Question 33 evidence tables

Question 33: Does treadmill training (+/- body weight support) improve outcomes and how should it be delivered?

NB Any discrepancies between reviewers in evidence quality and comment were discussed at the corresponding evidence review meeting

OUES = oxygen uptake efficiency slope, HR = heart rate, FMA = Fugl Myer Assessment Scale, MAL = Motor activity log, WMFT = Wolf Motor function Test, 9HPT = 9-hole peg test, B&BT = Box and block test, MAS = Modified Ashworth scale, UL = upper limb, 6MWT = 6 minute walk test, SR = systematic review, MA = meta-analysis, RCT = randomised controlled trial, IPDMA = individual patient data meta-analysis, MDT = multidisciplinary team, PICO = patient/population, intervention, comparison and outcomes, OR = odds ratio, CI = confidence interval, QoL = quality of life, ADL = activities of daily living, OR = odds ratio, RR = relative risk, aOR = adjusted odds ratio, cOR = crude odds ratio, CI = confidence interval, RoB = risk of bias, I2 = heterogeneity statistic.

Ref ID	Source	Setting, design and subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
178	S. Abbasian & M. Rastegar Mm (2018). Is the Intensity or Duration of Treadmill Training Important for Stroke Patients? A Meta-Analysis. *Journal of Stroke & Cerebrovascular Diseases,* 27:1 32-43	Meta-analysis. No details of setting, time since stroke, stroke severity, age etc provided. Sample size of intervention and control groups not reported	Included studies were divided into 4 subgroups: i)Low intensity (≤.6m/s) – low volume/duration (≤ 500 min) ii)Low intensity, high volume/duration (> 500min) iii)High intensity (>.6m/s), low volume/duration iv)High intensity, high volume/duration	SMD (and 95% CI) for recovery of motor function in each of the 4 subgroups – in text states *'recovery of motor function was also measured by common tests and other motor behaviour tests'* but not stipulated which or when measures were taken.	Included: 19 studies (low intensity-low volume), 25 studies (low intensity-high volume), 15 studies (high intensity-low volume, 23 studies high intensity-high volume) They concluded that treadmill training regardless of intensity and volume has a positive impact on recovery of motor function. Low intensity-high volume had better motor function recovery than the other subgroups. Given concerns re quality of this analysis and lack of detail provided this should be interpreted with caution.	- Low Quality Only searched pubmed, only 1 author summarised studies. Not clear how scientific quality of included studies was established. Significant heterogeneity in pooled studies 75.3%, 78.4% and 74.8. Only one pooled group (high intensity, low volume had heterogeneity below 50% (40.6%)

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178	S. Abbasian & M. Rastegar Mm (2018). Is the Intensity or Duration of Treadmill Training Important for Stroke Patients? A Meta-Analysis. *Journal of Stroke & Cerebrovascular Diseases,* 27:1 32-43	Meta-Analysis; 33 trials with patients after stroke, number of participants not reported. No reporting of phase/severity of stroke.	Treadmill training, studies sorted into three groups; Low intensity-low volume Low intensity-high volume High intensity-low volume High intensity-high volume	Only studies with functional tests (peak O2 consumption, Fugl-Meyer, functional ambulation category, Rivermead Mobility Index, Walking Impairment Questionnaire and Berg Balance Scale) were included	Low intensity (≤6 m/s)-high volume (>500 minutes) treadmill training had the highest standard mean difference as measured by motor function tests.	– High risk of bias; not clear how many people selected studies, only one author extracted data. Possible likelihood of publication bias or conflict of interests not reported.
179	S. G. Brauer et al. (2021). High-intensity treadmill training and self-management for stroke patients undergoing rehabilitation: a feasibility study. *Pilot and Feasibility Studies,* 7:1 215	Higher performing stroke patients	Higher performing stroke patients	Activity: Walking speed, distance Societal walking Impairments VO_2 max		Low quality
179	S. G. Brauer et al. (2021). High-intensity treadmill training and self-management for stroke patients undergoing rehabilitation: a feasibility study. *Pilot and Feasibility Studies,* 7:1 215	phase I, single-group, pre-post intervention feasibility study. 40 stroke survivors from two public inpatient rehab units in Australia. <2mths post stroke Able to walk 10 m indep able to follow 3-stage commands.	high-intensity treadmill and self-management program for up to 30 min, 3xweek, for 8 weeks - up to 30 min treadmill at an intensity 40-60% HRR. self-management approach 5-10min	amount of physical activity, walking ability, and cardiorespiratory fitness collected re-training (week 0), post-training (week 8), and follow-up (week 26).	Completing 10 (SD 6) sessions, 94% at the specified intensity, 8/52: 2749 steps/day (95% CI 933 to 4564) more physical activity than at week 0. Walking distance increased by 110 m (95% CI 23 to 196), walking speed by 0.24 m/s (95% CI 0.05 to 0.42), and VO2 peak by 0.29 ml/kg/min (95%	**N/A** Feasibility study - no checklist. Reasonable study, but no a priori feasibility criteria. Only recruited 2/3-of planned sample, successful in recruiting 1/3 of pts

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			based on Health Action Process Approach (HAPA) [29] and Goal Setting Theory		CI 0.03 to 0.56). 26/52, increases in physical activity, walking distance and speed, and cardiorespiratory fitness were maintained.	Difficulties were noted with completing the required number and duration of treadmill sessions particularly during transition to home, as well as recording self-management and measuring O2 uptake.
180	E. Chumacero-Polanco et al. (2018). Body-weight-supported treadmill walking training improves functional walking and balance in stroke survivors at any poststroke stage: A systematic review. *Critical Reviews in Physical and Rehabilitation Medicine,* 30:4 303-322	Systematic review, no MA. 19 studies PEDRO for quality score	body-weight-supported treadmill walking training (BWS-TWT). BWS-TWT with no other complementary task was considered in this review (not clear what comparator included to me)	Pre- and a postintervention measurements of walking speed (WS), cadence, Berg balance scale (BBS), distance in the six-minute walking test (6minWT), and time in the timed-up-and-go test (TUGT) were analyzed.	No MA. After performing BWS-TWT, acute patients increased WS by 16.6%, BBS score by 98.7%, and distance in the 6minWT by 42.3%. Subacute patients increased WS by 84%, cadence by 32.23%, and score in the BBS by 57.6%. Chronic patients increased WS by 39.07%, cadence by 48.16%, BBS score by 5.07%, and distance in the 6minWT by 22.9%; TUGT time decreased by 3.8 s.	- Low quality- Limited search terms/ details Unclear who/ if more than 1 did study selection/ extraction, no meta-analysis and dubious pooling of data
180	E. Chumacero-Polanco et al. (2018). Body-weight-supported treadmill walking training improves functional walking and balance in stroke survivors at any poststroke stage: A	Systematic review	Body weight supported treadmill walking training The searches were not carried out on AMED and CINAHL. Limited to adult patients with no-cognitive disturbance.	Impairments BBS Activity Walking seped Cadence Walking distance TUG	Walking speed improved (results were significant i.e. 95% CI did not include zero) but the increase was marginal (highest speed 0.338 in acute patients and lowest was 0.191 in chronic) Not sure benefit of measuring cadence but the data showed	

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	systematic review. *Critical Reviews in Physical and Rehabilitation Medicine,* 30:4 303-322		19 papers selected		improvements that were significant (95% CI of difference did not include a zero). Chronic patients showed greater improvement. BBS score improved 955 CI did not include a zero difference were highest in acute. (one chronic study showed no difference) Walking distance improved following treatment – difference was significant 95% CI did not include a zero. Improvements in acute patients were better. (there was one NS study)	
181	K. A. Danks et al. (2016). Combining Fast-Walking Training and a Step Activity Monitoring Program to Improve Daily Walking Activity After Stroke: A Preliminary Study. *Archives of Physical Medicine and Rehabilitation,* 97:9 S185-S193	37 Chronic stroke patients from community studies in university hospital lab set up -able to walk 5 minutes at a self-selected pace on the treadmill -able to walk outside the home prior to stroke, -walked less than 10,000 steps per day, -were able to communicate with the investigators.	Fast treadmill walking and step activity monitoring both lead to improved walking speed/endurance BUT not to recommended levels. Therefore, this trial compared FAST + SAM vs FAST alone. FAST = walking training at their fastest possible speed on the treadmill (30 minutes) and over ground 3 times/week for 12 weeks.	Primary - steps/day Secondary – · time walking/day · walking speed · six minute walk test distance (6MWT).	There was a significant effect of time for both groups with all outcomes improving from pre to post-training, (all $p<0.05$). BUT when comparing changes, only 6MWT change was significantly greater in FAST+SAM compared to FAST ($p=0.018$)	**+**

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			SAM = daily step, goal setting, and identification of barriers to activity and strategies to overcome barriers			
181	K. A. Danks et al. (2016). Combining Fast-Walking Training and a Step Activity Monitoring Program to Improve Daily Walking Activity After Stroke: A Preliminary Study. *Archives of Physical Medicine and Rehabilitation,* 97:9 S185-S193	RCT 37 individuals greater than 6 months post-stroke, able to walk without assistance, able to walk 5 min on treadmill, were able to walk outside the home prior to stroke, walked less than 10,000 steps per day,	Fast Walking alone (FAST) group or the Fast Walking plus Step Activity Monitoring Program (FAST+SAM) group. 3 x week for 12/52 (36 sessions) FAST = fastest possible speed on the treadmill (30 minutes) and over ground SAM = daily step monitoring with a StepWatch Activity monitor, goal setting, and identification of barriers to activity and strategies to overcome barriers.	Daily step activity metrics (steps/day, time walking/day), walking speed and 6MWT.	Significant effect of time for both groups with all outcomes improving from pre to post-training, (all $p<0.05$). The FAST+SAM was superior to FAST for 6MWT ($p=0.018$), with a larger increase in the FAST+SAM group. The interventions had differential effectiveness based on baseline step activity. Most effective in persons with chronic stroke that have initial low levels of walking endurance and activity.	- Low quality (preliminary trial) Unclear how randomised No sample size calculation. Groups not the same pre-trial (time since stroke, and fugl-meyer- not statistically tested)
182	A. L. Leddy et al. (2016). Alterations in Aerobic Exercise Performance and Gait Economy Following High-Intensity Dynamic	Sub-acute: 1-6 months post stroke. Participants required to walk 10m overground with min or mod assist of therapist but at speeds of ≤0.9m/s at self-	0-weeks, up to 40 x 1hr sessions. High intensity (70-80% HR reserve) variable stepping training intervention (n=21).	This is a secondary analysis of 2 studies (pilot experimental study (n=9) and RCT - control =12, intervention=12) reporting on impairments.	Significant improvements observed in VO2submax, less consistent decreases in O2cost individually and these were not different to conventional therapy.	**+** Original RCT quality is acceptable. Data included in this secondary analysis also includes data from non-

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	Stepping Training in Persons With Subacute Stroke. *Journal of neurologic physical therapy : JNPT,* 40:4 239-248	selected speeds with assistive devices and below knee bracing as needed. Recruited from inpatient and outpatient clinics Authors note that in people with subacute stroke many training strategies focus on non-stepping tasks with inconsistent locomotor improvements and most training does not focus on achieving higher aerobic intensities.	Training sessions were divided between treadmill, overground and stair climbing activities with focus on stepping amount and aerobic intensity. Initial 2 weeks all training performed on the treadmill at highest speeds tolerated. Training over remaining sessions was divided into 10 min increments between speed dependent treadmill training, skill dependent treadmill training, overground training and stair climbing. Control intervention: standard physio interventions consistent with usual clinical practice. The number of conventional therapy sessions was supplemented in an effort to achieve 40 sessions over 10 weeks.	Original RCT reports on activities as well. Outcomes measured at baseline, post training and 2-3 month follow-up. Specific measures: Changes in VO2 submax and O2cost (gait economy) at fastest possible treadmill speeds and peak speeds at baseline testing. OUES (oxygen uptake efficiency slope) provides the ability to assess aerobic capacity without the need for maximal effort during testing so can be used with individuals who can't achieve maximal exertion.	Large differences observed in mean steps/session and mean peak HR/session in interventions vs control group.	randomized pilot (n=9) experimental study.

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182	A. L. Leddy et al. (2016). Alterations in Aerobic Exercise Performance and Gait Economy Following High-Intensity Dynamic Stepping Training in Persons With Subacute Stroke. *Journal of neurologic physical therapy : JNPT,* 40:4 239-248	Study (n=43) uses participants from both a previous pilot study and RCT (secondary analysis). Single-blind only 23/43 of participants, others non-blinded. Participants were 18-75 years, sub-acute stroke, ability to walk (with moderate assistance to independent with devices)	Dose matched (40 hours over 10 weeks) either conventional interventions (not clear) or experimental intervention treadmill training, overground training, stairclimbing.	Peak oxygen consumption and metabolic capacity and economy	Improvements in peak rate of oxygen consumption for intervention group	_ Over half of participants were unblinded to assessor No details on randomisation process Different stepping interventions used – not all treadmill
183	L. Luo et al. (2020). Effect of high-intensity exercise on cardiorespiratory fitness in stroke survivors: A systematic review and meta-analysis. *Annals of Physical and Rehabilitation Medicine,* 63:1 59-68	SR of 17 studies of effects of HIT (3) and HIIT(14) (via treadmill (11) or fixed bike (6)) on cardiorespiratory fitness, measured by VO2-peak, 6MWT. Subjects – stroke <6mo (3), >6mo(14) who were independent in ambulation with or without a walking aid (n = 15)	HIT (3) and HIIT(14) (via treadmill (11) or fixed bike (6)) Mostly 30-40 mins (14) Mostly <4 days/week Varied length <8wks (3), 8-12 wks (7), >12 wks (7) Intensity: 60% to 85% HRR or VO2 peak, control group performed 28 to 45 min of aerobic exercise (i.e. treadmill walking, stretching exercise, conventional physical therapy) at planned intensities < 50% HRR or VO2 peak.	VO2-peak, 6MinWT, 10MetreWT	Clear benefit on VO2-peak and 6MWT Not on 10MWT	++

Ref ID	Source	Setting, design and subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
183	L. Luo et al. (2020). Effect of high-intensity exercise on cardiorespiratory fitness in stroke survivors: A systematic review and meta-analysis. *Annals of Physical and Rehabilitation Medicine,* 63:1 59-68	Systematic review specifically investigating different intensities and high-intensity exercise programmes.	Any chronicity post stroke. Intensity had to be at least 60%HRR or VO2 peak, at least 70%max HR, 14 BORG in the treatment group. At least one outcome measure had to assess cardiovascular fitness. High intensity training in 14 studies and High intensity interval training in 3 studies. Eleven used treadmill training and six used cycle ergometer.	17 studies identified with inclusion criteria in 15 trials being that patient must be independent in ambulation either with or without aid. Three trials included those within 6 months and 14 at least six months post stroke. VO2 Peak (15 studies) 6MWT (14 studies) 10MWT (7 studies) Adverse events (16 studies)	VO2 Peak – MD=0.56 (0.4 to 0.72) 6MWT – MD=0.26 (0.1 to 0.4) 10MWT – MD=0.33 (-0.26 to 0.92) Adverse events – 6 studies reported no adverse events at all and 10 reported no SAEs. 5 reported adverse events with pooled analysis indicating no significant difference in falls (OR=1.4(CI=0.7to2.85)), pain (OR=3.3(CI=0.8to13.5)), Skin injuries(OR=1.1(CI=0.3to3.9)),	Excellent methodological quality of this systematic review.
184	J. Mehrholz et al. (2018). The Improvement of Walking Ability Following Stroke. *Deutsches Arzteblatt International,* 115:39 639-645	Setting: Systematic review of RCTs with network meta-analysis. 95 RCT (20% cross-over trials) were selected. Trial size =5- 282 patients (mean: 26 patients). Subjects: 4458 post-stroke patients. Mean time since stroke = 3 days to 8 years. Included patients with any level of severity/ disability	Compared to: no gait training, conventional gait training (reference category/control), treadmill +/- BWS support, treadmill +/- speed paradigm, and electro-mechanically assisted (robotic) gait training with end-effector or exoskeleton device	Primary endpoint; gait velocity. Secondary: ability to walk, maximum walking distance, and gait stability.	End-effector electro-mechanical gait training significantly improved gait speed (MD= 0.16 m/s; 95%CI0.04- 0.28). End effector and TTwBWS improved endurance (MD = 47 m, [4; 90], and MD = 38 m, [4; 72], respectively). All interventions were safe.	**++** Very classy analysis

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184	J. Mehrholz et al. (2018). The Improvement of Walking Ability Following Stroke. *Deutsches Arzteblatt International,* 115:39 639-645	Systematic review using network meta-analysis of published and unpublished studies including parallel group design & randomised cross-over trials. A total of 95 trials n=4458.(published 1992 -2016) Mean age range 43 to 76 years . Time from stroke onset ranged 3 days to 8 years	Comparisons: No walking training. Conventional training TT with / without body weight support . TT training with/ without walking speed paradigm. Training with end effector device or exoskeleton .	Walking speed(primary outcome)Measured in m/s. (75 trails n=3614) No specified outcome measure : Secondary outcome. Walking distance : 6MWT (44 trials n=2509) Walking ability(22 trials 1517 patients) Safety (57 trials n=2889)	End Effector training showed greater improvements in walking speed, MD 0.16 m/s . End effector training and TT with BWS increased compared with conventional walking rehabilitation.	**+** One person selected studies Not all studies included duration of intervention.
185	J. Mehrholz et al. (2017). Treadmill training and body weight support for walking after stroke. *Cochrane Database of Systematic Reviews,* 8: CD002840		Cochrane meta-analysis of body-weight supported walking for stroke. Aimed to assess whether treadmill training and body weight support can individually, or in combination, improve walking when assessed against other forms of training, placebo or no treatment.	Dichotomised walking ability (see column to right) was used to group trials. Primary outcomes of ability to walk Dichotomised – Dependent versus independent. Independent meant able to walk indoors without assistance or supervision. Continuous variables – 6 metre timed walk or 10m timed walk or 6MWT Secondary outcomes included participation and quality of life outcomes.	56 studies included in the analysis. Treadmill (with or without body weight support) versus other intervention Walking Speed m/s – Overall – 0.06 (0.03to0.09) *Subgroup* Initially dependent – -0.01 (-0.06to0.03) Initial Independent – 0.08 (0.05to0.12) Endurance M – Overall – 5.1 (-23.4to13.2) *Subgroup* Initially dependent – 19.7 (6.6to32.8) Initial Independent – 14.2 (2.9to25.5) Treadmill and Body weight support Walking Speed m/s – Overall – 0.07 (0.02to0.11) *Subgroup* Initially dependent –	Excellent study and extremely comprehensive.

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					-0.01 (-0.06to0.03) Initial Independent – 0.11 (0.06to0.17) Endurance M – Overall – 20.8 (0.4to41.1) *Subgroup* Initially dependent – 19.7 (6.6to32.8) Initial Independent – 36.9 (11.1to62.7) Independent only - CHRONICITY – <3months post stroke speed m/s = 0.15 (0.07to0.23) >3months post stroke = 0.06 (0.02 to 0.1) Distance M = <3months post stroke = 48.6 (24to73) >3months post stroke = 10.7 (-0.3 to 21.7) INTENSITY OF TRAINING speed m/s = Five times/week or more = 0.04 (0.02 to 0.07). Three to four times = 0.08 (0.03to0.12) Less than three times a week = 0.02 (-0.06 to 0.1) Distance M Five times/week or more = 27.3 (5.4 to 49.1). Three to four times = 12.4 (-3to28) Less than three times a week = -15 (-133.3 to 103.3)	

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					DURATION OF TRAINING – Speed m/s Less than 4 weeks = 0.08 (0.01to 0.14) More than 4 weeks 0.05 (0.01 to 0.09) Four weeks only – 0.13 (0.07 to 0.19) Distance M Less than 4 weeks = 9.8 (-15.5to35.1) More than 4 weeks 19.1 (2.3to35.9) Four weeks only – 29.4 (-4.8to63.5)	
185	J. Mehrholz et al. (2017). Treadmill training and body weight support for walking after stroke. *Cochrane Database of Systematic Reviews,* 8: CD002840	Cochrane SR 56 trials with 3105 participants (av age 60). -Both inpatient and outpatient settings	Treadmill training with/without body weight support	Walking speed Walking endurance	Overall, the use of treadmill training with/without BWS -did not increase the chances of walking independently compared with other physiotherapy interventions leads to small increase in walking velocity (0.06m/s) and walking endurance (14.19 m) in the short term and mostly for people who were independent in gait at the start (0.08m/s). But, the use of treadmill training with body weight did not help speed or endurance. Ideal frequencies, durations, or intensities unclear	**++** for the review itself (well conducted) The quality of evidence for treadmill training for walking after stroke was low to moderate. It was moderate for walking speed and walking endurance at the end of treatment and low for improving the ability to walk independently.

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186	L. R. Nascimento et al. (2021). Treadmill walking improves walking speed and distance in ambulatory people after stroke and is not inferior to overground walking: a systematic review. *Journal of Physiotherapy,* 67:2 95-104	Setting: SR and meta-analysis of RCTs. Quality assessed with Pedro. 16 trials. All measured speed, 12 measured distance and 4 participation. For 8, control =no/ non-walking intervention and for 9 = O-G walking. Subjects: 713 ambulatory stroke survivors. Mean ages = 49-74 years. Three trials were acute/ sub-acute stage (<6/12) and 12 chronic (>6 months) 1 trial included both.	Mechanically assisted walking (treadmill or gait trainer) without body weight support. Compared with no/non-walking intervention; or over-ground walking	Walking speed, walking distance and participation.	Mean PEDro = 6.3 (4-8). TT imp walking speed by 0.13 m/s (95%CI 0.08-0.19) and distance by 46 m (95%CI 24-68). Effects largely maintained. TT had a similar or better effect on walking speed (MD 0.07 m/s, 95%CI 0.00-0.13) and distance (MD 18 m, 95%CI 1-36) than O-G walking.	++
186	L. R. Nascimento et al. (2021). Treadmill walking improves walking speed and distance in ambulatory people after stroke and is not inferior to overground walking: a systematic review. *Journal of Physiotherapy,* 67:2 95-104	Systematic review of RCTS with meta analysis. 16 trials between 2003- 2020 with 713 participants. Participants were ambulatory defined as walking speed of at least 0.2m/s , a Functional Ambulation Category >= 3, with or without walking aids. 3 trials included participants in acute phase defined as <6mths & 12 trials > 6mths . One trial included acute and chronic participants .	8 trials (n=422) compared mechanically assisted walking with no/non walking intervention . Nine trials (n=351) compared mechanically assisted walking with overground walking Mechanically assisted walking provided by treadmill in 14 trials & gait trainer or exoskeleton in 2 trials.	Walking speed : measured by 10MWT. Walking distance measured as 6MWT Participation measured by Stroke Impact Scale / Sickness Impact Profile (reported in 4 trials)	TT compared with no/non walking intervention: Walking speed: 6 trials (n=266) . increase by 0.13m/s Walking distance: (pooled 6 trials n=235) increased by 46m . Participation : (3 trails n=156) May have beneficial effect TT compared with overground walking: Walking speed : (6 trials n=196) Same or slightly better . 0.07 m/s	+ Moderate quality evidence Authors suggest amount of practice is key and not specifically treadmill training.

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		Participants aged >18, with mean age 49 to 74.	Only forward walking & without body support included. (body weight support included for familiarisation purposes supporting no more than 10% of body weight) Control group matched practice amounts with experimental group. Participants undertook training 20 to 60 mins , 2 to 5 times /week for average 10 weeks.		Walking distance (6 trials n=210) 18m .Similar or slightly better Participation(1 trial n=22) : similar effects	
187	F. Nindorera et al. (2021). Effectiveness of walking training on balance, motor functions, activity, participation and quality of life in people with chronic stroke: a systematic review with meta-analysis and meta-regression of recent randomized controlled trials. *Disability & Rehabilitation,* : 01-Dec	Systematic review and MA; N=15, n=659 Chronic stroke participants	'Walking training' all interventions split into the following categories; Treadmill training Overground training Robot assisted training Aquatic training	Balance, walking function, activity, community participation, quality of life	Treadmill-walking training can improve balance and motor function in the chronic stroke phase. Indicates that treadmill and overground walking training programs are effective for improving, balance motor functioning, walking speed, endurance, participation and quality of life in people with chronic stroke	**++** Well conducted, high quality.

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187	F. Nindorera et al. (2021). Effectiveness of walking training on balance, motor functions, activity, participation and quality of life in people with chronic stroke: a systematic review with meta-analysis and meta-regression of recent randomized controlled trials. *Disability & Rehabilitation,* : 01-Dec	Setting: Systematic review and meta-analysis of 15 RCTs; TT=4; over-ground= 7; robotics=3; and aquatic training= 1.Quality assessed with Cochrane RoB. Subjects: Chronic stroke (>6/12). 653 participants (324 in active groups and 329 controls). Mean ages 50 to 76 years.	Any form of walk training inc recreational or 'real world' as well as rehabilitative walk training (e.g. robotics, treadmill, BWS, aquatic pool floor walking). Compared with any type of active or non-active control. The median duration of sessions = 30 min, 3 x/ week for 8 weeks.	Impairments (balance, motor impairment), activity (endurance and speed, functional independence), community participation, +/or QoL.	Quality=3-9. TT improved balance and motor impairment (SMD=0.70 [0.02,1.37] p=0.04) and 0.56 [0.15, 0.96] p=0.007 respectively. O-G walking improved endurance (SMD=0.38[0.16, 0.59] p<0.001), speed (MD=0.12[0.0, 0.18] p<0.001), participation (SMD=0.35[0.02, 0.68] p=0.04) and QoL (SMD=0.46[0.12, 0.80] p=0.008). Meta-regression of effect of training time was unclear.	++
188	A. D. Stookey et al. (2015). Higher Treadmill Training Intensity to Address Functional Aerobic Impairment after Stroke. *Journal of Stroke and Cerebrovascular Diseases,* 24:11 2539-2546	RCT n=51 randomized with stratification according to age and baseline walking capacity. Chronic hemiparetic stroke patients (>6 months) who had completed all conventional PT, mild-mod hemiparetic gait and demonstrated preserved capacity for ambulation with an assistive device. All were sedentary with no prior participation in aerobic training programs.	Higher intensity treadmill training (HI-TM, 80% Heart Rate Reserve- HRR) v lower intensity training (LO-TM, 50% HRR) 6mth protocol, not clear detail re: dose/ frequency. LO-TM group train for a longer time per session than HI-TM participants, so groups more comparable on caloric expenditure.	Change in VO2 peak, 6-minute walk distance (6MWD), 30-ft walk times (30WT) and 48-hr step counts (48SC).	HI-TM participants (N=18) had significantly greater gains in VO2 peak (+34%) than LO-TM participants (N=16) (+5%) across the 6 month intervention period (p=0.001, group time interaction). Conversely, there was no statistical difference between groups in the changes observed for 6MWD, 30WT, or 48SC.	- Drop outs 6/24 & 11/27 No ITT analysis Assessor not always blinded

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188	A. D. Stookey et al. (2015). Higher Treadmill Training Intensity to Address Functional Aerobic Impairment after Stroke. *Journal of Stroke and Cerebrovascular Diseases,* 24:11 2539-2546	Setting: SR of RCT, quality assed with PEDRO. Narrative analysis. 8 trials with 30-44 participants (active group = 10-20) and controls (11-24). Subject: 275 Chronic strokes. Mean age = 54.8 years and mean time since stroke = 6.3 to 70 months..	Treadmill training (NB all walked at velocities > self-determined, comfortable gait speeds) compared to conventional therapy (n=2); or compared different ways of delivering TT (n=2 eyes open/closed, split belt TT) or TT compared to TT + adjunct (n= 4, FES, dual task, Nordic poles) Dose of Tx = At least 30 mins, 2-5x/week for 4-12 weeks.	Balance – Berg Balance Scale and assorted instrumented measures	Moderate –good level evidence that TT improved balance at least as much, if not more than conventional treatment. Effects of 'adjuncts' unclear.	**+** Narrative analysis. Very mixed controls and method of delivering TT
189	Z. Tally et al. (2017). The efficacy of treadmill training on balance dysfunction in individuals with chronic stroke: a systematic review. *Topics in Stroke Rehabilitation,* 24:7 539-546	Systematic Review ;Eight trials, conducted between 2011 & 2016 . Participants recruited from hospital, rehab centres and advertisements. 275 chronic stroke survivors (>= 6 months post stroke ranging from 6.3 to 70mths), Participants aged 18 and over . Mean age 54.8 years .All subjects could perform independent ambulation from 6 to 15 metres.	Non body weight supported Treadmill training (TT) compared with control . 2 studies compared TT with conventional physical therapy 6 studies investigated TT in conjunction with FES,visual deprivation , rotational TT, dual tasking & Nordic walking.	Deficits in balance/postural control or instability. -BBS Berg Balance Scale (6 studies) -LOS :measures of Limits of Stability (2 studies) -Sway velocity : Eyes open -Sway velocity :-Eyes closed	Unknown if TT specifically improves balance parameters. Authors surmise intensity of practice is a key factor more than specificity of training .	Limitations across studies: -Variation in protocols -Different treatment approached -Variable frequency and intensity -Limited generalisation

Ref ID	Source	Setting, design and subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
			Intervention period varied from 4 weeks to 12 weeks . Frequency delivered minimum of twice weekly to 5 times per week. Sessions ranged 15mins up to 50mins			
189	Z. Tally et al. (2017). The efficacy of treadmill training on balance dysfunction in individuals with chronic stroke: a systematic review. *Topics in Stroke Rehabilitation,* 24:7 539-546	A systematic review – 8 studies included (275 participants) Chronic population (6mths +). Participants recruited from local hospitals, inpt rehab, and local newspapers. Mean age – 54.8yrs Mean time since stroke – 6.3 to 70 months.	Varied but all included TT. 2 studies compared TT to conventional physio interventions. 6 studies investigated TT in conjunction with other intervention eg FES, visual deprivation. Intervention period duration 4-12 weeks. Frequency of intervention – twice weekly to 5 times/week. Length of session ranged from 15-50 min.	6 studies used BBS. 2 used a combination of directional postural sway and limits of stability assessments. Only 1 study repeated balance measures at one-month follow-up after training had ceased.	While each selected study varied in its implementation of TT this SR review found moderate evidence to support the use of TT for balance dysfunction in people with chronic stroke.	**++**
190	M. Balinski & S. Madhavan (9000). 'Magic' number of treadmill sessions needed to achieve	Treadmill training alone without additional interventions. Study aimed to investigate what the optimal number of sessions using a treadmill was.	Chronicity – had to be over six months post stroke. Measure had to include gait speed.	19 treatment groups included in the review. Six deemed to be good quality.	Number of treadmill training sessions ranged from 1 to 78. 15 groups had significant improvement in speed from baseline to follow-up.	Questionable inclusion criteria was reflected in studies included – single session of treadmill training. Appears the review included non-

Ref ID	Source	Setting, design and subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
	meaningful change in gait speed post stroke: a systematic review. *American Journal of Physical Medicine & Rehabilitation,* :		Treadmill training protocols ranged from 10 to 50 minutes per session, with frequency of 1 to 5 times a week. The length of intervention lasted one week to 26 weeks.	Change in gait speed was calculated based on data from 10MWT, 2MWT straight-away-walk, get up and go test and from GAITRite data. Unclear how gait speed was calculated from GUAG test. Used Spearman's rank correlation to test the association between change in gait speed and the number of treadmill training sessions	Gait speed m/s = MD=0.12 (0 TO 0.56). Those who participated in 12-36 sessions of treadmill training gained the most benefit. Longer training sessions rather than number of training sessions appeared to be more important.	randomised controlled trials but does not state this. Only one person extracted data from each study. Used PEDro to assess for quality.
190	M. Balinski & S. Madhavan (9000). 'Magic' number of treadmill sessions needed to achieve meaningful change in gait speed post stroke: a systematic review. *American Journal of Physical Medicine & Rehabilitation,* :	Systematic Review Chronic stroke (more than 6 months post event). 17 articles met inclusion criteria. Total pooled sample size of all participants was 509 and total pooled sample size of participants for TT groups was 289. Studies were excluded if participant was receiving concurrent physio or other intervention.	TT only. Training duration ranged from 10-50mins per session, frequency ranged from 1-5 times per week and total intervention length ranged from 1-26 weeks. Intensity also varied significantly from high intensity interval treadmill training to progressive TT programmes that modified either total training duration time,	Gait speed needed to be included in the outcome measures for inclusion in the review. Measures used 10MWT, 2MWT, Straight away walk (SAW) or GAITRite. All changes in gait speed were converted to m/s to allow for comparison between studies. Selected studies were stratified into 1 of 2 categories – those that achieved the MCID change in gait speed (0.1m/s) – Responders and those	18 of 19 TT intervention grps had improvement in gait speed after the intervention period however this was not necessarily clinically or statistically significant. Studies that performed a moderate number of sessions (average 30.5) were most successful in achieving the MCID for change in gait speed. Sessions were performed within a period of 10 weeks and averaged 40 mins/session. Also noted was a longer duration of training within each session was associated	**++**

Ref ID	Source	Setting, design and subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
			speed or intensity (based on heart rate reserve or MHR) on a week to week basis. Number of sessions ranged from 1 to 78	that did not achieve the MCID – Non responders	with a positive change in gait speed. When comparing responders and non-responders – the biggest difference observed was in the number of training sessions (30.5 vs 20), length of training (total weeks 10 wks vs 6 wks) and total target duration (in minutes – 7 more minutes) of each TT session.	