Effect of Exercise Interventions on Health-Related Quality of Life After Stroke and Transient Ischemic Attack: A Systematic Review and Meta-Analysis.

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SUPPLEMENTARY MATERIALS

Expanded methods and materials I. Searching Strategy (PUBMED)

Searching Strategy (PUBMED)			
#	**Searches**	**Result**	**Search type**
1	Search **(((((((((Stroke) OR Ischaemic stroke) OR Brain ischaemia) OR Cerebrovascular Disorders) OR Cerebrovascular accident) OR Infract) OR Infarction) OR cerebral infarction) OR (National Institute of Neurological Disorders and Stroke)) OR middle cerebral artery infarction**	768119	Advanced
2	Search **(((haemorrhagic stroke) OR Hemorrhagic stroke) OR Intracranial haemorrhage) OR intracranial hemorrhage**	91171	Advanced
3	Search **(((transient ischaemic attack) OR mini stroke) OR TIA) OR non disabling stroke**	32160	Advanced
4	1 or 2 or 3	776401	Advanced
5	Search **((((((((((exercise) OR physical activity) OR aerobic) OR resistance) OR training) OR circuit training) OR exercise) OR running) OR cycling) OR weights) OR exercise therapy**	3373504	Advanced
6	Search **(rehabilitation) OR neurological rehabilitation**	612826	Advanced
7	5 or 6	3786492	Advanced
8	Search **((Health related quality of life) OR quality of life) OR health outcomes**	752089	Advanced
9	Search **((randomised controlled trial) OR RCT) OR randomised trial**	671847	Advanced
10	4 and 7 and 8 and 9	2304	Advanced
11	**limit 10 to english language**	2239	Advanced

Expanded methods and materials II. Calculation of prediction intervals (PI) for primary analysis of the effects of exercise on overall HRQoL.

Prediction interval = summary effect size ± two-tailed t-value$_{0.02/2,\ k-1}$ x SD_{PI}

Where the:

- Summary effect size is **-0.23** SMD
- The two-tailed t-value$_{0.02/2,\ k-1}$ is **2.39787507**
- The SD_{pI}, or SD of the PI is calculated by the : $\sqrt{(\tau^2 + SE^2)}$
    - Where τ is the heterogeneity statistic of the random effects model = **0.09**
    - Where the Se is the standard error, estimated by dividing the difference in the 95% CI by 3.92 = **-0.0842**
    - Thus the SD_{PI} = **0.1233**

Therefore the prediction interval around the summary effect size is **± 0.2956**

= -0.23 SMD, 95% PI -0.53 to 0.06

Table I. Risk of Bias 2 assessment for included studies.

Study	Randomization Process	Deviation Assignment	Deviation Adherence	Missing Outcome Data	Outcome Measurement	Result Reporting	Overall Assessment (High Risk/Low Risk/ Some Concerns)
Duncan et al 1998[27]	Some	Some	Some	Low	Some	Some	**High**
Taxeira-Salmela et al 1999[28]	Some	Some	Some	Low	High	Some	**High**
Ada et al 2003[29]	Low	Low	Low	Low	Low	Some	**Some**
Kim et al 2001[30]	Low	Low	Low	Low	Low	Some	**Some**
Studentski et al 2005[31]	Low	Low	Low	Low	Low	Some	**Some**
Lai et al 2006[32]	Some	Some	Low	Low	Some	Some	**High**
Mead et al 2017[33]	Some	Low	Low	Low	Low	Some	**Some**
Flansbjer et al 2008[34]	Low	Low	Low	Low	Low	Low	**Low**
Langhammer et al 2008[35]	Low	Low	Low	Low	Low	Low	**Low**
Lee et al 2008[36]	Low	Low	Low	Low	Low	Low	**Low**
Sims et al 2009[37]	Low	Low	Some	Low	Low	Some	**Some**
Yoo et al 2011[38]	Low	Some	Some	Low	Low	Some	**High**

Dean et al 2012[39]	Low	Low	Some	Low	Some	Low	**Some**
Globas et al 2012[40]	Low	Low	Low	Low	Low	Low	**Low**
Shaughnessy et al 2012[41]	Some	Some	High	Low	High	Some	**High**
Zedlitz et al 2011[42]	Some	Low	Low	Low	Low	Some	**Some**
Ada et al 2013[43]	Low	Some	Some	Low	Low	Low	**Some**
Gordon et al 2013[44]	Low	Low	Some	Some	Low	Some	**High**
Kirk et al 2014[45]	Low	Low	Low	Low	Low	Low	**Low**
Moore et al 2015[46]	Low	Low	Low	Low	Low	Low	**Low**
Aidar et al 2016[47]	Low	Low	Low	Low	Low	Some	**Some**
Sandberg et al 2017[48]	Low	Low	Low	Low	Low	Low	**Low**
Heron et al 2017[49]	Low	Low	Some	Low	Low	Some	**Some**
Vahlberg et al 2017[50]	Low	Low	Some	Some	Low	Low	**Some**
Lee et al 2018[51]	Low	Low	Low	Low	Low	Low	**Low**
Gezer et al 2019[52]	Some	Some	Low	Low	Some	Some	**Some**
Rosenfeldt et al 2019[53]	Some	Low	Some	Low	Some	Some	**High**
Vloothuis et al 2019[54]	Low	Some	Low	Low	Low	Some	**Some**
Nave et al 2019[55]	Low	Low	Low	Low	Low	Low	**Low**

Krawcyk et al 2019[56]	Low	Low	Some	Some	Low	Low	**Some**

Table II. Summary of findings table for the GRADE assessment as the outcome level of Health Related Quality of Life.

Exercise interventions compared with control for stroke and TIA						
Patient or population: Stroke and TIA **Settings: Home based or community centres** **Intervention: Exercise (aerobic, resistance or mixed)** **Comparison: Usual care, relaxation, stretching, education, balance training**						
Outcomes	**Illustrative comparative risks* (95% CI)**		**Relative effect (95% CI)**	**No of Participants (studies)**	**Quality of the evidence (GRADE)**	**Comments**
	Assumed risk	**Corresponding risk**				
	Control arms	**Exercise arms**				
Effect of exercise on overall HRQoL score (Scales used included SF-36, SF-12, EQ-5D, Nottingham Health Profile, Stroke Impact Scale, Stroke Adapted Sickness Impact Profile, Stroke Specific Quality of Life Score) Standardised mean differences used to pool data. Effects assessed at the end of intervention.	NA	NA	SMD -0.23 (-0.07 to -0.40) In favour of exercise arms	N = 1,451 (24 RCTs)	⊕⊕⊕⊖ **moderate**	Outcome level dropped for inconsistency (I^2 56%). Effect on overall HRQoL measure was similar to that for individual composites e.g. physical, mental, social.
*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI). **CI:** Confidence interval						
GRADE Working Group grades of evidence **High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate. **Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. **Very low quality:** We are very uncertain about the estimate.						

Table III. Characteristics of studies included in the review.

Study	Participant characteristics N (Int : Con), mean age (yrs), inclusion	Design	Intervention initiation (post stroke)	Intervention and control description	Recruitment rate	Outcome measures
Duncan et al 1998[27] USA	N=20 (10:10) Age 67 Sub-acute stroke Ambulant MMSE > 18	RCT of home based exercise vs usual care	30 to 90 days	**Intervention**: Home based, supervised exercises concentrating on endurance, strength, and balance, 30 mins, 3 x weekly for 6 weeks. **Control**: Repetitive upper limb task training, 3 x weekly for 6 weeks.	22 randomised, 2 dropouts	Baseline and 12 week SF-36
Teixeira-Salmela e al 1998[28] Canada	N=13 (6:7) Age 67.7 Chronic stroke Ambulant	RCT with pre-test and post-test design of exercise training vs usual care	> 9 months	**Intervention**: mixed aerobic (walking and cycling, HRR 50-70%) and strength training (resistance sets of upper and lower limb, 50-80% 1RM), 60-90 mins, 3 x weekly for 10 weeks. **Control**: usual care	NS	Baseline and 10 week Nottingham Health Profile (NHP)
Ada et al 2003[29] Australia	N=27 (13:14) Age 66 Chronic stroke Ambulant	RCT of treadmill training and over ground walking vs stretching and balance exercises	> 6 months	**Intervention**: Treadmill training and cognitive dual task progressing to increasing over ground walking times, 45 mins, 3 x weekly, for 4 weeks. **Control**: Lower limb strengthening, stretching and balance training and advice to walk daily.	29 recruited, 2 dropouts	Baseline and 3 months Sickness Impact Profile (SA-SIP30)
Kim et al 2001[30] Canada	N=20 (10:10) Age 61 Chronic stroke Ambulant 40m	RCT isokinetic strength training vs passive stretching	> 6 months	**Intervention**: Isokinetic flexion and extension exercises of the lower limbs using dynamometer, 45 mind, 3 x weekly for 6 weeks. **Control**: Passive ROM stretching 6 weeks.	NS	Baseline and 6 week SF-36
Studenski et al 2005[31] USA	N=100 (50:50) Age 69.5 Sub-acute stroke Ambulant 25 ft MMSE > 16	RCT exercise programme vs usual care	1-5 months	**Intervention**: Mixed (strength, balance, endurance) supervised home exercise programme, 30mins, 3 x weekly for 12 weeks. **Control**: Education (exercise, stroke prevention) every 2 weeks for 12 weeks.	100 randomised, 20 dropped out (10 in each group)	Baseline, 3 month and 6 months SF-36 and SIS
Lai et al 2006[32] USA	N=93 (44: 49) Age 69.8 Sub-acute stroke	RCT progressive therapeutic	NS	**Intervention**: Home training programme (endurance, strength, balance, upper limb function), 3 x weekly for 12 weeks. **Control**: Activity advice.	100 randomised 93 completed	Baseline, 3 month and 9 months SF-36 and SIS

		exercise vs usual care				
Mead et al 2007[33] UK	N=66 (32:34) Age 72 Ambulant	RCT exercise training vs relaxation	NS	**Intervention**: Endurance (cycle ergometry, kettle bell, shuttle walking, RPE 13-16) and resistance training (weight and machine reps) circuits, 60 mins, 3 x weekly for 12 weeks. **Control**: Relaxation therapy (seated deep breathing), 20-49 mins 1 x weekly for 12 weeks.	301 patients screened, 66 randomised, 2 dropouts.	Baseline, 3 month and 7 month SF-36
Flansbjer et al 2008[34] Sweden	N=25 (16:9) Age 61 Chronic stroke Ambulant 200m	RCT progressive resistance training vs usual care	> 6 months	**Intervention**: Progressive resistance training mainly lower limbs, 80% 1RM, 90 mins, 3 x weekly, for 10 weeks. Included stretching. **Control**: usual daily activities.	133 patients screened, 25 randomised, 1 dropout.	Outcome Baseline, 10 week and 5 month SIS
Langhammer et al 2008[35] Sweden	N=75 (35:40) Age 74	RCT of intensive exercise vs usual therapy	> 1 year	**Intervention**: mixed endurance (walking, treadmill, stationary cycling, 70-80% HRR) and strength training (weights, machines, 50-60% 1RM), 40-60 mins, 2-3 x weekly, for 12 weeks. **Control**: Usual physiotherapy (therapeutic).	75 randomised, no dropouts	Baseline, 3 month, 6 month and 12 month Nottingham Health Profile (NHP)
Lee et al 2008[36] Australia	N=52 (14:13:13:12) Age 63.2 Sub-acute stroke Hemiparesis Ambulant	RCT of cycling vs resistance training vs combined vs usual care	> 3 months	**Intervention:** Cycling group (recumbent cycling 50-70% VO2 peak) or lower limb resistance training (50-80% 1RM) or combined, 60 mins 3 x weekly for 12 weeks. **Control**: Sham cycling and resistance training (very light intensity and non-progressive).	122 screened eligible, 52 randomised, 4 dropouts all from intervention groups.	Baseline and 12 week SF-36
Sims et al 2009[37] Australia	N=45 (23:22) Age 67 Chronic stroke Ambulant 20m Depressed	RCT progressive resistance training vs usual care	> 6 months	**Intervention**: Progressive resistance training, 80% 1RM, 2 x weekly for 10 weeks. **Control**: usual care.	104 patients screened, 45 randomised.	Baseline, 10 week and 6 months SF-12 and SIS
Yoo et al 2011[38] South Korea	N=28 (14:14) Age 61 Chronic stroke Ambulant MMSE > 24	RCT of supervised vs self-monitored exercise	> 1 year	**Intervention**: Supervised circuit training focusing on upper extremity exercises, 90 mins, 3 x weekly for 24 weeks. **Control**: unsupervised advice on exercise	NS	Baseline and 24 week Stroke Short Form - Quality of Life (Korean version) (SS-QOL)
Dean et al 2012[39] Australia	N=151 (76:75) Age 67 Chronic stroke Ambulant 10m MMSE > 20	RCT of circuit training vs upper limb therapy	NS	**Intervention**: Circuit training (stepping, calf raises, treadmill training, home or centre based, 40 mins 3 x weekly, for 40 weeks. **Control**: Arm based therapy and cognitive training tasks.	309 patients screened, 151 randomised, 133 completed programme for follow up	Baseline and 12 months SF-12

					assessments.	
Globas et al 2012[40] Switzerland	N=38 (20:18) Age 68.7 Chronic stroke Hemiparesis MMSE >20	RCT of treadmill training vs stretching and balance training	> 6 months	**Intervention**: Treadmill training, initially 40-50% HRR increasing to 60-80% HRR, 40 mins, 3 x weekly for 12 weeks. **Control**: Stretching and balance exercises 1-3 x weekly for 12 weeks.	> 300 patients screened, 38 randomised, 2 dropouts in the control group.	Baseline and 3 month SF-12.
Shaughnessy et al 2012[41] USA	N= 113 (37:84) Age 64.3	RCT of treadmill training vs stretching	NS	**Intervention**: Treadmill training, 60% HRR, 40 mins, 3 x weekly for 6 months. **Control**: Stretching 3 x weekly for 6 months.	162 patients screened, 113 randomised, 42 dropouts (20 intervention, 22 control)	Baseline and 6 months Stroke Impact Scale (SIS)
Zedlitz et al 2011[42] Netherlands	N=73 (38:45) Age 55 Chronic stroke Severe fatigue	RCT cognitive therapy + graded exercise vs cognitive therapy	>4 months	**Intervention**: Cognitive treatment and treadmill training 40-70% HRR and strength training, 120 mins, 2 x weekly for 12 weeks. **Control**: Cognitive therapy 120 mins 2 x weekly for 12 weeks.	231 patients screened, 73 patients completed treatment, 68 available at follow-up	Baseline, 3 month and 6 months Stroke-Adapted Sickness Impact Profile
Ada et al 2013[43] Australia	N=98 (43:33:31) Age 66 Chronic stroke Ambulant MMSE > 23	Three-arm RCT 4 months treadmill training vs 2 months vs usual care	< 5 years	**Intervention**: Treadmill training and over ground walking, 30 mins, 3 x weekly for 16 weeks or 8 weeks **Control**: Usual care.	102 recruited, 98 completed	Baseline, 4 month, 6 month and 12 month EQ-5D
Gordon et al 2015[44] Jamaica	N=128 (64:64) Age 64 Chronic stroke Ambulant	RCT of home walking programme vs light massage	6 – 24 months	**Intervention:** Home supervised walking programme (60-80% HRR) increasing from 15 to 30 mins 3 x weekly for 12 weeks. **Control**: Light massage.	124 randomised, 13 dropouts (7 intervention, 5 control)	Baseline, 6 week and 3 month SF-36
Kirk et al 2014[45] UK	N=24 (12:12) Age 67 Mild stroke / TIA	RCT of cardiac rehabilitation vs usual care	< 1 month	**Intervention:** Mixed aerobic (50-70% HRR) and strength circuit training delivered as phase 3 and phase 4 cardiac rehabilitation, 60 mins, 2-3 x weekly for 18 weeks. Health lifestyle education sessions. **Control**: usual care.	70 patients screened eligible, 24 randomised, no drop outs.	Baseline and 18 week SF-36
Moore et al 2015[46] UK	N=40 (20:20) Age 69 Chronic stroke Ambulant MMSE > 24	RCT community exercise vs stretching	> 6 months	**Intervention:** Mixed aerobic (70-80% HRR) and strength training circuit class, 60 mins, 3 x weekly for 19 weeks. **Control**: Matched duration home stretching programme.	400 screened, 40 randomised, no dropouts.	Baseline and 19 week SIS
Aidar et al 2016[47]	N=22 (11:11)	RCT PRT vs	> 1 year	**Intervention**: PRT 45-60 mins, 3 times a week for 12 weeks.	29 recruited, 22	Baseline and 12

Brazil	Age 52 Hemiparesis	control		**Control**: Usual care.	completed	weeks SF-36
Sandberg et al 2016[48] Sweden	N=56 (29:27) Age 71 Subacute stroke Ambulant 5 m NIHSS <6	RCT intensive aerobic exercise vs usual care	Median 20 days	**Intervention:** 12 weeks of 2x weekly 60 mins intensive aerobic exercise **Control**: Usual care. General advice about exercise and encouraged to try to return to their previous level of activity.	100 screened 56 randomised No drop outs at 3 months 2 dropouts (CG) 6 month follow up	Baseline, 3 month and 6 month EQ-5D and SIS
Heron et al 2017 [49] UK	N = 15 (5:10) Age 69 NDS and TIA	RCT exercise manual vs rehabilitation manual vs usual care	< 4 weeks	**Intervention**: Home exercise manual and pedometer, 6 weeks. **Control**: Rehabilitation manual or usual care.	107 patients screened, 28 invited, 15 completed the study	Baseline and 6 week EQ-5D
Vahlberg et al 2017[50] Sweden	N=67 (34:33) Age 73 Chronic stroke Ambulant 10m Short portable mental status questionnaire >7	RCT PRB + motivational discussion groups + one at-home exercise vs continuing regular activity	1-3 years	**Intervention:** Progressive resistance and balance (PRB) exercises (10mins warm up and 45 mins circuit) 2x weekly with motivational discussion groups afterwards + one daily at-home exercise for 3 months **Control**: Continuing regular activity.	198 screened 67 randomised 10 dropped out by 3 months (8 from IG and 2 CG) 14 dropped out by 15months (10 from IG and 4 CG)	Baseline, 3, 6 and 15 months EQ-5D
Lee et al 2018[51] South Korea	N= 37 (19:18) Age 63.2 Hemiparesis	RCT aquatic therapy vs land-based aerobic exercise	> 3 months	**Intervention**: Progressive resistance training (PRT), 50-80% 1RM, and stationary cycling, 50-70% HRR, 30 mins 5 x weekly for 4 weeks. **Control**: sham cycling and sham PRT.	122 telephone screening and 37 fulfilled the inclusion criteria.	Baseline and 12 week SF-36
Gezer et al 2019[52] Turkey	N=42 (22:20) Age 52 Independent sitting	Non-randomised clinical trial Aerobic exercise vs conventional rehabilitation	NS	**Intervention**: Conventional rehabilitation (1 hr) and aerobic exercise, cycle ergometry, (30 mins) 5 days a week for 6 weeks, 60-80% HRR **Control**: Conventional rehabilitation (1 hr) 5 days per week for 6 weeks.	50 recruited and 42 completed	Baseline and 6 week Nottingham Health Profile (NHP)
Rosenfeldt et al 2019[53] USA	N=40 (16:24) Age 60 Chronic stroke Ambulant	RCT Forced exercise vs voluntary exercise vs education	< 6 months	**Intervention**: 24 sessions (90 minutes each), forced exercise (FE), HRR 60-80% stationary cycling + Repetitive Task Practice (RTP)(n=16) **Control**: voluntary exercise (VE) + RTP(n=16) or stroke education (EDU) + RTP (n=8)	202 patients screened, 40 randomised	Baseline and 4-week follow up Stroke Impact Scale (SIS)

Vloothuis et al 2019 [54] Netherlands	N=66 (32:34) Age 60 Impaired walking MMSE > 18 Carer available	Observer blinded RCT caregiver-mediated exercises vs usual care	NS (although avg time < 2 months)	**Intervention**: 30 mins caregiver delivered exercise therapy, mobility based, 5 x weekly for 8 weeks. Exercise program composed by a trained physical therapist from 37 standardized exercises. **Control**: usual care.	1082 screened 66 recruited	Baseline, 8 and 12 weeks Self-reported mobility domain of the Stroke Impact Scale 3.0 (SIS)
Nave et al 2019[55] Germany	N= 200 (105:95) Age 69 Sub-acute stroke Barthel < 65/100	RCT aerobic treadmill training vs relaxation	5 – 45 days	**Intervention:** Body weight supported treadmill training aiming 50-60% HRR, 25 mins 5 x weekly for 4 weeks. **Control**: Body relaxation techniques 25 mins 5 x weekly for 4 weeks.	7,120 screened, 200 randomised, 29 participants (18:11) had poor adherence (< 75%), 16 were lost to follow up (5:11)	Baseline, 4 week, 3 month and 6 month EQ-5D
Krawcyk et al 2019[56] Denmark	N=71 (35:36) Age 63.7 Lacunar stroke	RCT HIIT vs usual care	< 3 weeks	**Intervention:** Home-based high-intensity interval training (HIIT) 3x daily 3 mins HIIT with 2 mins active recovery 5 x per week for 12 weeks **Control**: usual care. Track physical activity in an exercise diary	3098 screened, 129 eligible 58 declined participation 71 randomised 8 drop outs (4 from each group)	Baseline and 3 month WHO mental wellbeing

NIHSS – National Institute of Health Stroke Scale; RCT – randomised controlled trial; NDS – non-disabling stroke; TIA – transient ischaemic attack; RM – repetition max; HRR – heart rate reserve; SF-36 – Short Form-36; NS – not specified; hr – hour; mins – minutes; RPE – rate of perceived exertion (Borg); VO2 – oxygen consumption (ml/kg/min); MMSE – Mini-mental State Examination; Barthel – Barthel Index.

Table IV. Functional and neurological impairments of participants in the studies included.

Study	Validated Functional Measurement Score	Neurological Impairment (%)
Duncan et al 1998[27]	BI (mean) 82	NR
Teixeira-Salmela et al 1998[28]	NR	NR
Ada et al 2003[29]	NR	NR
Kim et al 2001[30]	Chedoke-McMaster Activity Inventory (range) 3-6	NR
Studenski et al 2005[31]	FIM (mean) 81	NR
Lai et al 2006[32]	OPS (mean) 3.4	NR
Mead et al 2007[33]	FIM (mean) 118	Arm weakness – 28% Leg weakness – 22% Speech impairment – 30% Neglect – 6%
Flansbjer et al 2008[34]	NR	NR
Langhammer et al 2008[35]	NR	NR
Lee et al 2008[36]	NR	NR
Sims et al 2009[37]	mRS (median) 2	NR
Yoo et al 2011[38]	NR	NR
Dean et al 2012[39]	NR	NR
Globas et al 2012[40]	BI (mean) 91.7 NIHSS (mean) 4.5	NR
Shaughnessy et al 2012[41]	NR	NR
Zedlitz et al 2011[42]	NR	NR
Ada et al 2013[43]	NR	Spasticity – 73% Sensory impairment – 35% Neglect – 15%

Gordon et al 2015[44]	NR	NR
Kirk et al 2014[45]	NR	NR
Moore et al 2015[46]	NIHSS (mean) 3	NR
Aidar et al 2016[47]	mRS – 18% 0-1 - 64% 2-3 - 18% 4-5	NR
Sandberg et al 2016[48]	NR	NR
Heron et al 2017 [49]	mRS – 90% 0-2 - 10% 3-5	NR
Vahlberg et al 2017[50]	NR	NR
Lee et al 2018[51]	FMA (mean) 73	NR
Gezer et al 2019[52]	FIM (mean) 92	NR
Rosenfeldt et al 2019[53]	FMA upper limb (mean) 35	NR
Vloothuis et al 2019 [54]	NR	Speech impairment – 25% Visual impairment – 15% Neglect – 31%
Nave et al 2019[55]	NIHSS (mean) 8	NR
Krawcyk et al 2019[56]	SSS (mean) 54.6	Weakness – 74% Sensory impairment – 35% Visual impairment – 16% Balance impairment – 16%

BI – Barthel Index (Score 0 – 100; < 20 = total dependence, 100 = perfectly independent)
Chedoke-McMaster Activity Inventory (1-2 = complete dependence; 3-5 = modified dependence; 6-7 = Independence)
FIM – Functional Independence Measure (18 = lowest score and complete dependence; 126 = highest score and total independence; Scores >80 = largely independent)
OPS – Orpington Prognostic Scale (<3.2 = mild impairment; 3.2 – 5.2 = moderate; >5.2 = severe)
mRS – Modified Rankin Score (0-2 = independent; 3-5 = dependent; 6 = dead)
NIHSS – National Institute of Health Stroke Score (0-5 = mild; 6-15 = moderate; 16-25 = severe; > 25 very severe impairment)
FMA – Fugyl Myer Assessment (score 0 = lowest ability; max 226 = maximal ability)
FMA UL – Fugyl Myer Assessment Upper Limb (score 0 = lowest ability; max 58 = maximal ability)
SSS – Scandinavian Stroke Scale (0-25 = severe; 26-42 = moderate; 43-58 = mild)
NR – not reported

Table V. Consensus on Exercise Reporting Template (CERT) details for including studies

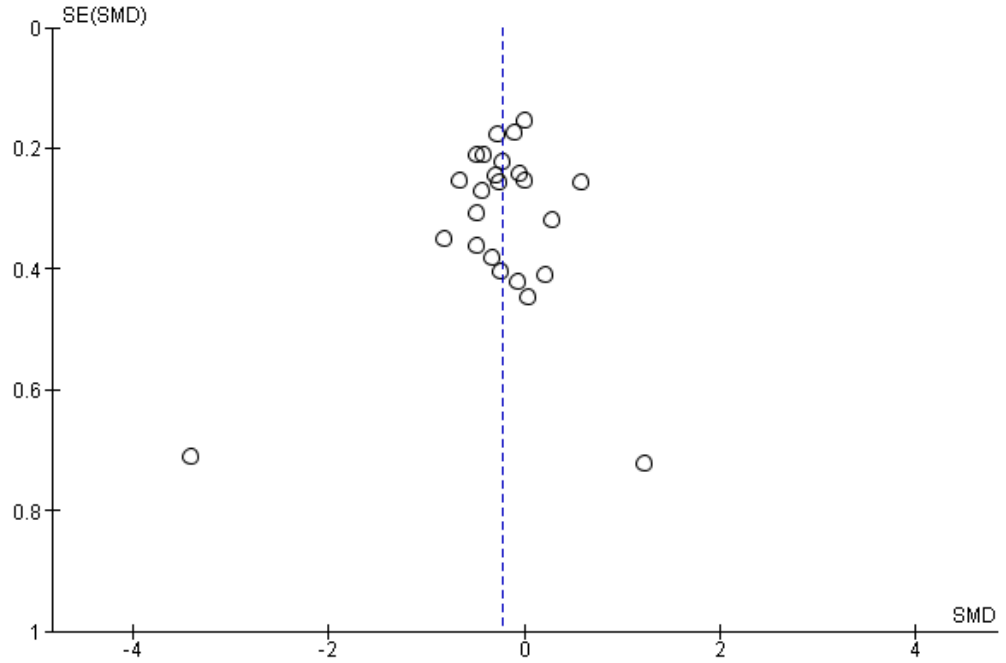
	Equipment	Qualification	Group or individual	Supervision	Adherence	Motivation Strategies	Decision Rules	Details of progression	Replication details	Home component	Non-exercise component	Adverse events	Setting	Details of intervention	Generic vs tailored	Starting level	Fidelity	Delivery as planned
Duncan et al 1998[27]	✓	X	✓	✓	X	X	X	X	X	✓	X	X	✓	✓	X	X	X	X
Teixiera Salmela et al 1999[28]	✓	X	X	✓	X	X	✓	✓	✓	✓	X	X	X	✓	✓	✓	X	X
Ada et al 2003[29]	✓	X	✓	✓	✓	✓	X	✓	✓	X	X	X	X	✓	X	X	✓	✓
Kim et al 2001[30]	✓	X	X	X	X	X	X	X	✓	X	X	X	X	✓	X	X	X	X
Studenski et al 2005[31]	X	X	✓	✓	✓	X	X	X	✓	✓	✓	X	✓	✓	X	X	X	X
Lai et al 2006[32]	✓	X	✓	X	✓	X	X	X	✓	✓	X	X	✓	✓	X	X	X	X
Mead et al 2007[33]	✓	✓	✓	✓	✓	X	X	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓
Flansbjer et al 2008[34]	✓	X	X	✓	✓	X	X	X	✓	X	X	✓	X	✓	✓	✓	✓	✓
Langhammer et al 2008[35]	✓	X	✓	✓	✓	X	X	X	✓	X	X	X	X	✓	✓	X	✓	X
Lee et al 2008[36]	✓	x	x	✓	X	X	✓	✓	✓	X	X	X	X	✓	✓	✓	X	X
Sims et al 2009[37]	X	X	✓	✓	✓	X	X	X	✓	X	X	X	✓	✓	X	✓	X	X
Yoo et al 2011[38]	X	X	X	X	X	X	X	X	X	X	X	X	✓	✓	X	X	X	X
Dean et al	✓	✓	✓	✓	✓	X	X	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2012[39]																		
Globas et al 2012[40]	✓	X	X	✓	✓	X	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓
Shaugnessy et al 2012[41]	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Zedlitz et al 2012[42]	✓	X	✓	✓	X	X	X	X	✓	X	✓	X	X	X	X	✓	X	X
Ada et al 2013[43]	✓	X	✓	✓	✓	X	X	✓	✓	X	X	X	X	✓	X	X	✓	✓
Gordon et al 2013[44]	X	X	✓	✓	X	X	X	✓	✓	✓	X	X	✓	✓	X	X	X	X
Kirk et al 2014[45]	✓	✓	✓	✓	X	✓	✓	✓	✓	X	✓	X	✓	✓	X	✓	X	X
Moore et al 2015[46]	✓	X	✓	✓	✓	X	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓
Aidar et al 2016[47]	✓	X	X	✓	X	X	✓	✓	✓	X	X	X	X	✓	✓	✓	X	X
Sandberg et al 2016[48]	X	✓	✓	✓	✓	X	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓
Heron et al 2017[49]	✓	X	✓	X	X	X	X	X	X	✓	X	X	✓	X	X	X	X	X
Vahlberg et al 2017[50]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	X	✓	✓	✓	X	X
Lee et al 2018[51]	✓	X	✓	✓	X	X	X	X	✓	X	X	X	✓	✓	✓	✓	✓	✓
Gezer et al 2019[52]	✓	X	X	X	✓	X	X	X	✓	X	X	X	X	✓	X	X	✓	X
Rosenfeld et al 2019[53]	✓	X	X	✓	X	X	X	X	✓	X	X	X	X	✓	X	X	X	X
Vloothius et al 2019[54]	X	X	✓	✓	X	X	X	X	X	✓	X	X	✓	X	X	X	X	X
Nave et al 2019[55]	✓	X	✓	✓	✓	X	✓	✓	✓	X	X	✓	X	✓	✓	✓	✓	✓

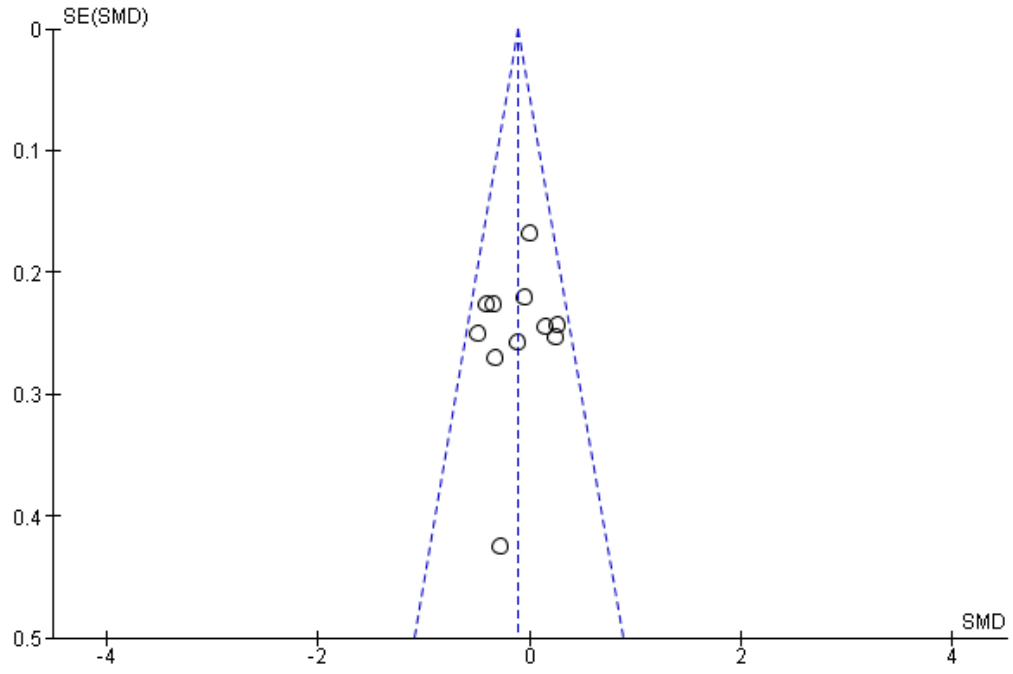
Krawcyk et al 2019[56]	✓	X	✓	✓	✓	✓	X	X	✓	X	✓	✓	✓	✓	✓	✓	✓	✓
Totals (%)	**76.7**	**16.6**	**66.6**	**83.3**	**53.3**	**13.3**	**30.0**	**43.3**	**83.3**	**26.7**	**20.0**	**26.7**	**53.3**	**86.7**	**46.7**	**53.3**	**43.3**	**36.7**

Online figure I. Funnel plots for studies reporting HRQoL following exercise interventions at end of intervention (a), and at longer term follow up (b).

(a)



(b)



Online figure 2. Forrest plots comparing the effect of exercise interventions on overall HRQoL compared to control arms with the exclusion of studies at high risk of bias.