Data base	Search terms for query
Pubmed	
#1	Rheumatoid arthritis
#2	(((exercise training) OR progressive resistance training) OR
	strength training) OR physical activity
#3	(((((skeletal muscle mass) OR lean body mass) OR fat free mass)
	OR appendicular lean mass) OR body composition)
#4	((((muscle morphology) OR muscle architecture) OR muscle
	((thickness) OR cross section area) OR muscle CSA) OR muscle
	hypertrophy)
#5	(#3) OR #4
#6	(Randomized controlled trial) OR Randomization
#7	#1 AND #2 AND #5 AND #6
Physiotherapy	Evidence Database (PEDro)
	Method: clinical trial
	Abstract & Title:
#1	rheumatoid arthritis
#2	exercise training
#3	resistance training
#4	strength training
#5	physical activity
#6	lean body mass
#7	fat free mass
#8	skeletal muscle mass
#8	appendicular lean mass
#9	body composition
#10	muscle thickness
#11	muscle cross-sectional area
#12	muscle architecture
#13	muscle morphology
#14	muscle hypertrophy
	(continued)

# Supplementary table S1. Database search formulas

(continued)

Data base	Search terms for query
Excerpta Med	lica dataBASE (EMBASE)
#1	rheumatoid arthritis
#2	exercise training
#3	resistance training
#4	strength training
#5	physical activity
#6	lean body mass
#7	fat free mass
#8	skeletal muscle mass
#9	muscle cross sectional area
#10	muscle thickness
#11	muscle hypertrophy
#12	muscle morphology
#13	muscle architecture
#14	body composition
#15	#2 OR #3 OR #4 OR #5
#16	#6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14
#17	#1 AND #15 AND #16 AND ([systematic review]/lim OR [meta analysis]/lim
	OR [randomized controlled trial]/lim) AND [humans]/lim

#### **Cochrane Library Database**

#1	rheumatoid arthritis
#2	exercise training
#3	resistance training
#4	strength training
#5	physical activity
#6	lean body mass
#7	fat free mass
#8	muscle cross sectional area
#9	muscle thickness
#10	muscle hypertrophy
#11	body composition
#12	#2 OR #3 OR #4 OR #5
#13	#6 OR #7 OR #8 OR #9 OR #10 OR #11
#14	randomized controlled trial
#15	#1 AND #12 AND #13 AND #14

(continued)

## Data base Search terms for query

## China knowledge resource integrated database

#1	rheumatoid arthritis
#2	(((exercise training) OR progressive resistance training) OR strength training) OR physical activity
#3	(((((skeletal muscle mass) OR lean body mass) OR fat free mass) OR appendicular lean mass) OR body composition)
#4	((((muscle morphology) OR muscle architecture) OR muscle ((thickness) OR cross section area) OR muscle CSA) OR muscle hypertrophy)
#5	randomized controlled trial
#6	#1 AND #2 AND #3 AND #4 AND #5

#### Google Scholar

#1	allintitle: rheumatoid arthritis
#2	allintitle: "exercise training" OR "resistance training" OR "strengthening
	exercise" OR "physical activity"
#3	allintitle: "skeletal muscle mass" OR "lean body mass" OR "fat free mass"
	OR "appendicular lean mass" OR "body composition"
#4	allintitle: "muscle morphology" OR "muscle cross sectional area" OR
	"muscle thickness" OR "muscle hypertrophy"
#5	allintitle: randomized controlled trial

			Experime	ental group					Control group
Study Häkkinen 1994	Flexibility/ROM/		Muscle strengthening (progr	Muscle strengthening (progressive RET)					
	stretching exercises	Training part	Resistance set	Intensity	Training volume	(min/session)	(session/w)	duration (wk)	
	None	Upper and lower extremity, and trunk (9 different exercises).	Individually designed; Elastic (rubber) bands	40%–80% 1RM	3 sets of 10–30 repetitions	30	2–3	6	Maintained habitual physical activities which are not related to strength training (walking, biking, and swimming; 3–4 session/week, 50–60 min/session).
Lemmey 2009; 2012	10-min warm up and 10-min cooling down (low-intensity ROM exercises)	Upper and lower extremity	Multi-stack machine exercises: leg press, chest press, leg extension, seated rowing, leg curl, triceps extension, standing calf raises, and bicep curl.	60%–80% 1RM	1–3 sets of 8–15 repetitions (1–2 minutes of rest between sets)	60ª	2	6	Maintained habitual physical activity levels and diet during the experimental period; home-based, low-intensity range of movement (ROM) exercise
Piva 2019	5-min warm up (stationary cycling; 1–2 bouts of 30-sec quadriceps stretching).	Lower extremity (targeted mainly the bilateral quadriceps muscles)	Respective machines: leg extension and leg press exercises.	40%–80% 1RM	1–3 sets of 8–15 repetitions (2-sec concentric load, 2-sec eccentric load, and 3-sec interval between each contraction); 1–2 minutes of rest between sets.	60ª	2–3	16	NMES (frequency: 75 pulses/s; pulse duration: 450 ms; stimulus on/off time (1-min cycle) was 12-sec on (3-sec ramp up, 6-sec full contraction, 3-sec ramp down), and 48-sec off.
Prioreschi 2016	None	Lower limbs	Whole body vibration training (standing on a vertical synchronous vibration plate)	Vibration was set at 3 mm amplitude and a frequency of 30 Hz.	10 repetitions	15	2	12	Maintained normal daily activities during the experimental period
Rodrigues 2020	None	Lower limbs (Bilateral)	Leg press and knee extension exercises	50%–70% 1RM	4–5 sets of 10 repetitions (1- minute rest interval between each set)	NR	2	12	Maintained habitual daily living activities
	None	Lower limbs (Bilateral)	BFRT with an air cuff (leg press; knee extension exercises)	20%–30% 1RM	4–5 sets of 15 repetitions (1- minute rest interval between each set)	NR	2	12	Maintained habitual daily living activities
Sandstad 2015	Warm-up for 10 min (70 % of HR <sub>max</sub> )	Lower limbs	High intensity interval training	85–95 % of HR <sub>max</sub>	4 sets: 4-minute interval of training period (85–90% HR <sub>max</sub> ); 3-min recovery period (70 % HR <sub>max</sub> ).	35	2	10	Maintained habitual daily living activities

## Supplementary table S2. Summary of exercise training protocols in the included studies

Continued.

#### Supplementary table S2. Continued

				Experimental grou	p				Control group
Study	Flexibility/ROM/stretching		Muscle	Intervention					
	exercises	Training part	Resistance set	Intensity	Training volume	(min/session)	(session/w)	duration (wk)	
Siqueira 2017	Warm up: 5-min walk (the plantar flexion of knees and hips was restricted to a maximum of 90 degrees); 15–30 min lower-limb exercises.	Lower extremity	Aquatic exercise (water-based aerobic training); the weight of the lower limbs was the training load. An adaptation period was provided to adapt to the environment (water or land) and learn the sequence and level of effort for the 11 movements as needed to provide body control in the use of the chair.	bic training); the weight of the (60%-85% 1RM) <sup>a</sup> seconds) r limbs was the training load. daptation period was provided lapt to the environment (water nd) and learn the sequence level of effort for the 11 ements as needed to provide y control in the use of the chair.	30–60	3	16	Maintained habitual daily living activities	
	Warm up: 5-min walk (the plantar flexion of knees and hips was restricted to a maximum of 90 degrees); 15–30 min lower-limb exercises.	Lower extremity	Land-based exercise; the weight of the lower limbs was the training load. An adaptation period was provided to adapt to the environment (water or land) and learn the sequence and level of effort for the 11 movements as needed to provide body control in the use of the chair.	Borg CR-10: 5–8 (60%–85% 1RM) <sup>a</sup>	2–4 sets (each set comprised 11 series of 30 seconds)	30–60	3	16	Maintained habitual daily living activities
Strasser 2011	Warm-up (10 min, stretching exercise)	Upper extremity (bench press, chest cross, shoulder press); trunk (pull downs, bicep curls); Lower extremity (leg press)	NR	70% 1RM	2–4 sets of 10–15 repetitions	NR	2	24	Maintained recreational physical activity; stretching exercises to maintain their joint mobility.
		Lower extremity	Cycle ergometer	Endurance training: 60% of VO <sub>2max</sub> (75% of HR <sub>max</sub> ) <sup>a</sup>	In combination with RET	15–80	2	24	

<sup>a</sup>Data is estimated.

1RM, one repetition maximum; BFRT, blood-flow restriction training; Borg CR-10, Borg's category ratio-scale (0 extremely easy to 10 extremely hard); HR<sub>max</sub>, maximal heart rate; NMES, neuromuscular electrical stimulation; RET, resistance exercise training; ROM, range of motion; VO<sub>2max</sub>, maximal oxygen consumption.

Study author (year)	Overal <sup>+</sup>	Eligibility criteria <sup>‡</sup>	1	2	3	4	5	6	7	8	9	10
Häkkinen, 1994	5/10		Х		X				X		X	Х
Lemmey, 2009	5/10	Х	Х		X					Х	X	X
Lemmey, 2012	4/10		X		X						X	X
Piva, 2019	8/10	Х	Х	X	X			Х	X	X	X	X
Prioreschi, 2016	6/10	X	X		X			Х		X	X	X
Rodrigues, 2020	7/10		Х		X			Х	X	X	X	X
Sandstad, 2015	6/10	Х	Х		X				X	X	X	X
Siqueira, 2017	8/10	Х	Х	X	X			Х	X	X	Х	X
Strasser, 2011	6/10	Х	Х		X				X	X	Х	X
Summary <sup>§</sup>		6	9	2	9	0	0	4	6	7	9	9

Supplementary table S3. Summary of methodological quality based on the PEDro classification scale\*

\*PEDro = Physiotherapy Evidence Database. Guidelines of the PEDro scale is available from the PEDro database (<u>https://www.pedro.org.au/english/downloads/pedro-scale/</u>).

<sup>+</sup>Points of methodological quality were "*X*" when a criterion was fulfilled. Methodological quality: high, ≥7/10; medium, 4–6/10 points; low, ≤3/10 points.

<sup>‡</sup>Not used to calculate the total score.

<sup>§</sup>This was calculated as the number of studies satisfied.

PEDro classification scale: 1 = random allocation, 2 = concealed allocation, 3 = similarity at the baseline, 4 = subject blinding, 5 = therapist blinding, 6 = assessor blinding, 7 = more than 85% follow-up for at least one key outcome, 8 = intention-to-treat analysis, 9 = between-group statistical comparison for at least one key outcome, 10 = point and variability measures for at least one key outcome.

Subgroups	Comparison, n (reference)	SMD(95% CI)	P value	l <sup>2</sup> (%)
Methodology quality				
High (PEDro score ≥7)	3 [18, 20, 22]	0.62 (–0.52 <i>,</i> 1.76) <sup>‡</sup>	n.s.	92
Medium (PEDro score 4–6)	6 [16, 17, 19, 21, 39, 40]	0.88 (0.56, 1.19) <sup>+</sup>	<0.00001	0
Subgroup difference			n.s.	0
Control type				
Exercise	4 [19, 20, 39, 40]	0.54 (–0.16, 1.24) <sup>‡</sup>	n.s.	72
Regular care	5 [16-18, 21, 22]	0.95 (0.27, 1.63) <sup>‡</sup>	0.006	81
Subgroup difference			n.s.	0
Exercise type				
RET	6 [16, 18, 20, 22, 39, 40]	0.66 (0.06, 1.26) <sup>‡</sup>	0.03	77
Non-RET	5 [17-19, 21, 22]	0.87 (–0.08, 1.83) <sup>‡</sup>	n.s.	89
Subgroup difference			n.s.	0
Usage of steroid				
Use	6 [16-18, 21, 39, 40]	1.05 (0.55 <i>,</i> 1.55) <sup>‡</sup>	<0.0001	60
No use	3 [19, 20, 22]	0.29 (–0.36, 0.93) <sup>‡</sup>	n.s.	75
Subgroup difference			n.s.	70.4

Supplementary table S4. Summary of the results of subgroup analyses for muscle mass

<sup>+</sup>Fixed-model effect

<sup>‡</sup>Random-model effect

SMD, standard mean difference;  $I^2$ , heterogeneity; n.s., statistically nonsignificant (P > 0.05); PEDro, Physiotherapy Evidence Database; RET, resistance exercise training.

	Effect size of changes in muscle mass										
Covariate	Comparison (N)	Coefficient	(95% CI)	$\tau^2$	R <sup>2</sup> (%)	l <sup>2</sup> (%)	P value				
Age, years	12	-0.013	(-0.038, 0.012)	0.089	0	27.67	0.282				
BMI, kg/m <sup>2</sup>	11	-0.059	(-0.127, 0.007)	0.039	46.23	16.69	0.075				
Sex rate (women, %)	12	-0.003	(-0.032, 0.026)	0.096	0	40.14	0.845				
Disease duration, mo	12	-0.006	(-0.009, -0.003)	0.022	69.69	9.71	0.005				
Intervention duration, mo	12	0.110	(-0.101, 0.321)	0.112	0	38.61	0.272				
Follow-up duration, mo	12	0.007	(–0.197, 0.212)	0.118	0	34.61	0.938				

Supplementary table S5. Summary of meta-regression analyses results

BMI, body mass index.

Study author (year)	Evercise type	Training intensity	EG (events or pa	atients/group sample)	CG (events or patients/group sample)		
Study aution (year)	LARICISE type	Training intensity	Related to exercise	Unrelated to exercise	Related to exercise	Unrelated to exercise	
<b>Withdraw (drop out)</b> <sup>a</sup> RET							
Häkkinen, 1994 Lemmey, 2009; 2012 Piva, 2019	RET RET RET	40%-80% 1RM 60%-80% 1RM 40%-80% 1RM	N N X (1/28)	X (2/21) X (9/18) <sup>c</sup> X (1/28)	N N X (6/31)	X (2/18) X (9/18) <sup>c</sup> X (1/31)	
Rodrigues, 2020	HI-RET	50%-70% 1RM	X (1/16)	Ν	Ν	X (1/16)	
Siqueira, 2017	LB-ET	Borg CR-10: 5–8 (60%-85% 1RM) <sup>b</sup>	X (8/33)	X (1/33)	Ν	X (2/34)	
Non-RET							
Prioreschi, 2016	WBV		Ν	X (5/20) <sup>c</sup>	Ν	X (7/19) <sup>c</sup>	
Rodrigues, 2020 Sandstad, 2015	BFR, LI-RET HIIT, 1st session HIIT, 2nd session	20%-30% 1RM 85–95 % of HR <sub>max</sub> 85–95 % of HR <sub>max</sub>	N N N	X (1/16) X (3/9) <sup>c</sup> X (1/7) <sup>c</sup>	N N N	X (1/16) X (2/9) <sup>c</sup> X (1/6) <sup>c</sup>	
Siqueira, 2017 Strasser, 2011	AQ-ET MET	Borg CR-10: 5–8 (60%-85% 1RM) <sup>b</sup> 70% 1RM for RET; 60% of VO2max (75% of HRmax) <sup>b</sup> for AET	X (6/33) N	N X (5/20)	N N	X (2/34) N (0/20)	
Summary, No. of trials (No. of	patient)		3 (16/110)	7 (29/172)	1 (6/31)	7 (24/165)	
Adverse events <sup>a</sup>							
Häkkinen, 1994 Lemmey, 2009; 2012 Piva, 2019	RET RET RET	40%-80% 1RM 60%-80% 1RM 40%-80% 1RM	X (1/21) N X (NR)	X (6/21) N N	X (1/18) N X (NR)	X (5/18) N N	
Siqueira, 2017	RET, LB-ET	Borg CR-10: 5–8 (60%-85% 1RM) <sup>b</sup>	X (8/33)	X (7/33)	X (21/34)	X (12/34)	
Rodrigues, 2020 Non-RET	RET, HI-RET	50%-70% 1RM	X (1/16)	N	N	X (1/16)	
Prioreschi, 2016 Sandstad, 2015	WBV HIIT, 1st session HIIT, 2nd session	85–95 % of HR <sub>max</sub> 85–95 % of HR <sub>max</sub>	NR NR NR	NR NR NR	NR NR NR	NR NR NR	
Siqueira, 2017	AQ-ET	Borg CR-10: 5–8 (60%-85% 1RM) <sup>b</sup>	Ν	X (3/33)	X (21/34)	X (12/34)	
Rodrigues, 2020	BFR, LI-RET	20%-30% 1RM	Ν	X (1/16)	Ν	X (1/16)	
Strasser, 2011	MET	70% 1RM for RET; 60% of VO <sub>2max</sub> (75% of HRmax) <sup>b</sup> for AET	NR	NR	NR	NR	
Summary, No. of trials (No. of	event)		4 (15/70)	3 (12/103)	3 (26/52)	3 (14/68)	

#### Supplementary table S6. Summary of withdraw and adverse events in the included trials

<sup>a</sup>The occurrence of adverse events is denoted as "X" with the number of events. N = the trial reported no complication event; NA = data of the complications or adverse events were not available <sup>b</sup>Data is estimated.

<sup>c</sup>The events did not occur during exercise periods.

1RM, one-repetition maximum; AET, aerobic exercise training; AQ-ET, aquatic exercise training; Borg CR-10, Borg's category ratio-scale (0 extremely easy to 10 extremely hard); CG, control group; EG, experimental group; HIIT, high-intensity interval training; HI-ET, high intensity exercise training; HR<sub>max</sub>, maximal heart rate; LB-ET, land-based exercise training; LI-ET, low intensity exercise training; MET, multicomponent exercise training; NR, not reported; RET, resistance exercise training; VO<sub>2max</sub>, maximal oxygen consumption; WBV, whole body vibration.



#### Figure S1. PRISMA flowchart of study selection.

		ET		С	ontrol			Std. Mean Difference		Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV. Fixed, 95% C		IV. Fixed. 95% Cl
2.1.1 Lean body mass, overall										
Lemmey 2009, RET vs ROM	1.54	1.83	13	-0.4	3.94	15	15.1%	0.60 [-0.16, 1.36]		<b>—</b>
Prioreschi 2016, WBV vs RC	-1	3.57	16	-2.27	1.98	15	17.2%	0.42 [-0.29, 1.14]		
Siqueira 2017, RET vs RC	0.1	1.81	66	-0.4	2.22	34	50.7%	0.25 [-0.16, 0.67]		
Strasser 2011, MET vs Stretch Subtotal (95% CI)	1.47	3.43	15 <b>110</b>	-1.46	2.28	20 <b>84</b>	17.1% 100.0%	1.01 [0.30, 1.73] <b>0.46 [0.17, 0.76]</b>		•
Heterogeneity: Chi <sup>2</sup> = 3.38, df = 3	B (P = 0.	34); l²	= 11%							
Test for overall effect: Z = 3.08 (F	e = 0.00	2)								
2.1.3 Lean body mass, >6 mo										
Subtotal (95% Cl)			0			0		Not estimable	•	
Heterogeneity: Not applicable										
Test for overall effect: Not applica	able									
2.1.4 Lean body mass, >3 mo, :	≤6 mo									
Lemmey 2009, RET vs ROM	1.54	1.83	13	-0.4	3.94	15	15.0%	0.60 [-0.16, 1.36]		
Prioreschi 2016, WBV vs RC	-1	3.57	16	-2.27	1.98	15	17.2%	0.42 [-0.29, 1.14]		
Siqueira 2017, RET vs RC	0	1.78	66	-0.4	2.22	34	50.7%	0.20 [-0.21, 0.62]		
Strasser 2011, MET vs Stretch	1.47	3.43	15	-1.46	2.28	20	17.1%	1.01 [0.30, 1.73]		
Subtotal (95% CI)			110			84	100.0%	0.44 [0.14, 0.74]		$\bullet$
Heterogeneity: $Chi^2 = 3.87$ , df = 3	B(P = 0.)	28); I <sup>2</sup>	= 23%							
l est for overall effect: $Z = 2.92$ (F	<sup>2</sup> = 0.00	4)								
2.1.5 Lean body mass, ≤3 mo										
Prioreschi 2016, WBV vs RC	0	3.58	16	0	3.47	15	25.8%	0.00 [-0.70, 0.70]		
Siqueira 2017, RET vs RC	0.1	1.81	66	-0.4	2.22	34	74.2%	0.25 [-0.16, 0.67]		
Subtotal (95% CI)			82			49	100.0%	0.19 [-0.17, 0.55]		<b>•</b>
Heterogeneity: $Chi^2 = 0.37$ , df = 1 Test for overall effect: Z = 1.03 (F	(P = 0. P = 0.30	54); l² )	= 0%							
									<b>1</b> 2	
									-4	-2 0 2 4
									+	Favours [Control] Favours [ET]

**Figure S2.** Forest plot summarizing effects of exercise therapy(ET) on leanbody mass at an overall duration and each follow-up time point. The horizontal line links the lower and upper limits of the 95% CI of this effect. The combined effects are plotted using black diamonds.

95% CI = 95% confidence interval; Std. = standard; IV = inverse variance; MET, multicomponent exercise training; RC, regular care; RET, resistance exercise training; ROM, range of motion exercise; WBV, whole body vibration.



**Figure S3. Forest plot summarizing effects of exercise therapy(ET) on appendicular lean mass at an overall duration and each follow-up time point.** The horizontal line links the lower and upper limits of the 95% CI of this effect. The combined effects are plotted using black diamonds.

95% CI = 95% confidence interval; Std. = standard; IV = inverse variance; HIIT = high-intensity interval training; RC, regular care; RET, resistance exercise training; ROM, range of motion exercise.

		ET	Control				:	Std. Mean Difference	Std. Mean Diff	erence
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% C	IV, Random,	95% CI
2.3.1 SMI, overall										
Prioreschi 2016, WBV vs RC	0.2	0.42	16	-1.14	1.17	15	48.2%	1.50 [0.69, 2.32]	_	
Siqueira 2017, RET vs RC	0	0.3	66	0.2	0.88	34	51.8%	-0.35 [-0.77, 0.07]		
Subtotal (95% CI)			82			49	100.0%	0.54 [-1.27, 2.36]		
Heterogeneity: Tau <sup>2</sup> = 1.61; Chi <sup>2</sup> = 15.92, df = 1 (P < 0.0001); I <sup>2</sup> = 94%										
Test for overall effect: Z = 0.59 (P = 0.56)										
2.3.2 SMI, >6 mo										
Subtotal (95% CI)			0			0		Not estimable		
Heterogeneity: Not applicable										
Test for overall effect: Not appli	icable									
2.3.3 SMI, >3 mo, ≤6 mo										_
Prioreschi 2016, WBV vs RC	0.2	0.42	16	-1.14	1.17	15	48.2%	1.50 [0.69, 2.32]		
Siqueira 2017, RET vs RC	0	0.3	66	0.2	0.88	34	51.8%	-0.35 [-0.77, 0.07]		
Subtotal (95% CI)			82			49	100.0%	0.54 [-1.27, 2.36]		
Heterogeneity: Tau <sup>2</sup> = 1.61; Ch	i² = 15.9	92, df =	= 1 (P <	0.0001	);  ² = 9	94%				
Test for overall effect: Z = 0.59	(P = 0.5	56)								
2.3.4 SMI, ≤3 mo									1. 1.	
Prioreschi 2016, WBV vs RC	0.2	0.39	16	-0.86	1.17	15	47.8%	1.20 [0.43, 1.97]		
Siqueira 2017, RET vs RC	0	0.3	66	0.2	0.79	34	52.2%	-0.38 [-0.80, 0.04]		
Subtotal (95% CI)			82			49	100.0%	0.37 [-1.18, 1.92]		
Heterogeneity: Tau <sup>2</sup> = 1.15; Chi <sup>2</sup> = 12.45, df = 1 (P = 0.0004); l <sup>2</sup> = 92%										
Test for overall effect: Z = 0.47	(P = 0.6	64)								
									4 -2 0	2 4
									Favours [Control] Fa	vours [ET]

**Figure S4. Forest plot summarizing effects ofexercisetherapy(ET)onskeletal musclemass index (SMI)at anoverall duration and each follow-up time point.** The horizontal line links the lower and upper limits of the 95% CI of this effect. The combined effects are plotted using black diamonds.

95% CI = 95% confidence interval; Std. = standard; IV = inverse variance; RC, regular care; RET, resistance exercise training; WBV, whole body vibration.

		ET	Control		:	Std. Mean Difference	Std. Mean Difference			
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV. Random, 95% Cl	IV, Random, 95% Cl	
1.1.1 Muscle mass, overall										
Häkkinen 1994, RET vs RC	3.6	5.79	21	-0.4	2.63	18	11.5%	0.85 [0.19, 1.51]		
Lemmey 2009, RET vs ROM	1.19	1	13	-0.16	1.8	15	10.5%	0.88 [0.10, 1.67]		
Lemmey 2012, RET vs ROM	1.21	0.98	9	-0.03	2.11	9	9.2%	0.72 [-0.24, 1.68]		
Piva 2019, RET vs NMES	2.65	3.27	26	3.6	2.81	24	12.3%	-0.31 [-0.86, 0.25]		
Prioreschi 2016, WBV vs RC	0.2	0.42	16	-1.14	1.17	15	10.3%	1.50 [0.69, 2.32]		
Rodrigues 2020, RET vs RC	10.15	5.06	32	0.9	3.21	16	11.0%	2.00 [1.27, 2.74]		
Sandstad 2015, HIIT vs RC	0.6	0.83	12	0.2	1.6	15	10.7%	0.29 [-0.47, 1.06]		
Siqueira 2017, RET vs RC	0.1	1.81	66	-0.4	2.22	34	13.4%	0.25 [-0.16, 0.67]		
Strasser 2011, MET vs Stretch	1.47	3.43	15	-1.46	2.28	20	11.1%	1.01 [0.30, 1.73]		
Subtotal (95% CI)			210			166	100.0%	0.77 [0.30, 1.24]		
Heterogeneity: Tau <sup>2</sup> = 0.39; Chi <sup>2</sup> = 34.67, df = 8 (P < 0.0001); l <sup>2</sup> = 77%										
Test for overall effect: Z = 3.22 (F	P = 0.00	1)								
1.1.3 Muscle mass, >6 mo										
Lemmey 2012, RET vs ROM Subtotal (95% CI)	-0.09	0.92	9 9	-0.31	2.04	9 9	100.0% 100.0%	0.13 [-0.79, 1.06] 0.13 [-0.79, 1.06]		
Heterogeneity: Not applicable										
Test for overall effect: Z = 0.28 (F	P = 0.78	)								
1.1.4 Muscle mass, >3 mo, ≤6	mo									
Häkkinen 1994, RET vs RC	3.6	5.79	21	-0.4	2.63	18	14.8%	0.85 [0.19, 1.51]		
Lemmey 2009, RET vs ROM	1.19	1	13	-0.16	1.8	15	13.1%	0.88 [0.10, 1.67]		
Lemmey 2012, RET vs ROM	1.21	0.98	9	-0.03	2.11	9	11.0%	0.72 [-0.24, 1.68]		
Piva 2019, RET vs NMES	2.65	3.27	26	3.6	2.81	24	16.2%	-0.31 [-0.86, 0.25]		
Prioreschi 2016, WBV vs RC	0.2	0.42	16	-1.14	1.17	15	12.8%	1.50 [0.69, 2.32]		
Siqueira 2017, RET vs RC	0	1.78	66	-0.4	2.22	34	18.1%	0.20 [-0.21, 0.62]		
Strasser 2011, MET vs Stretch	1.47	3.43	15	-1.46	2.28	20	14.0%	1.01 [0.30, 1.73]		
Subtotal (95% Cl)			166			135	100.0%	0.64 [0.18, 1.10]	-	
Heterogeneity: Tau <sup>2</sup> = 0.26; Chi <sup>2</sup>	= 20.01	, df = 6	6 (P = 0	.003); l²	² = 70%	6				
Test for overall effect: Z = 2.74 (P = 0.006)										
1.1.5 Muscle mass, ≤3 mo										
Prioreschi 2016, WBV vs RC	0	3.58	16	0	3.47	15	24.5%	0.00 [-0.70, 0.70]		
Rodrigues 2020, RET vs RC	10.15	5.06	32	0.9	3.21	16	24.1%	2.00 [1.27, 2.74]		
Sandstad 2015, HIIT vs RC	0.6	0.83	12	0.2	1.6	15	23.7%	0.29 [-0.47, 1.06]		
Siqueira 2017, RET vs RC	0.1	1.81	66	-0.4	2.22	34	27.7%	0.25 [-0.16, 0.67]	<b>†</b> •-	
Subtotal (95% CI)			126			80	100.0%	0.62 [-0.19, 1.44]		
Heterogeneity: Tau <sup>2</sup> = 0.58; Chi <sup>2</sup> = 19.80, df = 3 (P = 0.0002); l <sup>2</sup> = 85%										
Test for overall effect: Z = 1.50 (P = 0.13)										
									7 7 7 7 7 7	
									4 -2 0 2 4	
									Favours [Control] Favours [ET]	

**Figure S5. Forest plot summarizing effects ofexercisetherapy(ET) on pooled muscle mass measures at an overall duration and each follow-up time point.** The horizontal line links the lower and upper limits of the 95% CI of this effect. The combined effects are plotted using black diamonds.

95% CI = 95% confidence interval; Std. = standard; IV = inverse variance; HIIT = high-intensity interval training; MET, multicomponent exercise training; RC, regular care; RET, resistance exercise training; ROM, range of motion exercise; WBV, whole body vibration.



**Figure S6. Univariate meta-regression between effect size of change in muscle mass and disease duration.** Each circle represents an independent comparison. The size of each circle is proportional to that study's weight (inverse variance weighted). The effect size of change in muscle mass predicted by the regression model is represented by a solid line. Dotted lines represent the 95% CI.



**Figure S7. Compliance of resistance exercise training (RET) and non-RET therapy.** The horizontal line links the lower and upper limits of the 95% CI of this effect. The combined effects are plotted using black diamonds.

95% CI, 95% confidence interval; IV, inverse variance; BFR-ET, blood-flow restriction exercise training; HIIT, high-intensity interval training; HI-RET, high-intensity resistance exercise training; MET, multicomponent exercise training; NMES, neuromuscular electrical stimulation; RC, regular control; RET, resistance exercise training; ROM, range of motion exercise; WBV, whole body vibration.



**Figure S8. Funnel plots of exercise intervention effects for muscle mass.** Each circle represents an independent comparison, with the X-axis representing a standard mean difference (SMD) over control comparisons and the Y-axis showing the standard error (SE) of SMD. The vertical dotted line indicates the SMD of the combined effect for each outcome measure.