CANADIAN STROKE BEST PRACTICE RECOMMENDATIONS

Rehabilitation and Recovery following Stroke Evidence Tables

Mobility, Balance and Transfers

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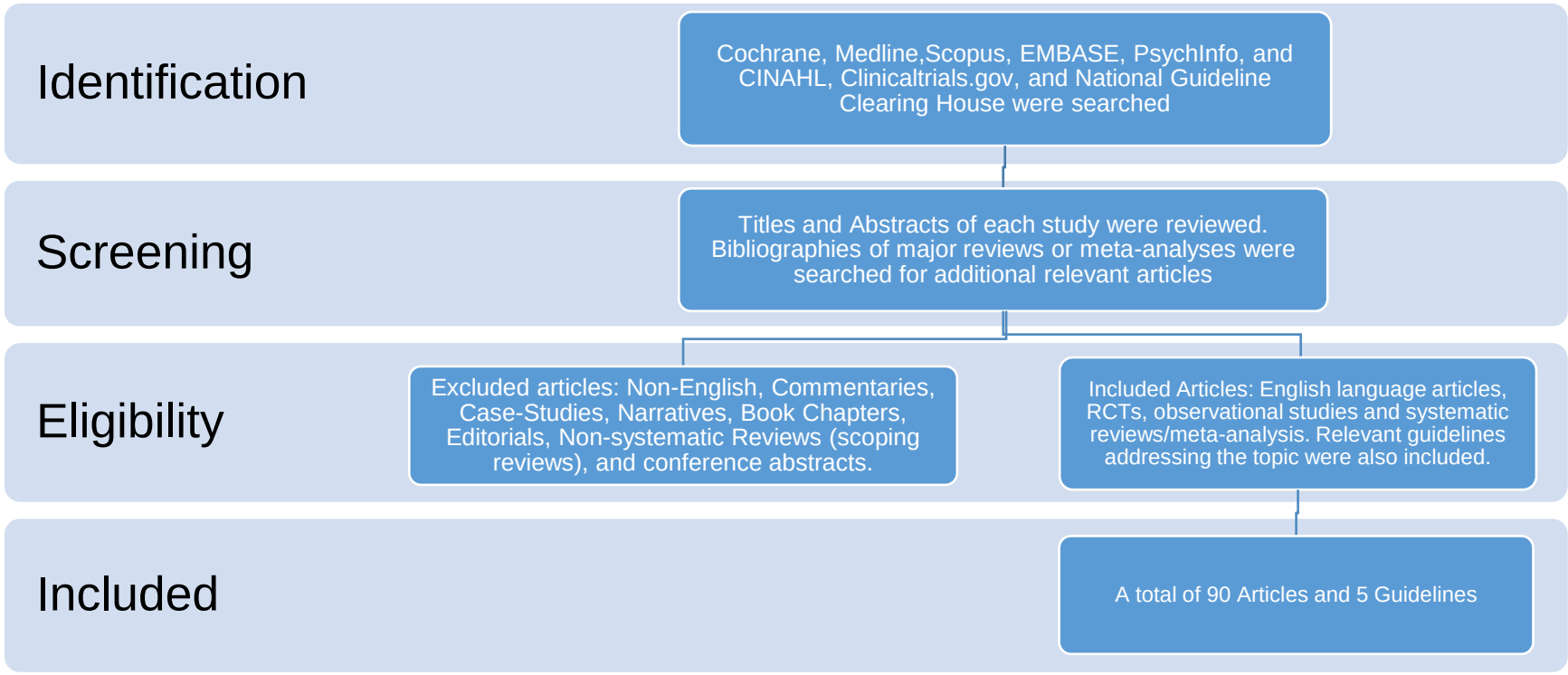
on Behalf of the Canadian Stroke Best Practice Recommendations
Rehabilitation and Recovery following Stroke Writing Group

Table of Contents

Search Strategy



Cochrane, Medline, and CINAHL, Clinicaltrials.gov, and National Guideline Clearing House, Scopus, EMBASE and PsycINFO were searched using the keywords: (Stroke OR CVD OR “cerebrovascular disease”) AND (“lower limb” OR “lower extremity”) AND gait. Titles and abstract of each article were reviewed for relevance. Bibliographies were reviewed to find additional relevant articles. Articles were excluded if they were: non-English, commentaries, case-studies, narrative, book chapters, editorials, non-systematic review, or conference abstracts. Additional searches for relevant best practice guidelines were completed and included in a separate section of the review. A total of 90 articles and 5 guidelines were included and were separated into separate categories designed to answer specific questions.

Published Guidelines

Guideline	Recommendations
Clinical Guidelines for Stroke Management 2017. Melbourne (Australia): National Stroke Foundation. Section 5. Rehabilitation	For stroke survivors, rehabilitation should be structured to provide as much scheduled therapy (occupational therapy and physiotherapy) as possible. For stroke survivors, group circuit class therapy should be used to increase scheduled therapy time. (strong recommendation) Stroke survivors should be encouraged to continue with active task practice outside of scheduled therapy sessions. This could include strategies such as: • self-directed, independent practice; • semi-supervised and assisted practice involving family/friends, as appropriate. A minimum of three hours a day of scheduled therapy (occupational therapy and physiotherapy) is recommended, ensuring at least two hours of active task practice occurs during this time. (weak recommendation) For stroke survivors, rehabilitation should include individually-tailored exercise interventions to improve cardiorespiratory fitness. (strong recommendation) All stroke survivors should commence cardiorespiratory training during their inpatient stay. Stroke survivors should be encouraged to participate in ongoing regular physical activity regardless of their level of disability. For stroke survivors who have difficulty sitting, practising reaching beyond arm's length while sitting with supervision/assistance should be undertaken. (strong recommendation) For stroke survivors who have difficulty in standing up from a chair, practice of standing up should be undertaken. (strong recommendation) For stroke survivors who have difficulty standing, task-specific practice of standing balance should be provided. Strategies could include: • practising functional tasks while standing; • walking training that includes challenge to standing balance (e.g. overground walking, obstacle courses). For stroke survivors who have difficulty with standing balance, virtual reality including treadmill training with virtual reality or use of Wii Balance Boards may be used. (weak recommendation) Stroke survivors with difficulty walking should be given the opportunity to undertake tailored repetitive practice of walking (or components of walking) as much as possible. The following modalities may be used: • Circuit class therapy (with a focus on overground walking practice); • Treadmill training with or without body weight support For stroke survivors with difficulty walking, one or more of the following interventions may be used in addition to those listed above: (weak recommendation) • Virtual reality training.

Guideline	Recommendations
	• Electromechanically assisted gait training. • Biofeedback. • Cueing of cadence. • Electrical stimulation. For stroke survivors, individually fitted lower limb orthoses may be used to minimise limitations in walking ability. Improvement in walking will only occur while the orthosis is being worn. (weak recommendation) For stroke patients, a falls risk assessment, including fear of falling, should be undertaken on admission to hospital. A management plan should be initiated for all patients identified as at risk of falls. For stroke survivors at high risk of falls, a comprehensive home assessment for the purposes of reducing falling hazards should be carried out by a qualified health professional. Appropriate home modifications (as determined by a health professional) for example installation of grab rails and ramps may further reduce falls risk. For stroke survivors who are at risk of falling, multifactorial interventions in the community, including an individually prescribed exercise program and advice on safety, should be provided.
Winstein CJ, Stein J, Arena R, Bates B, Cherney LR, Cramer SC, Deruyter F, Eng JJ, Fisher B, Harvey RL, Lang CE, MacKay-Lyons M, Ottenbacher KJ, Pugh S, Reeves MJ, Richards LG, Stiers W, Zorowitz RD; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, and Council on Quality of Care and Outcomes Research. **Guidelines for adult stroke rehabilitation and recovery: a guideline for healthcare professionals from the American Heart Association/American Stroke Association.** ***Stroke* 2016;47:e98–e169**	It is recommended that individuals with stroke discharged to the community participate in exercise programs with balance training to reduce falls. (B) It is recommended that individuals with stroke be provided a formal fall prevention program during hospitalization. (A) Tai Chi training may be reasonable for fall prevention. (B) Individuals with stroke who have poor balance, low balance confidence, and fear of falls or are at risk for falls should be provided with a balance training program. (A) Individuals with stroke should be prescribed and fit with an assistive device or orthosis if appropriate to improve balance. (A) Postural training and task-oriented therapy may be considered for rehabilitation of ataxia. (C) Intensive, repetitive, mobility- task training is recommended for all individuals with gait limitations after stroke. (A) An AFO after stroke is recommended in individuals with remediable gait impairments (eg, foot drop) to compensate for foot drop and to improve mobility and paretic ankle and knee kinematics, kinetics, and energy cost of walking. (A) Group therapy with circuit training is a reasonable approach to improve walking. (A) Incorporating cardiovascular exercise and strengthening interventions is reasonable to consider for recovery of gait capacity and gait related mobility tasks. (A) NMES is reasonable to consider as an alternative to an AFO for foot drop. (A) Practice walking with either a treadmill (with or without body-weight support) or overground walking exercise training combined with conventional rehabilitation may be reasonable for recovery of walking function. (A) Robot-assisted movement training to improve motor function and mobility after stroke in combination with conventional therapy may be considered. (A) Mechanically assisted walking (treadmill, electromechanical gait trainer, robotic device, servo-motor) with body weight

Guideline	Recommendations
	support may be considered for patients who are nonambulatory or have low ambulatory ability early after stroke. (A) There is insufficient evidence to recommend acupuncture for facilitating motor recovery and walking mobility (B) The effectiveness of TENS in conjunction with everyday activities for improving mobility, lower extremity strength, and gait speed is uncertain. (B) The effectiveness of rhythmic auditory cueing to improve walking speed and coordination is uncertain. (B) The usefulness of electromyography biofeedback during gait training in patients after stroke is uncertain. (B) Virtual reality may be beneficial for the improvement of gait. (B) The effectiveness of neurophysiological approaches (ie, neurodevelopmental therapy, proprioceptive neuromuscular facilitation) compared with other treatment approaches for motor retraining after an acute stroke has not been established. (B) The effectiveness of water-based exercise for motor recovery after an acute stroke is unclear. (B) The effectiveness of fluoxetine or other SSRIs to enhance motor recovery is not well established. (B) The effectiveness of levodopa to enhance motor recovery is not well established. (B) The use of dextroamphetamine or methylphenidate to facilitate motor recovery is not recommended. (B)
National Clinical guidelines for stroke" 5th Edition 2016; Intercollegiate Stroke Working Party. Royal College of Physicians	**4.9 Mobility** *4.9.1 Weakness and ataxia* People with stroke should be assessed for motor impairment and/or ataxia using a standardised approach, and have the impairment explained to them, their family/carers and the multidisciplinary team. People with loss of movement and/or ataxia after stroke sufficient to limit their activities should be assessed by a physiotherapist with experience in neurological rehabilitation. People with loss of movement and/or ataxia after stroke should be taught task-specific, repetitive, intensive exercises or activities that will increase strength. *4.9.2 Balance* People with impaired sitting balance after stroke should receive trunk training exercises. People with significant impairment of their balance and walking ability after stroke should receive progressive balance training, functional task-specific training, lower limb strengthening exercises and be considered for an ankle-foot orthosis. People with moderate to severe limitation of their walking ability after stroke should be assessed for a walking aid to improve their stability. *4.9.3 Falls and Fear of falling* People with stroke should be offered falls risk assessment and management as part of their stroke rehabilitation,

Guideline	Recommendations
	including training for them and their family/carers in how to get up after a fall. People with stroke should be offered an assessment of fear of falling as part of their falls risk assessment. People at high risk of falls after stroke should be offered a standardised assessment of fragility fracture risk as part of their stroke rehabilitation. People with stroke with symptoms of vitamin D deficiency, or those who are considered to be at high risk (e.g. housebound) should be offered calcium and vitamin D supplements. People at high risk of falls after stroke should be advised to participate in physical activity/exercise which incorporates balance and co-ordination at least twice per week. *4.9.4 Walking* People with limited ability to walk after stroke should be assessed by a physiotherapist with experience in neurological rehabilitation to guide management. People with limited mobility after stroke should be assessed, provided and trained in how to use appropriate mobility aids including a wheelchair to enable safe independent mobility. People with stroke who are able to walk with or without assistance should undergo tasks pecific walking training with a cardiorespiratory and/or muscle strength focus at sufficient intensity to improve endurance and walking speed. People with stroke, including those who use wheelchairs or have poor mobility, should be advised to participate in exercise with the aim of improving aerobic fitness and/or muscle strength unless there are contraindications. People who are able to walk independently after stroke should be offered treadmill training with or without body weight support or other walking-orientated interventions at a higher intensity than usual care and as an adjunct to other treatments. People who cannot walk independently after stroke should be considered for electromechanical-assisted gait training including body weight support. People with stroke who have compromised ankle/foot stability and/or reduced ability to dorsiflex the foot (‘foot-drop’) that impedes safe and efficient walking should be offered an ankle-foot orthosis to improve walking and balance. The orthosis should be evaluated and individually fitted before long-term use. People with stroke who have reduced ability to dorsiflex the foot (‘foot-drop’) should be offered functional electrical stimulation to improve their gait. People with stroke should only receive therapeutic electrical stimulation for treatment of the leg (other than for foot-drop) in the context of a clinical trial.
Mackay-Lyons M, Macko R, Eng J, et al. Aerobic Exercise Recommendations to Optimize Best Practices in Care After Stroke (AEROBICS) (2013)	Aerobic training should be incorporated into a comprehensive, inter-professional program of stroke rehabilitation, vascular risk reduction, and secondary stroke prevention. Aerobic training should be implemented as part of an overall exercise program that may also include, but is not limited to, muscle strengthening and task-oriented training of motor control, balance, gait, and functional use of the upper extremity. Physical activity designed to maintain cardiovascular fitness is an important aspect of community reintegration after stroke. Strong

Guideline	Recommendations
http://strokebestpractices.ca/wp-content/uploads/2013/07/AEROBICS-FINAL-July-2013.pdf **(selected)**	A variety of exercise modes can be used to induce an aerobic training effect. Task-specific exercise that activates large muscle masses is recommended. Strong
Scottish Intercollegiate Guidelines Network (SIGN). Management of patients with stroke: rehabilitation, prevention and management of complications, and discharge planning. A national clinical guideline. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2010 Jun. p.p. 15-18	Lower-Limb Function-Summary of Recommendations (4.2.1) **Recommended** AFO, individualized interventions, gait-oriented physical fitness training, repetitive task training, muscle strengthening, increased intensity of rehabilitation **Consider** Treadmill training in people who are independent in walking, FES for drop-foot, electromechanical assisted gait training **Not recommended** Routine treadmill training, and EMG biofeedback, balance platform training with visual feedback **Insufficient evidence** Routine electrostimulation; walking aides Treadmill training is not recommended as a routine gait training intervention after stroke. (B) Treadmill training may be considered to improve gait speed in people who are independent in walking at the start of treatment. (B) EMG biofeedback is not recommended as a routine treatment for gait, balance or mobility problems after stroke. (B) Balance platform training with visual feedback is not recommended for the treatment of gait, balance or mobility problems after stroke. (B) Functional electrical simulation may be considered as a treatment for drop-foot, where the aim of treatment is the immediate improvement of walking speed and/or efficiency. (C) Where the aim of treatment is to have an immediate improvement on walking speed, efficiency or gait pattern or weight bearing during stance, patients should be assessed for suitability for an AFO by an appropriately qualified health professional. (C) Physiotherapists should not limit their practice to one 'approach,' but should select interventions according to the individual needs of the patient. (B) Gait-oriented physical fitness training should be offered to all patients assessed as medically stable and functionally safe

Guideline	Recommendations
	to participate, when the goal of treatment is to improve functional ambulation. (A) Electromechanical assisted gait training may be offered to selected patients where the necessary equipment is already available and healthcare professionals are competent in the use of the equipment. (B) Rehabilitation should include repetitive task training, where it is assessed to be safe and acceptable to the patient, when the aim of treatment is to improve gait speed, walking distance, functional ambulation or sit-to-stand-to-sit. (B) Muscle strength training is recommended when the specific aim of treatment is to improve muscle strength. (B) Where considered safe, every opportunity to increase the intensity of therapy for improving gait should be pursued. (B)
Management of Stroke Rehabilitation Working Group. VA/DoD clinical practice guideline for the management of stroke rehabilitation. Washington (DC): Veterans Health Administration, Department of Defense; 2010. p.80-98	There is insufficient evidence to recommend for or against using neurodevelopmental training (NDT) in comparison to other treatment approaches for motor retraining following an acute stroke. [I] Recommend that motor recovery program should incorporate multiple interventions, emphasizing progressive difficulties, repetition, and functional task practice. [B] Interventions for motor recovery (including improving ambulation) should include cardiovascular exercise fitness and strengthening. [A] (see Strengthening and Exercise and Cardiovascular Conditioning and Fitness below) Consider using strength training as a component of the therapeutic approach in paretic patients. [B] Consider active and passive ROM prolonged stretching program to decrease risk of contracture development (night splints, tilt table) in early period following stroke. [C] Recommend that patients demonstrating balance impairments following stroke should be provided a balance training program: including task-specific balance training [C], aquatic therapy (B), force platform biofeedback training (C), Tai Chi (C), cycling (C) Consider using treadmill training in conjunction with other task specific practice and exercise training techniques in individuals with gait impairments post stroke without known cardiac risks for treadmill exercise. [B] Consider the use of partial bodyweight support for treadmill training (partial BWSTT) (up to 40% of individuals' weight) in conjunction with other task specific and exercise training techniques for individuals with gait impairments post stroke without known cardiac risks for treadmill exercise. [B] Recommend FES as an adjunctive treatment for patients with impaired muscle contraction, specifically for patients with impaired gait due to ankle/knee motor impairment. FES can be utilized for individuals with acute or chronic deficits after stroke. [B] Consider transcutaneous electrical nerve stimulation (TNS or TENS) as an adjunctive treatment for enhancing recovery

Guideline	Recommendations
	of gait function after stroke. [C] Consider rhythmic auditory cueing as a modality to include in multimodal interventions to improve walking speed. [B] Recommend for patient with foot drop, ankle foot orthoses (AFO) to prevent foot drop and improve knee stability during walking. [B] There is not sufficient evidence supporting use of robotic devices during gait training in patients post stroke. [D] Consider using virtual reality (VRT) to enhance gait recovery following stroke. [B]

Summary of Therapeutic Mobility Interventions from Selected Guideline Documents

Intervention	CBPR 2013	SIGN 118 2010	NSF 2017	VA/DoD 2010	AHA/ASA 2016	RCP 2016
Repetitive task-specific training	A [Early; Late]	B	Recommended	B	Recommended [A]	Recommended
Neurophysiological approaches	I	-	-	I	I	Recommended
Body-weight support treadmill training	A [Early; Late]	-	Recommended	-	Recommended [A]	Recommended
Electromechanical-assisted gait training devices	C [Early] B [Late]	B Not recommended routinely	Recommended	D	Recommended [A]	Recommended
FES	A [Early; Late]	C	Recommended	C	-	Recommended
Fitness training	B	A	Recommended	A	Recommended [A]	Recommended
High-intensity training	-	B	-	-	Recommended [A]	-
EMG biofeedback	-	B Not recommended	Recommended	-	I	-
Virtual reality	-	-	Recommended	B	Recommended [B]	-
AFO in selected patients/splinting	A [Early; Late]	C	Recommended	B	Recommended [A]	Recommended
Rhythmic gait cueing	-	-	Recommended	B	I	-
Strengthening	-	B	-	B	Recommended [A]	Recommended
Balance platform	-	B Not recommended	Recommended	C	Balance training recommended [B]	Balance training recommended
Additional sit-to-stand reps	C	B	-	-	-	-

I: Insufficient evidence to recommend for/against providing intervention

Evidence Tables

Physiotherapy Approaches

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Pollock et al. 2014 **UK** **Cochrane Review**	N/A	RCTs focused on improving recovery of function of mobility after stroke through the use of physical rehabilitation approaches.	A total of 96 studies (n=10401) were included. To facilitate analysis, three groupings were explored: intervention vs. no treatment (41 studies), intervention vs. usual care or attention control (22 studies), and one intervention vs. another (13 studies).	**Primary outcomes:** Independence in Activities of daily living (e.g., FIM, Barthel Activities of Daily Living Index, Modified Rankin Scale, and motor function (e.g., FMA-LE, Motor assessment scale, Rivermead mobility index, Rivermead Motor Assessment) **Secondary Outcomes:** Balance and gait velocity.	Based on 27 studies, treatment was shown to have a beneficial effect when compared to no treatment for functional recovery (SMD=0.78, 95% CI 0.58 to 0.97, I^2=85%). To improve motor function, intervention is more effective than usual care (SMD =0.42, 95% CI 0.24 to 0.61, I^2=42%). It is also more effective for improving balance SMD= 0.31, 95% CI 0.05 to 0.56) and gait velocity (SMD= 0.46, 95% CI 0.32 to 0.60). No one physical rehabilitation approach was more (or less) effective than any other approach for increasing motor function.
Van Vliet et al. 2005 **UK** **RCT**	CA: ☑ Blinding: assessor ☑ ITT:☒	120 patients admitted for stroke rehabilitation within 2 weeks of event. Inclusion criteria: able to tolerate at least ½ hour to complete the physical tasks required for initial evaluation	Comparison of Bobath based treatment (n=60) vs. motor relearning approach (n=60) Treatment was outpatient based and provided for as long as needed. No details regarding the content of the treatment programs are provided. Therapy was based on written guidelines consisting of theoretical concepts and clinical objectives.	**Primary Outcomes:** Rivermead Motor Assessment (RMA), Motor Assessment Scale (MAS) **Secondary Outcomes:** 6MWT, Modified Ashworth Scale BI, Extended Activities of Daily Living, Nottingham Sensory Assessment Outcomes were assessed at 1, 3 and 6 months after randomization	Median RMA (gross function) at baseline and 6 months: Bobath 2 to 8 vs. Motor relearning 1 to 8, p=0.61 Median RMA (leg & trunk) at baseline and 6 months: Bobath 4 to 7 vs. Motor relearning 2 to 7, p=0.41 Median MAS (balanced sitting): at baseline and 6 months: Bobath 5 to5 vs. Motor relearning 4 to 25 p=0.25 Median MAS (supine to sitting) at baseline and 6 months: Bobath 4 to 6 vs. Motor relearning 2 to 6, p=0.00067 Median MAS (walking) at baseline and 6 months: Bobath 0 to 4 vs. Motor relearning 0 to 3, p=0.27 Median BI scores at baseline and 6 months:

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					Bobath 8 to 18 vs. Motor relearning 8 to 17, p=0.20 Median 6MWT (m/s) at baseline and 6 months: Bobath 0.66 to 0.76 vs. Motor relearning 0.60 to 0.64, p=0.54. Adverse events: No reporting Dropouts: Bobath group n=15, Motor learning group n=5

Task Oriented Training (Task-Specific Training)

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
English et al. 2017 **Australia** **Cochrane review**	N/A	17 RCTs (1297 subjects) including persons with stroke.	Trials compared circuit class training (minimum of 3 clients) provided for a minimum of once-weekly CCT sessions for a minimum of four weeks, with no therapy, sham therapy, or another therapy modality. 3 trials were based in-hospital and 14 were community based. Only studies that reported interventions with a focus on repetitive (within session) practice of functional tasks arranged in a circuit, with the aim of improving mobility, were included.	**Primary Outcomes:** 6-minute walk test (6MWT). **Secondary Outcomes:** Walking speed, Timed up and go Test (TUG), Rivermead Mobility Index, Berg Balance Scale (BBS), Functional Reach Test, lower limb strength, range of motion, activities of daily living, Health related quality of life.	<u>Circuit class versus other therapy</u> 6MWT early (<1yr) post stroke (n=4): MD=46.56, 95% CI 21.35, 71.77 6MWT late (>1yr) post stroke (n=6): MD=71.15, 95% CI 49.76 to 92.54 Gait speed early post stroke (n=2): MD=0.17, 95% CI 0.10 to 0.25 Gait speed late post stoke (n=6): MD=0.13, 95% CI 0.07 to 0.19 Cadence (n=2): MD=1.57, 95% CI 7.52, 19.62 TUG (n=5): MD=-3.62, 95% CI -6.09 to -1.16 Rivermead mobility index (n=2): MD=0.56, 95% CI 0.17 to 0.95 Functional ambulation classification (n=3): OR=1.19, 95% CI 1.01 to 3.60 BBS (n=4): 1.21, 95% CI -0.62 to 3.04

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					Step test (n=3): MD=0.98, 95% CI -0.40 to 2.37 Activities specific confidence scale (n=2): MD=7.76, 95% CI 0.66 to 14.87 Stroke impact scale (physical (n=2): MD=2.91, 95% CI 0.00 to 5.82 VO2 Peak (n=2): MD=2.81, 95% CI 0.90 to 4.72 Steps per day (n=2): MD=1325.66, 95% CI 411.09 to 2240.22 Length of stay (n=2): MD=-16.35, 95% CI -37.69 to 4.99 <u>Circuit class plus education versus no therapy:</u> TUG (n=2): MD=0.90, 95% CI -0.94 to 2.75
French et al. 2016 **UK** **Cochrane review**	N/A	33 RCTs including person with stroke (1,853 participants). 2 trials compared upper limb with lover limb training, 6 trials evaluated upper limb training, and 17 trials evaluated lower limb training.	One arm of the trial had to include an intervention where an active motor sequence was performed repetitively within a single training session, and where the practice was aimed towards a clear functional goal. Comparisons: Intervention vs attention control (i.e. recreation or cognitive therapy, educational sessions, splint control light massage, sham sitting protocol, comparison training program for upper or lower limb), and vs usual care. Mean time since stroke	**Primary Outcomes:** <u>Lower limb function</u>: walking distance, walking speed, functional ambulation, Timed Up and Go Test/sit-to-stand; measures of lower limb function, such as the Rivermead Motor Assessment, Sødring Motor Evaluation Scale, Walking Ability Questionnaire, Stroke Impact Scale - mobility domain. <u>Standing balance/reach:</u> Berg Balance Scale, Standing Equilibrium Index, Functional Reach, Activities Based Confidence Scale, Timed Balance Test. **Secondary Outcomes:** ADL, global motor function,	<u>Post treatment:</u> Walking distance (n=9): MD=34.80, 95% CI 18.19 to 51.41, p=0.00004 in favor of treatment. Walking speed (n=12): SMD=0.39, 95% CI -0.02 to 0.79, p=0.061. Functional ambulation (n=8): SMD=0.35, 95% CI 0.04 o 0.66, p=0.026 in favor of treatment. Sit-to-stand (n=7): SMD=0.36, 95% CI 0.13 to 0.56, p=0.0018 in favor of treatment. Lower limb functional measures (n=5): SMD=0.29, 95% CI 0.10 to 0.48, p=0.0032 in favor of treatment. Standing balance (n=9): SMD=0.24, 95% CI 0.07 to 0.42, p=0.0071 in favor of treatment. <u>Follow-up for lower limb function:</u> Under 6mo post stroke (n=8): SMD=0.34, 95% CI 0.16 to 0.53, p=0.000028 in favor of treatment

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
			onset: ≤1mo: 10 trials 1-3mo: 5 trials 3-6mo: 4 trials 6-12mo: 5 trials Chronic phase: 9 trials Duration of training: 2-4wk: 19 trials 4-12wk: 8 trials 12-20wk: 4 trials Inpatient rehabilitation: 2 trials	measures of quality of life, adverse events. Outcomes were assessed at post-intervention and at follow-up.	6 to 12mo post stroke (n=6): SMD=0.06, 95% CI -0.18 to 0.31, p=0.61. <u>Lower limb function: dosage:</u> 0 to 20 hours (n=16): SMD=0.39, 95% CI 0.07 to 0.71, p=0.018 in favor of treatment >20 hours 9 (n=8): SMD=0.33, 95% CI 0.16, 0.50, p=0.00011 in favor of treatment <u>Lower limb function: time since stroke:</u> 0-15days (n=5): SMD=0.16, 95% CI -0.15 to 0.46, p=0.31. 16days to 6mo (n=9): SMD=0.52, 95% CI -0.03 to 1.07, p=0.065. >6mo (n=10): SMD=0.41, 95% CI 0.21 to 0.60, p=0.000035 in favor of treatment <u>Lower limb function: type of intervention:</u> Whole therapy (n=2): SMD=0.10, 95% CI -0.24 to 0.43, p=0.57. Mixed training (n=17): SMD=0.42, 95% CI 0.17 to 0.67, p=0.00088 in favor of treatment Single task training (n=5): SMD=0.07, 95% CI -0.42 to 0.55, p=0.79. Adverse events: Number of falls and other serious and non-serious adverse events (e.g. arrhythmias) were measured in only 4 trials.
Renner et al. 2016 **Netherlands** **RCT**	CA: ☑ Blinding: Assessor ☑ ITT: ☑	73 subacute patients with stroke who were not able to walk without physical assistance	Group 1 received group task training, and Group 2 received individual task training. The training was 90min, for a total of 30 sessions over 6wk.	**Primary Outcomes:** Stroke Impact Scale (SIS); 6 Minute Walk Test (6MWT); Timed Up and Go test (TUG); Chair stand-up test; Modified stairs test; Hospital Anxiety and Depression	No adverse events were reported in either arm of the trial. There were no significant differences between groups for the SIS mobility domain at the end of the intervention (Z= -0.26, P = 0.79). No significant differences between groups were found in gait speed improvements (GT:0.38 ±0.23; IT:0.26±0.35), any other gait related parameters, or

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
				Scale. Outcomes were assessed at baseline, 6wk, and 24wk.	in non-physical outcomes such as depression and fatigue.
Pollock et al. 2014 **UK** **Cochrane Review**	N/A	13 RCTs (N=603) Subjects were recruited 30-51 days (5 studies), 3-8 months (3 studies), and >1 year (3 studies); time post stroke was not stated in 1 study Subjects were independent in sit-to-stand (6 studies), independent in walking (3 studies)	Repetitive sit-to-stand (6 studies), exercise training programs (4 studies), sit-to-stand training program (1 study), augmented feedback (1 study), altered chair design (1 study) Treatment ranged 15-60 minutes/session, 3-5 sessions/week, 2-12 weeks	**Primary Outcome:** Sit-to-stand ability **Secondary Outcomes**: Time to sit-to-stand, lateral symmetry, incidence of falls, reaction forces, joint kinematics Outcomes were assessed before and after treatment, with follow-up periods of 3 weeks to 33 months (7 studies)	One study (at high risk of bias) found training increased the odds of independent sit-to-stand (OR=4.86, 95%CI 1.43–16.50) 5 studies showed sit-to-stand interventions reduced time needed for sit-to-stand (SMD=0.85, 95%CI 0.38–1.33); long-term improvements were shown Adverse events: The effect of sit-to-stand training on number of falls was imprecise (no benefit or harm)
Langhorne et al. 2009 **UK** **Systematic review & meta-analysis**	N/A	11 RCTs (564 subjects) specific to LE identified from a Cochrane review from a total of 14 studies. Subjects in 7 studies were recruited in the first month following stroke; one trial recruited within the first 3 months of stroke; 2 trials recruited within 12 months of stroke and two trials recruited more than 1 year following stroke.	Two trials evaluated whole therapy motor approaches, 4 trials evaluated single tasks related to balance, reach, or sit to stand training, 3 trials evaluated circuit training, 2 trials included functional task practice + additional components [strengthening + treadmill training (n=1) and lower-limb exercises (n=1)] Treatment duration varied widely from a total of 10 to >40 hours provided over 2 to 20 weeks.	**Primary Outcomes:** 6MWT, 10-Metre Walk speed, 5-Metrs comfortable walk speed, 6-metre walk speed, Functional Ambulation Classification, Motor Assessment Scale, Timed Up & Go, timed sit to stand, Sodring Motor Evaluation Scale, Step Test, Upright Equilibrium Index, BBS Outcomes were assessed before and after treatment. In 7 studies there were follow-up periods of 2, 3 and 6 months and 4 years.	Walking distance (metres)-change from baseline: MD=54.6, 95% CI 17.5 to 91.7, p=0.004 Results from 3 studies included Walking speed: SMD= 0.29, 95% CI 0.04 to 0.53, p=0.021 Results from 5 studies included Functional ambulation: SMD= 0.25, 95% CI 0.04 to 0.51, p=0.054 Results from 5 studies included Sit to stand: Standardized effect: 0.35, 95% CI 0.13 to 0.56, p=0.018 Results from 7 studies included Lower-limb functional measures: SMD= 0.20, 95% CI -0.10 to 0.50, p=0.19 Results from 4 studies included Standing Balance/Reach: SMD= 0.29, 95% CI -0.06 to 0.63, p=0.10 Results from 3 studies included

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					Comparison of all outcomes (<6 months post treatment): SMD=0.11, 95% CI -0.33 to 0.56, p=0.062 Results from 4 studies included; > 6 months post treatment: SMD=-0.01, 95% CI -0.32 to 0.29, p=0.08. Results from 3 studies included Adverse events: Two trials reported no adverse events. One trial reported a non-significant decrease in falls associated with the intervention group (3/25 vs. 4/23)
van de Port et al. 2012 **The Netherlands** **RCT**	CA: ☑ Blinding: Assessor ☑ ITT: ☑	250 patients who had completed inpatient rehabilitation following stroke, were able to walk 10 m without physical assistance and were to be discharged home, with the intention of participating in an outpatient rehabilitation program	Subjects were randomized to receive a graded task specific circuit training program (n=126) or usual outpatient physiotherapy. Circuit training involved 8 workstations designed to improve walking ability and consisted of 90-minute sessions, 2/week over 12 weeks. Subjects in the control group received usual outpatient physiotherapy.	**Primary outcome:** Mobility sub scale of the Stroke Impact Scale (SIS) **Secondary outcomes:** Other domains of the SIS, Rivermead Mobility Index, Falls Efficacy Scale, Nottingham Extended Activities of Daily Living, Hospital Anxiety and Depression Scale, Fatigue Severity Scale, Motricity Index, 6MWT, Functional Ambulation Categories, TUG, 5 m comfortable walking speed, modified stairs test) Primary outcome was assessed at baseline, 6, 12, 18 and 24 weeks post randomization. Secondary outcomes were assessed at baseline, 12 and 24 weeks.	Mean ± SD SIS (mobility) scores at baseline, 12 weeks and 24 weeks Circuit training group: 80.9 ± 13.04 to 87.27 ± 12.38 to 86.56 ± 13.19 Control group: 77.8 ± 15.0 to 83.73 ± 13.25 to 84.42 ± 14.48 p<0.001 (baseline to 24 weeks) Mean ± SD RMI scores at baseline, 12 weeks and 24 weeks Circuit training group: 12.67 ± 1.58 to 13.47 ± 11.44 to 13.50 ± 1.42 Control group: 12.35 ± 2.00 to 12.82 ± 1.90 to 13.03 ± 1.82 p<0.001 (baseline to 24 weeks) Mean ± SD 6MWT (s) at baseline, 12 weeks and 24 weeks Circuit training group: 339 ± 120 to 412 ± 117 to 416 ± 118 Control group: 306 ± 135 to 1354 ± 145 to 1366 ± 151 p<0.001 (baseline to 24 weeks) Dropouts: circuit training group n=1, control group n=7 Adverse events: falls (n=29, circuit training group, n=26, control group). 2 serious adverse events were reported by 2 subjects in the circuit training group.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Salbach et al. 2004, 2005 **Canada** **RCT**	CA: ☑ Blinding: Assessor ☑ ITT: ☑	91 community-dwelling subjects with a residual walking deficit within one year of a first or recurrent stroke. (Mean chronicity of subjects in both groups was > 6 months).	Subjects were randomized to an intervention group which comprised 10 functional tasks designed to strengthen the lower extremities and enhance walking balance, speed and distance or to a control intervention focusing on upper extremity activities. 18 training sessions were provided 3 days a week x 6 wks.	**Primary outcome:** 6MWT, ABC scale **Secondary outcomes:** 5-m walk (comfortable and maximum pace), Berg Balance Scale and Timed 'Up and Go' test. Outcomes were assessed before and after treatment	Mean ± SD scores before and after treatment for the walking training group and the upper extremity training groups were: 6MWT (m): 209 ± 126 to 249 ± 136 vs. 204± 131 to 209 ±132, p<0.05 Comfortable walking speed (m/s): 0.64 ± 0.33 to 0.78 ±0.40 vs. 0.61 ± 0.37 to 0.64 ± 0.37, p<0.05 Maximum walking speed (m/s): 0.79 ± 0.45 to 0.99 ± 0.56 vs. 0.81 ± 0.49 to 0.81 ± 0.49, p<0.05 TUG (s): 24.4 ± 18.8 to 23.2 ± 20.6 vs. 25.5 ± 21.7 to 27.1 ± 27.1, p=ns BBS: 42 ± 11 to 44 ± 11 vs. 40 ± 13 to 41 ± 13, p=0.854 Mean ± SD Δ in scores from baseline to end of treatment for walking training and upper extremity training groups were: ABC scale: 8.2 ± 18.6 vs. 0.6 ± 13.7, p<0.05 Effect size=0.40 Dropouts: intervention group n=3, control group n=4 Adverse events: 6 falls in total were reported, none resulting in serious injury

Treadmill Based Gait Training Without Body-Weight Support

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Baer et al. 2017 **UK** **RCT**	CA: ☑ Blinding: Assessor ☑	77 participants within 3mo of stroke onset recruited from 4 hospital-based units	Participants were randomized to treadmill training (minimum twice weekly) plus normal gait re-education or normal	**Primary Outcomes:** Rivermead mobility Index (RMI) **Secondary Outcomes:**	No significant between-group differences were found at post-intervention, or at 6-month follow-up on any of the outcome measures.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
	ITT: ☒		gait re-education only (control) for up to eight weeks	Functional ambulation category (FAC), Timed up and go Test (TUG), confidence in walking (VAS), 10-meter walk test (10MWT), gait speed, 6-minute walk test (6MWT), Barthel index (BI), Motor Assessment Scale (MAS), Stroke Impact Scale (SIS).	
Ada et al. 2013 **AMBULATE trial** **Australia** **RCT**	CA: ☑ Blinding: ☑ Assessor ITT: ☑	102 community-dwelling individuals who had been discharged from formal rehabilitation, were community dwelling, and walked slowly (defined as being able to walk 10 m across flat ground in bare feet without any aids taking more than nine seconds). Mean duration since stroke ranged from 19 to 22 months, across study groups.	Participants were randomized to one of 3 groups: 1) 30 min of treadmill and overground walking 3x/week for four-months, 2) same intervention as group 1, but was provided for 2 months and 3) a control group that received no intervention	**Primary Outcomes**: 6MWT, 10m walk test **Secondary Outcomes**: EuroQol (EQ-5D-3L), Adelaide Activities Profile, Walking Self-Efficacy Scale Assessments were conducted at baseline, 2, 4, 6 and 12 months	Assessed using the 6-minute walk test, the 4-month training group walking further than the control group at 2 and 4 months; however, at 12 months, the 4-month training group was not walking further than the control (MD= 9m; 95% CI -27 to 47). The 2-month training group out walked the control at 2 months but not at 4 months (MD 9m, 95% CI -13 to 31). No improvements in walking speed in the 4-month training group compared to the control remained at 12 months. No between group differences were shown in terms of improvement on the EuroQol, Adelaide Activities Profile or the Walking Self-Efficacy Scale.
Nadeau et al. 2013 **LEAPS Trial** **USA** **RCT**	CA: ☑ Blinding: Assessor ☑ ITT: ☑	408 adult participants who were a mean of 63.8 days post stroke and had residual lower extremity paresis.	There were two treatment groups and a control group. Participants received locomotor training program (LTP; treadmill and over ground training), home exercise program (HEP; strength, balance, coordination exercises provided by a PT) or usual care (UC).	**Primary Outcome:** Functional level of walking **Secondary outcomes:** 10m walking speed, 6MWT, steps taken per day, FMA-LE, BBS, Stroke impact scale, ABC scale, and the Modified Rankin Scale.	The adjusted odds ratio for improving on the functional walking level with LTP vs. UC was 1.94 (95% CI = 1.18-3.21, p=0.010) and 2.04 (95% CI=1.22-3.42, p=0.007) for HEP vs. UC. No difference was shown for LTP vs. HEP. Improvements in walking speed were shown for all groups (p<0.0001). Differences in the gains made for walking speed were 0.13m/s (95% CI = 0.09-0.18) for LTP vs. UC and 0.10m/s (95% CI = 0.05-0.14) for HEP vs. UC. Significant improvements (p<0.0001) were shown for all groups on the FM, BBS, ABC scale, and

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
			Treatment groups received 90minute sessions, 3/week (30-36 sessions).		modified Rankin Score. Greater improvement was shown for the two treatment groups vs. usual care on the BBS, ABC scale and physical mobility (p<0.0014).

Treadmill Training with and Without Body-weight Support

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Mehrholz et al. 2017 **Germany** **Cochrane review**	N/A	56 randomized or quasi-randomized controlled and cross-over trials of treadmill training and body weight support, individually or in combination, for the treatment (TM) of walking after stroke (3105 subjects)	Intervention comparisons included: treadmill training with body weight support versus other physiotherapy, placebo, or no intervention; treadmill training without body weight support versus other physiotherapy, placebo, or no intervention; treadmill training with body weight support versus treadmill training without body weight support; and body weight support (without treadmill training) versus other physiotherapy, placebo or no intervention.	**Primary Outcomes:** Walking ability **Secondary Outcomes:** Activities of daily living measures.	<u>Treadmill training and body weight support vs other interventions:</u> **Walking speed at end of TM:** Dependent in walking at start of TM (n=8): MD=-0.01, 95% CI -0.06 to 0.03, p=0.51. Independent in walking at start of TM (n=18): MD=.011, 95% CI 0.06 to 0.17, p=0.0000078 in favor of treatment. **Walking endurance at end of TM:** Dependent in walking at start of TM (n=5): MD=-5.09, 95% CI -23.41 to 13.22, p=0.59. Independent in walking at start of TM (n=10): MD=36.91, 95% CI 11.14 to 62.68, p=0.005 in favor of TM **Walking speed at follow-up:** Dependent in walking at start of TM (n=3): MD=-0.05, 95% CI -0.13 to 0.03, p=0.2. Independent in walking at start of TM (n=9): MD=0.06, 95% CI -0.03 to 0.15, p=0.19. **Walking endurance at follow-up:** Dependent in walking at start of TM (n=2): MD=-6.78, 95% CI -34.57 to 21.02, p=0.63. Independent in walking at start of TM (n=8):

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					MD=31.55, 95% CI 0.57 to 62.53, p=0.046 in favor of TM <u>Adverse events:</u> RD=0.02, 95% CI -0.01 to 0.05, p=0.14.
Van Nunen et al. 2015 **Netherlands** **RCT**	CA: ☒ Blinding: Assessor ☒ ITT: ☒	30 first ever stroke patients within the subacute phase of stroke recovery (experimental: 61.6d; control: 67.1d)	One group (n = 16) received Lokomat therapy twice a week, combined with three times 30 min a week of conventional overground therapy. The second group (n = 14) received conventional assisted overground therapy only, during a similar amount of time (3.5 h a week). The intervention was part of the normal rehabilitation program.	**Primary Outcomes:** Walking speed (10m timed walk test). **Secondary Outcomes:** Functional ambulation category (FAC), Berg Balance Scale (BBS), Motricity Index (MI), Burnnstrom-Fugl Meyer (FM), Rivermead Mobility Index (RMI), Timed Up and Go test (TUG). All outcome measures were assessed before and after the intervention and at wk 24 and wk 36 after start of the intervention.	There was no significant difference between groups at post-intervention, 10wk, or at follow-up (24 and 36wk) on walking speed, FAC, BBS, RMI, FM, or TUG.
Mao et al. 2015 **China** **RCT**	CA: ☒ Blinding: Assessor ☑ ITT: ☒	24 subacute stroke patients recruited from inpatient department of rehabilitation hospital	Participants were randomized to receive either body weight supported treadmill training or conventional overground walking training. Patients received gait training with BWSTT or CT for an average of 30 minutes/day, 5 days/week, for 3 weeks.	**Primary Outcomes:** Fugl Meyer Assessment (FMA-LL), Brunel balance assessment (BBA), cadence, stride length, stride time, step length, step time, gait speed, kinematic measures. Outcomes were assessed at baseline and after the intervention.	There was no significant difference between groups on the BBA and FMA-LL at post intervention. Cadence and gait speed were significantly higher in the BWSTT group than CT group after training ($p<0.05$). BWSTT group showed significantly reduced hip flexion and increased peak hip extension after training, whereas the CT group did not. There were no significant differences in the angle of knee flexion or extension and ankle dorsiflexion or plantarflexion or in the peak moments at the hip, knee, or ankle joints in either the BWSTT group or the CT group ($P > 0.05$) after interventions.
Kelley et al. 2013	CA: ☑	20 patients. Male = 13, female = 7. Mean age =	Participants randomized to either robotic-assisted	**Primary Outcomes:** 10m Walk Test (10m WT),	Time post-stroke differed significantly at baseline between the Lokomat (3.71 yrs) and the OGT

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
USA **RCT**	Blinding: Assessor ☑ ITT: ☒	65.75 years. Mean time since stroke onset = 2.87 years. National Institutes of Health Stroke Scale Lower Extremity motor score of 1–4 and could walk at least 10m.	body weight supported treadmill training using the Lokomat (n=11), or Overground Gait Training (OGT, n=9). 1 hour, 5 days a week for 8 weeks. Measurements were taken at baseline, post-intervention, and 3 months post.	six-minute walk distance (6 MWD). **Secondary Outcomes:** FMA-LE, Functional Independence Measure locomotion (FIM-L), Barthel Index, Stroke Impact Scale (SIS).	(1.44yrs) groups (p=0.025) No significant differences were seen between the Lokomat and OGT groups between baseline and post-intervention, or between baseline and 3-month follow-up on the primary outcome measures, the FM-LE or Barthel Index.
Ribeiro et al. 2013 **Brazil** **RCT**	CA: ☒ Blinding: Assessor ☑ ITT: ☒	20 subjects who suffered a stroke a mean time of 27.7 months prior to study were included in the final analysis.	The subjects were randomized into the treadmill training with partial body-weight support (TPBWS) group or to the proprioceptive neuromuscular facilitation (PNF) method on gait training group.	**Primary Outcomes:** STREAM, Motor score of the Functional Independence Measure (FIM), gait analysis.	After training, both groups showed significant improvements in STREAM scores, motor FIM scores, and symmetry ratio ($p<0.05$). Between groups, the PNF group showed greater improvements in the maximum ankle dorsiflexion over the swing phase ($p= 0.024$).
Duncan et al. 2011 **USA** **RCT**	CA: ☑ Blinding: assessor ☑ ITT: ☑	408 patients with stroke onset of 2 months, who were able to walk 3 m with maximum of one person assist, able to follow 3-step commands, capable of self-selected walking speed of <0.8 sec over 10 m, residing in the community	Subjects were randomized to undergo one of 3 training regimens: 1) early treadmill training with partial body-weight support (within 2 months of stroke) (n=139), 2) late treadmill training with partial body-weight support (6 months after stroke) (n=143) and 3) home-based exercise program (n=126). All programs consisted of 90 min sessions, 3x/week for 12 to 16 weeks.	**Primary outcome:** The proportion of patients with improved level of functional walking, defined as the ability to walk independently at a speed of >0.4 m/s (severe impairment at baseline) or >0.8 m/s (moderate baseline impairment) at 1 year. **Secondary outcomes:** Gait speed, Fugl-Meyer Assessment, BBS, activities of daily living and items on the Stroke Impact Scale. Outcomes were assessed at baseline, 6 and 12 months.	At one-year, 52% of all patients had improved functional walking ability. There was no difference in the proportion of improvement found among the 3 groups. The adjusted ORs for improving level of walking were: Early group vs. home group OR=0.83, 95% CI 0.50 to 1.39 Late group vs. home group OR=1.19, 95% CI 0.72 to 1.99 There were no differences among the groups on any of the secondary outcomes at 12 months. Mean ± sd Δ in comfortable walking speed (m/s): Early: 0.23±0.20, Late: 0.24±0.23, home: 0.25±0.22 Mean ± sd Δ in distance walked in 6 min (m): Early: 73.2±69.4, Late: 79.0±75.1, Home:85.2±72.9 Adverse events:

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					Any serious event: n=191 (no significant differences among groups) Falls n=139 (no significant differences among groups) Dropouts: intervention was not completed by 13% of subjects in the early group, 17% in late group and 3% in home-exercise group.
Ada et al. 2010 **Dean et al. 2010** **The MOBILISE Trial** **Australia** **RCT**	CA: ☑ Blinding: assessor ☑ ITT: ☑	126 acute (within 28 days of stroke onset), nonambulatory stroke patients.	Subjects were randomized to an experimental (n=64) or a control group (n=62) and received treatment until they achieved independent walking or for as long as they remained in hospital. Subjects in both groups received 30 minutes of walking practice 5 days/week. Additional lower-limb therapy was provided for an additional 30 minutes/day. Subjects in the experimental group undertook up to 30 minutes per day of treadmill walking with sufficient body weight support such that initially, the knee was within 15 degrees of extension in mid stance. Subjects the control group received up to 30 minutes of overground walking training, with the use of aides, if required.	**Primary outcome:** The proportion of subjects who achieved independent walking (ability to walk 15 m continuously across flat ground) at 6 months. **Secondary outcomes:** Gait speed, stride length, 6MWT, falls Outcomes were assessed at baseline and 6 months	At 6 months 43/59 (71%) subjects in the experimental group were independent ambulators compared with 36/60 (60%) subjects in the control group. The proportion of subjects who were independent ambulators at months 1, 2 and 6 was not significantly different between groups (p=0.13). Subjects in the experimental group achieved independence in ambulation a median of 14 days earlier. At 6 months from baseline the mean ± sd outcomes of independent ambulators in the experimental and control groups were: Walking speed (m/sec): 0.57 ± 0.36 vs. 0.47 ± 0.28, p=ns Walking stride (cm): 73 ± 31 vs. 67 ± 24, p=ns 6MWT (m): 240 ± 130 vs. 183 ±99, Δ 1.0, 95% CI 0.1 to 1.9, p<0.05. No. of fallers 61% vs. 51%, p=ns Dropouts/losses to follow up: n=7 (experimental group n=5, control group n=2) Adverse events: 2 subjects in the control group experienced anxiety related to the treatment and withdrew from the study. There were 47 reports of adverse events in the experimental group and 27 reports in the control group, none of which were attributed to the treatment.

Aerobic Training

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Saunders et al. 2016 **UK** **Cochrane review**		58 RCTs trials, involving 2,797 stroke survivors who were considered suitable for fitness training. Mean age was approximately 62 years. The mean time since stroke onset ranged from 8.8 days in trials assessing participants before discharge from hospital to 7.7 years in trials assessing participants after hospital discharge	Trials compared cardiorespiratory interventions (28 trials, 1408 participants), resistance interventions (13 trials, 432 participants), and mixed training interventions with usual care, no intervention, or a non-exercise intervention	**Primary outcomes:** Case fatality, death or dependency and disability **Secondary outcomes:** Physical fitness, mobility	Deaths were rare (2/957) No trial assessed death or dependence *Cardiovascular vs. control* Active intervention was not associated with significant improvements in FIM or Barthel Index scores. Maximum gait speed over 5-10 metres: Active intervention was associated with significantly greater speed at the end of the intervention (MD=6.71 m/min, 95% CI 2.73 to 10.69; 14 trials), and at the end of follow-up (MD= 6.71 m/min, 95% CI 2.40 to 11.02; 5 trials). Preferred gait speed Active intervention was associated with significantly greater speed at the end of the intervention (MD=4.28 m/min, 95% CI 1.71 to 6.84; 10 trials), but not at the end of follow-up (MD= 1.67 m/min, 95% CI-3.27 to 6.62; 3 trials). 6-Minute Walk Test Persons in the active intervention group was significantly longer distance at the end of the intervention (MD=30.29 m, 95% CI 16.19 to 44.39; 15 trials) and at the end of follow-up (MD=38.29 m, 95% CI 7.19 to 69.39; 5 trials) *Resistance Intervention vs. control* Resistance training was not associated with significantly greater maximum gait speed, preferred gait speed or endurance at either the end of the intervention, or at follow-up, although a maximum of 4 trials were available for pooled analysis. *Mixed training Interventions* Mixed training resulted in significant improvements

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					in preferred gait speed, endurance and balance at the end of the intervention.
Hornby et al. 2016 **USA** **RCT** **VIEWS trial**	CA: ☑ Blinding: Assessor ☑ ITT: ☑	32 individuals with unilateral stroke (mean duration 101d)	Participants were randomized to receive ≤40, 1-hour experimental or control training sessions over 10 weeks. Experimental interventions consisted only of stepping practice at high cardiovascular intensity (70%-80% heart rate reserve) in variable contexts (tasks or environments). Control interventions were determined by clinical physical therapists and supplemented using standardized conventional strategies.	**Primary Outcomes:** Walking speed, fastest possible speeds (FS), 6-minute walk test (6MWT), steps/day. **Secondary Outcomes:** Spatiotemporal symmetry, Balance Berg Scale (BBS), Timed 5x sit to stand task (5XSTS), Activities-Specific Balance Confidence scale (ABC), Physical subscale of the Medical outcomes Short Form (SF36). Outcomes were assessed at baseline, midtraining, post-intervention, and at 2 mo follow-up	There was a significant G x T interaction for gait speed, 6MWT and FS (p=0.002; p=0.001, p=0.006) but not for steps/day. There was a significant G x T interaction for single-limb balance and single-limb stance (p<0.001; p=0.002) but not for step symmetry. There was a significant G x T interaction on the SF36 (p=0.014) but not on the BBS, 5XSTS or the ABC. There was significant difference between groups on gait velocity and on the 6MWT at midtraining, post-intervention and at follow-up (p<0.05).
Sandberg et al. 2016 **Sweden** **RCT**	CA: ☑ Blinding: Assessor ☒ ITT: ☒	56 Patients aged ≥50 years who had a mild stroke (98% ischemic) and were discharged to independent living and enrolled 20 days (median) after stroke onset	Sixty minutes of group aerobic exercise, including 2 sets of 8 minutes of exercise with intensity up to exertion level 14 or 15 of 20 on the Borg rating of perceived exertion scale, twice weekly for 12 weeks. The nonintervention group received no organized rehabilitation or scheduled physical exercise	**Primary Outcomes:** Peak work rate, 6-minute walk test (6MWT). **Secondary Outcomes:** Timed up and go Test (TUG), walking speed, single leg stance (SLS), European Quality of Life Scale (EQ-5D), Stroke impact Scale (SIS). Participants were evaluated pre- and postintervention.	The following improved significantly more in the intervention group (pre- to postintervention): peak work rate (group × time interaction, P=.006), 6MWT (P=.011), maximum walking speed for 10m (P<.001), TUG test (P<.001), SLS right and left (eyes open) (P<.001 and P=.022, respectively), and SLS right (eyes closed) (P=.019). Aerobic exercise was associated with improved EQ-5D scores (visual analog scale, P=.008) and perceived recovery (SIS domain 9, P=.002). These patient-reported improvements persisted at 6-month follow-up.
Vanroy et al. 2016 **Belgium**	CA: ☒ Blinding: Assessor ☑	59 patients with first stroke and able to cycle at 50 revolutions/min were enrolled in the study 3 to	Patients were randomly allocated to a 3-month active cycling group (ACG, n=33) and education, or to a control	**Primary Outcomes:** Cardiovascular parameters, Strength, gait speed, gait ability.	No significant differences between training groups were found over time. However, patients in both groups showed significant improvements on outcomes.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
RCT	ITT: ☒	10 weeks after stroke onset	group (CG, n=26). Afterward, patients in the ACG were randomly assigned either to a coaching (n=15) or to a noncoaching group (n=16) for 9 months.	Patients underwent a baseline assessment and reassessments after 3, 6, and 12 months.	
MacKay-Lyons et al. 2013 **Canada** **RCT**	CA: ☑ Blinding: Assessor ☑ ITT: ☑	50 subjects >18 years, within 1 month of first ischemic stroke who were rehabilitation inpatients at a single site and able to walk 5 m with or without aids, orthoses or assistance.	Comparison of body-weight supported treadmill training (BWSTT) + usual care (UC)(n=24) vs. UC (n=26). Subjects in both groups participated in dose-match sessions that consisted of 60-minute sessions, 5 days/week for 6 weeks, as inpatients, followed by 60-minute sessions, 3 days/week for 6 weeks, as outpatients (48 sessions total)	**Primary outcome:** Cardiovascular Fitness (VO_2 peak), walking ability (6MWT, gait speed). **Secondary outcome:** Functional balance (Berg Balance Scale), Chedoke McMaster Stages of Recovery (CMSR) Leg and Foot components, satisfaction with program Assessments were conducted at baseline, following treatment and at 6 and 12-month	Mean (95% CI) changes from baseline to 12 months in BWSTT and UC groups Peak VO_2 (mL/kg/min): 3.9 (2.1-5.7) vs. 0.5 (−1.0 to 2.00, p=0.004. 6MWT (m): 98.0 (62.9-133.1) vs. 46.2 (13.5-78.9), p=0.015. Gait speed (m/s): 0.26 (0.17-0.35) vs. 0.17 (0.10-0.25), p=0.424. BBS: 10.9 (7.4-14.5) vs. 9.0 (5.2-12.8), p=0.486. CMSR (leg): 1.1 (0.6-1.6) vs. 0.9 (0.5-1.4), p=0.734 CMSR (foot): 1.5 (0.8-2.2) vs. 0.7 (0.0-1.4), p=0.010. Adverse events: None Dropouts/losses to follow-up: n=5
Globas et al. 2012 **Switzerland** **RCT**	CA: ☒ Blinding: Assessor ☑ ITT: ☑	38 subjects over 60 yrs with residual hemiparetic gait >6 months after stroke	Subjects were randomized to receive 3 months (30-50 min 3x/week) progressive graded, high-intensity aerobic treadmill exercise (TAEX) or conventional care physiotherapy (tone-regulating exercises for upper and lower extremities). At the end of the intervention period,	**Primary outcomes:** Peak exercise capacity ($Vo_{2\ peak}$) and the 6-minute walk test (6MWT). **Secondary outcomes:** Gait velocity (10-m walk), 6MWT, Berg Balance Scale (BBS), functional leg strength (5 chair-rise), self-rated mobility (Rivermead Mobility Index), and quality of	Mean ± sd $Vo_{2\ peak}$ (mL/kg/min) at baseline and 3 months TAEX group: 18.9 ± 4.6 to 24.4 ± 6.6 Control group: 21.7 ± 7.8 to 20.9 ± 8.9 Mean difference between groups at crossover: 5.5 vs. -0.8 mL/kg/min, p<0.001 Mean ± sd 6MWT (m) at baseline and 3 months TAEX group: 274.4 ± 113 to 332.1 ± 138 Control group: 261.2 ± 177 to 265.9 ± 189 Mean difference between groups at crossover: 58 vs. 4.7, p<0.001.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
			control subjects crossed over and received TAEX.	life (SF-12). Assessments were conducted at baseline, post intervention and at 12 months.	Mean ± sd 10 m walk (comfortable speed) m/s at baseline and 3 months TAEX group: 0.73 ± 0.28 to 0.79 ± 0.29 Control group: 0.70 ± 0.44 to 0.70 ± 0.46 p=ns at crossover Mean ± sd BBS at baseline and 3 months TAEX group: 49.3 ± 6.5 to 51.1 ± 6.4 Control group: 45.2 ± 11.0 to 0.70 ± 0.46 p<0.05 Dropouts: 4 Adverse events: recurrent stroke (n=1), fractures unrelated to study (n=2)
Jin et al. 2012 **China** **RCT**	CA: ☑ Blinding: Assessor ☑ ITT: ☒	133 persons > 50 years with chronic hemiparesis who were independent ambulators (with or without an aid).	Subjects were randomized to either an exercise training group (n=68) and received 40 minutes of aerobic cycling exercise, with lower extremity weights, at a target intensity of 50-70% heart rate reserve, 5 days a week for 8 weeks, or a control group (n=65) that received low intensity overground walking training at a target heart rate of 20-30% heart rate reserve. Both groups received balance training (30 minutes) and stretching exercises (20 minutes).	**Primary Outcome:** Cardiovascular fitness (peak VO_2) and walking ability (6MWT and the Rivermead Mobility Index). **Secondary Outcomes:** Berg Balance Scale (BBS), Modified Ashworth Scale and Isokinetic dynamometry for isometric knee muscle strength. Outcomes were assessed before and after treatment	**Cardiovascular fitness** Mean ± sd peak VO_2 L/min before and after treatment: Cycle training group: 0.88 ± 0.14 to 1.13 ± 0.17 Control group: 0.87 ± 0.14 to 0.89 ± 0.14 p<0.001 Mean ± sd peak VO_2 L/min/kg before and after treatment: Cycle training group: 13.2 ± 0.9 to 16.8 ± 1.0 Control group: 13.2 ±1.0. to 13.3 ± 1.0 p<0.001 **Walking ability** Mean ± sd 6MWT (m): Cycle training group: 212 ± 63.5 to 218.5 ± 63.7 Control group: 212 ±50.1 to 1213.55 ± 50.6 p<0.001 Mean ± sd RMI Cycle training group: 10.3 ± 1.4 to 210.5 ± 1.7 Control group: 10.2 ±1.4 to 10.4 ± 1.6 p<0.557 **Impairment-Level Outcomes**

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					Mean ± sd BBS scores Cycle training group: 147.9 ± 3.1 to 48.6 ± 2.9 Control group: 47.4 ± 3.7to 48.3 ± 3.9 p<0.228 Median (IQR) MAS scores Cycle training group: 1 (0-1) to 1 (0-1) Control group: 1 (0-1) to 1 (0-1) p<0.910 Adverse events: None
Pang et al. 2006 **Canada** **Systematic review & meta-analysis**	N/A	7 RCTs, representing the results from 9 studies (480 subjects) were included. Subjects were mildly or moderately impaired. A portion of the subjects in 1 trial was recovering from brain injury due to causes other than stroke. Subjects were included in the acute, subacute and chronic stage of stroke.	Active treatments included: cycle ergometer (n=4), treadmill walking (n=1), a combination of stepping, brisk walking and repeated sit-to-stand (n=1) and aerobic exercises performed in the water (n=1). Control conditions included usual care, relaxation therapy, range-of-motion exercises, and a seated exercise program, The exercise intensity ranged from 50% to 80% heart rate reserve. Exercise duration ranged from 20-40 min, 3-5 days a week, for 3-19 weeks.	**Primary outcomes:** Aerobic capacity: peak oxygen consumption (Vo2), peak workload. **Secondary outcomes:** Walking velocity and endurance. Cycle ergometry was used to conduct the exercise tests	Vo2: SES= 0.42, 95% CI 0.15 to 0.69, p= 0.001. Peak workload: SES= 0.50, 95% CI 0.26 to 0.73, p< 0.001. Walking velocity: SES= 0.26, 95% CI 0.05-0.48, p= 0.008) Walking endurance: SES= 0.30, 95% CI 0.06 to 0.55, p= 0.008. Adverse events: falls (n=5), recurrent stroke (unrelated to treatment, n=3)

Electromechanical Gait Training Devices

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Mehrholz et al. 2017 **Germany** **Cochrane review**	N/A	36 trials (1472 subjects) investigate the effects of automated electromechanical- and robotic-assisted gait-training devices for improving walking after stroke	Trials evaluated electromechanical- and robotic-assisted gait training plus physiotherapy versus physiotherapy (or usual care) for regaining and improving walking after stroke.	**Primary Outcomes:** Ability to walk independently (FAC, FIM, Rivermead Mobility Index). **Secondary Outcomes:** Measures of activity limitations (walking speed, walking capacity. Outcomes were evaluated at postintervention and at follow-up.	Independent walking at end of intervention (n=16): OR=1.94, 95% CI 139 to 2.71, p=0.000096 in favor of treatment. Recovery of independent walking at follow-up (n=4): OR=1.93, 95% CI 0.72 to 5.13, p=0.19. Walking velocity and end of therapy (n=22): MD=0.04, 95% CI 0.00 to 0.09, p=0.077. Walking velocity at follow-up (n=9): MD=0.07, 95% CI -0.05 to 0.19, p=0.26. Walking capacity at end of therapy (n=12): MD=5.84, 95% CI -16.73 to 28.40, p=0.61. Walking capacity at follow-up (n=7): MD=-0.82, 95% CI -32.17 to 30.53, p=0.96. Death from all causes: MD=0.00, 95% CI -0.01 to 0.02, p=0.77. Independent walking at end of treatment in trials <3mo post stroke (n=15): OR=1.90, 95% CI 1.38 to 2.63, p=0.00009. Independent walking at end of treatment in trials >3mo post stroke (n=3): OR=1.20, 95% CI 0.40 to 3.65, p=0.74.
Han et al. 2016 **Korea** **RCT**	CA: ☒ Blinding: Assessor ☑ ITT: ☒	60 participants within 3mo of stroke onset	The experimental group received 30min of robot-assisted gait therapy and 30min of conventional rehabilitation therapy. The control group received 60min of rehabilitation therapy. The intervention was given 5x/wk for 4wk.	**Primary Outcomes:** Brachial–ankle pulse wave velocity (baPWV) **Secondary Outcomes:** Functional Ambulation Category (FAC), Fugl Meyer Assessment (FMA-LL), modified Barthel Index (BI), Berg Balance Scale (BBS).	Both groups showed significant improvement in the MBI, BBS, FAC, and FMA-LE over time (p≤0.001). There were no significant differences between the experimental group and control group in the BI, BBS, FAC, or FMA-LL.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
				All assessments were performed at baseline and after the 4-week intervention.	
Morone et al. 2016 **Italy** **RCT**	CA: ☒ Blinding: Assessor ☑ ITT: ☒	44 participants <90d from stroke	Patients were randomly assigned to two different groups that received the same therapy in two daily 40-min sessions 5 days a week for 4 weeks. Twenty sessions of standard therapy were performed by both groups. In the other 20 sessions the subjects enrolled in the i-Walker-Group (iWG) performed with the i-Walker and the Control-Group patients (CG) performed the same amount of conventional walking-oriented therapy.	**Primary Outcomes:** 6 Minute walk Test (6MWT), 10-meter walk test (10MWT). **Secondary Outcomes:** Tinetti's Scale (FS), Modified Ashworth Scale (MAS), Barthel Index (BI), Assessments were evaluated at baseline, post-intervention and at 6mo follow-up.	There was a significant group x time interaction on the 10MWT (p=0.001) and the 6MWT (p=0.008). The TS was significantly higher in the experimental group compared to the control group (p0.033). The BI and MAS was not significantly different between the two groups.
Kim et al. 2015 **Korea** **RCT**	CA: ☒ Blinding: Assessor ☒ ITT: ☒	30 participants within 6mo of stroke onset (experimental: 80.1d; control: 119.5d)	The experimental group received robotic therapy using the Walkbot and the control group received conventional therapy. Therapy was done for 40min/d, 5x/wk for 4wk.	**Primary Outcomes:** Functional Ambulation Category (FAC), Berg Balance Scale (BBS), Modified Barthel index (mBI), Modified Ashworth Scale (MAS), EuroQol-5 (EQ-5D). Outcomes were assessed at baseline, 4wk, and 8wk.	There were significant group by time interactions on the FAC (p=0.02), BBS (p=0.03), and K-MBI (p=0.00). There are no significant interactions between the experimental group and control group on the EG-5D or MAS.
Ochi et al. 2015 **Japan** **RT**	CA: ☑ Blinding: Assessor ☑ ITT: ☑	26 first-ever stroke with a stroke onset of less than 5 weeks	Patients were randomly assigned to either the GAR-assisted gait training (GAGT) group or the overground conventional gait training (OCGT) group. Both groups underwent 60 min of standard physical	**Primary Outcomes:** Functional Ambulation Category (FAC), **Secondary Outcomes:** Muscle Torque, 10-meter walk test (10MWT), Fugl Meyer Assessment (FMA-LL), Functional	After 4 weeks of intervention, the patients in both groups exhibited improvements in lower extremity function, FAC, and FIM mobility score compared to the preintervention values (p< 0.01). There was a significant group difference in the improvement in FAC score (p=0.02). There was no difference observed in the

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
			therapy and 20 min of GAGT or OCGT 5 days a week for 4 weeks.	Independence Measure (FIM).	improvements of FMA-LL or FIM mobility score between the groups. There was no difference in the muscle torque gain on the affected side between the two groups.
Dragin et al. 2014 **Serbia** **RCT**	CA: ☑ Blinding: Assessor ☑ ITT: ☒	22 sub-acute stroke patients who sustained their first stroke.	Patients were randomized to the treatment body postural support (BPS) group (assisted by the Walkaround) or the control group (assisted by conventional means – therapist/ cane) during gait training, provided for 30 minutes, 5 days a week for 4 weeks.	**Primary Outcome**: Gait speed **Secondary Outcomes:** Barthel Index, FMA-LE, BBS	Significant differences were found in the BBS after 6-months in both groups. The BPS group also showed statistically significant improvements in gait speed at end of therapy (4 weeks) and 6-months post treatment ($p<0.05$). Significant differences between groups were found in the BBS after 4 weeks and in gait speed at 4 weeks and 6 months ($p<0.05$).
Morone et al. 2011, 2012 **Italy** **RCT**	CA: ☒ Blinding: assessor ☑ ITT: ☑	48 participants, an average of 20 days post stroke with motor and gait dysfunction were stratified by the Motricity Index (MI) into high (<29) and low (≥ 29) impairment groups.	Subjects in each arm were randomized to a robotic or control group (RG or CG). All patients underwent standard rehabilitation (3 hours/day, 5x/week x 3 months). After one week of standard therapy, subjects in the RG group underwent additional robotic-assisted gait training instead of a second therapy session (20 sessions in total). These sessions lasted 40 minutes, 20 of which were active GT therapy. Walking speed was advanced from 1 to 1.5 km/hrs, with BWS of 0% to 50%. Subjects in the control group participated in a second therapy session (40 min/day-total of 20 sessions)	**Primary outcome:** Functional Ambulation Category (FAC) **Secondary outcomes:** Rivermead Mobility Index (RMI), Barthel Index and 6MWT. Outcomes were assessed at hospital admission, following intervention, and at hospital discharge. Follow-up assessments at 2 years were also conducted.	At the end of treatment subjects in the Low MI RG had improved significantly more than subjects in the Low MI CG on the FAC ($p < .001$), RMI ($p = .001$) and 6MWT ($p = .029$). Although subjects in the Hi MI groups also improved over time, there were no significant between-group differences on any of the outcomes. Similar results were found at hospital discharge. At the 2-year follow-up, the Low MI RG continued to demonstrate significantly improved scores in terms of FAC ($p=0.002$), BI ($p= 0.024$) and RMI ($p=0.01$), relative to the Low MI CG. There were no significant differences between High RG and CG on any of the outcomes at 2-year follow-up. Adverse events: RG hypotension (n=3), knee pain (n=1), CG knee pain (n=1) Dropouts: RG Low MI arm-7, CG Low MI arm-5 RG High MI arm-5, CG High MI arm-4

Balance Training

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Virtual Reality					
Iruthayarajah et al. 2017 **Canada** **Systematic review and meta-analysis**	PEDro scores ranged from 5 (fair) to 8 (good), with a mean score of 6.4	22 RCTs (N=552) Subjects were recruited in the chronic phase of stroke in all studies	Wii Fit balance board (7 studies) vs Alternative exercise / Conventional therapy / No treatment VR + Treadmill training (7 studies) vs Treadmill training / Conventional therapy Postural VR training (6 studies) vs Alternative exercise / Conventional therapy Treatment was delivered for 20-80 minutes/day, 2-5 days/week, 3-12 weeks	**Primary Outcomes:** Berg Balance Scale (BBS), Timed Up & Go Test (TUGT)	*BBS* Combined: MD=2.94, 95%CI 1.82–4.06, p<0.001; Q=11.3, I^2=2.62 (12 studies) Wii Fit: MD=2.01, 95%CI -0.578–4.59, p=0.128; Q=0.109, I^2=0.00 (4 studies) Treadmill VR: MD=1.960, 95%CI -0.12–4.04, p=0.065; Q=0.902, I^2=0.00 (3 studies) Postural VR: MD=3.82, 95%CI 2.27–5.37, p<0.001; Q=8.43, I^2=52.5 (5 studies) *TUGT* Combined: MD=2.49, 95%CI 1.37–3.61, p<0.001; Q=10.05, I^2=0.00 (13 studies) Wii Fit: MD=1.28, -1.01–3.56, p=0.273; Q=0.149, I^2=0.00 (5 studies) Treadmill VR: MD=2.15, 95%CI 0.41–3.88, p=0.016; Q=2.22, I^2=0.00 (5 studies) Postural VR: MD=3.74, 1.83–5.65, p<0.001; Q=5.98, I^2=66.6 (3 studies)
de Rooij et al. 2016 **Netherlands** **Systematic review & meta-analysis**	13 of the included studies had PEDro scores of 6-8	21 RCTs (N=516) Subjects were recruited between 13 days and 12 years post stroke	VR balance training (13 studies / VR treadmill training (8 studies) vs Dose-matched therapy (17 studies) / Conventional therapy (4 studies) Treatment was delivered 2-5 sessions/week for 3-8 weeks	**Primary Outcomes:** Berg Balance Scale (BBS), Timed Up & Go Test (TUGT) Studies evaluated static balance (2 studies), dynamic balance (7 studies), or both (9 studies) Outcomes were assessed before and after treatment	BBS, dose-matched: MD=2.18, 95%CI 1.52-2.85, p<0.00001; I^2=9%, p=0.36 (5 studies, N=130) BBS, additional: MD=1.17, 95%CI -6.54-8.88, p=0.77; I^2=98%, p=0.00001 (2 studies, N=44) TUGT, dose-matched: MD=2.48, 95%CI 1.28-3.67, p<0.0001; I^2=85%, p<0.0001 (6 studies, N=132) TUGT, additional: MD=0.70, 95%CI 0.29-1.11, p=0.0009 (1 study, N=20) PEDro scores ranged from 3 (poor) to 8 (good), with a median score of 6.0
Li et al. 2016 **China**	Risk of bias scores ranged from 2 to 4 (out of 5), with a	16 RCTs (N=428) Subjects were recruited in the acute/subacute (4	VR training + Conventional therapy vs Conventional therapy (10 studies)	**Primary Outcomes:** Berg Balance Scale (BBS), Timed Up & Go Test (TUGT) Functional Reach Test (FRT), Activities-	BBS: MD=1.46, 95%CI 0.09-2.83, p=0.04; I^2=0%, p=0.45 (8 studies, N=170) FRT: MD=1.97, 95%CI -0.22-4.17, p=0.08; I^2=60%, p=0.11 (2 studies, N=47)

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Systematic review & meta-analysis	mean score of 3 (good)	studies) and chronic (12 studies) phases of stroke	VR treadmill training vs Treadmill training (6 studies) VR training: WiiFit (5 studies), IREX (3 studies), BalanceTrainer (2 studies) Treatment was delivered for 15-30 minutes/session, 2-5 sessions/week, for 3-12 weeks	Specific Balance Confidence Scale (ABCS), Sway Velocity (SV), Weight Distribution (WD)	ABC: MD=3.73, 95%CI -1.01-8.46, p=0.12; I^2=77%, p=0.04 (2 studies, N=41) TUGT: MD=-1.62, 95%CI -3.07, -0.16, p=0.03; I^2=24%, p=0.24 (8 studies, N=214) SV: MD=0.07, 95%CI -0.30-0.43, p=0.72; I^2= 0%, p=0.76 (3 studies, N=69) WD: MD=-1.21, 95%CI -2.54-0.12, p=0.07; I^2=0%, p=0.57 (3 studies, N=74)
Trunk Training					
Bank et al. 2016 **Australia** **Systematic review & meta-analysis**	PEDro scores ranged from 4 (fair) to 7 (good), with a mean score of 5.5	11 RCTs Subjects were recruited in the acute (5 studies), subacute (5 studies), and chronic (1 study) phases of stroke	Physiotherapy + Additional therapy vs Physiotherapy Sitting balance training (5 studies), Standing balance training (2 studies), trunk training (3 studies), lower limb training (2 studies), gait training (2 studies) Treatment ranged from 20-60 minutes/session, 3-7 sessions/week, 2-8 weeks	**Primary Outcome:** Trunk Control Test (TCT), Trunk Impairment Scale (TIS) Outcomes were assessed before and after treatment, with follow-up periods of 2 weeks to 6 months (5 studies)	TCT: MD=-1.53, 95%CI -9.37–6.32, p=0.70; I^2=22%, p=0.28 (5 studies, N=263) TIS: MD=1.70, 0.62–2.78, p=0.002; I^2=75%, p=0.007 (4 studies, N=106) Adverse events: Fatigue (1 study), Discomfort (1 study), None (2 studies), Not reported (7 studies)
Van Criekinge et al. 2016 **Belgium** **Systematic review**	N/A	7 trials evaluating static and dynamic balances as primary outcome measures.	Comparisons included: unstable surfaces versus stable surfaces. Unstable surface intervention included conventional therapy + trunk training (using ball, air cushion, balance pad, sling, unstable board). Stable surfaces interventions included conventional therapy combined with trunk training or just conventional training or just trunk training. The interventions ranged from 2 to 12 weeks.	**Primary Outcomes:** Sitting balance, gait. Outcomes were assessed at post therapy.	Sitting balance (n=3): SMD=1.36, 95% CI 0.89 to 1.82, p<0.00001 in favor of unstable support surfaces. Gait (n=2): SMD=1.35, 95% CI 0.75 to 1.95, p<0.0001 in favor of unstable support surfaces.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Sorinola et al 2014 **UK** **Systematic review & meta-analysis**	Risk of bias was judged to be low in two studies, moderate in two studies and high in two studies.	6 RCTs (n=155) including survivors of ischemic or haemorrhagic stroke occurring within the previous 3 months. Mean days post stroke ranged from 12.1 to 53 days.	Trials compared specific trunk exercises in lying and sitting positions or other specific interventions such as sitting balance training, weight shifting in sitting and arm reaching in sitting, in addition to conventional rehabilitation vs. conventional rehabilitation only	**Primary outcomes:** At least one validated measure of either functional independence, balance, mobility or trunk performance.	Additional trunk training was not associated a with significant difference between groups on global measures of trunk performance (SMD=0.50; 95% CI −0.25 to 1.25, p=0.19; 5 trials), or standing balance (SMD = 0.72, 95% CI −0.01 to 1.45, p = 0.05; 2 trials), but did improve walking ability (SMD=0.81, 95% CI 0.30 to 1.33; p= 0.002; 3 trials)
Cabanas-Valdes et al. 2013 **Spain** **Systematic review**	PEDro scores ranged from 3 (poor) to 8 (good), with a mean score of 6.3	11 RCTs (N=317) Subjects were recruited in the subacute stage of stroke in all studies Subjects were independent in sitting in 9 studies	Trunk training exercises (TTE) + Conventional therapy vs Conventional therapy TTE involved trunk exercises (5 studies) or sitting training protocol (6 studies); 3 studies used an unstable surface Treatment ranged from 30-60 minutes/session, 4-5 session/week, for 2-8 weeks	**Primary Outcomes:** Modified Reach Test (MRT), Trunk Impairment Scale (TIS) Outcomes were assessed before and after treatment, with follow-up periods of 2-24 weeks (four studies)	MRT: all studies found a significant improvement with TTE, although the magnitude was variable (11 studies) TIS total: studies found a significant improvement with TTE (5 studies) TIS dynamic: all studies found a significant improvement with TTE (5 studies) TIS static: no study found a significant improvement with TTE (5 studies)
Sit-to-Stand					
Pollock et al. 2014 **UK** **Cochrane Review**	N/A	13 RCTs (N=603) Subjects were recruited 30-51 days (5 studies), 3-8 months (3 studies), and >1 year (3 studies); time post stroke was not stated in 1 study Subjects were independent in sit-to-stand (6 studies), independent in walking (3 studies)	Repetitive sit-to-stand (6 studies), exercise training programs (4 studies), sit-to-stand training program (1 study), augmented feedback (1 study), altered chair design (1 study) Treatment ranged 15-60 minutes/session, 3-5 sessions/week, 2-12 weeks	**Primary Outcome:** Sit-to-stand ability **Secondary Outcomes**: Time to sit-to-stand, lateral symmetry, incidence of falls, reaction forces, joint kinematics Outcomes were assessed before and after treatment, with follow-up periods of 3 weeks to 33 months (7 studies)	One study (at high risk of bias) found training increased the odds of independent sit-to-stand (OR=4.86, 95%CI 1.43–16.50) 5 studies showed sit-to-stand interventions reduced time needed for sit-to-stand (SMD=0.85, 95%CI 0.38–1.33); long-term improvements were shown Adverse events: The effect of sit-to-stand training on number of falls was imprecise (no benefit or harm)
Yoga					

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Lawrence et al. 2017 **UK** **Cochrane Review**	N/A	2 RCTs (N=72) Subjects were recruited at a mean 51 months post stroke and living in the community	Yoga vs Waitlist control Treatment was delivered for 60-90 minutes, 1-2 sessions/week for 8-10 weeks	**Primary Outcomes:** Berg Balance Scale (BBS), Activities-Specific Balance Confidence Scale (ABCS) **Secondary Outcomes:** Fear of Falling (FoF) Outcomes were assessed before and after treatment	BBS: MD=2.38, 95%CI -1.41–6.17, p=0.22 (N=69) ABCS: MD=10.60, 95%CI -7.08–28.28, p=0.24 (N=47) FoF: OR=3.40, 95%CI 0.63–18.22, p=0.15 (N=47)
Sling Exercises					
Chen et al. 2016 **China** **Systematic review & meta-analysis**	Risk of bias was unclear in most studies	9 RCTs (N=460) Subjects were in the acute (2 studies), subacute (3 studies), or chronic (3 studies) phase of stroke; one study did not specific stroke onset	Sling exercise training + Conventional therapy vs Conventional therapy Treatment ranged from 30-100 minutes/day, 3-6 days/week, for 4-8 weeks	**Primary Outcome:** Berg Balance Scale (BBS) Outcomes were assessed before and after treatment	BBS: MD=3.81, 95%CI 0.15-7.48, p=0.04; I^2=75%, p=0.003 (5 studies, N=204)
Exercise Therapy					
Van Duijnhoven et al. 2016 **Netherlands** **Systematic review & meta-analysis**	34 trials were considered high-quality	43 RCTs Stroke onset ranged from 7 months to 8 years	Exercise interventions: balance training (12 studies), gait training (14 studies), multisensory training (7 studies), aerobic exercise (4 studies), other training (6 studies). Treatment duration ranged from 2-62 hours total	**Primary Outcome:** Berg Balance Scale (BBS) **Secondary Outcomes:** Functional Reach Test (FRT), Sensory Organization Test (SOT)	*All Training:* BBS: MD=2.22, 95%CI 1.26–3.17, p<0.01; I^2=52% (28 studies, N=985) FRT: MD=3.12, 95%CI 0.90–5.35, p<0.01; I^2=74% (5 studies, N=153) SOT: MD=6.77, 95%CI 0.83–12.7, p=0.03; I^2=0% (4 studies, N=173) *Balance Training Only:* BBS (MD=3.75, 95%CI 1.71–5.78, p<0.01; I2=52% (8 studies, N=235)
Tang et al. 2015 **Canada** **Systematic review & meta-analysis**	All studies were good quality (PEDro>5)	15 trials (N=627) Subjects were recruited >3 months post stroke in all studies Subjects were independent in walking	Physical exercise interventions: fitness training, functional training, gait training alone or with virtual reality Controls included less intensive/lower dose activity	**Primary Outcomes:** Activities-Specific Balance Confidence (ABC) Scale, Falls Efficacy Scale Balance self-efficacy was not the primary outcome in any of the studies	Balance self-efficacy, post treatment: SMD=0.44, 95%CI 0.11–0.77, p=0.009 (N=627) Balance self-efficacy, follow-up: SMD=0.32, 95%CI -0.17–0.80, p=0.20 (N=347) ABC Scale: MD=3.17, 95%CI 0.45–5.89, p=0.02 (N=545)

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
		with/without assistive devices in all studies	(12 studies) or no treatment (3 studies) Treatment duration was <4 weeks (4 studies), 1-3 months (9 studies), or >5 months (2 studies) and the frequency was 1-5 sessions/week	Outcomes were assessed before and after treatment, with follow-up periods of 2 weeks to 6 months (11 studies)	
Biofeedback					
Rao et al. 2013 **USA** **RCT**	CA: ☒ Blinding: ☑ Assessor ITT: ☒	28 individuals with acute stroke (3-14 days before study recruitment). Excluded if they had any history of other neurological diseases.	Patients were randomized into two groups. The experimental group received treatment on balance using biofeedback and body weight support harness. The control group received conventional treatment. Both groups were receiving similar physical therapy and other services (OT, SLP, neuropsychology, etc.).	**Primary Outcomes:** FMA-LE, Fugl-Meyer Balance test, the Functional Independence Measure for gait (FIM-G).	Fugl-Meyer Balance scores increased significantly for both the experimental (6.23±1.75 to 8.29±1.59, p= 0.001), and control (6.64±1.08 to 8.50±2.1, p=0.001) groups after treatment. However, the improvement in FM-B scores between groups was not statistically significant. FIM-G scores increased for both the experimental (1.64±1.15 to 3.57±1.34, p=0.001) and control groups (1.71±0.91 to 3.43±1.34, p=0.001). There was no statistically significant difference between groups. FMA-LE scores also improved for the experimental (15.28±6.41 to 19.36±5.72, p= 0.0002) and control (12.5±5.7 to 18.14±5.7, p= 0.00001) groups. No significant difference found between groups (p-0.22).
Van Peppen et al. 2006 **Netherlands** **Systematic review and meta-analysis**	PEDro scores ranged from 3 (poor) to 6 (good), with a median score of 4	8 trials (N=214) Subjects were recruited in the subacute (4 studies) and chronic (4 studies) phase of stroke	Visual feedback balance training vs Conventional balance training Balance Master (5 studies), Standing Feedback Trainer (2 studies), Nottingham Balance Platform (1 study) Treatment was delivered for 2-8 weeks	**Primary Outcomes:** Postural Sway (PS), Weight Distribution (WD), Berg Balance Scale (BBS), Timed Up & Go Test (TUGT)	PS eyes open: SES=0.20, 95%CI -0.12–0.53, p>0.05 (5 studies, N=148) PS eyes closed: SES=0.28, 95%CI -0.18–0.75, p>0.05 (2 studies, N=73) WD: SES=0.40, 95%CI -0.60–0.86, p>0.05 (3 studies, N=75) BBS: SES=-0.20, 95%CI -0.79–0.39, p>0.05 (2 studies, N=45)

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					TUGT: SES=-0.14, 95%CI -0.73–0.45, p>0.05 (2 studies, N=44)
Barclay-Goddard et al. 2004 **Canada** **Cochrane Review**	N/A	7 RCTs (N=246) Subjects had abnormal weight bearing in the standing position or impaired standing balance Subjects in 6 trials were recruited an average of <6 months post stroke; time post stroke was not stated in 1 study Subjects were dependent (4 studies) or independent (3 studies) in walking at the start of treatment Subjects were inpatients (2 studies) or outpatients (5 studies)	Force platform balance training with visual or auditory feedback vs. Conventional treatment Force platform balance training with visual or auditory feedback vs. Other balance training Force platform balance training with visual or auditory feedback vs. Placebo balance training Force platforms with dual plates and continuous visual display (with/without auditory) were used in all studies Treatment duration ranged from 2-8 weeks. Intensity and frequency of treatment ranged from 20-60 minutes/session and 2-5 days/week	**Primary Outcome:** Standardized measures of standing balance and timed walking **Secondary Outcomes:** Laboratory measures of standing balance using force platform indicators, ADL instruments Outcomes were assessed before and after treatment with follow-up periods of at least 1 month (3 studies)	*Visual Feedback:* Berg Balance Scale: MD=-1.98, 95%CI -5.55–1.59, p=0.28 (2 studies) Timed Up & Go: MD=7.31, 95%CI -1.32–15.94, p=0.097 (2 studies) Centre of Pressure Position (stance symmetry): SMD=-0.68, 95%CI -1.31–0.04, p=0.037 (2 studies) Centre of Pressure Position (sway): SMD=-0.10, 95%CI -0.57, -0.36, p=0.667 (3 studies) *Visual + Auditory Feedback* Centre of Pressure Position (stance symmetry): SMD=-4.02; 95% CI -5.99, -2.04, p<0.0001 (2 studies) Dropouts: Experimental groups (N=21), Control groups (N=23); not reported in 3 trials
Motor Imagery					
Li et al. 2017 **China** **Systematic review and meta-analysis**	N/A	17 RCTs (N=735) Subjects were recruited in the acute (3 studies), subacute (7 studies), and chronic (7 studies) phases of stroke	Motor imagery training + Specific training/Routine therapy vs Specific Training/Routine therapy Treatment ranged from 5-30 minutes/session, 5-7 sessions/week, 2-8 weeks	**Primary Outcomes:** Berg Balance Scale, Timed Up & Go, Fugl-Meyer Assessment - Balance, Maximal Percentage in Limb Loading Outcomes were assessed before and after treatment	Balance: SMD=0.81, 95%CI -0.03–1.65, p=0.06; I^2=93%, p<0.00001 (11 studies, N=430) Sensitivity analysis: SMD=0.73, 95%CI 0.16–1.30, p=0.01; I^2=83% (9 studies) Risk of bias: selection=low/unclear, performance=low/high, detection=low, attrition=low, reporting=low, other=unclear

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Tang et al. 2015 **Canada** **Systematic review and meta-analysis**	All studies were good quality (PEDro>5)	19 RCTs examining interventions for balance self-efficacy, of which 4 examined motor imagery (n=102) Subjects were recruited >3 months post stroke in all studies Subjects were independent in walking with/without assistive devices in all studies	Motor imagery training vs Less intensive/lower dose activity Treatment duration was <4 weeks (3 studies) or 1-3 months (1 study) and the frequency was 1-5 sessions/week	**Primary Outcomes:** Activities-Specific Balance Confidence Scale, Falls Efficacy Scale Balance self-efficacy was not the primary outcome in any of the studies Outcomes were assessed before and after treatment	Balance self-efficacy: SMD=0.68, 95%CI -0.33–1.69, p=0.18 (N=102)
Vibration					
Yang et al. 2015 **China** **Systematic review and meta-analysis**	Risk of bias: selection=low to unclear, performance=high, detection=low, attrition=low to high, reporting=high, other=low	8 RCTs (N=271) Subjects were recruited in the acute (6 studies) or subacute (2 studies) phase of stroke	Exercise with whole-body vibration Controls included exercise with sham vibration, exercise with music, routine therapy, and no treatment Treatment was provided in 1-5 sessions/week for 4-12 weeks; two studies provided only 1 session	**Primary Outcomes:** Berg Balance Scale Outcomes were assessed before and after treatment, with follow-up periods of 4-6 weeks (3 studies)	Post treatment: MD=-0.08, 95%CI -1.35–1.19, p=0.91 (4 studies, N=186) Follow-up: MD=-0.18, 95%CI -1.44–1.08, p=0.78 (4 studies, N=184)
Lu et al. 2015 **China** **Systematic review & meta-analysis**	Risk of bias: selection=low performance=low-high, detection=low, attrition=low, reporting=low other=high	7 RCTs (N=298) Subjects were recruited in the chronic phase of stroke, ranging from 30 months to 8 years	Exercise with whole-body vibration vs Exercise with sham/no vibration Treatment ranged from a total of 1 to 24 sessions	**Primary Outcomes:** Berg Balance Scale Outcomes were assessed before and after treatment	WMD=-0.23, 95%CI=-1.54–1.09, p=0.74 (2 studies)
Traditional Chinese Exercises					
Ge et al. 2017 **China**	N/A	31 RCTs (N=2349) (Stroke onset not reported in review)	Chinese exercise vs Conventional exercise	**Primary Outcomes:** Berg Balance Scale (BBS), Fugl-Meyer Assessment	BBS: MD=2.07, 95%CI 1.52-2.62, p<0.000001, I^2>50% (19 studies, N=1272)

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Systematic review & meta-analysis			Tai Chi (20 studies), Baduanjin (6 studies), Daoyin (3 studies), Yijn Jing (2 studies) Treatment was delivered 5-7days/week for 2-52 weeks	Balance (FMAB), Timed Up & Go Test (TUGT)	FMAB: MD=0.83, 95%CI -0.10–1.77, p=0.08; I^2>50% (3 studies, N=114) TUGT: MD=-1.77, -2.87, -0.67, p=0.002; I^2=48% (4 studies N=202)
Chen et al. 2015 **China** **Systematic review and meta-analysis**	Risk of bias was assessed as high in all studies	9 RCTs (N=820) (Stroke onset not reported in review)	Chinese exercise vs Conventional exercise Tai Chi (6 studies), Baduanjin (2 studies), Yijin Jing (1 study) Treatment was delivered 1-3 sessions/day, 3-7 days/week, 2-12 weeks	**Primary Outcomes:** Berg Balance Scale (BBS), Limits of Stability Test (LOST), Sensory Organization Test (SOT), Short Physical Performance Battery (SPPB), Fugl-Meyer Assessment Balance (FMAB) Outcomes were assessed before and after treatment	BBS: MD=11.85, 95%CI 5.41-18.30, p=0.0003; I^2=99%, p<0.00001 (6 studies, N=529) LOTS: favoured intervention (1 study) SOT: favoured intervention (1 study) SPPB: favoured intervention (1 study) FMAB: favoured intervention (1 study)
Aquatic Exercises					
Kim et al. 2016 **South Korea** **RCT**	CA: ☒ Blinding: Patient ☒ Assessor ☒ ITT: ☒	20 patients ≥6 months post stroke who scored >24 points on the Mini-Mental State Examination, were capable of independently walking >10 m, had no visual field effect or handicap, and had no orthopedic disease of the lower limbs.	Patients were randomized 1:1 to receive a course of neurodevelopmental treatment (NDT) for 30 minutes a day, 5 days a week, for 6 weeks or the same amount of NDT plus aquatic dual-task for 30 minutes a day, 5 days a week, for 6 weeks. Aquatic dual-task training consisted of a stability exercise, stability exercise while conducting an assignment by using the hands, movement exercise, and movement exercise while conducting an assignment by using the hands.	**Primary outcomes:** Berg Balance Scale (BBS), Five Times Sit to Stand Test (FTSST), and Functional Reach Test (FRT). **Secondary outcomes:** 10-Meter Walk Test (10MWT), Timed Up and Go Test (TUGT), and Functional Gait Assessment (FGA)	Mean baseline BBS scores were 41.8 (experimental group) and 39.4 (control group). At the end of the treatment period, the mean improvement in BBS scores was significant greater in the experimental group (2.6 vs. 0.8, p<0.05). Significant y greater improvements were made in the experimental group in mean FTSST and FRT scores (-3.5 vs. -0.5 sec, p<0.05 and 2.5 vs. 0.4, p<0.05), and on all the secondary outcomes.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Jung et al. 2014 **Korea** **RCT**	CA: ☒ Blinding: Patient ☒ Assessor ☒ ITT: ☒	30 patients ≥6 months post stroke who scored >24 points on the Mini-Mental State Examination, and were capable of independently walking >15 m. Mean age was 56 years, 53% were men. Mean time since stroke was 13.6 months.	Patients were randomized 1:1 to a course of obstacle-based training in a pool or on land for 40 minutes, 3 times a week for 12 weeks.	**Primary outcomes:** Velocities of mediolateral (ML) and anteroposterior (AP) and sway area with subjects' eyes closed	While patients in both groups improved significantly at the end of the intervention, there were significant difference in ML velocity (p=0.021), AP velocity (p=0.036), and sway area (p=0.049) between the two groups, favouring the aquatic group.

Strength Training

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Kerr et al. 2017 **UK** **RCT**	CA: ☒ Blinding: Patient☒ Assessor ☑ ITT: ☒	93 stroke patients within 42 days of onset	Group 1 received functional strength training, Group 2 received movement performance therapy, and the control group received conventional therapy.	**Primary Outcomes:** Sit-to-Stand (STS; movement duration; flexion momentum duration; smoothness; co-ordination; symmetry when rising; symmetry at the end of the movement; paretic knee maximum angular velocity) Outcomes were analyzed at baseline, post-intervention, and at a 3mo follow-up.	There were no significant differences between groups on the STS and its subscales.
Flansbjer et al. 2008 & Flansbjer et al. 2012 (4-yr follow-up) **Sweden** **RCT**	CA: ☒ Blinding: Patient ☒ Assessor ☑	24 community-dwelling stroke subjects a minimum of 6 months post stroke who were able to ambulate at least 200 m without supervision, with or without an aid.	Subjects were randomized to a training group (n = 15) and participated in supervised progressive resistance training of the knee muscles (80% of maximum) twice weekly for 10 weeks, or to a control group (n = 9) who	**Primary Outcome:** Muscle strength **Secondary Outcomes:** Modified Ashworth Scale, Timed Up & Go (TUG), Fast gait speed, 6-Minute Walk test (6MWT), stroke impact Scale (SIS)	Outcome data from baseline, 5 months and 4 years are reported. Mean ± sd dynamic knee muscle strength extension of (paretic)(Nm) side Training group: 41.0 ± 13.6 to 59.4 ± 22.6 to 61.1 ± 15.8 Control group: 40.1 ± 18.7 to 42.0 ± 20.1 to 43.7 ±22.4,

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
	ITT: ☒		continued their usual daily activities.	Outcomes were assessed before and after treatment and 5 months post intervention and at 4 years	The difference in change scores between groups was significant (p<0.001) Mean ± sd dynamic knee muscle strength flexion of (paretic)(Nm) side Training group: 43.5 ± 19.5 to 70.6 ± 26.7 to 69.0 ± 23.8 Control group: 50.7 ± 18.7 to 53.0 ± 22.1 to 55.0 ± 24.3 The difference in change scores between groups was significant (p<0.001) Mean ± sd isokinetic knee muscle strength extension of (paretic)(Nm) side Training group: 64.2 ± 31.1 to 76.3 ± 34.6 to 77.5 ± 24.2 Control group: 58.6 ± 35.3 to 61.7 ± 30.6 to 57.4 ± 34.4 The difference in change scores between groups was significant (p<0.05). Mean ± sd isokinetic knee muscle strength flexion of (paretic)(Nm) side Training group: 15.3 ± 19.0 to 26.5 ± 24.8 to 22.4± 20.9 Control group: 16.1 ± 15.7 to 20.0 ± 14.1 to 19.5 ±19.2 The difference between groups was not significant Mean ± sd TUG (sec) Training group: 28.6 ± 13.9 to 23.6 ± 11.1 to 20.5 ±8.7 Control group: 26.9 ± 15.2 to 26.7 ± 18.9 to 27.7 ± 21.8 The difference between groups was not significant Mean ± sd fast gait speed over 10 m (m/sec) Training group: 0.86 ± 0.47 to 0.96 ± 0.41 to 0.92 ±0.41 Control group: 0.86 ± 0.51 to 0.86 ± 0.41 to 0.73 ±0.4

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					The difference between groups was not significant Mean ± sd 6MWT (m) Training group: 228 ± 137 to 251 ± 144 to 275 ± 135 Control group: 234 ± 134 to 240 ± 140 to 223 ± 1370.4 The difference between groups was not significant (all significance levels refer to the comparison of baseline scores to 4-year follow-up) Dropouts: 6 (training group n=4, control group n=2)
Clark & Patten 2013 **USA** **RCT**	CA: ☒ Blinding: Patient☒ Assessor ☑ ITT: ☒	33 patients who sustained a unilateral stroke 6 to 18 months prior to enrollment and completed the study. Patients able to ambulate independently for 25 feet with a walking aid and/or AFO at a minimum of 0.3 m/s.	Patients were randomized to either concentric resistance training (CON) or eccentric resistance training (ECC). Both groups also received gait training.	**Primary Outcomes:** Neuromuscular activation, walking speed, and strength of knee extensors.	Neuromuscular activation results are not presented. Self-selected and fast walking speeds increased in both groups by 0.12 m/s (CON, p= 0.002; ECC, p<0.0001). Fast walking speed also increased in the CON and ECC group (p=0.0006 and p=<0.0001, respectively). No significant differences in improvement were shown between groups for self-selected walking speed (p=0.86) and fast walking speed (p=0.73).
Cooke et al. 2010 **UK** **RCT**	CA: ☑ Blinding: Assessor ☑ ITT: ☑	109 stroke subjects, a mean of 34 days after stroke, with some voluntary muscle contraction in the lower paretic limb	Subjects were randomized to one of three groups that received treatment for 1 hr/day x 4 days/week x 6 weeks (24 hrs total). The 3 groups were, conventional physiotherapy (CPT) (n=35), CPT+CPT (n=35) and functional training (FST) + CPT (n=38). Experimental CPT included interventions that emphasized control/quality of movement and gave prominence to sensory	**Primary Outcome:** Walking speed (m/s). **Secondary outcomes**: Ability to walk >0.8m/s (i.e. community ambulation), knee extensor torque, and functional mobility. Outcomes were measured 6 weeks after baseline and at follow-up 12 weeks thereafter.	Mean ± sd walking speed (m/sec) before and after treatment CPT: 0.17 ± 0.24 to 0.30 ± 0.35 CPT + CPT: 0.27 ± 0.36 to 0.55 ± 0.49 FST + CPT: 0.23 ± 0.29 to 0.42 ± 0.39 p=0.031 (CPT vs. CPT+CPT), p=ns (CPT vs. FST+CPT) % of subjects able to walk ≥0.8m/sec before and after treatment CPT: 2.6 to 13 CPT + CPT: 14.3 to 35 FST + CPT: 2.8 to 20 p=0.038 (CPT vs. CPT+CPT) p=ns (CPT vs. FST+CPT) Mean ± sd Modified Rivermead Mobility Index

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
			stimulation and preparation of joint and muscle alignment prior to activating muscle or a functional task. Content of FST focused on repetitive, progressive resistive exercise during goal-directed functional activity. Subjects performed repetitive exercise of functional tasks such as sit-to-stand-to-sit, stair climbing/ step ups, inside and outside walking, transfer training, bed mobility, and treadmill training.		scores before and after treatment CPT: 29.4 ± 10.1 to 34.6 ± 10.8 CPT + CPT: 28.9 ± 11.0 to 36.6 ± 10.4 FST + CPT: 30.3 ± 10.2 to 37.7 ± 8.6 p=ns (CPT vs. CPT+CPT), p=ns (CPT vs. FST+CPT) There were no significant differences between groups on any of the other outcome measures at the end of treatment and no significant differences between groups on any of the outcomes assessed at follow-up Dropouts: at end of treatment n=10, at end of follow-up n=28

Virtual Reality

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Laver et al. 2017 **Australia** **Cochrane review**	N/A	72 trials (2470 subjects) evaluated the efficacy of virtual reality on stroke-related impairments 50 trials were included in quantitative synthesis. 13 trials recruited participants within 3mo of stroke onset, 2 trials recruited participants within 6mo of stroke onset, 2 trials recruited	Total dose of therapy varied between studies: 4 trials: <5hrs 25 trials: 6-10hrs 26 trials: 11-20hrs 7 trials: >21hrs 1 trial: included lower and higher intensity training Most of the trials compared virtual reality intervention with a comparable alternative intervention. The alternative intervention	**Primary Outcomes:** Upper limb function and activity. **Secondary Outcomes:** Gait, balance, global motor function, cognitive function, activity limitation, participation restriction and quality of life, adverse events. Outcomes were assessed at post-intervention and at	Virtual reality versus conventional therapy Gait speed post intervention (n=6): MD=0.09, -0.04 to 0.22, p=0.18. Timed up and go test post intervention (n=3): MD=-1.76, 95% CI -4.67 to 1.16, p=0.24. Balance post intervention (n=3): MD=0.39, 95% CI -0.09 to 0.86, p=0.11. <10hr of therapy on gait speed post intervention (n=2): MD=0.01, 95% CI -0.22 to 0.24, p=0.93. >10hr of therapy on gait speed post intervention

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
		participants within 12mo of stroke onset, 3 trials recruited participants over 2 or 3mo of stroke onset, and 31 trials recruited participants more than 6mo of stroke onset. 23 trials evaluated the effect of virtual reality on lower limb	was often described as therapy using a conventional approach.	follow-up.	(n=4): MD=0.12, 95% CI -0.03 to 0.28, p=0.12. ADL (n=11): SMD=0.25, 95% CI 0.06 to 0.43, p=0.0088. Additional virtual reality intervention Gait speed post intervention (n=3): MD=0.08, 95% CI -0.05 to 0.21, p=0.23. Timed up and go test post intervention (n=3): MD=-4.76, 95% CI -8.91 to -0.61, p=0.025 in favor of VR Balance (n=7): SMD=0.59, 95% CI 0.28 to 0.90, p=0.00022 in favor of VR Global motor function (n=3): SMD=0.01, 95% CI -0.60 to 0.61, p=0.98. ADL (n=8): SMD=0.44, 95% CI 0.11 to 0.76, p=0.0087
Gibbons et al. 2016 **Australia** **Systematic review & meta-analysis**	N/A	22 trials (552 subjects) evaluated the effects of virtual reality on lower limb outcomes post stroke	Trials were grouped according to acute-subacute (190 subjects) and chronic (362 subjects) stroke populations. Of the 22 included trials, 14 focused on standing VR balance games including Nintendo Wii, X-box Kinect and IREX VR systems, 4 focused on VR treadmill training, and one each on VR-based ankle exercises, stepping exercises, obstacle training, and optimal movement training. Majority of studies compared VR to conventional physiotherapy (11 trials).	**Primary Outcomes;** Functional balance, static balance, functional mobility, spatiotemporal characteristics/kinematics of gait, motor function.	<u>Acute-Subacute stroke</u> Functional balance at post intervention: SMD=0.42, 95% CI -0.21 to 1.06, p>0.05. Functional mobility at post intervention: WMD=-10.94, 95% CI -26.00 to 4.11, p>0.05. Motor Function: SMD=0.20, 95% CI -0.92 to 1.31, p>0.05. <u>Chronic stroke:</u> Functional balance at post intervention: SMD=0.42, 95% CI 0.11 t 0.73, p<0.05. Functional balance at follow-up: SMD=0.38, 95% CI -0.73 to 1.50, p>0.05. Static balance: WMD=0.28, 95% CI -1.93 to 2.49, p>0.05. Functional mobility at post intervention: WMD=-2.04,

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
			Therapy was provided from 2x/wk to 5x/wk, and ranged in duration from 2 to 8wk.		95% CI -5.82 to 1.75, p>0.05. Functional mobility at follow-up: WMD=-4.94, 95% CI -10.37 to 0.49, p>0.05. Spatiotemporal characteristics at post intervention: WMD=0.12, 95% CI 0.03 to 0.22, p<0.05. Cadence: WMD=11.91, 95% CI 2.05, to 21.78, p<0.05. Stride length: WMD=9.79, 95% CI 0.74 to 18.84, p<0.05. Step length: WMD=5.74, 95% CI 0.91 to 10.56, p<0.05. Motor function: SMD=.27, 95% CI -0.63 to 1.17, p>0.05.
McEwen et al. 2014 **USA** **RCT**	CA: ☑ Blinding: Assessor ☑ ITT: ☒	59 individuals who suffered a stroke began intervention while on an inpatient unit.	Patients were randomized to either: (1) standard rehabilitation plus a program of virtual reality (VR) exercises (challenged balance while standing), or (2) the control group which received standard therapy plus VR exercises that did not challenge balance (sitting).	**Primary Outcomes:** Timed Up and Go (TUG). **Secondary Outcomes:** Two Minute Walk Test (TMWT), Chedoke McMaster Stroke Assessment Scale Leg domain. Balance and mobility were assessed before, after, and 1 month after training.	More participants in the treatment group showed improvements on the Chedoke McMaster Stroke Scale Leg domain right after treatment (p=0.04) and 1- month post (p=0.02) than the control group. Both groups improved on the post-treatment assessment; however, the two groups did not differ significantly on the TUG or TMWT.

Rhythmic Auditory Stimulation (RAS)

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Yoo 2016	N/A	8 RCTs (n=242) including person with hemiparesis	Trials compared intentional synchronization of target	**Primary outcomes:** Lower limb-velocity,	RAS was associated with large significant effect sizes for all lower-limb outcomes

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Korea **Systematic review & meta-analysis**		following stroke. Mean age was 63.0 years. Mean of 7.0 months post stroke.	movement to externally generated rhythmic auditory cueing as the primary intervening stimulus compared with traditional rehabilitative interventions or other controlled interventions using different cueing (i.e., visual cueing) or using different rehabilitative strategies	cadence, stride length	Gait velocity: Hedges's g=0.98, 95% CI 0.69 to 1.28 Cadence: Hedges's g=0.84, 95% CI 0.63 to 1.15 Stride length: Hedges's g=0.76, 95% CI 0.47 to 1.05 Effect sizes for gait velocity and cadence were higher in studies including persons in the acute stage of stroke.
Suh et al. 2014 **Korea** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor ☑ ITT: ☒	16 persons who had sustained a stroke >6 months previously, who were able to walk ≥10 m with or without lower limb orthoses and were able to distinguish some auditory stimuli. Mean age was 65 years, mean time since stroke onset was 305 days.	Patients were randomized 1:1 to receive gait training with RAS vs. gait training without RAS for 3 weeks. In the RAS group, patients received a gait training session with 15-minute RAS each time, 5 times a week with his/her guardian.	**Primary outcomes:** gait velocity, stride length, and cadence **Secondary outcomes:** Measures of standing balance	At the end of training, there was significantly greater improvement in mean gait velocity in the RAS group (1.54 vs. 1.31 m/min, p=0.012), but not in mean cadence (5.24 vs.1.54 steps/min, p=0.141) or mean stride length (0.01 vs. 0.0 m, p=0.46). At the end of training, there was significantly greater improvement in measures of balance in the RAS group (overall stability index, anteroposterior index and mediolateral index)

Biofeedback

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Stanton et al. 2017 **Australia** **Systematic review**	All trials had a PEDro score of ≥4	18 trials evaluating biofeedback on lower limb activities. 7 trials evaluated participants <6mo post stroke, 8 trials evaluated participants >6mo post stroke, and 3 trials did not provide information on time post stoke onset.	Biofeedback used in the experimental interventions included: weight distribution from a force platform or sensor (11 trials); muscle activity from EMG (three trials); linear gait parameters such as step width or length from foot sensors (three trials); and joint angle from a	**Primary Outcomes:** Lower limb activities (combination of standing, walking, balance)	Lower limb activities (n=17): SMD=0.50, 95% CI 0.30 to 0.7, p<0.05.

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
			goniometer (one trial). Visual feedback was used in seven trials; auditory in seven trials; and a combination of both in four trials. The mean duration of intervention sessions was 33 minutes (SD 17), occurring with a mean frequency of 3.7 days per week (SD 1.6), and a mean duration of 5.2 weeks (SD 2.2).		
Woodford & Price 2007 **UK** **Cochrane review**	N/A	13 RCTs, 8 of which directed treatment at the lower extremity. Subjects were recruited an average of < 6 months (n=2) and ≥ 6 months (n=5) post stroke. Timing of stroke onset unclear in 1 trial.	Treatment contrasts included physiotherapy alone vs. physiotherapy plus EMG-BFB. Treatment duration ranged from 4 to 16 weeks. Intensity and frequency of treatment ranged from 15 min to 60 min/session, 2-3 days/week.	**Primary outcome:** Motor strength (MRC scale) **Secondary outcomes:** ROM, improvement in gait, ADL Outcomes were assessed before and after treatment. 12-week follow-up in one study.	Change in MRC scale (tibialis anterior): MD=1.09, 95% CI 0.48 to 1.70, p<0.0001. Results from a single trial included. Change in ROM (ankle joint): SMD=-0.17, 95% CI -1.15 to 0.81, p=0.82. Results from 5 trials included Change in stride length (no. of steps needed to walk 6 or 10 metres): MD=-0.51, 95% CI -3.27 to 2.25, p=0.72. Results from 2 studies included. Change in time taken to walk a specific distance: SMD=0.13, 95% CI -0.55 to 0.80, p=0.37. Results from 3 trials included.

AFO/Splinting

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Nikamp et al. 2017 **Netherlands** **RCT**	CA: ☑ Blinding: ☑ Assessor ITT: ☒	33 hemiparetic stroke patients within 6wk of stroke onset with indication of AFO use	Subjects were randomly assigned to early (at inclusion; week 1) or delayed provision (eight weeks later; week 9).	**Primary Outcomes:** Berg Balance Scale (BBS), Functional Ambulation categories (FAC), 6-minute walk test (6MWT), 10-meter walk test (10MWT), Rivermead Mobility Index	Positive effects of ankle-foot orthoses were found two weeks after provision, both when provided early (significant effects on all outcomes) or delayed (BBS: p = 0.011, FAC: p = 0.008, 6MWT: p = 0.005, TUG: p = 0.028). Comparing effects after early and delayed provision showed that early provision resulted in increased levels of improvement on BBS

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
				(RMI), Barthel Index, Timed up and go Test (TUG). Outcomes were performed at weeks 1, 3, 9 and 11	(+5.1 points, p = 0.002), BI (+1.9 points, p = 0.002) and non-significant improvements on 10MWT (+0.14 m/s, p = 0.093) and TUG (-5.4 seconds, p = 0.087), compared with delayed provision
Pomeroy et al. 2016 **UK** **RCT**	CA: ☑ Blinding: ☑ Assessor ITT: ☑	105 Participants were recruited 3 to 42 days post stroke	All received conventional physical therapy (CPT) that included use of "off-the-shelf" and orthotist-made AFOs. People allocated to the experimental group also received a SWIFT Cast for up to 6 weeks.	**Primary Outcomes:** Gait speed **Secondary Outcomes:** Functional Ambulatory Categories (FAC); Modified Rivermead Mobility Index (MRMI). Measures were undertaken before randomization, 6 weeks thereafter (outcome), and at 6 months after stroke (follow-up).	There were no significant differences between the groups in gait velocity, FAC, or MRMI at 6wk or 6mo.
Tyson & Kent 2013 **UK** **Systematic review & meta-analysis**	NA	13 RCTs (334 subjects). Subjects in all studies were in the subacute or chronic stage of stroke and were able to stand and walk alone for at least 10 m. Subjects in 2 studies were not functional ambulators	Comparisons of subjects walking with and without an AFO. Most of the AFOs were rigid, molded plastic and custom-made. All trials were crossover design. Most subjects had worn the AFO for at least a week prior to testing. Some were regular users of the device. Subjects in 4 trials had worn the orthosis for< 1 week or had no time to habituate prior to testing.	**Primary Outcomes:** Measures of mobility and balance Outcomes were assessed testing in a single testing session, whereby use of an AFO was compared with no AFO.	Gait speed (m/s): mean difference= 0.06, 95% CI, 0.03 to 0.08, p<.0001. Results from 11 trials included. Step or stride length: SMD= 0.28, 95% CI 0.05 to 0.51, p=0.02. Results from 7 trials included. Functional Ambulation Categories: SMD= 1.34; 95% CI 0.95 to 1.72, p<.001. Results from 3 trials included. Timed-up and Go: SMD= 0.39, 95% CI -0.83 to 0.06, p=0.09. Results from 2 trials included. Weight distribution while standing: SMD=0.32, 95% CI- 0.52 to-0.11, p=0.003. Results from 5 trials included. Postural sway: SMD= -0.18, 95% CI -0.40 to 0.04, p=0.10. Results from 4 trials included.
Choi et al. 2013	CA: ☒	30 patients with hemiplegia resulting from	Subjects were randomized to either the experimental	**Primary Outcomes:** Joint range of motion (ROM)	Significant differences were found between groups in ankle dorsiflexion, BBS, and 10-m walking times

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
South Korea **RCT**	Blinding: Assessor ☒ ITT: ☒	stroke.	group which received proprioceptive neuromuscular facilitation (PNF) combination patterns and kinesio taping, or the control group which received neurodevelopmental treatment.	at the hip and ankle for both sides using a goniometer, BBS, 10-meter walking test	(p<0.05). Significant differences in pre and post-test scores were found in the experimental group on the BBS and 10 m walking times (p<0.05), while the control group showed a statistically significant difference on the 10m walking time (p<0.05).
Erel et al. 2011 **Turkey** **RCT**	CA: ☑ Blinding: assessor ☒ ITT: ☒	32 subjects with a maximum MAS score of 3, at least 6 months following stroke and scored 3-5 on the Functional Ambulation Classification	Subjects were randomized to wear a custom dynamic ankle-foot orthosis worn inside tennis shoes, or tennis shoes only for 3 months. No therapy was provided.	**Primary outcomes:** Functional Reach, Timed Up and Go (TUG), Time up stairs (TUS), time downstairs (TDS), gait velocity and Physiological Cost Index (PCI). Assessments were conducted at baseline and 3 months	Mean ±sd outcomes at baseline and at 3 months for AFO and control groups were: Functional reach (cm): 28.50±8.48 to 33.43±9.59 vs. 27.11±5.41 to 28.46±4.4, p=0.065 TUG (sec): 16.57±10.01 to 14.79±10.36 vs. 22.50±13.53 to 19.07±8.19, p=0.065 TDS (sec): 15.29±12.72 to 13.29±11.21 vs. 18.11±10.38 to 15.36±8.37, p=0.117 TUS (sec): 13.64±12.59 to 12.00±10.21 vs. 18.93±15.99 to 15.00±7.29, p=0.040 Gait velocity (m/s): 0.84±0.40 to 0.99±0.45 vs. 0.65±0.19 to 0.72±0.20, p=0.001 PCI (beats/min): 0.19±0.10 to 0.12±0.06 vs. 0.31±0.23 to 0.28±0.13, p=0.001 Dropouts: n=4, 2 from each group
Wang et al. 2007 **Turkey** **RCT (crossover)**	CA: ☑ Blinding: assessor ☒ ITT: ☑	58 stroke patients with hemiparesis of duration of less than 6 months who were able to walk for 10 m without an assistive device and had never worn an AFO previously.	Measures of gait performance and balance were assessed with and without an AFO on the affected side. Assessments took place 2 hrs apart.t the end of the study.	**Measures of Balance:** Weight bearing distribution, and limit of stability were assessed using the Balance Master System **Measures of Gait:** Gait speed, cadence, cycle time, swing time, stance time, step length, stride	Mean ±sd for outcomes assessed with and without AFOs **Balance** Weight-bearing difference (degrees): 8.86±9.31 vs. 12.12±8.25, p=0.044 Movement velocity (deg/sec) affected: 4.53±1.48 vs. 3.39±1.62, p=0.040

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
				length were assessed using the GAITRite system	Maximal excursion (%) affected: 74.81±20.46 vs. 68.70±23.61, p=0.046 **Gait** Gait speed (cm/sec): 66.94±29.47 vs. 62.83±26.71, p=0.006 Cadence: 90.31±22.98 vs. 88.62±19.06, p=0.357 Cycle time (sec): 1.45±0.48 vs. 1.45±0.49, p=0.962 Swing time (sec) affected: 0.53±0.19 vs. 0.52±0.15, p=0.355 Stance time (sec) affected: 0.92±0.34 vs. 0.93±0.38, p=0.620 Step length (cm): affected: 44.58±13.19 vs. 42.29±12.27, p=0.010 Stride length (cm): 86.86±26.47 vs. 82.53±22.95, p=0.002
De Wit et al. 2004 **Netherlands** **RCT (crossover)**	CA: ☑ Blinding: assessor ☒ ITT: ☑	20 chronic stroke patients (> 6 months) who were able to walk independently with shoes with/without a walking aid and who had been wearing an AFO for at least the previous 6 months	Subjects who had been wearing a rigid, nonarticulated AFO daily were assessed with and without their AFO included, the order of which was randomized. AFO types included an AFO with a small posterior steel, AFO with big posterior heel and an AFO with 2 crossed posterior steels and an open heel	**Primary outcomes:** Comfortable walking speed, Timed Up & Go (TUG) test and stairs test TUG+ stair ascent/decent). Clinically relevant differences based on literature were defined for walking speed (20 cm/s), and the TUG test (10 s).	Mean ±sd for outcomes assessed with and without AFOs Gait speed (cm/s): 49.6±24.3 vs. 44.9±24, p=0.020 TUG (sec): 25.6±11.7 to 29.2±12.9, p<0.0001 TUG stairs (sec): 73.0±37.8 to 81.6±44.4, p=0.04

Functional Electrical Stimulation

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Howlett et al. 2015 **Australia** **Systematic review & meta-analysis**	One trial was considered to be of high quality	18 RCTs (n=485) including persons with stroke of any level of disability and any chronicity. The mean time after stroke ranged from <1 to 51 months, with 61% of the trials carried out after 6 months.	Trials compared FES vs. no intervention or placebo intervention or training of the same activity as the experimental group but without any electrical stimulation for upper and lower-limb rehabilitation. 8 trials involved the lower limb. Overall, length of FES sessions ranged from 20 minutes to 6 hours, frequency of sessions ranged from 2 to 7 per week and the duration of sessions ranged from 2 to 12 weeks, with the total dose of intervention ranging from 5 to 90 hours. The frequency of the electrical stimulation ranged from 25 to 50Hz, and pulse width ranged from 200 to 400µs.	**Primary outcome:** Activity (defined by ICF), gait speed	FES was associated in significantly faster gait speed compared with training alone (MD= 0.08 m/s (95% CI 0.02 to 0.15, results from 8 trials, 203 participants). (Activity outcomes included results from both upper and lower-limb trials)
Bauer et al. 2015 **Austria** **RCT**	CA: ☒ Blinding: assessor ☑ ITT: ☑	40 participants from 7d to 6mo stroke onset time	Participants were randomized to receive Functional Electrical Stimulation (FES) during cycling or cycling with no FES. Both groups cycled for 20min, 3x/wk for 4wk, for a total of 12 sessions.	**Primary Outcomes**: Functional Ambulation Category (FAC), Performance oriented mobility assessment (POMA). **Secondary Outcomes:** Motricity Index (MI), modified Ashworth Scale (MAS) Outcomes were assessed at baseline, 4wk, and 6wk.	There was a significantly greater improvement in FAC in the experimental group compared to the control group from baseline to 4wk (p=0.013) but not baseline to 6wk (p=0.148). There was a significantly greater improvement in POMA in the experimental group compared to the control group from baseline to 4wk (p<0.0004) but not baseline to 6wk (p=0.069). There was no significant difference between groups in MI from baseline to 4wk (p=0.651) and baseline to 6wk (p=0.663).

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					There was no significant difference between groups in MAS scores.
Shendkar et al. 2015 **India** **RCT**	CA: ☒ Blinding: Patient ☑ ITT: ☒	34 participants within 6mo of stroke onset	Participants were divided into two equal groups, where one group received functional electrical stimulation (FES) on the lower affected limb for 30 minutes, and the other group received conventional physiotherapy for 60 minutes.	**Primary Outcomes:** Walking Speed; Cadence; Step Length; Single Limb Support (SLS), Double Limb Support (DLS); Pulling Power; Swing Power; Ground Impact; stride Length. Participants were assessed before the intervention and after the intervention.	Both groups demonstrated a significant change from baseline to posttreatment on the SLS (p=0.020), SLS/DLS ratio (p=0.020), pulling acceleration (p=0.015), swing power (p=0.020), and ground impact (p=0.020). A significant group x time interaction was found for the pulling acceleration (p=0.009), swing power (p=0.024), and ground impact (p=0.049). A significant difference between groups was found on the pulling acceleration (p=0.21), swing power (p=0.027), and ground impact (p=0.46).
Tan et al. 2014 **China** **RCT**	CA: ☒ Blinding: Assessor ☑ ITT: ☑	45 subjects who sustained a first-time ischemic stroke (within 3 months of onset). A Brunnstrom stage of I, II, or IV	Subjects were randomized into a four-channel FES group, a placebo group (sham four-channel FES), or a dual-channel group. All groups received conventional stroke rehabilitation in addition to the experimental treatments. 30 minutes per day, for 5 days, over 3 weeks.	**Primary Outcomes:** FMA-LE, the Postural Assessment Scale for Stroke Patients (PASS), BBS, Functional Ambulation Category (FAC), and the Modified Barthel Index (MBI).	A significant difference in FMA-LE scores after treatment was found between the four channel and dual-channel groups (p= 0.024), but not between the four-channel and placebo groups (p=0.062). After treatment a significant difference between the four-channel and placebo groups was found in the PASS (p= 0.031) and BBS (p= 0.022). On the MBI, the four-channel group had significantly greater improvement compared to the placebo (p= 0.039) and dual channel groups (p= 0.021). Significant differences were found only between the four-channel and placebo groups on the BBS (p= 0.028), and MBI (p= 0.047) at the 3 month follow up.
Sheffler et al. 2013 **USA** **RCT**	CA: ☑ Blinding: Assessor ☒ ITT: ☑	110 individuals with hemiparetic stroke (≥12 weeks post stroke). Participants could ambulate ≥30ft without an AFO and ≥24 on the BBS.	Participants were placed in either an ambulation training group with peroneal nerve stimulator (PNS – Odstock Dropped-Foot Stimulator), or usual care group (AFO or no device).	**Primary Outcomes:** FMA-LE **Secondary Outcomes**: Modified Emory Functional Ambulation Profile (mEFAP), Stroke Specific Quality of Life (SSQOL) scale.	There was no significant treatment group main effect on the FMA-LE (p=0.797), the mEFAP (p=0.968), or the SSQOL scale (p=0.360).
Everaert et al.	CA: ☑	93 stroke patients with	Participants completed	**Primary Outcomes**: Figure-	All groups showed significant increases on the

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
2013 **Canada** **Cross-over RCT**	Blinding: Assessor ☒ ITT: ☒	hemiparesis and foot drop (<1 year post stroke). Participants had no prior experience with an AFO, and could ambulate 10m, FIM ambulation score ≥4.	two phases for the study: 6 weeks with one device then 6 weeks with another. The three treatment groups were: (1) WalkAide then Ankle-Foot Orthosis (AFO), (2) AFO then WalkAide, and (3) AFO for both phases.	of-8 walking speed and Physiological Cost Index **Secondary Outcomes**: 10m walking speed, modified Rivermead Mobility Index, Perceived Safety Level, and Device preference.	Figure-8 task and 10m walk (p<0.01), and on the modified Rivermead Mobility index (p<0.001). When comparing WalkAide to AFO for walking performance, improvements on the Figure 8 and 10m walk were not significantly different at phase 1 (p=0.89 and p=0.75, respectively) or phase 2 (p=0.25 and p=0.66, respectively). Greater orthotic effect was shown at phase 1 and 2 for the AFO compared to the WalkAide.
Ambrosini et al. 2011 **Italy** **RCT**	CA: ☑ Blinding: assessor ☑ ITT: ☒	35 patients with stroke onset of < 6 months who were able to sit for up to 30 minutes and had sufficient mobility in their joints to enable pedaling.	Subjects were randomized to receive FES-induced cycling training using a motorized cycle-ergometer or placebo FES. An 8-channel stimulator with surface electrodes attached on the quadriceps, hamstrings, gluteus maximum and tibialis anterior of both legs was used. Stimulus intensity was set to induce muscle contraction. 20 treatment sessions, each lasting 25 minutes were provided. In addition, subjects in both groups participated in a standard 3 –hour/day rehabilitation program.	**Primary outcomes:** Motricity Index (MI) leg subscale, gait speed during a 50-meter walking test. **Secondary outcomes:** Trunk Control Test (TCT), Upright Motor Control Test (UMCT) Assessments were conducted before training, after training, and at 3- to 5-month follow-up visits.	Mean ± sd at baseline and follow-up for FES and control groups MI scores: 39 ± 26 to 79 ± 24 vs. 45 ±35 to 63 ±25, p<0.001 Gait speed (m/s): 0.11±0.25 to 0.57±0.34 vs. 0.11±0.24 to 0.48±0.46. p=0.366 TCT: 46±19 to 85±22 vs. 58±20 to 69±17, p<0.001 UMCT: 1.4±1.5 to 4.1±2.1 vs. 1.7±1.9 to 2.9±1.7, p=0.005 Dropouts: FES group n=4, control group n=4
Pomeroy et al. 2006 **UK** **Cochrane review**	N/A	24 RCTs, (888 subjects) of which 12 included interventions and outcomes associated with mobility. Subjects were recruited an average of < 6 months (n=7) and ≥ 6 months	Comparison of internal and external electrode devices that included single channel, multi-channel, patterned multichannel stimulators, EMG-triggered FES, TENS +/- conventional therapy vs. control	**Primary outcomes:** Walking endurance, Timed Up & Go test, Motor Assessment Scale **Secondary outcomes:** Muscle tone, muscle function, gait velocity, cadence, stride length.	Gait speed: SMD= -0.02, 95% CI -0.30 to 0.26, p=ns. Results from 5 trials included Stride length: SMD=0.36, 95% CI -0.93 to 1.63, p=ns. Results from 2 trials included. Dropouts: No reporting in 8 trials. In the remaining trials n=16

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
		(n=3) post stroke. Subjects in 1 trial included subjects with a stroke chronicity of both < and > 6 months. Timing of stroke onset was unclear in 1 trial.	condition (no stimulation, sham stimulation). Intensity and frequency of intervention varied from 20-30 minutes, 2-3x/week, 20-60 minutes 5x/week, with duration of 3 to 12 weeks. Details of the specific magnitudes of the stimulation and treatment protocols are difficult to summarize	Outcomes were assessed before and after treatment. 8-9 week follow-up in one study.	
Burridge et al. 1997 **UK** **RCT**	CA: ☑ Blinding: assessor ☒ ITT: ☒	32 hemiplegic patients who had suffered a single stroke at least 6 months prior to start of study who exhibited single drop foot but with sufficient dorsiflexion of the ankle with stimulation to enable heel strike when walking and without undue comfort. Patients had the ability to stand unsupported and walk 10m; ability to stand from sitting without help and the ability to walk 50m before stroke independently.	Subjects were randomized to receive either FES using the Odstock Dropped Foot Stimulator while receiving a course of physiotherapy (PT) based on the Bobath method or to receive a course of PT alone (control). Subjects in both groups received 10 physiotherapy sessions each lasting 60 minutes.	**Primary outcomes:** Gait speed over 10 m. **Secondary outcome:** Walking efficiency assessed using the Physiological Cost Index (PCI) Assessments were conducted at baseline, between 4 and 5 weeks and between 12 and 13 weeks.	Mean ± sd at baseline and follow-up for FES and control groups Gait speed (m/s): 0.68±0.49 to 0.77±0.43 vs. 0.48±0.25 to 0.51±0.27. p=0.044 PCI (beats/min per m/min): 0.59±0.49 to 0.54±0.56 vs. 1.03±0.67 to 1.00±0.69. p=0.083 Dropouts: n=1

Neuromuscular Electrical Stimulation

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Wang et al.	CA: ☒	72 patients with sub-	Group 1 received sensory	**Primary Outcomes:**	Group 3 did significantly better than group 1, group

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
2016 **China** **RCT**	Blinding: Assessor ☑ ITT: ☒	acute post-stroke hemiplegia and plantar flexor spasticity	threshold-NMES, Group 2 received motor threshold-NMES, Group 3 received full-movement NMES, and the control group received conventional rehabilitation. Sessions were 30min, 2x/d, 5x/wk for 4wk.	Composite Spasticity Scale; Ankle Active Dorsiflexion Score; Timed Up and Go Test (TUG). Outcomes were evaluated pre-treatment, post-treatment, and at a 2wk follow-up.	2 and the control group in the composite spasticity scale and Ankle Active Dorsiflexion Score ($p<0.05$) at post-treatment. There were no significant differences between groups on the TUG at post-treatment.
Knutson et al. 2013 **USA** **RCT**	CA: ☒ Blinding: ☑ Assessor ITT: ☒(1)	24 stroke patients (onset ≥6 months) with footdrop during ambulation and less than normal ankle dorsiflexion strength (Medical Research Council Scale score of ≤4/5) completed the study.	Patients were randomized into 6 weeks of treatment in either the contralaterally controlled neuromuscular electrical stimulation (CCNMES) group (n=12) or the cyclic neuromuscular electrical stimulation (NMES) group (n=12). The assigned stimulator was used at home and both groups also received conventional post-stroke gait training from a physical therapist in lab sessions.	**Primary Outcomes:** FMA-LE **Secondary Outcomes:** modified Emory Functional Ambulation Profile, and gait velocity.	There were no significant differences between groups in the outcome trajectories for any of the measures. When the data after treatment from both groups was pooled, there were significant changes shown for the modified Emory Functional Ambulation Profile ($p=0.01$) and the FMA-LE ($p<0.01$).

Glossary

6MWT = 6 Minute Walk Test	ABC scale = Activities-specific Balance Confidence Scale
BBS = Berg Balance Scale	FMA-LE = Fugl Meyer Assessment – Lower extremity motor subscale
ROM = Range of Motion	STREAM = Stroke Rehabilitation Assessment of Movement
OR = Odds Ratio	ADL = Activity of Daily Living
CA = Concealed Allocation	CI = Confidence Interval
IQR = Interquartile Range	ITT = Intention to treat
N/A = Not Assessed	RCT= Randomized Controlled Trial
RD= risk difference	SMD = Standardized Mean Difference
WMD = weighted mean difference	

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