE], baseline: 71.1 [4.92]; 3 weeks after treatment: 88.8 [2.1]; 3 weeks after the end of treatment: 92.2 [2.4]; P > .05). Patients treated with CRB-iTBS, but not sham iTBS, showed a reduction of step width at the gait analysis (mean [SE], baseline: 16.8 [4.8] cm; 3 weeks after treatment: 14.3 [6.2] cm; P < .05) and an increase of neural activity over the posterior parietal cortex. Conclusions and relevance: Cerebellar intermittent θ-burst stimulation promotes gait and balance recovery in patients with stroke by acting on cerebello-cortical plasticity. These results are important to increase the level of independent walking and reduce the risk of falling.

Database: PubMed

23. Anterior-posterior displacement of center of pressure measured by insole foot pressure measurement system in subacute recovery stage of post-stroke hemiplegia.

Author(s): Choi, Hanboram; Kim, Woo-Sub

Source: Technology and health care : official journal of the European Society for Engineering and Medicine; 2018; vol. 26 (no. 4); p. 649-657

Publication Date: 2018
Publication Type(s): Journal Article Observational Study

Abstract: BACKGROUND Anterior-posterior displacement of center of pressure (AP_CoP) reflects stance limb function. However, AP_CoP’s clinical applicability in post-stroke hemiplegia is unclear. OBJECTIVE To investigate the clinical usefulness of parameters from AP_CoP in subacute stage post-stroke hemiplegia, their relationships with usage of gait aid, functional ambulatory category, and spatial-temporal parameters were tested. METHODS Nineteen participants with post-stroke hemiplegia were included in gait with aid group. Twenty one participants were included in gait with independence group. Twenty one participants were included in control group. Insole foot pressure measurement system was used to measure AP_CoP and spatial-temporal parameters. Effects of gait aid usage and functional ambulatory category on AP_CoP were tested with ANOVA. Relationships between AP_CoP and temporo-spatial parameters were investigated with correlation and linear regression analysis. RESULTS AP_CoP parameters were shorter in gait with aid group than gait with independence group. With better functional ambulatory category, AP_CoP were longer. AP_CoP showed positive relationship with walking speed. AP_CoP in more affected side showed positive relationship with symmetry of single support phase proportion. AP_CoP showed positive relationship with stride length. CONCLUSION AP_CoP reflects overall gait function, impairments in more affected side and adaptation in less affected side in subacute recovery stage of post-stroke hemiplegia. It can be used as a clinically significant parameter for gait rehabilitation.

Database: Medline

24. The effects of robot-assisted gait training using virtual reality and auditory stimulation on balance and gait abilities in persons with stroke

Author(s): Park J.; Chung Y.

Source: NeuroRehabilitation; 2018; vol. 43 (no. 2); p. 227-235

Publication Date: 2018

Publication Type(s): Article

Abstract: Background: Robot-assisted gait training provide a big therapeutic advantage in functional mobility for postural control. OBJECTIVE(S): The purpose of this study was investigate the effects of robot-assisted gait training using virtual reality and auditory stimulation on balance and gait abilities in stroke patients. METHOD(S): All subjects were randomly divided into three groups where twelve subjects were in the Virtual reality robot-assisted gait training group (VRGT), twelve subjects in the auditory stimulation robot-assisted gait training group (ARGT), and sixteen subjects in the control group. Subjects received virtual reality and auditory stimulation while undergoing robot-assisted gait training for 45 minutes, three times a week for 6 weeks, and all subjects had undergone general physical therapy for 30 minutes, five times a week for 6 weeks. All subjects were assessed with the Medical Research Council (MRC), Berg balance scale (BBS), timed up and go test (TUG), 10-meter walk test (10MWT), Fugl-Meyer Assessment (FMA) and Modified Barthel Index (MBI) pre-and post-intervention. RESULT(S): Results showed that BBS, TUG, and 10MWT scores significantly improved post-intervention (p < 0.05), and the control group also had significantly improved in all areas post-treatment (p < 0.05). In addition, it has been confirmed that VRGT had significantly improved in MRC and FMA scores compared with the auditory stimulation. Also, it has significantly improved in MRC, BBS, TUG, 10MWT and FMA compared with control group (p < 0.05). CONCLUSION(S): The results of this study showed improve balance and gait abilities after VRGT compared with general physical therapy and were found to be effective in enhancing the functional activity of persons with stroke. Copyright © 2018-IOS Press and the authors. All rights reserved.

Database: EMCARE
25. Effect of rehabilitation on the somatosensory evoked potentials and gait performance of hemiparetic stroke patients

**Author(s):** Yoon H.S.; Sohn M.K.; Cha Y.J.; You J.H.

**Source:** Technology and Health Care; 2018; vol. 26

**Publication Date:** 2018

**Publication Type(s):** Article

**Abstract:** BACKGROUND: Gait performance of stroke patients is affected by impaired sensory ability. The purpose of the present study was to determine the relationship between somatosensory-evoked potential (SSEP) parameters and gait performance in hemiparetic stroke patients.

**METHOD(S):** A convenience sample of 17 hemiparetic stroke patients (mean age 60.11 +/- 8.83 years; 10 women; right hemiplegia: 10, left hemiplegia: 7) were recruited for the present study. The Electro Synergy system (Viasys Healthcare; San Diego, CA, USA) was used for SSEP evaluation. The 17 patients were assigned to two groups according to their SSEP results as follows: 8 patients to the normal response group and 9 patients to the abnormal group. All the participants underwent the same rehabilitation exercise programs during 4 weeks, followed by clinical evaluation. A mixed-design analysis of a variance model was used to test for differences in timed up-and-go (TUG) test and 10-meter walking test (10MWT) scores between the two independent groups while the participants were subjected to repeated measures (pretest and posttest).

**RESULT(S):** Analysis of variance revealed the main time effect (p < 0.05) and group by time interaction effect (p < 0.05). The post hoc test result confirmed that the normal sensory group showed greater improvement in TUG test and 10MWT scores than the abnormal sensory group (p < 0.05). The TUG test and 10MWT scores in the posttest were greater in the normal sensory group than in the abnormal sensory group.

**CONCLUSION(S):** The present study demonstrated the importance of the clinical contribution of the baseline sensory function of individuals with hemiparetic stroke to their gait performance and recovery after stroke rehabilitation. As anticipated, the individuals who had intact or spared sensory function showed greater improvements in gait speed and performance measures than those who had impaired sensory function. Copyright © 2018 - IOS Press and the authors.

**Database:** EMCARE


**Author(s):** Ploughman, Michelle; Shears, Jennifer; Quinton, Susan; Flight, Cordell; O’Brien, Michelle; MacCallum, Phillip; Kirkland, Megan C.; Byrne, Jeannette M.

**Source:** Disability & Rehabilitation; Dec 2018; vol. 40 (no. 26); p. 3156-3163

**Publication Date:** Dec 2018

**Publication Type(s):** Academic Journal

**Abstract:** Purpose: Symmetrical gait is a key goal of rehabilitation post-stroke. Therapists employ techniques such as verbal instruction and haptic cues to increase activation of paretic muscles. We examined whether verbal or tactile cueing altered spatiotemporal gait parameters, kinematics and electromyography (EMG) of lower limb muscles on the more-affected side within a training session.

**Materials and methods:** Patients (n = 10) were recruited from rehabilitation services (<9 months post-stroke). Tactile (to the hip muscles) or verbal cues were provided on two testing days, 7-10 days apart (randomized order). Gait and angular kinematics were recorded using a Vicon motion capture system and muscle activation using EMG; at baseline (PRE), during the cue, directly afterwards.
without a cue (POST) and 20 min later without a cue (RETEST). Results: Both verbal and tactile cueing significantly increased muscle activity in paretic muscles but with no immediate effect on step length asymmetry. Tactile cues, more than verbal, temporarily altered gait speed, cadence and time in double support. Verbal cues caused more robust increases in muscle activation of vastus lateralis at weight acceptance and medial gastrocnemius activity from toe off to midswing. Conclusions: Within a treatment session, tactile cues more effectively altered cadence and double support time while verbal cues more consistently increased vastus lateralis and medial gastrocnemius activity. The effectiveness of these methods in fostering motor relearning in the longer term is an important area for future research. Implications for Rehabilitation: Therapist cueing alters muscle activity on hemiparetic side with no effects on symmetry. Tactile cues, more so than verbal cues, increase cadence and reduce time in double support. Verbal cues are more effective at increasing vastus lateralis and plantarflexor muscle activity.

Database: CINAHL

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27. Effects of MOTOmed movement therapy on the mobility and activities of daily living of stroke patients with hemiplegia: a systematic review and meta-analysis.

**Author(s):** Shen, Cuiling; Liu, Fang; Yao, Liqun; Li, Zhongyuan; Qiu, Li; Fang, Suzhu

**Source:** Clinical Rehabilitation; Dec 2018; vol. 32 (no. 12); p. 1569-1580

**Publication Date:** Dec 2018

**Publication Type(s):** Academic Journal

**Abstract:** Objective: To estimate the effectiveness of MOTOmed® movement therapy in increasing mobility and activities of daily living in stroke patients with hemiplegia. Design: Systematic review. Data sources: English- and Chinese-language articles published from the start of database coverage through 20 June 2018 were retrieved from the Embase, Web of Science, PubMed, OVID, Cochrane Central Register of Controlled Trials, Cochrane Systematic Reviews, Wanfang, Chinese National Knowledge Infrastructure, VIP, and Chinese Biomedicine databases. Articles were also retrieved by manual searches of Rehabilitation Medicine and Chinese journals. Methods: Randomized control trials examining MOTOmed movement therapy interventions for patients with post-stroke hemiplegia were included in this review. The risk of bias assessment tool was utilized in accordance with Cochrane Handbook 5.1.0. All included studies reported mobility effects as primary outcomes. Standardized mean differences or mean differences with the corresponding 95% confidence intervals (CIs) were calculated. Review Manager 5.3 was utilized for meta-analysis. Results: In total, 19 trials involving a total of 1099 patients were included in the analysis. All studies were of moderate quality, based on the Cochrane Handbook for Systematic Reviews of Intervention: Part 2:8.5. MOTOmed movement therapy resulted in a merged mean difference in the Fugl-Meyer Assessment score of 5.51 (95% CI: 4.03 to 6.98). Comparison of groups treated with and without MOTOmed movement therapy yielded the following mean differences: Modified Ashworth Scale, −1.13 (95% CI: −1.37 to −0.89); Berg Balance Scale, 13.66 (95% CI: 10.47–16.85); Functional Ambulation Category Scale, 0.85 (95% CI: 0.68–1.03); 10-m walk test, 10.15 (95% CI: 5.72–14.58); Barthel Index, 14.82 (95% CI: 12.96–16.68); and Modified Barthel Index, 11.49 (95% CI: 8.96–14.03). Conclusion: MOTOmed movement therapy combined with standard rehabilitation improves mobility and activities of daily living in stroke patients with hemiplegia.

Database: CINAHL

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**Author(s):** Lewek, Michael D.; Raiti, Cristina; Doty, Amanda
**Abstract:** Background. The residual hemiparesis after stroke results in a unilateral reduction in propulsive force during gait. Prior work has suggested the presence of a propulsive reserve in the paretic limb. Objective. The purpose of this study was to quantify the paretic propulsive reserve in individuals poststroke and to determine the biomechanical mechanism underlying the generation of additional paretic propulsive limb force. Methods. Ten individuals with chronic hemiparesis poststroke walked on a treadmill against an impeding force (ascending 0% to 10% body weight [BW], in 2.5% BW increments, followed by descending 10% to 0% BW, also in 2.5% BW increments) applied to the body's center of mass. The resulting propulsive forces were measured bilaterally and compared between impeding force levels. We then assessed potential mechanisms (trailing limb angle and plantarflexion moment) underlying the changes in propulsion. Results. Overall, peak paretic propulsive force increased by 92% and the paretic propulsive impulse increased by 225%, resulting in a significant increase in the paretic limb's contribution to propulsion. Participants continued to produce increased paretic propulsion on removal of the impeding force. The trailing limb angle contributed significantly to the increase in paretic propulsion, whereas the plantarflexion moment did not. Conclusions. Participants exhibited a robust propulsive reserve on the paretic limb, suggesting that there is untapped potential that can be exploited through rehabilitation to improve gait recovery. The increase in propulsive symmetry indicates that a greater response was observed by the paretic limb rather than increased compensation by the nonparetic limb.

**Database:** CINAHL

29. Effects of a 4-Week Self-Ankle Mobilization with Movement Intervention on Ankle Passive Range of Motion, Balance, Gait, and Activities of Daily Living in Patients with Chronic Stroke: A Randomized Controlled Study.

**Author(s):** Park, Donghwan; Lee, Ji-Hyun; Kang, Tae-Woo; Cynn, Heon-Seock

**Source:** Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association; Dec 2018; vol. 27 (no. 12); p. 3451-3459

**Publication Date:** Dec 2018

**Publication Type(s):** Comparative Study Randomized Controlled Trial Journal Article

**PubMedID:** 30193809

**Abstract:** GOAL To compare the effects of a 4-week self-ankle mobilization with movement training program with those of self-ankle mobilization with movement with a 10° inclined board in patients with chronic stroke. MATERIALS AND METHODS A randomized controlled assessor-blind trial was conducted. The patients were randomized into 2 arms. Subjects were 28 chronic stroke patients with hemiplegia. Both arms attended standard rehabilitation therapy for 30 minutes per session. In addition, self-ankle mobilization with movement and self-ankle mobilization with movement with a 10° inclined board trainings were performed 3 times per week for 4 weeks. Ankle dorsiflexion passive range of motion, static balance ability, Berg balance scale, gait parameters (walking speed, cadence, and step length), and activities of daily living were used to assess changes in motor function after training. FINDINGS After 4 weeks of training, all dependent variables were significantly improved in both arms as compared with their baseline values. Furthermore, relative to the self-ankle mobilization with movement arm, the self-ankle mobilization with movement with a 10° inclined board arm demonstrated significantly improved ankle dorsiflexion passive range of motion, static balance ability, gait speed, cadence, and affected-side step length. CONCLUSIONS Our results
support the hypothesis that self-ankle mobilization with movement with a 10° inclined board combined with standard rehabilitation was superior to self-ankle mobilization with movement combined with standard rehabilitation with respect to the improvement in motor function in the patients with chronic stroke.

**Database:** Medline

30. **Effect of reducing assistance during robot-assisted gait training on step length asymmetry in patients with hemiplegic stroke: A randomized controlled pilot trial.**

**Author(s):** Jin Seok Seo; Hee Seung Yang; Suk Jung; Chang Soon Kang; Sunghun Jang; Dae Hyun Kim; Seo, Jin Seok; Yang, Hee Seung; Jung, Suk; Kang, Chang Soon; Jang, Sunghun; Kim, Dae Hyun

**Source:** Medicine; Aug 2018; vol. 97 (no. 33); p. 1-6

**Publication Date:** Aug 2018

**Publication Type(s):** Academic Journal

**PubMedID:** NLM30113466

Available at Medicine - from Europe PubMed Central - Open Access

**Abstract:**Background: An assist-as-needed robot-assisted gait training protocol was recently developed. It allows active movement during training, but its exact criteria remain unknown. Asymmetric step length is a common abnormal gait pattern in hemiplegic stroke patients. We compared the effects of assist-as-needed robot-assisted gait training on the unaffected and affected limbs of hemiplegic stroke patients.

**Method:** Twenty-four chronic stroke patients with asymmetric step lengths were randomly assigned to 1 of 2 groups. Twelve completed the study protocol. Group 1 underwent 20 sessions of assist-as-needed robot-assisted gait training for the unaffected limb and fully-assisted robot-assisted training for the affected limb. Group 2 underwent 20 sessions of robot-assisted gait training using the opposite protocol. Clinical measurements were obtained and 3-dimensional gait analyses were performed at baseline and after 10 and 20 training sessions.

**Results:** Clinical measurements improved in both groups after 20 training sessions. The unaffected limb's step length asymmetry ratio and hip maximal extension moment significantly improved in group 1. The affected limb's maximal dorsiflexion angle for the ankle in the swing phase significantly improved in group 2.

**Conclusion:** Application of the assist-as-needed training mode for the unaffected limb helped improve step length asymmetry in chronic stroke patients.

**Database:** CINAHL

31. **Neural Decoding of Robot-Assisted Gait during Rehabilitation after Stroke**

**Author(s):** Contreras-Vidal J.L.; Bortole M.; Zhu F.; Nathan K.; Venkatakrishnan A.; Pons J.L.; Francisco G.E.; Soto R.

**Source:** American Journal of Physical Medicine and Rehabilitation; Aug 2018; vol. 97 (no. 8); p. 541-550

**Publication Date:** Aug 2018

**Publication Type(s):** Article

**Abstract:** Objective Advancements in robot-assisted gait rehabilitation and brain-machine interfaces may enhance stroke physiotherapy by engaging patients while providing information about robot-induced cortical adaptations. We investigate the feasibility of decoding walking from brain activity in stroke survivors during therapy using a powered exoskeleton integrated with an electroencephalography-based brain-machine interface. Design The H2 powered exoskeleton was designed for overground gait training with actuated hip, knee, and ankle joints. It was integrated
with active-electrode electroencephalography and evaluated in hemiparetic stroke survivors for 12 sessions per 4 wks. A continuous-time Kalman decoder operating on delta-band electroencephalography was designed to estimate gait kinematics. Results Five chronic stroke patients completed the study with improvements in walking distance and speed training for 4 wks, correlating with increased offline decoding accuracy. Accuracies of predicted joint angles improved with session and gait speed, suggesting an improved neural representation for gait, and the feasibility to design an electroencephalography-based brain-machine interface to monitor brain activity or control a rehabilitative exoskeleton. Conclusions The Kalman decoder showed increased accuracies as the longitudinal training intervention progressed in the stroke participants. These results demonstrate the feasibility of studying changes in patterns of neuroelectric cortical activity during poststroke rehabilitation and represent the first step in developing a brain-machine interface for controlling powered exoskeletons. Copyright © 2018 Wolters Kluwer Health, Inc.

**Database:** EMCARE

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**32. Performance and capacity-based measures of locomotion, compared to impairment-based measures, best predicted participation in individuals with hemiparesis due to stroke.**

**Author(s):** Faria-Fortini, Iza; Basílio, Marluce L.; Scianni, Aline A.; Faria, Christina D. C. M.; Teixeira-Salmela, Luci F.

**Source:** Disability & Rehabilitation; Jul 2018; vol. 40 (no. 15); p. 1791-1798

**Publication Date:** Jul 2018

**Publication Type(s):** Academic Journal

**Abstract:** Purpose: To determine the potential predictors of participation of individuals with post-stroke hemiparesis, taking into account modifiable variables of impairments, activity limitations, and environmental factors. Methods: One hundred and nine individuals (58 ± 12 years; 64 men) participated in this study. Outcomes included measures of impairments (depressive symptoms: Geriatric Depression Scale and motor-based impairments: finger-to-nose test, lower extremity (LE) motor coordination test, and handgrip strength, isometric strength of the LE muscles), activity (capacity: 10-meter walking speed test and Test d’Évaluation des Membres Supérieurs de Personnes Agées; performance: locomotion and manual abilities; environmental factors (Measure of the Quality of the Environment); and participation: Assessment of Life Habits (LIFE-H 3.1 Brazil)). Results: Regression analyses revealed that the explanatory variables accounted for 59% and 49% of the variance in the LIFE-H 3.1 Brazil daily activity and social role sub-scales, respectively. Locomotion performance (R2 = 39%; p < 0.0001) and walking speed (R2 = 32%; p < 0.0001) were the best predictors of the LIFE-H 3.1 Brazil daily activity and social role sub-scales, respectively. Depressive symptoms were the only impairments, which were retained in both models. Conclusions: Performance and capacity-based measures of locomotion showed to be the best predictors of participation. Additionally, depressive symptoms should not be underlooked. Implications for Rehabilitation: Activity-related measures of locomotion showed to be the main predictors of participation in individuals with post-stroke hemiparesis, as assessed by the daily activity and social role sub-scales of the LIFE-H 3.1. The daily activity model was best predicted by measures of performance, whereas the social role sub-scale, by measures of capacity. Although small, the impact of depressive symptoms on participation should not be underlooked. Locomotion appeared to be essential for participation and increases in walking speed and locomotion ability should be the main goals for both professionals and individuals, when the aim is to increase participation.

**Database:** CINAHL
33. Effects of water-based and land-based exercises on walking and balance functions of patients with hemiplegia.

Author(s): Eyvaz, Nuran; Dundar, Umit; Yesil, Hilal

Source: NeuroRehabilitation; Jun 2018; vol. 43 (no. 2); p. 237-246

Publication Date: Jun 2018

Publication Type(s): Academic Journal

Abstract: BACKGROUND: After the stroke, a number of changes occur in the neuromuscular system functions. OBJECTIVE: To determine whether the water based exercise (WBE) program applied in combination with the land-based exercises (LBE) compared to LBE alone contributes to the stroke patients’ motor functions, walking, balance functions and quality of life (QoL). METHODS: In total, 60 patients participated in this study. Patients were randomly divided into two groups. WBE therapy (3/week) + LBE (2/week) combination was applied to the patients in the study group (n = 30) for six weeks. LBE was applied to the control group (n = 30) 5/week for six weeks. Patients were evaluated before and after the treatment. Functional independence measurement, Berg balance scale, timed up and go test, and short form (SF) -36 assessment questionnaire were performed. RESULTS: Posttreatment results showed significant improvements in all of the parameters (except SF - pain parameter) in both groups. The improvement in the vitality parameter of SF-36 was higher in the study group (p < 0.05), and improvement in the BBS was significantly higher in the LBE group than the WBE group (p < 0.05). CONCLUSION: Applying WBE together with the LBE (except SF-36 vitality sub-parameter) in patients with hemiplegia did not make any additional contribution to the application of LBE alone.

Database: CINAHL

34. A Poincare map based analysis of stroke patients' walking after a rehabilitation by a robot.

Author(s): Abedi, Mohsen; Moghaddam, Majid M; Fallah, Davoud

Source: Mathematical biosciences; May 2018; vol. 299 ; p. 73-84

Publication Date: May 2018

Publication Type(s): Journal Article

PubMedID: 29518402

Abstract: Since the past decade, rehabilitation robots have become common technologies for recovering gait ability after a stroke. Nevertheless, it is believed that these robots can be further enhanced. Hence, several researches are making progress in optimizing gait rehabilitation robots. However, most of these researches have only assessed the robots and their controllers in improving spatiotemporal and kinetic features of walking. There are not many researchers have focused on the robots' controllers' effects on the central nervous or neuromuscular systems. On the other hand, recently computational methods have been utilized to investigate the rehabilitations of neural disorders, through developing neuromechanical models. However, these methods have neither studied the robot-assisted gait rehabilitation, nor have they theoretically proved why rehabilitation exercises enhance patients' walking ability. Therefore, this paper merged a theoretical approach into a computational method to investigate the effects of gait rehabilitation robots on post-stroke neuromuscular system. To this end, a neuromechanical model of gait has been developed and thereby, the Poincare maps of intact and stroke people have been obtained. Comparison of these maps revealed why a stroke reduces the stability of walking. Then, the effect of an impedance controller, which is used in a rehabilitative robot, is scrutinized in stabilizing a walking motion. Obtaining the Poincare map of this close-loop system, proved that this controller improves motion stability. Finally, the effect of this controller is investigated by simulations and experiments. The
35. Effectiveness of Neuromuscular Electrical Stimulation on Lower Limbs of Patients With Hemiplegia After Chronic Stroke: A Systematic Review.

**Author(s):** Hong, Zhongqiu; Sui, Minghong; Zhuang, Zhiqiang; Liu, Huihua; Zheng, Xiuyuan; Cai, Chuanping; Jin, Dongmei

**Source:** Archives of physical medicine and rehabilitation; May 2018; vol. 99 (no. 5); p. 1011

**Publication Date:** May 2018

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article Systematic Review

**PubMedID:** 29357280

**Abstract:**

OBJECTIVE: To investigate the effectiveness of neuromuscular electrical stimulation (NMES) with or without other interventions in improving lower limb activity after chronic stroke. DATA SOURCES: Electronic databases, including PubMed, EMBase, Cochrane Library, PEDro (Physiotherapy Evidence Database), and PsycINFO, were searched from the inception to January 2017.

STUDY SELECTION: We selected the randomized controlled trials (RCTs) involving chronic stroke survivors with lower limb dysfunction and comparing NMES or combined with other interventions with a control group of no electrical stimulation treatment.

DATA EXTRACTION: The primary outcome was defined as lower limb motor function, and the secondary outcomes included gait speed, Berg Balance Scale, timed Up and Go, 6-minute walk test, Modified Ashworth Scale, and range of motion.

DATA SYNTHESIS: Twenty-one RCTs involving 1481 participants were identified from 5759 retrieved articles. Pooled analysis showed that NMES had a moderate but statistically significant benefit on lower limb motor function (standard mean difference 0.42, 95% confidence interval 0.26-0.58), especially when NMES was combined with other interventions or treatment time within either 6 or 12 weeks. NMES also had significant benefits on gait speed, balance, spasticity, and range of motion but had no significant difference in walking endurance after NMES.

CONCLUSIONS: NMES combined with or without other interventions has beneficial effects in lower limb motor function in chronic stroke survivors. These data suggest that NMES should be a promising therapy to apply in chronic stroke rehabilitation to improve the capability of lower extremity in performing activities.

**Database:** Medline

36. Structural analysis of a rehabilitative training system based on a ceiling rail for safety of hemiplegia patients

**Author(s):** Kim K.; Song W.K.; Chong W.S.; Yu C.H.

**Source:** Technology and Health Care; May 2018; vol. 26

**Publication Date:** May 2018

**Publication Type(s):** Conference Paper

**Available at Technology and Health Care - from Unpaywall**

**Abstract:** The body-weight support (BWS) function, which helps to decrease load stresses on a user, is an effective tool for gait and balance rehabilitation training for elderly people with weakened lower-extremity muscular strength, hemiplegic patients, etc. This study conducts structural analysis to secure user safety in order to develop a rail-type gait and balance rehabilitation training system (RRTS). The RRTS comprises a rail, trolley, and brain-machine interface. The rail (platform) is connected to the ceiling structure, bearing the loads of the RRTS and of the user and allowing experimental tests are performed by Arman rehabilitative robot. Clinical Reference Number: IR.TMU.REC.1394.254.

**Database:** Medline
locomobility. The trolley consists of a smart drive unit (SDU) that assists the user with forward and backward mobility and a body-weight support (BWS) unit that helps the user to control his/her body-weight load, depending on the severity of his/her hemiplegia. The brain-machine interface estimates and measures on a real-time basis the body-weight (load) of the user and the intended direction of his/her movement. Considering the weight of the system and the user, the mechanical safety performance of the system frame under an applied 250-kg static load is verified through structural analysis using ABAQUS (6.14-3) software. The maximum stresses applied on the rail and trolley under the given gravity load of 250 kg, respectively, are 18.52 MPa and 48.44 MPa. The respective safety factors are computed to be 7.83 and 5.26, confirming the RRTS's mechanical safety. An RRTS with verified structural safety could be utilized for gait movement and balance rehabilitation and training for patients with hemiplegia.Copyright © 2018 - IOS Press and the authors.

**Database**: EMCARE

37. **Effect of the synchronization-based control of a wearable robot having a non-exoskeletal structure on the hemiplegic gait of stroke patients**

**Author(s)**: Mizukami N.; Takeuchi S.; Tsukahara A.; Hashimoto M.; Tetsuya M.; Yoshida K.; Matsushima A.; Maruyama Y.; Tako K.

**Source**: IEEE Transactions on Neural Systems and Rehabilitation Engineering; May 2018; vol. 26 (no. 5); p. 1011-1016

**Publication Date**: May 2018

**Publication Type(s)**: Article

**Abstract**: We have been developing the robotic wear curara as both a welfare device and rehabilitation robot that assists the elderly and disabled. curara is aimed at user friendliness. We have, thus, chosen a non-exoskeleton structure made of a plastic so that the robot is as light in weight as possible and to minimize the restraining stress against natural human movement. We verified the assistance effect of curara on 15 hemiplegic patients with stroke by comparing gait parameters (i.e., velocity, step length, cadence, and symmetry of joint angles) among three conditions. The conditions were 'without assistance' (i.e., a control mode that cancels frictional resistances in actuators), Condition A (where joint angles are enlarged but there is no change in gait cycle), and Condition B (where there is no change in joint angles but the gait cycle is shortened). curara improved the walking velocity by 19% and 27% under Conditions A and B, respectively. Improvements in step length and cadence were, respectively, 11% and 7% under Condition A and 14% and 11% under Condition B. Moreover, the two assistance conditions reduced the difference in joint angles between unaffected and paralyzed legs. We consider that curara will facilitate the rehabilitation of stroke patients. Copyright © 2001-2011 IEEE.

**Database**: EMCARE

38. **Evaluating the effects of delivering integrated kinesthetic and tactile cues to individuals with unilateral hemiparetic stroke during overground walking.**

**Author(s)**: Afzal, Muhammad Raheel; Pyo, Sanghun; Oh, Min-Kyun; Park, Young Sook; Yoon, Jungwon

**Source**: Journal of NeuroEngineering & Rehabilitation (JNER); Apr 2018; vol. 15 (no. 1)

**Publication Date**: Apr 2018

**Publication Type(s)**: Academic Journal

**PubMedID**: NLM29661237
Abstract: Background: Integration of kinesthetic and tactile cues for application to post-stroke gait rehabilitation is a novel concept which needs to be explored. The combined provision of haptic cues may result in collective improvement of gait parameters such as symmetry, balance and muscle activation patterns. Our proposed integrated cue system can offer a cost-effective and voluntary gait training experience for rehabilitation of subjects with unilateral hemiparetic stroke. Methods: Ten post-stroke ambulatory subjects participated in a 10 m walking trial while utilizing the haptic cues (either alone or integrated application), at their preferred and increased gait speeds. In the system a haptic cane device (HCD) provided kinesthetic perception and a vibrotactile feedback device (VFD) provided tactile cue on the paretic leg for gait modification. Balance, gait symmetry and muscle activity were analyzed to identify the benefits of utilizing the proposed system. Results: When using kinesthetic cues, either alone or integrated with a tactile cue, an increase in the percentage of non-paretic peak activity in the paretic muscles was observed at the preferred gait speed (vastus medialis obliquus: \(p < 0.001, \text{partial } \eta^2 = 0.954\); semitendinosus \(p < 0.001, \text{partial } \eta^2 = 0.793\)) and increased gait speeds (vastus medialis obliquus: \(p < 0.001, \text{partial } \eta^2 = 0.881\); semitendinosus \(p = 0.028, \text{partial } \eta^2 = 0.399\)). While using HCD and VFD (individual and integrated applications), subjects could walk at their preferred and increased gait speeds without disrupting trunk balance in the mediolateral direction. The temporal stance symmetry ratio was improved when using tactile cues, either alone or integrated with a kinesthetic cue, at their preferred gait speed (\(p < 0.001, \text{partial } \eta^2 = 0.702\)). Conclusions: When combining haptic cues, the subjects walked at their preferred gait speed with increased temporal stance symmetry and paretic muscle activity affecting their balance. Similar improvements were observed at higher gait speeds. The efficacy of the proposed system is influenced by gait speed. Improvements were observed at a 20% increased gait speed, whereas, a plateau effect was observed at a 40% increased gait speed. These results imply that integration of haptic cues may benefit post-stroke gait rehabilitation by inducing simultaneous improvements in gait symmetry and muscle activity.

Database: CINAHL

39. Effectiveness of prowling with proprioceptive training on knee hyperextension among stroke subjects using videographic observation - a randomised controlled trial.

Author(s): Dalal, Khushboo K.; Joshua, Abraham M.; Nayak, Akshatha; et al.

Source: Gait & Posture; Mar 2018 ; p. 232-237

Publication Date: Mar 2018

Publication Type(s): Academic Journal

PubMedID: NLM29413790

Abstract: Introduction: Knee hyperextension is seen in 40-68% of ambulating hemiparetics. If left untreated it may lead to laxity of posterior structures of knee resulting in early degeneration of knee leading to pain, reduced independence in activities of daily living (ADL), deformities and instability. In this study we hypothesize walking with bent knee attitude (prowling) along with proprioceptive training may help to reduce knee hyperextension during the stance phase of gait cycle. Objective: To test the efficacy of prowling along with proprioceptive training on knee hyperextension range, dorsiflexion range and spatio temporal parameters of gait using Wisconsin gait scale (WGS) as compared to routine physiotherapy. Method: 32 subjects were randomized into 2 groups - experimental and control groups. Both the groups were given routine physiotherapy. Experimental group received an additional treatment consisting of prowling along with proprioceptive training. Knee hyperextension and ankle dorsiflexion ranges were videotaped and analysed using Kinovea software, and for spatio-temporal gait parameters WGS was used. Results: In our study, the
experimental group showed significant improvement over the control group with regards to knee hyperextension, dorsiflexion range and WGS score. Pre post intervention analysis, within the group, for time taken to cover the distance revealed significant improvement, however between group analysis did not reveal any significant difference. Conclusion: Prowling along with proprioceptive training is effective in reducing knee hyperextension, increasing dorsiflexion range and improving spatio-temporal gait parameters.

**Database:** CINAHL

40. **Sympathetic nervous system activity measured by skin conductance quantifies the challenge of walking adaptability tasks after stroke.**

**Author(s):** Clark, David J.; Chatterjee, Sudeshna A.; McGuirk, Theresa E.; et al.

**Source:** Gait & Posture; Feb 2018 ; p. 148-153

**Publication Date:** Feb 2018

**Publication Type(s):** Academic Journal

**PubMedID:** NLM29216598

**Available at:** Gait & posture - from Unpaywall

**Abstract:** Background: Walking adaptability tasks are challenging for people with motor impairments. The construct of perceived challenge is typically measured by self-report assessments, which are susceptible to subjective measurement error. The development of an objective physiologically-based measure of challenge may help to improve the ability to assess this important aspect of mobility function. The objective of this study to investigate the use of sympathetic nervous system (SNS) activity measured by skin conductance to gauge the physiological stress response to challenging walking adaptability tasks in people post-stroke. Methods: Thirty adults with chronic post-stroke hemiparesis performed a battery of seventeen walking adaptability tasks. SNS activity was measured by skin conductance from the palmar surface of each hand. The primary outcome variable was the percent change in skin conductance level (ΔSCL) between the baseline resting and walking phases of each task. Task difficulty was measured by performance speed and by physical therapist scoring of performance. Walking function and balance confidence were measured by preferred walking speed and the Activities-specific Balance Confidence Scale, respectively. Results: There was a statistically significant negative association between ΔSCL and task performance speed and between ΔSCL and clinical score, indicating that tasks with greater SNS activity had slower performance speed and poorer clinical scores. ΔSCL was significantly greater for low functioning participants versus high functioning participants, particularly during the most challenging walking adaptability tasks. Conclusion: This study supports the use of SNS activity measured by skin conductance as a valuable approach for objectively quantifying the perceived challenge of walking adaptability tasks in people post-stroke.

**Database:** CINAHL

41. **Relationship between dynamic balance and spatiotemporal gait symmetry in hemiplegic patients with chronic stroke.**

**Author(s):** An CM

**Source:** Hong Kong Phsiother 2017 Mar 8;37:19-24

**Abstract:** Background: Poor dynamic balance, which is common after stroke, may affect gait function. In particular, spatiotemporal asymmetrical gait patterns may occur in hemiplegic patients after stroke. **Objective:** This study aimed to assess the relationship between dynamic balance and spatiotemporal gait symmetry in patients with chronic hemiplegic stroke. **Methods:** To calculate
symmetry ratios for step length (spatial parameter) and swing time (temporal parameter), 41 patients with chronic stroke walked at a comfortable speed. The dynamic balance measures included limit of stability (LOS) during standing and heel-to-heel base of support (H-H BOS) during gait. Analysis of correlations between various measures was performed. Results: The overall LOS score correlated with temporal gait symmetry \((r = 0.66)\). The forward, backward, paretic, and non-paretic direction LOS scores were related to temporal gait symmetry \((r = 0.38-0.62)\). The H-H BOS was correlated with temporal \((r = -0.63)\) and spatial \((r = -0.36)\) gait symmetries. Other dynamic balance variables were not significantly correlated with spatial gait symmetry. Conclusion: Thus, control of dynamic balance abilities is related to the magnitude of temporal gait symmetry. This observation suggests that rehabilitation strategies that improve dynamic balance may enhance temporal gait symmetry in post-stroke patients.

**Database:** PubMed

42. **Inertial Sensor-Based Motion Analysis of Lower Limbs for Rehabilitation Treatments.**

**Author(s):** Sun, Tongyang; Li, Hua; Liu, Quanquan; Duan, Lihong; Li, Meng; Wang, Chunbao; Liu, Qihong; Li, Weiguang; Shang, Wanfeng; Wu, Zhengzhi; Wang, Yulong

**Source:** Journal of healthcare engineering; 2017; vol. 2017; p. 1949170

**Publication Date:** 2017

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article

**PubMedID:** 29065575

**Available at:** Journal of healthcare engineering - from Europe PubMed Central - Open Access

**Abstract:** The hemiplegic rehabilitation state diagnosing performed by therapists can be biased due to their subjective experience, which may deteriorate the rehabilitation effect. In order to improve this situation, a quantitative evaluation is proposed. Though many motion analysis systems are available, they are too complicated for practical application by therapists. In this paper, a method for detecting the motion of human lower limbs including all degrees of freedom (DOFs) via the inertial sensors is proposed, which permits analyzing the patient's motion ability. This method is applicable to arbitrary walking directions and tracks of persons under study, and its results are unbiased, as compared to therapist qualitative estimations. Using the simplified mathematical model of a human body, the rotation angles for each lower limb joint are calculated from the input signals acquired by the inertial sensors. Finally, the rotation angle versus joint displacement curves are constructed, and the estimated values of joint motion angle and motion ability are obtained. The experimental verification of the proposed motion detection and analysis method was performed, which proved that it can efficiently detect the differences between motion behaviors of disabled and healthy persons and provide a reliable quantitative evaluation of the rehabilitation state.

**Database:** Medline

43. **Novel multi-pad functional electrical stimulation in stroke patients: A single-blind randomized study**

**Author(s):** Dujovic S.D.; Malesevic J.; Malesevic N.; et al.

**Source:** NeuroRehabilitation; 2017; vol. 41 (no. 4); p. 791-800

**Publication Date:** 2017

**Publication Type(s):** Article

**Abstract:** BACKGROUND: Foot drop is common gait impairment after stroke. Functional electrical stimulation (FES) of the ankle dorsiflexor muscles during the swing phase of gait can help correcting
foot drop. OBJECTIVE(S): To evaluate efficacy of additional novel FES system to conventional therapy in facilitating motor recovery in the lower extremities and improving walking ability after stroke. METHOD(S): Sixteen stroke patients were randomly allocated to the FES group (FES therapy plus conventional rehabilitation program) (n=8), and control group (conventional rehabilitation program) n=8. FES was delivered for 30min during gait to induce ankle plantar and dorsiflexion. Main Outcome Measure(s): Gait speed using 10 Meter Walk Test (10 MWT), Fugl-Meyer Assessment (FMA), Berg Balance Scale (BBS) and modified Barthel Index (MBI). RESULT(S): Results showed a significant increase in gait speed in FES group (p<0.001), higher than the minimal detected change. The FES group showed improvement in functional independence in the activities of daily living, motor recovery and gait performance. CONCLUSION(S): The findings suggest that novel FES therapy combined with conventional rehabilitation is more effective on walking speed, mobility of the lower extremity, balance disability and activities of daily living compared to a conventional rehabilitation program only. Copyright © 2017 - IOS Press and the authors. 

Database: EMCARE

44. Six-month effects of early or delayed provision of an ankle-foot orthosis in patients with (sub)acute stroke: a randomized controlled trial.

Author(s): Nikamp, Corien D. M.; Buurke, Jaap H.; van der Palen, Job; et al.

Source: Clinical Rehabilitation; Dec 2017; vol. 31 (no. 12); p. 1616-1624

Publication Date: Dec 2017

Publication Type(s): Academic Journal

Abstract: Objective: To study the six-month clinical effects of providing ankle-foot orthoses at different moments (early or delayed) in (sub)acute stroke; this is a follow-up to a published trial. Design: Randomized controlled trial. Setting: Rehabilitation centre. Subjects: Unilateral hemiparetic stroke subjects maximal six weeks post-stroke with indication for ankle-foot orthosis use. Interventions: Subjects were randomly assigned to early (at inclusion; week 1) or delayed provision (eight weeks later; week 9). Outcome measures: Functional tests assessing balance and mobility were performed bi-weekly for 17 weeks and at week 26. Results: In all, 33 subjects were randomized. No differences at week 26 were found between both groups for any of the outcome measures. However, results suggest that early provision leads to better outcomes in the first 11–13 weeks. Berg Balance Scale (P = 0.006), Functional Ambulation Categories (P = 0.033) and 6-minute walk test (P < 0.001) showed significantly different patterns over time. Clinically relevant but statistically non-significant differences of 4–10 weeks in reaching independent walking with higher balance levels were found, favouring early provision. Conclusion: No six-month differences in functional outcomes of providing ankle-foot orthoses at different moments in the early rehabilitation after stroke were found. Results suggest that there is a period of 11–13 weeks in which early provision may be beneficial, possibly resulting in early independent and safe walking. However, our study was underpowered. Further research including larger numbers of subjects is warranted.

Database: CINAHL

45. Relationship between dynamic balance and spatiotemporal gait symmetry in hemiplegic patients with chronic stroke.

Author(s): Chang-Man An; Young-Lan Son; Young-Hyun Park; Sung-Jun Moon

Source: Hong Kong Physiotherapy Journal; Dec 2017; vol. 37 ; p. 19-24

Publication Date: Dec 2017
Abstract: Background: Poor dynamic balance, which is common after stroke, may affect gait function. In particular, spatiotemporal asymmetrical gait patterns may occur in hemiplegic patients after stroke. Objective: This study aimed to assess the relationship between dynamic balance and spatiotemporal gait symmetry in patients with chronic hemiplegic stroke. Methods: To calculate symmetry ratios for step length (spatial parameter) and swing time (temporal parameter), 41 patients with chronic stroke walked at a comfortable speed. The dynamic balance measures included limit of stability (LOS) during standing and heel-to-heel base of support (H-H BOS) during gait. Analysis of correlations between various measures was performed. Results: The overall LOS score correlated with temporal gait symmetry (r = 0.66). The forward, backward, paretic, and non-paretic direction LOS scores were related to temporal gait symmetry (r = 0.38 to 0.62). The H-H BOS was correlated with temporal (r = -0.63) and spatial (r = -0.36) gait symmetries. Other dynamic balance variables were not significantly correlated with spatial gait symmetry. Conclusion: Thus, control of dynamic balance abilities is related to the magnitude of temporal gait symmetry. This observation suggests that rehabilitation strategies that improve dynamic balance may enhance temporal gait symmetry in post-stroke patients.

Database: CINAHL

46. Forced Use of the Paretic Leg Induced by a Constraint Force Applied to the Nonparetic Leg in Individuals Poststroke During Walking.

Author(s): Hsu, Chao-Jung; Kim, Janis; Roth, Elliot J.; Rymer, William Z.; Wu, Ming

Source: Neurorehabilitation & Neural Repair; Dec 2017; vol. 31 (no. 12); p. 1042-1052

Abstract: Background. Individuals with stroke usually show reduced muscle activities of the paretic leg and asymmetrical gait pattern during walking. Objective. To determine whether applying a resistance force to the nonparetic leg would enhance the muscle activities of the paretic leg and improve the symmetry of spatiotemporal gait parameters in individuals with poststroke hemiparesis. Methods. Fifteen individuals with chronic poststroke hemiparesis participated in this study. A controlled resistance force was applied to the nonparetic leg using a customized cable-driven robotic system while subjects walked on a treadmill. Subjects completed 2 test sections with the resistance force applied at different phases of gait (ie, early and late swing phases) and different magnitudes (10%, 20%, and 30% of maximum voluntary contraction [MVC] of nonparetic leg hip flexors). Electromyographic (EMG) activity of the muscles of the paretic leg and spatiotemporal gait parameters were collected. Results. Significant increases in integrated EMG of medial gastrocnemius, medial hamstrings, vastus medialis, and tibialis anterior of the paretic leg were observed when the resistance was applied during the early swing phase of the nonparetic leg, compared with baseline. Additionally, resistance with 30% of MVC induced the greatest level of muscle activity than that with 10% or 20% of MVC. The symmetry index of gait parameters also improved with resistance applied during the early swing phase. Conclusion. Applying a controlled resistance force to the nonparetic leg during early swing phase may induce forced use on the paretic leg and improve the spatiotemporal symmetry of gait in individuals with poststroke hemiparesis.

Database: CINAHL
47. Speed and temporal-distance adaptations during non-motorized treadmill walking in stroke and non-disabled individuals.

**Author(s):** Wang, Jia-Chi; Sung, Wen-Hsu; Chang, Ya-Ling; Wu, Szu-Hsien; Chuang, Tien-Yow

**Source:** European journal of physical and rehabilitation medicine; Dec 2017; vol. 53 (no. 6); p. 863-869

**Publication Date:** Dec 2017

**Publication Type(s):** Journal Article

**PubMedID:** 27442718

**Abstract:**

**BACKGROUND**
Treadmill training has received widespread attention to facilitate gait retraining and allow gait analysis in the stroke population in recent decades. While previous studies have used motorized treadmills for gait analysis or training, no study has investigated the use of non-motorized treadmill (NMT) in a rehabilitation setting. AIM The aim of this study was to compare the speed between overground (OG) and NMT walking and measure the adaptation of the gait pattern from comfortable to maximal walking speeds during NMT walking in participants with stroke and non-disabled individuals. DESIGN Cross-sectional study. SETTING Tertiary care center. POPULATION Twenty chronic hemiplegic stroke patients and 20 non-disabled controls. METHODSThe speeds attained OG and on a NMT were compared within each group. Cadence and stride length were measured while walking on the NMT. Adaptations of the gait pattern from comfortable to maximal walking speeds during NMT walking were measured in both groups. RESULTS In both groups, when walking on the NMT, participants walked with significantly lower speed than on the ground. While on the NMT, the non-disabled individuals significantly increased the cadence and stride length simultaneously as the speed increased. The participants with stroke significantly increased the cadence but showed little increase in stride length with increased speed. CONCLUSIONS Participants ambulated with significantly lower speeds on the NMT than during OG. Participants with stroke use a different strategy to increase walking velocity during NMT walking, relying mostly on increasing the cadence. CLINICAL REHABILITATION IMPACT Lower speed during NMT walking indicated that lesser total distance covered with NMT training when compared to OG gait training, which may inadvertently impact training amount. This is an important obstacle to overcome in order for NMT to be used effectively in the retraining of gait in patients with stroke.

**Database:** Medline


**Author(s):** Trinh, Terry; Shiner, Christine T.; Thompson-Butel, Angelica G.; McNulty, Penelope A.

**Source:** Disability & Rehabilitation; Sep 2017; vol. 39 (no. 18); p. 1939-1949

**Publication Date:** Sep 2017

**Publication Type(s):** Academic Journal

**Abstract:**

**Purpose:** Post-stroke hemiparesis may manifest as asymmetric gait, poor balance, and inefficient movement patterns. We investigated improvements in lower-limb muscle activation and function during Wii-based Movement Therapy (WMT), a rehabilitation program specifically targeting upper-limb motor-function. Methods: Electromyography (EMG) was recorded bilaterally from tibialis anterior (TA) in 20 stroke patients during a 14-day WMT program. EMG amplitude and burst duration were analyzed during stereotypical movement sequences of WMT activities. Functional movement ability was assessed pre- and post-therapy including 6-min walk test (6MWT), stair-climbing speed, and Wolf Motor Function Test timed-tasks. Results: TA EMG burst duration during Wii-golf increased by 30% on the more-affected side (p = 0.04) and decreased by 28% on the less-
affected side. Patients who did not step during Wii-tennis had a 16% decrease in more-affected TA burst sum (p = 0.047) resulting in more symmetrical activation ratio at late-therapy, with the ratio changing from 3.24 ± 2.25 to 0.99 ± 0.11 (p = 0.047). Six-minute walk and stair-climbing speed improved (p = 0.005 and 0.03, respectively), as did upper-limb movement (p ≤ 0.001).

Conclusion: This study provides physiological evidence for lower-limb improvements with WMT. Different patterns of muscle activation changes were evident across the WMT activities. Despite the relatively good pre-therapy lower-limb function, muscle activation and symmetry improved significantly with upper-limb WMT. Implications for rehabilitation: WMT is an upper-limb neurorehabilitation program that also improves lower-limb motor-function. We report a shift towards more symmetrical muscle activation of tibialis anterior on the more- and less-affected sides that were reflected in increased distance walked during the 6MWT. The use of standing during therapy not only improves lower-limb function but also permits larger and more powerful upper-limb movements. Targeted upper-limb rehabilitation can also significantly improve mobility and balance, whether dynamic or static, that should reduce the risk of falls post-stroke.

**Database:** CINAHL

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49. **Consumer-Based Physical Activity Monitor as a Practical Way to Measure Walking Intensity During Inpatient Stroke Rehabilitation.**

**Author(s):** Klassen, Tara D.; Semrau, Jennifer A.; Dukelow, Sean P.; et al.

**Source:** Stroke (00392499); Sep 2017; vol. 48 (no. 9); p. 2614-2617

**Publication Date:** Sep 2017

**Publication Type(s):** Academic Journal

**PubMedID:** NLM28784922

Available at *Stroke (00392499)* - from HighWire - Free Full Text

**Abstract:**

**Background and Purpose:** Identifying practical ways to accurately measure exercise intensity and dose in clinical environments is essential to advancing stroke rehabilitation. This is especially relevant in monitoring walking activity during inpatient rehabilitation where recovery is greatest. This study evaluated the accuracy of a readily available consumer-based physical activity monitor during daily inpatient stroke rehabilitation physical therapy sessions.

**Methods:** Twenty-one individuals admitted to inpatient rehabilitation were monitored for a total of 471 one-hour physical therapy sessions which consisted of walking and nonwalking therapeutic activities. Participants wore a consumer-based physical activity monitor (Fitbit One) and the gold standard for assessing step count (StepWatch Activity Monitor) during physical therapy sessions. Linear mixed modeling was used to assess the relationship of the step count of the Fitbit to the StepWatch Activity Monitor. Device accuracy is reported as the percent error of the Fitbit compared with the StepWatch Activity Monitor.

**Results:** A strong relationship (slope=0.99; 95% confidence interval, 0.97-1.01) was found between the number of steps captured by the Fitbit One and the StepWatch Activity Monitor. The Fitbit One had a mean error of 10.9% (5.3) for participants with walking velocities 0.8 m/s.

**Conclusions:** This study provides preliminary evidence that the Fitbit One, when positioned on the nonparetic ankle, can accurately measure walking steps early after stroke during inpatient rehabilitation physical therapy sessions.

**Clinical Trial Registration:** URL: https://www.clinicaltrials.gov. Unique identifier: NCT01915368.

**Database:** CINAHL

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50. **Associations between lower-limb muscle activation and knee flexion in post-stroke individuals: A study on the stance-to-swing phases of gait**
Reduced knee flexion is a leading feature of post-stroke gait, but the causes have not been well understood. The purpose of this study was to investigate the relationship between the knee flexion and the lower-limb muscle activation within the stance-to-swing phases of gait cycle in the post-stroke hemiplegic patients. Ten stroke patients and 10 age- and gender-matched healthy subjects participated in the experiment. The lower-limb kinematic signals and the surface electromyography (sEMG) signals of the left and right rectus femoris (RF), biceps femoris (BF) and lateral gastrocnemius (GS) were recorded during walking. The angle range (AR) of knee flexion, the root mean square (RMS) and the mean frequency (MNF) of sEMG signals were calculated from the terminal stance (TSt) to the initial swing (ISw) phases of gait cycle.

Stroke patients showed lower bilateral AR of knee flexion and lower RMS of GS on the paretic side, but higher MNF of RF on the non-paretic side compared with the controls. Within the stroke patients, significant differences were found between their paretic and non-paretic limbs in the AR of knee flexion, as well as in the RMS and MNF of GS (p < 0.05). Regression analysis showed that the RMS of BF, MNF of BF and MNF of GS explained 82.1% of variations in AR of knee flexion on paretic side (r² = 0.821). But the RMS and MNF of all the muscles (including the RF, GS and BF) could explain 65.6% of AR of knee flexion variations on the non-paretic side (r² = 0.656), and 45.2% of variations for the healthy subjects (r² = 0.452). The reduced knee flexion during gait was associated with altered magnitude and frequency of muscle contractions and with simplified muscle synergy in the post-stroke hemiplegic patients. Identifying the muscles that are responsible for knee stiffness may facilitate improvement of rehabilitation strategy for post-stroke gait. Copyright © 2017 Wang et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Database: EMCARE
score of 56.8 or higher on the prognostic scale suggested that the patient would be able to walk and that assistance with ADL would be unnecessary at the time of hospital discharge. In addition, a score of 41.3 points indicated that the patient’s return home was feasible. The reliability and the results were in good agreement. These findings showed that the ability or inability to walk was predictable in 85%, the need of assistance with ADL in 82.5%, and the feasibility of home return in 76.3% of cases. CONCLUSION: At the time of admission, four evaluation items permitted the prediction of three outcomes at time of discharge. Our formula predicts three outcomes with an accuracy of more than 76%.

Database: Medline

52. Early or delayed provision of an ankle-foot orthosis in patients with acute and subacute stroke: a randomized controlled trial.

**Author(s):** Nikamp, Corien D. M.; Buurke, Jaap H.; van der Palen, Job; et al.

**Source:** Clinical Rehabilitation; Jun 2017; vol. 31 (no. 6); p. 798-808

**Publication Date:** Jun 2017

**Publication Type(s):** Academic Journal

**Abstract:** Objective: (1) To study the effects of providing ankle-foot orthoses in subjects with (sub)acute stroke; and (2) to study whether the point in time at which an ankle-foot orthosis is provided post-stroke (early or delayed) influences these effects. Design: Randomized controlled trial.

Setting: Rehabilitation centre. Subjects: Unilateral hemiparetic stroke subjects with indication for use of an ankle-foot orthosis and maximal six weeks post-stroke. Interventions: Subjects were randomly assigned to: early provision (at inclusion; Week 1) or delayed provision (eight weeks later; Week 9). Outcome measures: 10-metre walk test, 6-minute walk test, Timed Up and Go Test, stairs test, Functional Ambulation Categories, Berg Balance Scale, Rivermead Mobility Index and Barthel Index; assessed in Weeks 1, 3, 9 and 11. Results: A total of 33 subjects were randomized (16 early, 17 delayed). Positive effects of ankle-foot orthoses were found two weeks after provision, both when provided early (significant effects on all outcomes) or delayed (Berg Balance Scale p = 0.011, Functional Ambulation Categories p = 0.008, 6-minute walk test p = 0.005, Timed Up and Go Test p = 0.028). Comparing effects after early and delayed provision showed that early provision resulted in increased levels of improvement on Berg Balance Scale (+5.1 points, p = 0.002), Barthel Index (+1.9 points, p = 0.002) and non-significant improvements on 10-metre walk test (+0.14 m/s, p = 0.093) and Timed Up and Go Test (–5.4 seconds, p = 0.087), compared with delayed provision. Conclusions: We found positive effects of providing ankle-foot orthoses in (sub)acute stroke subjects that had not used these orthoses before.

Database: CINAHL

53. The effect of an arm sling used for shoulder support on gait efficiency in hemiplegic patients with stroke using walking aids.

**Author(s):** Jeong, Yeon-Gyu; Jeong, Yeon-Jae; Koo, Jung-Wan

**Source:** European journal of physical and rehabilitation medicine; Jun 2017; vol. 53 (no. 3); p. 410-415

**Publication Date:** Jun 2017

**Publication Type(s):** Randomized Controlled Trial Journal Article

**PubMedID:** 28118695
Abstract: BACKGROUND The effects of an arm sling on the physiological costs of walking are not known. Even though a previous study reported that an arm sling can improve gait efficiency, its entrance criteria was only hemiparetic patients able to walk without walking aids independently. AIM The aim of this study was to investigate the effect of shoulder support by an arm sling on gait efficiency in hemiplegic stroke patients using walking aids. DESIGN Randomized crossover design. SETTING Rehabilitation department of a university hospital. POPULATION A total of 57 hemiplegic patients with shoulder subluxation dependent on canes were grouped into single cane (N.=30) and quad cane groups (N.=27) as walking aids. METHODS All patients performed a walk with their own walking aid with and without an arm sling in randomized order, on the same day. We measured the energy cost and energy expenditure using a portable gas analyzer and heart rate during a 6-minutes Walk Test and a 10-m Walk Test. We analyzed all outcomes measures with and without an arm sling between the patients who were grouped according to their walking aids using 2-way repeated ANOVA. RESULTS The energy cost (0.068±0.023 mL/kg/m) and oxygen expenditure (8.609±2.155 mL/kg/minutes) were lower with the arm sling (P<0.05) than without the arm sling (0.074±0.029 mL/kg/m, and 9.109±2.406 mL/kg/minutes, respectively), and the walking endurance (138.942±47.043 m) were longer (P<0.05) with the arm sling among the hemiplegic patients with single cane. CONCLUSIONS Among the hemiplegic patients with a single cane, the walking endurance achieved with an arm sling significantly improved than those achieved without an arm sling, and the energy expenditure and energy cost was significantly lower. CLINICAL REHABILITATION IMPACT: The hemiplegic arm support with an arm sling may be beneficial for gait efficiency in hemiplegic patients using a single cane, which lead to decreased oxygen use at a given speed.

Database: Medline

54. Effect of novel guidance tubing gait on electromyographic neuromuscular imbalance and joint angular kinematics during locomotion in hemiparetic stroke patients

Author(s): Lee JJ

Source: Arch Phys Med Rehabil. 2017 Dec;98(12):2526-2532

Abstract: Objective: To compare the immediate effects of conventional treadmill gait and guidance tubing gait (GTG) on electromyographic neuromuscular imbalance and knee joint kinematics in hemiparetic gait. Design: Case-control study. Setting: University medical center. Participants: Participants (N=33; 19 men, 14 women) were patients with hemiparetic stroke (n=18 [experimental]; mean age ± SD, 39.2±16.8y) and healthy controls (n=15; mean age ± SD, 26.3±2.6y). Interventions: The GTG was provided for approximately 30 minutes and involved application of an assistive guidance force using the tubing, specifically to improve knee joint stabilization during midstance and increase knee joint flexion during midswing phase. Main outcome measures: Clinical tests included the Korean Mini-Mental State Examination, Modified Ashworth Scale, Berg Balance Scale, manual muscle test, and knee joint range of motion and sensory tests. Knee joint muscle electromyographic and kinematic analyses were determined at pretest and posttest. Results: After the intervention, the experimental group showed significantly greater improvements in balanced quadriceps and hamstring electromyographic coactivation and knee joint kinematics relative to the control group (P=.005). The GTG intervention decreased overactive hamstring activity (P=.018) and reciprocally increased quadriceps activity (P<.001). The knee joint kinematic analysis showed significant changes in the hemiparetic stroke group (P=.004). Conclusions: This study demonstrates the effectiveness of the tubing gait condition to restore knee joint muscle imbalance and kinematics in individuals with hemiparetic stroke who present with an abnormal hyperextension knee gait.

Database: PubMed
55. Crouch gait can be an effective form of forced-use/no constraint exercise for the paretic lower limb in stroke

Author(s): Tesio L.; Rota V.; Malloggi C.; Brugliera L.; Catino L.
Source: International Journal of Rehabilitation Research; Jun 2017
Publication Date: Jun 2017
Publication Type(s): Article In Press

Abstract: In hemiplegic gait the paretic lower limb provides less muscle power and shows a briefer stance compared with the unaffected limb. Yet, a longer stance and a higher power can be obtained from the paretic lower limb if gait speed is increased. This supports the existence of a 'learned non-use' phenomenon, similar to that underlying some asymmetric impairments of the motion of the eyes and of the upper limbs. Crouch gait (CG) (bent-hip bent-knee, about 30 degree minimum knee flexion) might be an effective form of 'forced-use' treatment of the paretic lower limb. It is not known whether it also stimulates a more symmetric muscle power output. Gait analysis on a force treadmill was carried out in 12 healthy adults and seven hemiplegic patients (1-127 months after stroke, median: 1.6). Speed was imposed at 0.3 m/s. Step length and single and double stance times, sagittal joint rotations, peak positive power, and work in extension of the hip, knee, and ankle (plantar flexion), and surface electromyography (sEMG) area from extensor muscles during the generation of power were measured on either side during both erect and crouch walking. Significance was set at P less than 0.05; corrections for multiplicity were applied. Patients, compared with healthy controls, adopted in both gait modalities and on both sides a shorter step length (61-84%) as well as a shorter stance (76-90%) and swing (63-83%) time. As a rule, they also provided a higher muscular work (median: 137%, range: 77-250%) paralleled by a greater sEMG area (median: 174%, range: 75-185%). In erect gait, the generation of peak extensor power across hip, knee, and ankle joints was in general lower (83-90%) from the paretic limb and higher (98-165%) from the unaffected limb compared with control values. In CG, peak power generation across the three lower limb joints was invariably higher in hemiparetic patients: 107-177% from the paretic limb and 114-231% from the unaffected limb. When gait shifted from erect to crouch, only for hemiplegic patients, at the hip, the paretic/unaffected ratio increased significantly. For peak power, work, sEMG area, and joint rotation, the paretic/unaffected ratio increased from 55 to 85%, 56 to 72%, 68 to 91%, and 67 to 93%, respectively. CG appears to be an effective form of forced-use exercise eliciting more power and work from the paretic lower limb muscles sustained by a greater neural drive. It also seems effective in forcing a more symmetric power and work from the hip extensor muscles, but neither from the knee nor the ankle. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal. http://creativecommons.org/licenses/by-nc-nd/4.0/Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.

Database: EMCARE

56. Effects of treadmill training with load addition on non-paretic lower limb on gait parameters after stroke: A randomized controlled clinical trial.

Author(s): Ribeiro, Tatiana S.; Silva, Emília M.G.S.; Silva, Isaíra A.P.; et al.
Source: Gait & Posture; May 2017; vol. 54 ; p. 229-235
Publication Date: May 2017
Publication Type(s): Academic Journal
Abstract: The addition of load on the non-paretic lower limb for the purpose of restraining this limb and stimulating the use of the paretic limb has been suggested to improve hemiparetic gait. However, the results are conflicting and only short-term effects have been observed. This study aims to investigate the effects of adding load on non-paretic lower limb during treadmill gait training as a multisession intervention on kinematic gait parameters after stroke. With this aim, 38 subacute stroke patients (mean time since stroke: 4.5 months) were randomly divided into two groups: treadmill training with load (equivalent to 5% of body weight) on the non-paretic ankle (experimental group) and treadmill training without load (control group). Both groups performed treadmill training during 30 min per day, for two consecutive weeks (nine sessions). Spatiotemporal and angular gait parameters were assessed by a motion system analysis at baseline, post-training (at the end of 9 days of interventions) and follow-up (40 days after the end of interventions). Several post-training effects were demonstrated: patients walked faster and with longer paretic and non-paretic steps compared to baseline, and maintained these gains at follow-up. In addition, patients exhibited greater hip and knee joint excursion in both limbs at post-training, while maintaining most of these benefits at follow-up. All these improvements were observed in both groups. Although the proposal gait training program has provided better gait parameters for these subacute stroke patients, our data indicate that load addition used as a restraint may not provide additional benefits to gait training.

Database: CINAHL

57. Intensive seated robotic training of the ankle in patients with chronic stroke differentially improves gait.

Author(s): Chang, Johanna L.; Lin, Regina Y.; Saul, Maira; et al.

Source: NeuroRehabilitation; Apr 2017; vol. 41 (no. 1); p. 61-68

Publication Date: Apr 2017

Publication Type(s): Academic Journal

Abstract: BACKGROUND: Robotic driven treatment plans targeting isolated joints of the upper limb have improved the sensorimotor condition of patients with stroke. Similar intensive efforts to allay lower limb gait impairment have not been so successful. In patients with stroke, targeted robot assisted training of the ankle joint, in a seated position, has demonstrated significant alterations in ankle stiffness and foot-ankle orientation at foot strike which may provide a new treatment option for gait impairment. OBJECTIVE: To determine if isolated robot-assisted training of the ankle joint improves chronic hemiparetic gait in patients with stroke who are categorized according to baseline gait impairment. METHODS: Patients with chronic stroke (>6 mo) and hemiparetic gait (N = 29) received 18 sessions of isolated robot-assisted motor training of the ankle (3x/week for 6 weeks). All participants had stable clinical baseline scores across three admission measures, and no participant was receiving simultaneous outpatient rehabilitation. Baseline gait speed determined three impairment groups: high, >0.8 m/s; medium, 0.4-0.8 m/s; low, 0.16 m/s) for the high function group across all gait speed and endurance measures at discharge and at 3 months. The moderate group also exhibited clinically significant improvements at follow-up on the 10 Meter Walk Test, fast pace (0.16 m/sec), and approached clinical significance for the 10 Meter Walk comfortable pace (0.12 m/sec). The low group had small but significant improvements, at discharge on two of the three gait measures, and these improvements were maintained at 3 months. For balance measures, the low and moderate impairment groups had significant improvements at discharge that were robust on follow-up measure. The high function group demonstrated no significant change in balance. CONCLUSIONS: Joint-specific robotic training of the paretic ankle provided the most benefit to individuals with moderate or mild gait speed impairments after stroke. Baseline gait speed function
(low, moderate, high) was associated with three distinct recovery profiles. This suggests that severity-specific intervention may be critical to improving efficiency of stroke recovery.

**Database:** CINAHL

58. Feasibility of rehabilitation training with a newly developed, portable, gait assistive robot for balance function in hemiplegic patients

**Author(s):** Sung J.; Choi S.; Kim M.J.; Kim H.; Lee G.; Han C.; Ji Y.; Shin D.; Hwang S.; Yun D.; Jang H.

**Source:** Annals of Rehabilitation Medicine; Apr 2017; vol. 41 (no. 2); p. 178-187

**Publication Date:** Apr 2017

**Publication Type(s):** Article

**Abstract:** Objective To investigate the clinical feasibility of a newly developed, portable, gait assistive robot (WA-H, 'walking assist for hemiplegia') for improving the balance function of patients with stroke-induced hemiplegia. Methods Thirteen patients underwent 12 weeks of gait training on the treadmill while wearing WA-H for 30 minutes per day, 4 days a week. Patients' balance function was evaluated by the Berg Balance Scale (BBS), Fugl-Meyer Assessment Scale (FMAS), Timed Up and Go Test (TUGT), and Short Physical Performance Battery (SPPB) before and after 6 and 12 weeks of training. Results There were no serious complications or clinical difficulties during gait training with WA-H. In three categories of BBS, TUGT, and the balance scale of SPPB, there was a statistically significant improvement at the 6th week and 12th week of gait training with WA-H. In the subscale of balance function of FMAS, there was statistically significant improvement only at the 12th week. Conclusion Gait training using WA-H demonstrated a beneficial effect on balance function in patients with hemiplegia without a safety issue. Copyright © 2017 by Korean Academy of Rehabilitation Medicine.

**Database:** EMCARE


**Author(s):** Ribeiro, Tatiana Souza; da Silva, Tâllyta Camyla Chaves; Carlos, Renata; et al.

**Source:** NeuroRehabilitation; Mar 2017; vol. 40 (no. 3); p. 345-354

**Publication Date:** Mar 2017

**Publication Type(s):** Academic Journal

**Abstract:** BACKGROUND: Although exercises involving both lower limbs are indicated for aerobic training, stroke patients have shown expressive asymmetry between the paretic and non-paretic lower limb (NPLL). Performing activities that stimulate the paretic limb during aerobic exercise may optimize training results. OBJECTIVE: To evaluate if there is influence of load addition on NPLL during treadmill training on cardiovascular parameters and gait performance of subacute stroke patients. METHODS: Thirty-eight stroke subjects with gait deficits were randomized into experimental group, which underwent treadmill training with a mass attached on NPLL, and control group, which underwent only treadmill training. Interventions lasted 2 weeks (9 sessions). Main outcomes were heart rate, arterial blood pressure, gait speed and distance covered. Assessments occurred at rest, 10th and 20th minutes of the session and immediately after each session. RESULTS: There was improvement in speed and walking distance in both groups. All cardiovascular parameters had showed no changes compared to 1st and 9th sessions and there were no differences between groups within each session. CONCLUSIONS: Load addition on NPLL did not alter cardiovascular
parameters and gait training provide better gait performance of subacute stroke patients, which indicates this therapy can be considered useful and safe for these patients.

Database: CINAHL

60. Effects of Treadmill Training in chronic hemiparetic: a randomized, double-blind clinical trial.

**Author(s):** de Lima Gomes, Wildja; de Nadai Dias, Luciara Irene; Guimarães, Rachel Paes; et al.

**Source:** Manual Therapy, Posturology & Rehabilitation Journal; Jan 2017; vol. 15; p. 1-5

**Publication Date:** Jan 2017

**Publication Type(s):** Academic Journal

**Abstract:** Background: It is estimated that the prevalence of cerebrovascular accident (CVA) increases significantly as a result of the increase in the elderly population, leading to dependence and care. Interventions with physical exercises are essential for patients with chronic CVA and hemiparesis to contribute to functional motor recovery. The gait of the hemiparetic patients is very impaired, including decreased speed, unipodal support in the abbreviated paretic limb, increased step length, decreased hip flexion, increased knee flexion and plantar flexion and involves compensatory strategies to deal with deficits of the affected limb. Rehabilitation programs of patients with CVA should focus on the restoration of the individual's independence and ability to move. Objective: To analyze the effects of the addition of a load on a lower limb not affected in the discharge of weight and motor function of paretic lower limb. Method: Experimental, randomized, double-blind study conducted at the Physiotherapy and Occupational Therapy Outpatient Clinic of the Hospital das Clínicas (HC) - UNICAMP. Participants were assessed by the Confidence and Balance Scale, Fugl-Meyer Assessment of Physical Performance (FMA), Modified Ashworth Scale (MAS), Postural Stroke Scale for post-stroke patients (PSS), Time up and go test (TUG), 10-Meter gait test, Stroke Scale Barthel and weight transfer in the affected lower limb. Participants were treated in 12 walking training sessions on the treadmill with 1 kg added to the ankle of the lower limb. Results: There were variations between the 3 times for gait time (p= 0.005), FMA (p= 0.002), Activities-specific Balance Confidence Scale (ABC scale) (p= 0.007) and EAPA (p= 0.042). Conclusion: Treadmill therapy and weight addition in the healthy limb revealed improvement in motor function, balance in orthostatism and walking speed.

Database: CINAHL

61. Effects of a sitting boxing program on upper limb function, balance, gait, and quality of life in stroke patients.

**Author(s):** Junhyuck Park; Jihwan Gong; Jongeun Yim

**Source:** NeuroRehabilitation; Jan 2017; vol. 40 (no. 1); p. 77-86

**Publication Date:** Jan 2017

**Publication Type(s):** Academic Journal

**Abstract:** Background: Boxing training including traditional stretching, muscular strength training, and duration training would be considered to be effective for improved functional stretching, dynamic balance, walking speed, and quality of life. OBJECTIVE: We aimed to investigate upper limb function, balance, gait, and quality of life in stroke patients before and after a sitting boxing program. METHODS: Twenty-six participants were randomly allocated to a boxing group (n = 13) and control group (n = 13) after the upper limb function, balance, gait, and quality of life were recorded. The boxing group underwent a sitting boxing program (3 times/week) as well as conventional physical therapy (3 times/week) for 6 weeks. The control group only underwent conventional
physical therapy (3 times/week) for 6 weeks. RESULTS: The Manual Functional Test (MFT), non-affected hand grip, Berg Balance Scale (BBS), velocity moment with eye opened, 10-m Walk Test (10MWT), and Stroke-Specific Quality of Life questionnaire (SS-QOL) were significantly improved in the boxing group (p < 0.05) and showed significantly greater improvements in the boxing group compared to the control group (p < 0.05) after 6 weeks. CONCLUSIONS: The sitting boxing program group had positive effects on upper extremity function, balance, gait, and quality of life in stroke patients.

Database: CINAHL

62. Treadmill training with Thera-Band improves motor function, gait and balance in stroke patients.

Author(s): Taesung In; Youngmi Jin; Kyoungsim Jung; Hwi-young Cho

Source: NeuroRehabilitation; Jan 2017; vol. 40 (no. 1); p. 109-114

Publication Date: Jan 2017

Publication Type(s): Academic Journal

Abstract: OBJECTIVES: The purpose of this study was to evaluate the effects of treadmill training with Thera-Band on motor function, gait and balance abilities in patients with stroke. METHODS: 30 participants with hemiparetic stroke were recruited and randomly divided into two groups: the experimental group (n = 15) and the control group (n = 15). Participants in both groups received conventional physical therapy for 30 minutes before the intervention. Additionally, subject in the experimental group performed treadmill training with Thera-Band for 30 minutes, five times a week for four weeks, while the control group conducted treadmill training only for the same amount of time. To measure motor function, Fugl-Meyer assessment (FMA) was used. Timed-up and Go (TUG), 10-meter walk test (10MWT) and Performance-oriented mobility assessment (POMA) were used to analysis balance and gait abilities. RESULTS: In FMA, TUG, 10MWT and Gait POMA, there were significant improvements in both groups after intervention. And more significant changes were shown in the experimental group than the control group (p < 0.05). However, there was no significant difference within group and between the groups in the Balance POMA. CONCLUSIONS: Our findings indicate that treadmill training with Thera-Band is beneficial and effective to improve motor function of the lower extremities, gait and balance ability in stroke patients.

Database: CINAHL


Author(s): Staples, Andrea


Publication Date: Jan 2017

Publication Type(s): Dissertation

Abstract: Objective: This meta-analysis examined the effectiveness of Lokomat robotic-assisted gait training (RAGT) versus over ground training (OGT) and conventional care techniques on balance and functional muscle tone recovery in hemiparetic adults with stroke in the chronic stage of recovery. Methods: Studies analyzing Lokomat RAGT were compared to studies analyzing combinations of OGT and conventional care techniques. The studies were meta-analyzed to determine both treatment effect size and homogeneity of pooled studies. Results: Ten studies were included in the meta-analysis. A moderate treatment effect size and homogeneity was found for primary analysis for
balance using the Berg Balance Scale, and the results were statistically significant. A small treatment effect and homogeneity was found for the secondary analysis for functional muscle tone using the Fugl-Meyer Lower Extremity Assessment, but the results were not statistically significant. Conclusion: Within this meta-analysis, the findings reveal that Lokomat RAGT had a greater treatment effect size for treatment of balance in hemiplegic patients with chronic stroke than OGT and conventional care techniques, and may be considered as a new standard of care for treatment in this population.

Database: CINAHL

64. Validity of gait asymmetry estimation by using an accelerometer in individuals with hemiparetic stroke

Author(s): Okaye K


Abstract: The purpose of this study was to evaluate the validity of estimating step time and length asymmetries, using an accelerometer against force plate measurements in individuals with hemiparetic stroke. [Subjects and Methods] Twenty-four individuals who previously had experienced a stroke were asked to walk without using a cane or manual assistance on a 16-m walkway. Step time and length were measured using force plates, which is the gold standard for assessing gait asymmetry. In addition to ground reaction forces, trunk acceleration was simultaneously measured using an accelerometer. To estimate step time asymmetry using accelerometer data, the time intervals between forward acceleration peaks for each leg were calculated. To estimate step length asymmetry using accelerometer data, the integration of the positive vertical accelerations following initial contact of each leg was calculated. Asymmetry was considered the affected side value divided by the unaffected side value. [Results] Significant correlations were found between the accelerometer and the force plates for step time and length asymmetries (rho=0.83 and rho=0.64, respectively). [Conclusion] An accelerometer might be useful for assessing step time and length asymmetries in individuals with hemiparetic stroke, although improvements are needed for estimating the accuracy of step length asymmetry.

Database: PubMed

65. Effects of Talocrural Mobilization with Movement on Ankle Strength, Mobility, and Weight-Bearing Ability in Hemiplegic Patients with Chronic Stroke: A Randomized Controlled Trial

Author(s): An C.-M.; Jo S.-O.

Source: Journal of Stroke and Cerebrovascular Diseases; Jan 2017; vol. 26 (no. 1); p. 169-176

Publication Date: Jan 2017

Publication Type(s): Article

Abstract: Background and Objective In general, adequate movement of the ankle joint is known to play an important role in functional activities. Stroke survivors frequently have limited range of motion of the ankle, leading to dysfunctional weight transfer toward the paretic lower limb during standing or gait. The purpose of this study was to investigate the effects of talocrural mobilization with movement (MWM) on ankle strength, dorsiflexion passive range of motion (DF-PROM), and weight-bearing ability on the paretic limb during standing or gait in stroke patients with limited ankle dorsiflexion. Methods Twenty-six participants with chronic hemiplegia (>6 months post stroke) were divided into 2 groups: MWM group (n=13) and control group (n=13). Both groups attended conventional physiotherapy sessions 3 times a week for 5 weeks. Additionally, the MWM group underwent talocrural MWM 3 times a week for 5 weeks. Isokinetic ankle strength, DF-PROM, and weight-bearing ability measures included the limit of stability (LOS); gait parameters were evaluated
before and after interventions. Results Plantarflexors peak torque and DF-PROM significantly increased in the MWM group. In addition, forward and forward-parietic direction LOS significantly increased in the MWM group. Paretic direction LOS, single-limb support phase of the paretic limb significantly increased and double limb support phase significantly decreased within the MWM group. Conclusions This study demonstrates that talocrural MWM has an augmented effect on ankle strength, mobility, and weight-bearing ability in chronic stroke patients with limited ankle motion when added to conventional therapy. Copyright © 2017 National Stroke Association  

**Database:** EMCARE

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### 66. **Effects of 3-dimensional lumbar stabilization training for balance in chronic hemiplegic stroke patients: A randomized controlled trial**  
**Author(s):** Chun J.-Y.; Seo J.-H.; Park S.-H.; Won Y.H.; Kim G.-W.; Moon S.-J.; Ko M.-H.  
**Source:** Annals of Rehabilitation Medicine; 2016; vol. 40 (no. 6); p. 972-980  
**Publication Date:** 2016  
**Publication Type(s):** Article  
**Available at Annals of rehabilitation medicine - from Europe PubMed Central - Open Access  
**Abstract:** Objective To investigate the effects of the newly developed Spine Balance 3D system on the balance and gait abilities of hemiplegic stroke patients. Methods Twenty-eight hemiplegic patients with chronic stroke were randomly assigned to an experimental (n=14) or control group (n=14). The experimental and control groups performed balance training by using the newly developed Spine Balance 3D system and the well-known Biodex Balance System 30 minutes per day, three times a week for 7 weeks. The Berg Balance Scale (BBS), 10-m walking test (10mWT), Timed Up and Go Test (TUG), Functional Reach Test (FRT), the Korean version of the Fall Efficacy Scale-International (KFES-I), trunk muscle strength and stability were evaluated before and after 7 weeks of intervention. Results The 10mWT improved significantly (p=0.001) in the experimental group (using the Spine Balance 3D system) but not in the control group, and core muscle strength, which we checked using Spine Balance 3D system evaluation program, improved more in the experimental group as well. The results of the BBS, FRT, TUG, KFES-I, and Biodex Balance System evaluation program improved in both groups after 7 weeks of balance training. Conclusion We suggest that the newly-developed Spine Balance 3D system can be a more useful therapeutic tool for gait and dynamic balance rehabilitation in hemiplegic patients than a conventional 2D-based balance training system. A large-scale randomized controlled study is needed to prove the effect of this system. Copyright © 2016 by Korean Academy of Rehabilitation Medicine.  
**Database:** EMCARE

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### 67. **Transcranial motor evoked potentials of lower limbs can prognosticate ambulation in hemiplegic stroke patients**  
**Author(s):** Hwang P.; Sohn M.K.; Jee S.; Lee H.  
**Source:** Annals of Rehabilitation Medicine; 2016; vol. 40 (no. 3); p. 383-391  
**Publication Date:** 2016  
**Publication Type(s):** Article  
**Available at Annals of rehabilitation medicine - from Europe PubMed Central - Open Access  
**Abstract:** Objective To examine the association between motor evoked potentials (MEPs) in lower limbs and ambulatory outcomes of hemiplegic stroke patients. Methods Medical records of hemiplegic patients with the first ever stroke who received inpatient rehabilitation from January
2013 to May 2014 were reviewed. Patient who had diabetes, quadriplegia, bilateral lesion, brainstem lesion, severe musculoskeletal problem, and old age over 80 years were excluded. MEPs in lower limbs were measured when they were transferred to the Department of Rehabilitation Medicine. Subjects were categorized into three groups (normal, abnormal, and absent response) according to MEPs findings. Berg Balance Scale (BBS) and Functional Ambulation Category (FAC) at initial and discharge were compared among the three groups by one-way analysis of variance (ANOVA). Correlation was determined using a linear regression model. Results Fifty-eight hemiplegic patients were included. BBS and FAC at discharge were significantly (ANOVA, p<0.001) different according to MEPs findings. In linear regression model of BBS and FAC using stepwise selection, patients' age (p<0.01), BBS at admission (p<0.01), and MEPs (p<0.01) remained significant covariates. In regression assumption model of BBS and FAC at admission, MEPs and gender were significant covariates. Conclusion Initial MEPs of lower limbs can prognosticate the ambulatory outcomes of hemiplegic patients.

Database: EMCARE

68. Comparison of heart rate reserve-guided and ratings of perceived exertion-guided methods for high-intensity robot-assisted gait training in patients with chronic stroke focused on the motor function and gait ability

Author(s): Bae Y.-H.; Kim Y.-H.; Fong S.S.M.

Source: Topics in Geriatric Rehabilitation; 2016; vol. 32 (no. 2); p. 119-126

Publication Date: 2016

Publication Type(s): Article

Abstract: The present study was to compare the effectiveness of heart rate reserve (HRR)-guided high-intensity robot-assisted gait training (RAGT) to RPE-guided high-intensity RAGT on motor function and gait ability in patients with chronic stroke. The HRR-guided high-intensity RAGT group received the RAGT at 70% of HRR, whereas the RPE-guided high-intensity RAGT group received RAGT at RPE of 15. Both groups received their assigned therapy for 30 minutes per session, 3 days per week for 6 weeks. HRR-guided high-intensity RAGT group was signifi cantly more improved than the RPE-guided high-intensity RAGT group in Fugl-Meyer assessment Lower extremity score, walking speed, cadence, step length, stride length, swing time, double support rate, single support rate, symmetrical index of swing, symmetrical index of stance, and 10-m velocity test (P <.05). Thus, HRR-guided high-intensity RAGT group improved in terms of motor function, gait ability, and controlled symmetric gait pattern more than the RPE-guided high-intensity RAGT group by physiological gait training at more high intensity. These results suggest that HRR-guided high-intensity RAGT group is safe and effective for improvement of motor function and gait ability in chronic stroke. Copyright © 2016 Wolters Kluwer Health, Inc.

Database: EMCARE


Author(s): Laddha, Darshan; Ganesh, G. Shankar; Pattnaik, Monalisa; et al.

Source: Physiotherapy Research International; Dec 2016; vol. 21 (no. 4); p. 247-256

Publication Date: Dec 2016

Publication Type(s): Academic Journal

Abstract: Background and Purpose Spasticity is a major disabling symptom in patients post stroke. Although studies have demonstrated that transcutaneous electrical nerve stimulation (TENS) can
reduce spasticity, the duration of single session TENS is a subject of debate. The purpose of this study was to determine the sustainability of the effects of TENS applied over common peroneal nerve in the reduction of ankle plantar-flexor spasticity and improving gait speed in patients post stroke. Methods Thirty patients (11 women and 19 men) (mean age of 46.46 years) were randomly assigned to group 1 (task oriented exercises), group 2 (TENS for 30 min and task oriented exercises) and group 3 (TENS for 60 min and task oriented exercises) for a period of five sessions per week for 6 weeks. All patients were assessed for ankle plantar-flexor spasticity, passive ankle dorsi-flexion range of motion, clonus and timed up and go test at the time of recruitment to study, at 3 and 6 weeks of therapeutic intervention. Results The overall results of the study suggest that there was a decrease in ankle plantar flexor spasticity, ankle clonus and timed up and go score in all the groups. A greater reduction of spasticity was seen in TENS groups (groups 2 and 3) when compared to control. No significant improvement was found in timed up and go test (TUG) scores between groups. Conclusion Both 30 min and 60 min of application of TENS are effective in reducing spasticity of ankle plantar flexors, improving walking ability and increase the effectiveness of task related training. Based on the effect size, we would recommend a longer duration application for the reduction of spasticity. Copyright © 2015 John Wiley & Sons, Ltd.

Database: CINAHL

70. Systematic review of published studies on aquatic exercise for balance in patients with multiple sclerosis, Parkinson's disease, and hemiplegia

Author(s): Methajarunon P.; Eitivipart C.; Foongchomcheay A.; Diver C.J.

Source: Hong Kong Physiotherapy Journal; Dec 2016; vol. 35 ; p. 12-20

Publication Date: Dec 2016

Publication Type(s): Review

Available at Hong Kong physiotherapy journal : official publication of the Hong Kong Physiotherapy Association Limited = Wu li chih liao - from Unpaywall

Abstract: Background Multiple sclerosis, Parkinson's disease, and hemiplegia are common disorders that directly cause impairment of balance and gait. Aquatic exercises are used for neurological rehabilitation. It is suggested that the contributing factors of the water setting such as buoyancy, viscosity, and hydrostatic pressure offer an ideal environment for rehabilitative programmes. Objective To conduct a systematic review of studies that assess the effect of aquatic exercises on balance in neurological patients (i.e., patients with multiple sclerosis, Parkinson's disease, and hemiplegia). Methods A systematic literature search of six databases (MEDLINE, PEDro, AMED, CINAHL, Embase, SPORTDiscus) for randomized controlled trials and quasi-experimental trials on aquatic exercises in three different neurological disorders, namely, multiple sclerosis, Parkinson's disease, and hemiplegia, was performed. Reference lists from identified studies were manually searched for additional studies. Methodological quality was assessed using the Downs and Black checklist. The data were analyzed and synthesized by two independent reviewers. Disagreements in extracted data were resolved by discussion among the reviewers. Results The methodological quality of eight studies included in this review ranged from fair to good. The findings illustrated that there were statistically significant improvements in static and dynamic balance in patients with multiple sclerosis and hemiplegia. The statistically significant improvements in gait ability were only found in the studies conducted on multiple sclerosis. No conclusions can be drawn in Parkinson's populations as only two trials conducted with a small sample size were available. Conclusion Aquatic exercises may be effective at improving balance impairment in patients with hemiplegia and multiple sclerosis. There is a need for further research investigating its effect on Parkinson's disease before encouraging the use of aquatic exercises. Copyright © 2016 Hong Kong Physiotherapy Association

Database: EMCARE
71. Quantitative assessment of retropulsion of the hip, excessive hip external rotation, and excessive lateral shift of the trunk over the unaffected side in hemiplegia using three-dimensional treadmill gait analysis.

Author(s): Tanikawa, Hiroki; Ohtsuka, Kei; Mukaino, Masahiko; et al.

Source: Topics in stroke rehabilitation; Oct 2016; vol. 23 (no. 5); p. 311-317

Publication Date: Oct 2016

Publication Type(s): Journal Article

PubMedID: 27077992

Abstract: BACKGROUND Gait assessment is important to determine the most effective strategy to regain gait function during stroke rehabilitation. To understand the mechanisms that cause abnormal gait patterns, it is useful to objectively identify and quantify the abnormal gait patterns. Objective assessment also helps evaluate the efficacy of treatments and can be used to provide suggestions for treatment. OBJECTIVE To evaluate the validity of quantitative indices for retropulsion of the hip, excessive hip external rotation, and excessive lateral shift of the trunk over the unaffected side in hemiplegic patients. METHODS Forty-six healthy control subjects and 112 hemiplegic patients participated. From the 112 patients, 50 patients were selected into each abnormal gait pattern with some overlap. Participants were instructed to walk on a treadmill and were recorded using a three-dimensional motion analysis system. An index to quantify each of the three abnormal gait patterns was calculated from the three-dimensional coordinate data. The index values of patients were compared with those of healthy subjects and with the results of observational gait assessment by three physical therapists with expertise in gait analysis. RESULTS Strong correlation was observed between the index value and the median observational rating for all three abnormal gait patterns (ranging from 0.56 to 0.74). Most of the patients with an abnormal gait pattern had a higher index value than the healthy subjects. CONCLUSION The proposed indices are useful for clinical gait analysis. Our results encourage a more detailed analysis of hemiplegic gait using a motion analysis system.

Database: Medline

72. Reliability and minimum detectable change of the gait profile score for post-stroke patients.

Author(s): Devetak, Gisele Francini; Martello, Suzane Ketlyn; de Almeida, Juliana Carla; et al.

Source: Gait & Posture; Sep 2016; vol. 49; p. 382-387

Publication Date: Sep 2016

Publication Type(s): Academic Journal

PubMedID: NLM27497756

Abstract: The objectives of this work were (i) to determine Gait Profile Score (GPS) for hemiparetic stroke patients, (ii) to evaluate its reliability within and between sessions, and (iii) to establish its minimal detectable change (MDC). Seventeen hemiparetic patients (mean age 54.9±10.5 years; 9 men and 8 women; 6 hemiparetic on the left side and 11 on the right side; mean time after stroke 6.1±3.5 months) participated in 2 gait assessment sessions within an interval of 2-7 days. Intra-session reliability was obtained from the intraclass correlation coefficient (ICC) between the three strides of each session. Inter-session reliability was estimated by the ICC from the averages of that three strides. GPS value of non paretic lower limb (NPLL) (13.9±2.4°) was greater than that of paretic lower limb (PLL) (12.0±2.8°) and overall GPS (GPS_O) was 13.7±2.5°. The Gait Variable Scores (GVS), GPS and GPS_O exhibited intra-session ICC values between 0.70 and 0.99, suggesting high intra-day stability. Most of GVS exhibited excellent inter-session reliability (ICC between 0.81 and 0.93). Only
hip rotation, hip abduction of PLL exhibited moderate reliability with ICC/MDC values of 0.57/10.0° and 0.71/3.1°, respectively. ICC/MDC values of GPS were 0.92/2.3° and 0.93/1.9° for PLL and NPLL, respectively. GPS_O exhibited excellent test-retest reliability (ICC=0.95) and MDC of 1.7°. Given its reliability, the GPS has proven to be a suitable tool for therapeutic assessment of hemiparetic patients after stroke.

Database: CINAHL

73. Effects of 8 weeks of mat-based pilates exercise on gait in chronic stroke patients
Author(s): Roh S.; Gil H.J.; Yoon S.
Source: Journal of Physical Therapy Science; Sep 2016; vol. 28 (no. 9); p. 2615-2619
Publication Date: Sep 2016
Publication Type(s): Article
Available at Journal of Physical Therapy Science - from Europe PubMed Central - Open Access
Abstract:[Purpose] The purpose of this study was to investigate the effects of an 8-week program of Pilates exercise on gait in chronic hemiplegia patients and to determine whether or not it can be used for rehabilitation in poststroke patients. [Subjects and Methods] Twenty individuals with unilateral chronic hemiparetic stroke (age, 66.1 +/- 4.4 yrs; height, 162.3 +/- 8.3 cm; weight, 67.4 +/- 12.3 kg) participated in this study and were randomly allocated equally to either a Pilates exercise group or a control group. To identify the effects of Pilates exercise, a 3-D motion analysis with 8 infrared cameras was performed. [Results] For the gait parameters, improvements were found in the Pilates exercise group for all variables, and statistical significance was observed for stride length, gait velocity, knee range of motion and hip range of motion. For the asymmetry indexes, insignificant improvements were found for all variables in the Pilates exercise group. [Conclusion] In conclusion, an 8-week program of Pilates exercise had a positive influence on improving the gait ability of poststroke patients, and the intervention could be applied to poststroke patients with various levels of physical disability by adjusting the intensity of training. Copyright © 2016 The Society of Physical Therapy Science. Published by IPEC Inc.
Database: EMCARE

74. Prediction of Independent Walking Ability for Severely Hemiplegic Stroke Patients at Discharge from a Rehabilitation Hospital.
Author(s): Hirano, Yoshitake; Hayashi, Takeshi; Nitta, Osamu; et al.
Source: Journal of Stroke & Cerebrovascular Diseases; Aug 2016; vol. 25 (no. 8); p. 1878-1881
Publication Date: Aug 2016
Publication Type(s): Academic Journal
PubMedID: NLM27156902
Abstract: Background: It is important to predict walking ability for stroke patients, because rehabilitation programs are planned on such predictions. We therefore examined predictive factors that are available before discharge from a rehabilitation hospital. Methods: Seventy-two consecutive patients with a first attack of stroke with severe hemiplegia were included in this study. We retrospectively evaluated background factors (age, gender, time from stroke onset, paresis side, and stroke type). Other neurological and physical parameters were collected by means of the modified National Institutes of Health Stroke Scale, the Mini-Mental State Examination, the Trunk Control Test (TCT), and the knee extension strength/body weight ratio on the unaffected side (KES/BW-US) at the time of admission. We divided the patients into 2 groups, the independent group (n = 49) and the
dependent group (n = 23), on the basis of the Barthel Index of mobility at the time of discharge. We then compared the 2 groups with respect to the aforementioned parameters. We also performed stepwise discriminant analyses to ascertain which parameters are the best predictors of walking ability at the time of discharge. Results: Age, TCT score, and the KES/BW-US ratio were significantly different between the groups. Discriminant analysis revealed that younger age and a higher KES/BW-US ratio were significantly associated with walking ability at discharge, which could be precisely predicted using the following formula: Y = .093 × (age) - 4.316 × (KES/BW-US) - 4.984. Conclusions: At the time of admission, age and the KES/BW-US ratio permit the prediction of independent walking ability at the time of discharge. Our formula predicts walking ability with an accuracy of more than 91%.

Database: CINAHL

75. Full-movement neuromuscular electrical stimulation improves plantar flexor spasticity and ankle active dorsiflexion in stroke patients: a randomized controlled study.

Author(s): Wang, Yong-hui; Meng, Fei; Zhang, Yang; Xu, Mao-yu; Yue, Shou-wei
Source: Clinical Rehabilitation; Jun 2016; vol. 30 (no. 6); p. 577-586
Publication Date: Jun 2016
Publication Type(s): Academic Journal
Abstract: Objective: To investigate whether full-movement neuromuscular electrical stimulation, which can generate full range of movement, reduces spasticity and/or improves motor function more effectively than control, sensory threshold—neuromuscular electrical stimulation, and motor threshold—neuromuscular electrical stimulation in sub-acute stroke patients. Design: A randomized, single-blind, controlled study. Setting: Physical therapy room and functional assessment room. Participants: A total of 72 adult patients with sub-acute post-stroke hemiplegia and plantar flexor spasticity. Method: Patients received 30-minute sessions of neuromuscular electrical stimulation on the motor points of the extensor hallucis and digitorum longus twice a day, five days per week for four weeks. Measures: Composite Spasticity Scale, Ankle Active Dorsiflexion Score, and walking time in the Timed Up and Go Test were assessed at pretreatment, posttreatment, and at two-week follow-up. Results: After four weeks of treatment, when comparing interclass pretreatment and posttreatment, only the full-movement neuromuscular electrical stimulation group had a significant reduction in the Composite Spasticity Scale (mean % reduction = 19.91(4.96)%, F = 3.878, p < 0.05) and improvement in the Ankle Active Dorsiflexion Score (mean scores = 3.29(0.91), F = 3.140, p 0.05). Conclusions: Full-movement neuromuscular electrical stimulation with a stimulus intensity capable of generating full movement can significantly reduce plantar flexor spasticity and improve ankle active dorsiflexion, but cannot decrease walking time in the Timed Up and Go Test in sub-acute stroke patients.

Database: CINAHL

76. Early rehabilitation treatment combined with equinovarus foot deformity surgical correction in stroke patients: safety and changes in gait parameters.

Author(s): Giannotti, Erika; Merlo, Andrea; Zerbinati, Paolo; et al.
Source: European journal of physical and rehabilitation medicine; Jun 2016; vol. 52 (no. 3); p. 296-303
Publication Date: Jun 2016
Publication Type(s): Journal Article Observational Study
PubMedID: 26629841
Abstract: BACKGROUND Equinovarus foot deformity (EVFD) compromises several prerequisites of walking and increases the risk of falling. Guidelines on rehabilitation following EVFD surgery are missing in current literature. AIM The aim of this study was to analyze safety and adherence to an early rehabilitation treatment characterized by immediate weight bearing with an ankle-foot orthosis (AFO) in hemiplegic patients after EVFD surgery and to describe gait changes after EVFD surgical correction combined with early rehabilitation treatment. DESIGN Retrospective observational cohort study. SETTING Inpatient rehabilitation clinic. POPULATION Forty-seven adult patients with hemiplegia consequent to ischemic or haemorrhagic stroke (L/R 20/27, age 56±15 years, time from lesion 6±5 years). METHODS A specific rehabilitation protocol with a non-articulated AFO, used to allow for immediate gait training, started one day after EVFD surgery. Gait analysis (GA) data before and one month after surgery were analyzed. The presence of differences in GA space-time parameters, in ankle dorsiflexion (DF) values and peaks at initial contact (DF at IC), during stance (DF at St) and swing (DF at Sw) were assessed by the Wilcoxon Test while the presence of correlations between pre- and post-operative values by Spearman's correlation coefficient. RESULTS All patients completed the rehabilitation protocol and no clinical complications occurred in the sample. Ankle DF increased one month after surgery at all investigated gait phases (Wilcoxon Test, P<0.0001), becoming neutral at IC. Significant (P<0.05) variations were found for stride length, stride width, anterior step length of the affected side and for the duration of the double support phase of the contralateral side. The postsurgery ankle DF at St was found to be correlated (R=0.81, P<0.0001) with its pre-surgery value, thus being predictable. Weaker significant correlations were found for DF at Sw and DF at IC, where contribution from the dorsiflexor muscles is required in addition to calf muscle passive lengthening. CONCLUSIONS An orthosis-assisted immediate rehabilitation associated with surgical procedure is safe and may be suitable to correct EVFD by restoring both the neutral heel foot-ground contact and the ankle DF peaks during stance and swing at one month from surgery. CLINICAL REHABILITATION IMPACT The proposed protocol is a safe and potentially useful rehabilitative approach after EVFD surgical correction in stroke patients.

Database: Medline

77. Smartphone-Based Visual Feedback Trunk Control Training Using a Gyroscope and Mirroring Technology for Stroke Patients: Single-blinded, Randomized Clinical Trial of Efficacy and Feasibility. Author(s): Shin, Doo Chul; Song, Chang Ho

Source: American journal of physical medicine & rehabilitation; May 2016; vol. 95 (no. 5); p. 319-329

Publication Date: May 2016

Publication Type(s): Randomized Controlled Trial Journal Article

PubMedID: 26829087

Abstract: OBJECTIVE The purpose of this study was to assess the preliminary efficacy and feasibility of smartphone-based visual feedback trunk control training (SPVFTCT) for improving balance and trunk performance in stroke patients. DESIGN Twenty-four patients who had experienced a stroke more than 6 months previously and could sit and walk independently participated in the study. The participants were allocated to a SPVFTCT (n = 12) or to a control group (n = 12). Both groups completed five 80-minute sessions per week of conventional rehabilitation for 4 weeks. The SPVFTCT group additionally received three 20-minute sessions per week of SPVFTCT for 4 weeks. The outcome was assessed using static balance assessment, the modified functional reach test, the timed up and go test, and the trunk impairment scale. Feasibility of SPVFTCT was evaluated by retention, adherence, acceptability, and safety. RESULTS The static balance assessment, modified functional reach test, timed up and go test, and trunk impairment scale scores in the SPVFTCT group improved significantly compared to those in the control group (P < 0.05). In the SPVFTCT group, retention and adherence rates were 100% and 97%, respectively. All participants reported that
The SPVFTCT approach is a feasible method to improve balance and trunk performance in stroke patients.

**Database:** Medline

**78. Rhythmic auditory stimulation using a portable smart device: Short-term effects on gait in chronic hemiplegic stroke patients**

**Author(s):** Ko B.-W.; Lee H.-Y.; Song W.-K.

**Source:** Journal of Physical Therapy Science; May 2016; vol. 28 (no. 5); p. 1538-1543

**Publication Date:** May 2016

**Available at:** Journal of Physical Therapy Science - from Europe PubMed Central - Open Access

**Abstract:**

Purpose: The effects of various rhythmic auditory stimulation tempos on stroke gait pattern changes when training patients with a smartphone-based rhythmic auditory stimulation application were investigated.

Subjects and Methods: Fifteen patients with chronic stroke were included. Cadence during comfortable walking was measured (baseline). After the baseline findings were recorded, rhythmic auditory stimulation with five different tempos (i.e., -10%, -5%, 0%, +5%, and +10% change from baseline) was randomly applied. Finally, comfortable walking without rhythmic auditory stimulation was initiated to evaluate gait pattern changes.

Results: As the tempo increased, the spatiotemporal gait parameters of the stroke patients changed significantly. Gait speed, cadence, and gait cycle duration showed the greatest improvement in the +10% rhythmic auditory stimulation condition compared to baseline. After gait training with rhythmic auditory stimulation, gait speed, cadence, stride length, gait cycle duration, and step length of the affected and unaffected sides improved significantly compared to baseline.

Conclusion: Significant changes in the gait pattern of stroke patients were noted for various tempos after training with rhythmic auditory stimulation. These findings could be used to customize rehabilitative gait training for patients who experience stroke with hemiplegia. Copyright © 2016 The Society of Physical Therapy Science. Published by IPEC Inc.

**Database:** EMCARE

**79. Comparison of Heart Rate Reserve-Guided and Ratings of Perceived Exertion-Guided Methods for High-Intensity Robot-Assisted Gait Training in Patients With Chronic Stroke.**

**Author(s):** Young-Hyeon Bae; Yun-Hee Kim; Fong, Shirley S. M.

**Source:** Topics in Geriatric Rehabilitation; Apr 2016; vol. 32 (no. 2); p. 119-126

**Publication Date:** Apr 2016

**Available at:** Topics in Geriatric Rehabilitation - from Europe PubMed Central - Open Access

**Abstract:**

The present study was to compare the effectiveness of heart rate reserve (HRR)-guided high-intensity robot-assisted gait training (RAGT) to RPE-guided high-intensity RAGT on motor function and gait ability in patients with chronic stroke. The HRR-guided high-intensity RAGT group received the RAGT at 70% of HRR, whereas the RPE-guided high-intensity RAGT group received RAGT at RPE of 15. Both groups received their assigned therapy for 30 minutes per session, 3 days per week for 6 weeks. HRR-guided high-intensity RAGT group was significantly more improved than the RPE-guided high-intensity RAGT group in Fugl-Meyer assessment Lower extremity score, walking speed, cadence, step length, stride length, swing time, double support rate, single support rate, symmetrical index of swing, symmetrical index of stance, and 10-m velocity test (P < .05). Thus, HRR-guided high-intensity RAGT group improved in terms of motor function, gait ability, and controlled
symmetric gait pattern more than the RPE-guided high-intensity RAGT group by physiological gait training at more high intensity. These results suggest that HRR-guided high-intensity RAGT group is safe and effective for improvement of motor function and gait ability in chronic stroke.

**Database:** CINAHL

**80. Conflicting results of robot-assisted versus usual gait training during postacute rehabilitation of stroke patients: a randomized clinical trial.**

**Author(s):** Taveggia, Giovanni; Borboni, Alberto; Mulé, Chiara; Villafañe, Jorge H.; Negrini, Stefano

**Source:** International Journal of Rehabilitation Research; Mar 2016; vol. 39 (no. 1); p. 29-35

**Publication Date:** Mar 2016

**Publication Type(s):** Academic Journal

**Abstract:** Robot gait training has the potential to increase the effectiveness of walking therapy. Clinical outcomes after robotic training are often not superior to conventional therapy. We evaluated the effectiveness of a robot training compared with a usual gait training physiotherapy during a standardized rehabilitation protocol in inpatient participants with poststroke hemiparesis. This was a randomized double-blind clinical trial in a postacute physical and rehabilitation medicine hospital. Twenty-eight patients, 39.3% women (72 ± 6 years), with hemiparesis (<6 months after stroke) receiving a conventional treatment according to the Bobath approach were assigned randomly to an experimental or a control intervention of robot gait training to improve walking (five sessions a week for 5 weeks). Outcome measures included the 6-min walk test, the 10m walk test, Functional Independence Measure, SF-36 physical functioning and the Tinetti scale. Outcomes were collected at baseline, immediately following the intervention period and 3 months following the end of the intervention. The experimental group showed a significant increase in functional independence and gait speed (10m walk test) at the end of the treatment and follow-up, higher than the minimal detectable change. The control group showed a significant increase in the gait endurance (6-min walk test) at the follow-up, higher than the minimal detectable change. Both treatments were effective in the improvement of gait performances, although the statistical analysis of functional independence showed a significant improvement in the experimental group, indicating possible advantages during generic activities of daily living compared with overground treatment.

**Database:** CINAHL

**81. "Stepping Up" Activity Poststroke: Ankle-Positioned Accelerometer Can Accurately Record Steps During Slow Walking.**

**Author(s):** Klassen, Tara D.; Simpson, Lisa A.; Lim, Shannon B.; Louie, Dennis R.; Parappilly, Beena

**Source:** Physical Therapy; Mar 2016; vol. 96 (no. 3); p. 355-360

**Publication Date:** Mar 2016

**Publication Type(s):** Academic Journal

**Available at:** Physical Therapy - from HighWire - Free Full Text

**Abstract:** Background. As physical activity in people poststroke is low, devices that monitor and provide feedback of walking activity provide motivation to engage in exercise and may assist rehabilitation professionals in auditing walking activity. However, most feedback devices are not accurate at slow walking speeds. Objective. This study assessed the accuracy of one accelerometer to measure walking steps of community-dwelling individuals poststroke. Design. This was a cross-
sectional study. Methods. Two accelerometers were positioned on the nonparetic waist and ankle of participants (N=43), and walking steps from these devices were recorded at 7 speeds (0.3-0.9 m/s) and compared with video recordings (gold standard). Results. When positioned at the waist, the accelerometer had more than 10% error at all speeds, except 0.8 and 0.9 m/s, and numerous participants recorded zero steps at 0.3 to 0.5 m/s. The device had 10% or less error when positioned at the ankle for all speeds between 0.4 and 0.9 m/s. Limitations. Some participants were unable to complete the faster walking speeds due to their walking impairments and inability to maintain the requested walking speed. Conclusions. Although not recommended by the manufacturer, positioning the accelerometer at the ankle (compared with the waist) may fill a long-standing need for a readily available device that provides accurate feedback for the altered and slow walking patterns that occur with stroke.

Database: CINAHL

82. The Use of Cuff Weights for Aquatic Gait Training in People Post-Stroke with Hemiparesis.

Author(s): Nishiyori, Ryota; Lai, Byron; Lee, Do Kyeong; Vrongistinos, Konstantinos; Jung, Taeyou

Source: Physiotherapy Research International; Mar 2016; vol. 21 (no. 1); p. 47-53

Publication Date: Mar 2016

Publication Type(s): Academic Journal

Abstract: Background and Purpose This study aimed to examine how spatiotemporal and kinematic gait variables are influenced by the application of a cuff weight during aquatic walking in people post-stroke. The secondary purpose was to compare the differences in gait responses between the placements of cuff weights on the proximal (knee weight) and distal end (ankle weight) of the shank.

Methods Twenty-one participants post-stroke with hemiparesis aged 66.3 ± 11.3 years participated in a cross-sectional comparative study. Participants completed two aquatic walking trials at their self-selected maximum walking speed across an 8-m walkway under each of the three conditions: 1) walking with a knee weight; 2) walking with an ankle weight; and 3) walking with no weight. Cuff weights were worn on the paretic leg of each participant. Gait speed, cadence, step width and joint kinematics of the hip, knee and ankle joints were recorded by a customized three-dimensional underwater motion analysis system. Results Mean aquatic walking speeds significantly increased with the use of cuff weights when compared to walking with no weight. Changes in gait variables were found in the non-paretic leg with the addition of weight, while no significant changes were found in the paretic leg. Conclusion The results suggest that the use of additional weight can be helpful if the goal of gait training is to improve walking speed of people post-stroke during pool floor walking. However, it is interesting to note that changes in gait variables were not found in the paretic limb where favourable responses were expected to occur. Copyright © 2014 John Wiley & Sons, Ltd.

Database: CINAHL

83. Association of trunk control with mobility performance and accelerometry-based gait characteristics in hemiparetic patients with subacute stroke.

Author(s): Isho, Takuya; Usuda, Shigeru

Source: Gait & Posture; Feb 2016; vol. 44 ; p. 89-93

Publication Date: Feb 2016

Publication Type(s): Academic Journal

PubMedID: NLM27004638
Abstract: Trunk control plays an important role in movement control and postural balance during functional activities. The purpose of this study was to investigate the association of trunk control early after stroke with mobility performance and quantitative gait characteristics derived from trunk accelerations. Fifteen patients with hemiparesis following stroke (median age, 61 years [range, 56-78 years]; median time since stroke, 9 days [range, 7-15 days]) participated in this cross-sectional observational study. Subjects were evaluated using the Trunk Impairment Scale (TIS), the short-form of the Berg Balance Scale (SF-BBS), an isometric knee extension strength test, the Timed Up and Go test (TUG), and a timed walking test. The linear acceleration of the lower trunk was recorded along the 3 axes during walking and quantified using the autocorrelation coefficient and harmonic ratio to assess the variability and smoothness of upper-body movement. The TIS total score had a significant correlation with TUG time. The coordination subscale score of the TIS was significantly correlated with TUG time, walking speed, and accelerometry variables in univariate analysis. The TIS coordination subscale score was significantly related to accelerometry variables in the partial correlation analysis adjusted for SF-BBS score and knee extension strength on the paretic and nonparetic side. These results indicate that trunk motor impairment after stroke is closely associated with poor mobility performance and trunk instability in gait. These findings support intensive rehabilitation treatment targeting trunk control to regain better mobility and stable gait in patients early after stroke.

Database: CINAHL

84. Baseline predictors of treatment gains in peak propulsive force in individuals poststroke.

Author(s): HaoYuan Hsiao; Higginson, Jill S.; Binder-Macleod, Stuart A.; Hsiao, HaoYuan

Source: Journal of NeuroEngineering & Rehabilitation (JNER); Jan 2016; vol. 13 ; p. 1-5

Publication Date: Jan 2016

Publication Type(s): Academic Journal

PubMedID: NLM26767921

Available at Journal of neuroengineering and rehabilitation - from Europe PubMed Central - Open Access

Abstract: Background: Current rehabilitation for individuals poststroke focuses on increasing walking speed because it is an indicator of community walking ability and quality of life. Propulsive force generated from the paretic limb is critical to walking speed and may reflect actual neural recovery that restores the affected neural systems. A wide variation across individuals in the improvements in paretic propulsive force was observed following an intervention that targeted paretic propulsive force. This study aimed to determine if specific baseline characteristics can be used to predict patients who would respond to the intervention. Methods: Participants (N = 19) with chronic poststroke hemiparesis walked at their self-selected and maximal walking speeds on a treadmill before and after a 12-week gait training program. Propulsive forces from the paretic limb were analyzed. Pearson correlation coefficient was used to determine the relationships between (1) treatment gains in walking speed and propulsive force following intervention, and (2) treatment gains in propulsive force and baseline propulsive forces. Results: Treatment gains in self-selected walking speed were correlated to treatment gains in paretic propulsive force following intervention. In addition, changes in paretic propulsive force between self-selected and maximal walking speeds at baseline were strongly correlated to treatment gains in paretic propulsive force. Conclusions: The capacity to modulate paretic propulsive force, rather than the absolute propulsive force during self-selected or maximal walking speed, predicted treatment gains in propulsive force following the intervention. Findings from this research could help to inform clinicians and researchers to target the appropriate patient population for rehabilitation interventions.

Database: CINAHL

**Author(s):** Luque-Moreno, Carlos; Ferragut-Garcías, Alejandro; Rodríguez-Blanco, Cleofás; et al.

**Source:** BioMed research international; 2015; vol. 2015 ; p. 342529

**Publication Date:** 2015

**Publication Type(s):** Journal Article Review Systematic Review

**PubMedID:** 26539480

Abstract: **OBJECTIVE** To develop a systematic review of the literature, to describe the different virtual reality (VR) interventions and interactive videogames applied to the lower extremity (LE) of stroke patients, and to analyse the results according to the most frequently used outcome measures. **MATERIAL AND METHODS** An electronic search of randomized trials between January 2004 and January 2014 in different databases (Medline, Cinahl, Web of Science, PEDro, and Cochrane) was carried out. Several terms (virtual reality, feedback, stroke, hemiplegia, brain injury, cerebrovascular accident, lower limb, leg, and gait) were combined, and finally 11 articles were included according to the established inclusion and exclusion criteria. **RESULT** The reviewed trials showed a high heterogeneity in terms of study design and assessment tools, which makes it difficult to compare and analyze the different types of interventions. However, most of them found a significant improvement on gait speed, balance and motor function, due to VR intervention. **CONCLUSIONS:** Although evidence is limited, it suggests that VR intervention (more than 10 sessions) in stroke patients may have a positive impact on balance, and gait recovery. Better results were obtained when a multimodal approach, combining VR and conventional physiotherapy, was used. Flexible software seems to adapt better to patients' requirements, allowing more specific and individual treatments.

**Database:** Medline

86. Effects of balance control training on functional outcomes in subacute hemiparetic stroke patients

**Author(s):** Huh J.S.; Lee Y.-S.; Kim C.-H.; Jung T.-D.; Min Y.-S.; Kang M.-G.

**Source:** Annals of Rehabilitation Medicine; 2015; vol. 39 (no. 6); p. 995-1001

**Publication Date:** 2015

**Publication Type(s):** Article

Abstract: **Objective:** To investigate the efficacy of balance control training using a newly developed balance control trainer (BalPro) on the balance and gait of patients with subacute hemiparetic stroke. **Method(s):** Forty-three subacute stroke patients were assigned to either a balance control training (BCT) group or a control group. The BCT group (n=23) was trained with BalPro for 30 minutes a day, 5 days a week for 2 weeks, and received one daily session of conventional physical therapy. The control group (n=20) received two sessions of conventional physical therapy every day for 2 weeks. The primary outcome was assessment with the Berg Balance Scale (BBS). Secondary outcomes were Functional Ambulation Category (FAC), the 6-minute walking test (6mWT), Timed Up and Go (TUG), the Korean version of Modified Barthel Index (K-MBI), and the manual muscle test (MMT) of the knee extensor. All outcome measures were evaluated before and after 2 weeks of training in both groups. **Result:** There were statistically significant improvements in all parameters except MMT and FAC after 2 weeks of treatment in both groups. After training, the BCT group
showed greater improvements in the BBS and the 6mWT than did the control group. Conclusion(s): Balance control training using BalPro could be a useful treatment for improving balance and gait in subacute hemiparetic stroke patients.

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**Database:** EMCARE

**87. Relationship between the weight-bearing ratio on the affected lower extremity and gait ability using a portable electronic foot sensor shoe (Step Aid) in hemiplegic stroke patients**

**Author(s):** Itotani K.; Murakami M.; Itotani M.; Nagai A.; Imabori Y.; Fujimoto K.; Tanaka M.; Kato J.  
**Source:** Journal of Physical Therapy Science; 2015; vol. 27 (no. 2); p. 321-323  
**Publication Date:** 2015  
**Publication Type(s):** Article  
Available at Journal of Physical Therapy Science - from Europe PubMed Central - Open Access  
**Abstract:** [Purpose] This study investigated the association between the weight-bearing ratio (WBR) and gait ability of a paretic lower limb while walking using a shoe-type load-measuring apparatus.  
[Subjects] The Subjects comprised 17 stroke patients who were classified into the following two groups: the independent walking group, and the non-independent walking group.  
[Methods] The 10-m walking time (inside and outside parallel bars) and the Berg Balance Scale (BBS) were measured. The WBR of the paretic lower limb was measured during static standing and while walking inside and outside parallel bars, and the coefficient of variation (CV) was calculated. WBR was evaluated using the Step Aid.  
[Results] The BBS and WBR were significantly decreased in the non-independent walking group, while the 10-m walking time and the CV were significantly increased in the non-independent walking group.  
[Conclusion] The CV and WBR of a paretic lower limb while walking appear to be important indices of achievement of independent gait in hemiplegic stroke patients, and they may be used in gait rehabilitation for diseases requiring weight-bearing training to follow the course of training using a shoe-type load-measuring apparatus. Copyright © 2015 The Society of Physical Therapy Science.  
**Database:** EMCARE

**88. Relationships of balance, gait performance, and functional outcome in chronic stroke patients: A comparison of left and right lesions**

**Author(s):** Lopes P.G.; Lopes J.A.F.; Brito C.M.; Alfieri F.M.; Rizzo Battistella L.  
**Source:** BioMed Research International; 2015; vol. 2015  
**Publication Date:** 2015  
**Publication Type(s):** Article  
Available at BioMed Research International - from Europe PubMed Central - Open Access  
**Abstract:** Introduction. This study compared the balance by center of pressure (COP) and its relationship with gait parameters and functional independence in left (LH) and right (RH) chronic stroke patients. Methods. In this cross-sectional study, twenty-one hemiparetic stroke patients were assessed for Functional Independence Measure (FIM), balance with a force platform, and gait in the Motion Analysis Laboratory. Results. The amplitudes of the COP in the anteroposterior and mediolateral directions were similar in both groups. The anteroposterior direction was greater than the mediolateral direction. Only the temporal parameters showed any statistically significant differences. The LH showed a significant correlation between stride length, step length, and gait velocity with COP velocity sway for the healthy and paretic lower limbs. In both groups, the area of
COP was significantly correlated with stride length. Motor FIM was significantly correlated with the COP in the LH group. Conclusion. There was no difference in the performance of balance, gait, and functional independence between groups. The correlation of the COP sway area with stride length in both groups can serve as a guideline in the rehabilitation of these patients where training the static balance may reflect the improvement of the stride length. Copyright © 2015 Priscila Garcia Lopes et al.

Database: EMCARE

89. Long-Term Follow-up to a Randomized Controlled Trial Comparing Peroneal Nerve Functional Electrical Stimulation to an Ankle Foot Orthosis for Patients With Chronic Stroke.

Author(s): Bethoux, Francois; Rogers, Helen L.; Nolan, Karen J.; et al.

Source: Neurorehabilitation & Neural Repair; Nov 2015; vol. 29 (no. 10); p. 911-922

Publication Date: Nov 2015

Publication Type(s): Academic Journal

PubMedID: NLM25653225

Abstract: Background. Evidence supports peroneal nerve functional electrical stimulation (FES) as an effective alternative to ankle foot orthoses (AFO) for treatment of foot drop poststroke, but few long-term, randomized controlled comparisons exist. Objective. Compare changes in gait quality and function between FES and AFOs in individuals with foot drop poststroke over a 12-month period. Methods. Follow-up analysis of an unblinded randomized controlled trial (ClinicalTrials.gov #NCT01087957) conducted at 30 rehabilitation centers comparing FES to AFOs over 6 months. Subjects continued to wear their randomized device for another 6 months to final 12-month assessments. Subjects used study devices for all home and community ambulation. Multiply imputed intention-to-treat analyses were utilized; primary endpoints were tested for noninferiority and secondary endpoints for superiority. Primary endpoints: 10 Meter Walk Test (10MWT) and device-related serious adverse event rate. Secondary endpoints: 6-Minute Walk Test (6MWT), GaitRite Functional Ambulation Profile, and Modified Emory Functional Ambulation Profile (mEFAP). Results. A total of 495 subjects were randomized, and 384 completed the 12-month follow-up. FES proved noninferior to AFOs for all primary endpoints. Both FES and AFO groups showed statistically and clinically significant improvement for 10MWT compared with initial measurement. No statistically significant between-group differences were found for primary or secondary endpoints. The FES group demonstrated statistically significant improvements for 6MWT and mEFAP Stair-time subscore. Conclusions. At 12 months, both FES and AFOs continue to demonstrate equivalent gains in gait speed. Results suggest that long-term FES use may lead to additional improvements in walking endurance and functional ambulation; further research is needed to confirm these findings.

Database: CINAHL

90. The effect of knee joint Mulligan taping on balance and gait in subacute stroke patients

Author(s): Hyun K.-H.; Cho H.-Y.; Lim C.-G.

Source: Journal of Physical Therapy Science; Nov 2015; vol. 27 (no. 11); p. 3545-3547

Publication Date: Nov 2015

Publication Type(s): Article

Abstract: [Purpose] This study aimed to determine the effects of Mulligan taping on balance and gait in subacute stroke patients. [Subjects] Thirty patients with subacute stroke were randomly divided...
into two groups: the experimental group (n = 15) and the control group (n = 15). Mulligan taping was applied to the knee joints of participants in the experimental group while placebo taping was applied to knee joints of subjects in the control group. Biodex was used to assess their balance ability and the GAITRite System was used to test gait. All measurements were performed before and after the intervention. [Results] Dynamic standing balance of the experimental group significantly improved after taping. Gait, gait cadence, velocity, step length, and stride length also improved significantly. However, no significant differences in standing balance or gait were observed for the control group. Furthermore, significant differences in dynamic standing balance, cadence, and velocity were found between the two groups after the intervention. [Conclusion] Our results demonstrate that Mulligan taping is effective for improving balance and gait in subacute stroke patients. Thus, this technique is a potential method for actively facilitating rehabilitation programs for hemiplegia patients.

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Database: EMCARE

91. Feasibility of Measuring Ventilatory Threshold in Adults With Stroke-Induced Hemiparesis: Implications for Exercise Prescription.

Author(s): Rogers Bosch, Pamela; Holzapfel, Simon; Traustadottir, Tinna

Source: Archives of Physical Medicine & Rehabilitation; Oct 2015; vol. 96 (no. 10); p. 1779-1784

Publication Date: Oct 2015

Publication Type(s): Academic Journal

PubMedID: NLM25979162

Abstract: Objectives: To assess the feasibility of measuring ventilatory threshold (VT) in adults with walking impairments due to stroke. Secondary objectives are to assess reliability of VT over trials; assess whether participants could sustain treadmill walking at VT; and compare mean heart rate during sustained treadmill walking to estimated heart rate reserve (HRR). Design: Cross-sectional, single-group design. Setting: University research laboratory. Participants: Volunteer sample of adults (N = 8) with impaired walking resulting from chronic stroke. Interventions: Three submaximal treadmill walking tests on 3 separate days; a 30-minute treadmill walking session on a fourth day. Main Outcome Measures: Gas exchange variables were measured, and 2 independent observers identified VT. Mean heart rate response to treadmill walking at VT was measured and compared with estimated 40% of HRR. Results: VT was measured successfully in 88% of all trials. There was no difference in VT among trials (P = .17). After multiple imputations to account for 3 missing data points, the intraclass correlation coefficient was .87 (95% confidence interval, .80-.95). All participants were able to walk for 20 minutes at VT. Mean ± SD heart rate during the session was 66.0%±8.0% of estimated maximal heart rate. There was no significant difference between mean heart rate and estimated HRR values (P = .70). Conclusions: In adults with impaired walking resulting from stroke, VT can be safely measured during submaximal treadmill walking. Participants were able to sustain walking at VT, and this value may provide an appropriate stimulus for aerobic exercise prescription in this population.

Database: CINAHL

92. A comparison of the effects of visual deprivation and regular body weight support treadmill training on improving over-ground walking of stroke patients: a multiple baseline single subject design.

Author(s): Kim, Jeong-Soo; Kang, Sun-Young; Jeon, Hye-Seon

Source: Physiotherapy Theory & Practice; Oct 2015; vol. 31 (no. 7); p. 466-473
Abstract: The body-weight-support treadmill (BWST) is commonly used for gait rehabilitation, but other forms of BWST are in development, such as visual-deprivation BWST (VDBWST). In this study, we compare the effect of VDBWST training and conventional BWST training on spatiotemporal gait parameters for three individuals who had hemiparetic strokes. We used a single-subject experimental design, alternating multiple baselines across the individuals. We recruited three individuals with hemiparesis from stroke; two on the left side and one on the right. For the main outcome measures we assessed spatiotemporal gait parameters using GAITRite, including: gait velocity; cadence; step time of the affected side (STA); step time of the non-affected side (STN); step length of the affected side (SLA); step length of the non-affected side (SLN); step-time asymmetry (ST-asymmetry); and step-length asymmetry (SL-asymmetry). Gait velocity, cadence, SLA, and SLN increased from baseline after both interventions, but STA, ST-asymmetry, and SL-asymmetry decreased from the baseline after the interventions. The VDBWST was significantly more effective than the BWST for increasing gait velocity and cadence and for decreasing ST-asymmetry. VDBWST is more effective than BWST for improving gait performance during the rehabilitation for ground walking.

Database: CINAHL

93. Effects of ankle-foot orthoses on mediolateral foot-placement ability during post-stroke gait

Author(s): Zissimopoulos A.; Fatone S.; Gard S.

Source: Prosthetics and Orthotics International; Oct 2015; vol. 39 (no. 5); p. 372-379

Abstract: Background: Accurate and precise mediolateral foot placement is important for balance during gait, but is impaired post stroke. Mediolateral foot placement may be improved with ankle-foot orthosis use. Objective(s): The purpose of this study was to determine whether an ankle-foot orthosis improves mediolateral foot-placement ability during post-stroke ambulation. Study design: Crossover trial with randomized order of conditions tested. Method(s): The accuracy and precision of mediolateral foot placement was quantified while subjects targeted four different randomized step widths. Subjects were tested with and without their regular non-rigid ankle-foot orthosis in two separate visits (order randomized). Result(s): While ankle-foot orthosis use corrected foot and ankle alignment (i.e. significantly decreased mid-swing plantar flexion, p = 0.000), effects of ankle-foot orthosis use on hip hiking (p = 0.545), circumduction (p = 0.179), coronal plane hip range of motion (p = 0.06), and mediolateral foot-placement ability (p = 0.537) were not significant. Conclusion(s): While ankle-foot orthosis-mediated equinovarus correction of the affected foot and ankle was not associated with improved biomechanics of walking (i.e. proximal ipsilateral hip kinematics or mediolateral foot-placement ability), it may affect other aspects of balance that were not tested in this study (e.g. proprioception, cerebellar, vestibular, and cognitive mechanisms). Clinical relevance: Studies that investigate the effect of ankle-foot orthosis on gait can help advance stroke rehabilitation by documenting the specific gait benefits of ankle-foot orthosis use. In this study, we investigated the effect of ankle-foot orthosis use on mediolateral foot-placement ability, an aspect of gait important for maintaining balance. Copyright © International Society for Prosthetics and Orthotics 2014.

Database: EMCARE
94. **Effects of robot-assisted gait training on the balance and gait of chronic stroke patients: Focus on dependent ambulators**

**Author(s):** Cho D.Y.; Lee M.J.; Park S.-W.; Park D.S.; Kim E.J.

**Source:** Journal of Physical Therapy Science; Oct 2015; vol. 27 (no. 10); p. 3053-3057

**Publication Date:** Oct 2015

**Publication Type(s):** Article

Available at [Journal of physical therapy science](#) - from Europe PubMed Central - Open Access

**Abstract:**

**Purpose** The purpose of this study was to confirm the effect of robot-assisted gait training on the balance and gait ability of stroke patients who were dependent ambulators. **Subjects and Methods** Twenty stroke patients participated in this study. The participants were allocated to either group 1, which received robot-assisted gait training for 4 weeks followed by conventional physical therapy for 4 weeks, or group 2, which received the same treatments in the reverse order. Robot-assisted gait training was conducted for 30 min, 3 times a week for 4 weeks. The Berg Balance Scale, Modified Functional Reach Test, Functional Ambulation Category, Modified Ashworth Scale, Fugl-Meyer Assessment, Motricity Index, and Modified Barthel Index were assessed before and after treatment. To confirm the characteristics of patients who showed a significant increase in Berg Balance Scale after robot-assisted gait training as compared with physical therapy, subgroup analysis was conducted. **Results** Only lateral reaching and the Functional Ambulation Category were significantly increased following robot-assisted gait training. Subscale analyses identified 3 patient subgroups that responded well to robot-assisted gait training: a subgroup with hemiplegia, a subgroup in which the guidance force needed to be decreased to <=45%, and a subgroup in which weight bearing was decreased to <=21%. **Conclusion** The present study showed that robot-assisted gait training is not only effective in improving balance and gait performance but also improves trunk balance and motor skills required by high-severity stroke patients to perform activities daily living. Moreover, subscale analyses identified subgroups that responded well to robot-assisted gait training. Copyright © 2015 The Society of Physical Therapy Science.

**Database:** EMCARE

95. **Effects of Combined Aerobic and Resistance Exercise on Central Arterial Stiffness and Gait Velocity in Patients with Chronic Poststroke Hemiparesis.**

**Author(s):** Yong Hee Lee; Soo Hyun Park; Eun Sun Yoon; Chong-Do Lee; Sang Ouk Wee; Bo Fernhall; Sae Young Jae

**Source:** American Journal of Physical Medicine & Rehabilitation; Sep 2015; vol. 94 (no. 9); p. 687-695

**Publication Date:** Sep 2015

**Publication Type(s):** Academic Journal

**Abstract:**

**Objective:** The effects of combined aerobic and resistance exercise training on central arterial stiffness and gait velocity in patients with chronic poststroke hemiparesis were investigated. **Design:** Twenty-six patients with chronic poststroke hemiparesis were randomly assigned to either the combined aerobic and resistance exercise group (n = 14) or the control group (n = 12). The exercise intervention group received a combined aerobic and resistance exercise training (1 hr/day, three times/week for 16 wks), whereas the control group received usual care. Central arterial stiffness was determined by pulse wave velocity and augmentation index. Gait velocity was assessed using the 6-min walk test, 10-m walk test, and the Timed Up-and-Go test. **Results:** Patients in the exercise intervention group had greater improvement of mean pulse wave velocity (P < 0.001), augmentation index (P = 0.048), and gait velocity (6-min walk test, P < 0.001; 10-m walk test, P < 0.001) than did patients in the control group. Patients in the exercise intervention group also had
greater improvements in physical fitness component (grip strength, P < 0.001; muscular strength of upper and lower limbs, P < 0.027; flexibility, P < 0.001) when compared with control patients. Conclusions: The combined aerobic and resistance exercise program significantly reduced central arterial stiffness and increased gait velocity in patients with chronic poststroke hemiparesis.

Database: CINAHL

96. Effects of robotic gait rehabilitation on biomechanical parameters in the chronic hemiplegic patients.

Author(s): Wallard, L; Dietrich, G; Kerlirzin, Y; Bredin, J
Source: Neurophysiologie clinique = Clinical neurophysiology; Sep 2015; vol. 45 (no. 3); p. 215-219
Publication Date: Sep 2015
Publication Type(s): Journal Article
PubMedID: 26381192
Abstract: Hemiplegia is a more or less complete loss of hemibody voluntary motricity following a brain injury, usually resulting in alterations of the locomotor system with persistent disorders of movement and posture. We were interested in studying the gait pattern called "stiff knee gait" with the main objective to highlight the role of a robotic rehabilitation in improving or modifying/changing the walking pattern in adults with chronic hemiplegic disorders. Data were collected by a motion analysis system (Vicon®--Oxford Metrics, Oxford, UK) in order to achieve a Clinical Gait Analysis before and after a robotic gait rehabilitation (Lokomat®). Four intensive sessions per weeks during five weeks were performed by ten chronic hemiplegic adults. The results show a significant improvement in locomotor parameters (walking speed, step length, single and double support time) and in the knee kinematics. This first study provides experimental evidence of the importance and usefulness of the robotic rehabilitation as an aid in the rehabilitation of gait pattern in adults with chronic hemiplegia.

Database: Medline

97. Therapeutic effects of reaching with forward bending of trunk on postural stability, dynamic balance, and gait in individuals with chronic hemiparetic stroke

Author(s): Jeon S.-H.; Kim J.-H.; Lee S.-M.
Source: Journal of Physical Therapy Science; Aug 2015; vol. 27 (no. 8); p. 2447-2451
Publication Date: Aug 2015
Publication Type(s): Article
Available at Journal of Physical Therapy Science - from Europe PubMed Central - Open Access
Abstract: [Purpose] The objective of this study was to perform forward bending of the trunk and reaching training in chronic stroke patients and to investigate subsequent changes in trunk control, dynamic balance, and gait. [Subject] Twenty-three chronic stroke patients were randomly divided into two groups, with 10 patients in the forward bending of the trunk and reaching group and 13 patients in the control group. [Methods] Both groups underwent 30 minutes of rehabilitation therapy, five days a week, for four weeks. The forward bending of the trunk and reaching group additionally performed forward bending of the trunk and reaching training five times a week for four weeks, which involved four sets of pressing buttons 35 times, for a total of 140 button presses per session. The subjects were tested before and after training using the Trunk Impairment Scale, Berg Balance Scale, Timed Up and Go Test, Six-Minute Walking Test, and 10-Meter Walking Test. Trunk control, dynamic balance, and walking ability were compared between the two groups. [Result] The
results of the study showed that the results of the Trunk Impairment Scale, Berg Balance Scale, Timed Up and Go Test, Six-Minute Walking Test improved significantly in the FBR group, while there were no significant differences in the control group. [Conclusion] This study results suggest that forward bending of the trunk and reaching training can be an effective exercise method for chronic stroke patients. Copyright © 2015 The Society of Physical Therapy Science.

Database: EMCARE

98. A Portable Gait Asymmetry Rehabilitation System for Individuals with Stroke Using a Vibrotactile Feedback.

Author(s): Afzal, Muhammad Raheel; Oh, Min-Kyun; Lee, Chang-Hee; Park, Young Sook; Yoon, Jungwon

Source: BioMed Research International; Jun 2015; vol. 2015 ; p. 1-16

Publication Date: Jun 2015
Publication Type(s): Academic Journal
Available at BioMed Research International - from Europe PubMed Central - Open Access

Abstract: Gait asymmetry caused by hemiparesis results in reduced gait efficiency and reduced activity levels. In this paper, a portable rehabilitation device is proposed that can serve as a tool in diagnosing gait abnormalities in individuals with stroke and has the capability of providing vibration feedback to help compensate for the asymmetric gait. Force-sensitive resistor (FSR) based insoles are used to detect ground contact and estimate stance time. A controller (Arduino) provides different vibration feedback based on the gait phase measurement. It also allows wireless interaction with a personal computer (PC) workstation using the XBee transceiver module, featuring data logging capabilities for subsequent analysis. Walking trials conducted with healthy young subjects allowed us to observe that the system can influence abnormality in the gait. The results of trials showed that a vibration cue based on temporal information was more effective than intensity information. With clinical experiments conducted for individuals with stroke, significant improvement in gait symmetry was observed with minimal disturbance caused to the balance and gait speed as an effect of the biofeedback. Future studies of the long-term rehabilitation effects of the proposed system and further improvements to the system will result in an inexpensive, easy-to-use, and effective rehabilitation device.

Database: CINAHL


Author(s): Sheffler, Lynne R.; Taylor, Paul N.; Nogan Bailey, Stephanie; et al.

Source: American Journal of Physical Medicine & Rehabilitation; May 2015; vol. 94 (no. 5); p. 341-358

Publication Date: May 2015
Publication Type(s): Academic Journal
Available at American Journal of Physical Medicine & Rehabilitation - from Unpaywall

Abstract: Objective: The objective of this study was to evaluate possible mechanisms for functional improvement and compare ambulation training with surface peroneal nerve stimulation vs. usual care via quantitative gait analysis. Design: This study is a randomized controlled clinical trial. Setting: The setting of this study is a teaching hospital of an academic medical center. Participants: One hundred ten chronic stroke survivors (>12 wks poststroke) with unilateral hemiparesis participated in this study. Interventions: The subjects were randomized to a surface peroneal nerve stimulation
device or usual care intervention. The subjects were treated for 12 wks and followed up for 6-mo posttreatment. Main Outcome Measures: Spatiotemporal, kinematic, and kinetic parameters of gait were the main outcome measures. Results: Cadence (F3, 153 = 5.81, P = 0.012), stride length (F3,179 = 20.01, P < 0.001), walking speed (F3,167 = 18.2, P < 0.001), anterior-posterior ground reaction force (F3, 164 = 6.61, P = 0.004), peak hip power in preswing (F3,156 = 8.76, P < 0.001), and peak ankle power at push-off (F3.149 = 6.38, P = 0.005) all improved with respect to time. However, peak ankle ankle dorsiflexion in swing (F3,184 = 4.99, P = 0.031) worsened. In general, the greatest change for all parameters occurred during the treatment period. There were no significant treatment group x time interaction effects for any of the spatiotemporal, kinematic, or kinetic parameters. Conclusions: Gait training with peroneal nerve stimulation and usual care was associated with improvements in peak hip power in pre-swing and peak ankle power at push-off, which may have resulted in improved cadence, stride length, and walking speed; however, there were no differences between treatment groups. Both treatment groups also experienced a decrease in peak ankle ankle dorsiflexion in swing, although the clinical implications of this finding are unclear.

Database: CINAHL

100. Effects of auditory feedback during gait training on hemiplegic patients' weight bearing and dynamic balance ability.

Author(s): Ki, Kyong-II; Kim, Mi-Sun; Moon, Young; Choi, Jong-Duk
Source: Journal of physical therapy science; Apr 2015; vol. 27 (no. 4); p. 1267-1269
Publication Date: Apr 2015
Publication Type(s): Journal Article
PubMedID: 25995603
Available at Journal of physical therapy science - from Europe PubMed Central - Open Access

Abstract:[Purpose] This study examined the effects of auditory feedback during gait on the weight bearing of patients with hemiplegia resulting from a stroke. [Subjects] Thirty hemiplegic patients participated in this experiment and they were randomly allocated to an experimental group and a control group. [Methods] Both groups received neuro-developmental treatment for four weeks and the experimental group additionally received auditory feedback during gait training. In order to examine auditory feedback effects on weight bearing during gait, a motion analysis system GAITRite was used to measure the duration of the stance phase and single limb stance phase of the subjects. [Results] The experimental group showed statistically significant improvements in the duration of the stance phase and single limb stance phase of the paretic side and the results of the Timed Up and Go Test after the training. [Conclusion] Auditory feedback during gait training significantly improved the duration of the stance phase and single limb stance phase of hemiplegic stroke patients.

Database: Medline

101. Effects of Kinesio Tape application to quadriceps muscles on isokinetic muscle strength, gait, and functional parameters in patients with stroke.

Author(s): Ekiz, Timur; Aslan, Meryem Doğan; Özgirgin, Neşe
Source: Journal of Rehabilitation Research & Development; Mar 2015; vol. 52 (no. 3); p. 323-331
Publication Date: Mar 2015
Publication Type(s): Academic Journal
Abstract: The aim of this study was to evaluate the effects of Kinesio Tape (KT) application to quadriceps muscles on isokinetic muscle strength, gait, and functional parameters in patients with stroke. Twenty-four patients were allocated into KT and control groups. All patients participated in the same conventional rehabilitation program 5 times/wk for 4 wk. In addition, KT was applied to quadriceps muscles bilaterally to the patients in the KT group. Compared with baseline, peak torque levels increased significantly in both groups (all p < 0.05). However, change levels were significantly higher in the KT group than the control group at 60 degrees/second angular velocity (AV) in extension (p = 0.04) and 60 and 180 degrees/second AV in flexion (both p = 0.02) on the paretic side. Moreover, the change levels were more prominent in the KT group at 60 and 180 degrees/second AV in extension (p = 0.03 and p = 0.04, respectively) on the nonparetic side. Gait, balance, mobility, and quality of life values improved significantly in both groups (all p 0.05). KT application to quadriceps muscles in addition to conventional exercises for 4 wk is effective on isokinetic but not functional parameters.

Database: CINAHL
Abstract: The objective of this study was to determine the effect of transcranial direct current stimulation (tDCS) during task-related training (TRT) on the gait ability of patients with chronic stroke. [Subjects and Methods] The participants were 24 patients who were diagnosed with hemiplegia due to stroke. Three groups were created: subjects who performed TRT for general exercise therapy (TRT), subjects who received sham tDCS during TRT for general exercise therapy (TST), and subjects who received tDCS during TRT for general exercise therapy (TT). [Results] The stance phase symmetry profile, the swing phase symmetry profile, and gait velocity all decreased significantly in the TT group compared with the TRT group. However, there was no significant difference in the step length symmetry profile among the groups. [Conclusion] A application of tDCS, that affects the excitatory regulation in the cortical motor area, is an effective rehabilitation method for gait improvement. Copyright © 2015 The Society of Physical Therapy Science.

Database: EMCARE

104. The effects of symmetric center of pressure displacement training with feedback on the gait of stroke patients

Author(s): Kim J.-S.

Source: Journal of Physical Therapy Science; Mar 2015; vol. 27 (no. 3); p. 855-857

Publication Date: Mar 2015

Publication Type(s): Article

Abstract: [Purpose] This study investigated the effects of COP displacement training using visual feedback had on the gait of patients with hemiplegia due to stroke. [Subjects and Methods] This study was conducted with 20 patients with hemiplegia due to stroke. The training consisted of five training sets repeated 10 times and the activity was conducted for 15 minutes each session, three times per week for six weeks immediately after completion of central nervous system developmental treatment. [Results] A comparison of the results of before and after the experiment found that the COP displacement training group showed significant improvements in step length, stride length, gait velocity, and the functional reach test, while the control group showed significant improvement only in the functional reach test. In the intergroup comparison, the COP displacement training group showed significant improvements in paretic side step length, paretic side stride length, gait velocity, and the functional reach test compared to the control group. [Conclusion] In conclusion, according to the results of this study, visual feedback training for COP displacement is more effective at enhancing the gait and balance of hemiplegic patients due to stroke than only performing feedback training for even weight distribution. Copyright © 2015 The Society of Physical Therapy Science.

Database: EMCARE

105. Use of an Ankle-Foot Orthosis Improves Aerobic Capacity in Subacute Hemiparetic Stroke Patients

Author(s): Hyun C.W.; Han E.Y.; Kim S.M.; Kim B.R.

Source: PM and R; Mar 2015; vol. 7 (no. 3); p. 264-269

Publication Date: Mar 2015

Publication Type(s): Article

Abstract: Objective: To investigate aerobic capacity with and without an ankle-foot orthosis (AFO) in subacute hemiparetic stroke patients. Design(s): Prospective crossover intervention study. Setting(s):
Rehabilitation clinic in secondary care. Patient(s): Patients diagnosed with first-ever cerebral stroke involving the cortical or subcortical area resulting in hemiparesis (n=15, 8 men and 7 women; average age, 62.1 years). Method(s): All subjects participated in 2 continuous, symptom-limited, low-velocity graded treadmill exercise stress tests under 2 different conditions, namely, with and without an AFO. The rest interval between tests was at least 48 hours. The order of exercise stress tests was randomized. Main Outcome Measurements: To assess cardiorespiratory responses, oxygen consumption, heart rate, systolic blood pressure, diastolic blood pressure, rate-pressure product, and respiratory exchange ratio were measured continuously throughout the test, and peak values were obtained. The rating of perceived exertion was recorded immediately after each test. The percentage of the age-predicted maximal heart rate and total exercise duration were also measured. Gait function was assessed by the Six-Minute Walk Test. Result(s): Using an AFO significantly increased peak oxygen consumption and Six-Minute Walk Test results. Peak values of each of heart rate, systolic blood pressure, diastolic blood pressure, rate-pressure product, and respiratory exchange ratio, rating of perceived exertion, percentage of age-predicted maximal heart rate, and total exercise duration were similar regardless of AFO use. Conclusion(s): Use of an AFO may improve aerobic capacity in subacute hemiparetic stroke patients, and may improve energy efficiency and gait endurance. Copyright © 2015 American Academy of Physical Medicine and Rehabilitation.

Database: EMCARE

106. The effect of progressive task-oriented training on a supplementary tilt table on lower extremity muscle strength and gait recovery in patients with hemiplegic stroke.

Author(s): Kim, Chang-Yong; Lee, Jung-Sun; Kim, Hyeong-Dong; Kim, June-Sun

Source: Gait & Posture; Feb 2015; vol. 41 (no. 2); p. 425-430

Publication Date: Feb 2015

Publication Type(s): Academic Journal

PubMedID: NLM25467171

Abstract: The purpose of this study was to determine the influence of progressive task-oriented training on a supplementary tilt table on the lower extremity (LE) muscle strength and spatiotemporal parameters of gait in subjects with hemiplegic stroke. Thirty subjects between three and nine months post stroke were included in this study. Thirty subjects were randomly allocated to a control group (CG, n1=10), experimental group I (EG1, n2=10), and experimental group II (EG2, n3=10). All of the subjects received routine therapy for half an hour, five times a week for three weeks and additionally received training on the following three different tilt table applications for 20 min a day: (1) both knee belts of the tilt table were fastened (CG), (2) only the affected side knee belt of the tilt table was fastened and one-leg standing training was performed using the less-affected LE (EG1), and (3) only the affected side knee belt of the tilt table was fastened and progressive task-oriented training was performed using the less-affected LE (EG2). The effect of tilt table applications was assessed using a hand-held dynamometer for LE muscle strength and GAITRite for spatiotemporal gait data. Our results showed that there was a significantly greater increase in the strength of all LE muscle groups, gait velocity, cadence, and stride length, a decrease in the double limb support period, and an improvement in gait asymmetry in subjects who underwent progressive task-oriented training on a supplementary tilt table compared to those in the other groups. These findings suggest that progressive task-oriented training on a supplementary tilt table can improve the LE muscle strength and spatiotemporal parameters of gait at an early stage of rehabilitation of subjects with hemiplegic stroke.

Database: CINAHL
107. Feasibility of lower-limb muscle power training to enhance locomotor function poststroke.

**Author(s):** Morgan, Patrick; Embry, Aaron; Perry, Lindsay; Holthaus, Katy; Gregory, Chris M.

**Source:** Journal of Rehabilitation Research & Development; Jan 2015; vol. 52 (no. 1); p. 77-84

**Publication Date:** Jan 2015

**Publication Type(s):** Academic Journal

Available at Journal of rehabilitation research and development - from ProQuest (Health Research Premium) - NHS Version

Available at Journal of rehabilitation research and development - from Unpaywall

**Abstract:** Poststroke motor control is characterized by greatly reduced muscle power generation. To date, the extent to which muscle power limits walking performance or whether its remediation should be a primary component of locomotor rehabilitation has yet to be established. The purpose of this study was to examine the feasibility and the effects of Poststroke Optimization of Walking using Explosive Resistance training, an intervention aimed at improving poststroke muscular and locomotor function. Twelve subjects (6-60 mo poststroke) participated in 24 training sessions (3 sessions/wk for 8 wk). Exercises included leg press, calf raises, and jump training, all performed at high concentric velocity, as well as trials of fast walking. We measured self-selected and fastest comfortable walking speeds as well as knee extensor and plantar flexor strength and power at pretraining, posttraining, and 8 wk follow-up time points. In addition, we also performed a number of clinical assessments commonly used in poststroke rehabilitation trials. Following training, significant improvements in lower-limb muscle strength and power were realized and accompanied by improvements in self-selected as well as fastest comfortable walking speeds. No changes in clinical assessments resulted from training.

**Database:** CINAHL

108. Effect of the class and individual applications of task-oriented circuit training on gait ability in patients with chronic stroke

**Author(s):** Song H.S.; Park S.D.; Kim J.Y.

**Source:** Journal of Physical Therapy Science; Jan 2015; vol. 27 (no. 1); p. 187-189

**Publication Date:** Jan 2015

**Publication Type(s):** Article

Available at Journal of Physical Therapy Science - from Europe PubMed Central - Open Access

**Abstract:**[Purpose] This study aimed to determine differences in gait abilities by comparing class-based task-oriented circuit training (CTCT) and individual-based task-oriented circuit training (ITCT). [Subjects and Methods] The subjects were 30 patients who were diagnosed with hemiplegia due to stroke more than six months previously. They were divided into Group I (n=10), which received conventional physiotherapy, Group II (n=10), which received conventional physiotherapy and ITCT, and Group III (n=10), which received conventional physiotherapy and CTCT. To determine the qualitative aspect of gait ability, a GAITRite (CIR Systems Inc., Sparta NJ, USA) was employed, while a two-minute walking test (2MWT) was conducted to determine the quantitative aspect. [Results] The gait ability showed significant differences in velocity, cadence, and 2MWT between groups in the significance test. As a result, the Bonferroni post test showed that gait velocity was significantly different between Groups I and II and between Groups I and III, while cadence showed a significant difference between Groups I and III. In the 2MWT, Groups I and II and Groups I and III also showed significant differences. [Conclusion] Both the individual and class applications task-oriented circuit training were effective for improving gait ability. This result indicates that CTCT can improve the
Analysis of gait within the uncontrolled manifold hypothesis: Stabilisation of the centre of mass during gait

**Author(s):** Papi E.; Rowe P.J.; Pomeroy V.M.

**Source:** Journal of Biomechanics; Jan 2015; vol. 48 (no. 2); p. 324-331

**Publication Date:** Jan 2015

**Publication Type(s):** Article

Available at [Journal of Biomechanics](http://example.com) - from ProQuest (Health Research Premium) - NHS Version

Available at [Journal of Biomechanics](http://example.com) - from Unpaywall

**Abstract:** This study investigated the feasibility of the uncontrolled manifold approach (UCM) to analyse gait data variability in relation to the control of the centre of mass (COM) in adults with and without neuropathology. The proposed method was applied to six able-bodied subjects to characterise mechanisms of normal postural control during stance phase. This approach was repeated on an early stroke patient, who attended the laboratory three times at three monthly intervals, to characterise the variability of COM movement during walking with and without an orthosis. Both able-bodied subjects and the stroke participant controlled COM movement during stance but utilised a different combination of lower limb joint kinematics to ensure that the COM trajectory was not compromised. Interestingly, the stroke subject, despite a higher variability in joint kinematics, was able to maintain a stable COM position throughout stance phase. The stabilisation of the COM decreased when the patient walked unaided without the prescribed orthosis but increased over the six months of study. The UCM analysis demonstrated how a stroke patient used a range of lower limb motion pattern to stabilise the COM trajectory. It is suggested that this analysis can be used to track changes in these movement patterns in response to rehabilitation. As such we propose that this approach could have clinical utility to evaluate and prescribe rehabilitation in stroke patients.

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Cochrane Database was also searched, but no further references were found.
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