

Supplementary materials

List of content:

–Table 1. PubMed search strategy

–Table 2. EMBASE search strategy

–Table 3. The Cochrane Library search strategy

–Table 4. Ovid search strategy

–Table 5. The CINAHL search strategy

–Fig. 1. Mean change in 6-minute walk distance (6MWD) (m) after exercise intervention vs. non-exercise treatment after bariatric surgery

–Table 6. Summary of synthetic exercise intervention outcomes

–Table 7. GRADE analysis: quality assessment and summary of findings

Table 1. PubMed search strategy

Search	Query	Items found
#1	Search (((((((("Bariatric Surgery"[Mesh]) OR "Gastric Bypass"[Mesh]) OR "Gastroplasty"[Mesh]) OR "Gastroenterostomy"[Mesh]) OR "Gastrectomy"[Mesh]) OR "Biliopancreatic Diversion"[Mesh]) OR "Jejunioileal Bypass"[Mesh]) OR "Anastomosis, Roux-en-Y"[Mesh]) OR (((((((((((bariatric surgical procedure*[Title/Abstract]) OR bariatric surg*[Title/Abstract]) OR metabolic Surg*[Title/Abstract]) OR stomach stapl*[Title/Abstract]) OR weight loss surgery[Title/Abstract]) OR weight reduction surgery[Title/Abstract]) OR obesity surgery[Title/Abstract]) OR Roux-en-Y Gastric Bypass[Title/Abstract]) OR sleeve gastrectomy[Title/Abstract]) OR gastric sleeve[Title/Abstract]) OR gastric banding[Title/Abstract]) OR LAGB[Title/Abstract]) OR LSG[Title/Abstract]) OR bariatric operation[Title/Abstract]) OR duodenal switch[Title/Abstract] OR lap band[Title/Abstract]))) Sort by: Best Match	61612
#2	Search (((((((("Exercise"[Mesh]) OR "Exercise Therapy"[Mesh]) OR ("Physical Education and Training"[Mesh])) OR "Exercise Movement Techniques"[Mesh]) OR "Weight Reduction Programs"[Mesh]) OR "Motor Activity"[Mesh]) OR "Resistance Training"[Mesh]) OR (((((((((((exercis*[Title/Abstract]) OR strength train*[Title/Abstract]) OR physical activ*[Title/Abstract]) OR aerobic train*[Title/Abstract]) OR endurance train* [Title/Abstract]) OR Structured exercis*[Title/Abstract]) OR physical exercis*[Title/Abstract]) OR isometric exercis*[Title/Abstract]) OR exercise train*[Title/Abstract]) OR walk*[Title/Abstract]) OR jog*[Title/Abstract]) OR swim*[Title/Abstract]) OR physical train*[Title/Abstract]))))) Sort by: Best Match	564740
#3	Search (((randomized controlled trial[Publication Type] OR randomized[Title/Abstract] OR placebo[Title/Abstract]))) Sort by: Best Match	777239
#4	#1 and #2 and #3	175

Table 2. The Cochrane Library search strategy

Search	Query	Items found
#1	MeSH descriptor: [Bariatric Surgery] explode all trees	1106
#2	MeSH descriptor: [Gastric Bypass] explode all trees	519
#3	MeSH descriptor: [Gastroplasty] explode all trees	265
#4	MeSH descriptor: [Jejunioileal Bypass] explode all trees	25
#5	MeSH descriptor: [Gastroenterostomy] explode all trees	572
#6	MeSH descriptor: [Gastrectomy] explode all trees	1026
#7	MeSH descriptor: [Biliopancreatic Diversion] explode all trees	33
#8	MeSH descriptor: [Anastomosis, Roux-en-Y] explode all trees	152
#9	obes* surg*:ti,ab,kw (Word variations have been searched)	2894
#10	weight loss surg*:ti,ab,kw (Word variations have been searched)	2404
#11	weight reduction surg*:ti,ab,kw (Word variations have been searched)	1824
#12	antiobes* surg*:ti,ab,kw (Word variations have been searched)	7
#13	metabolic surg*:ti,ab,kw (Word variations have been searched)	1872
#14	gastric surg*:ti,ab,kw (Word variations have been searched)	4613
#15	bariatric surg*:ti,ab,kw (Word variations have been searched)	1413
#16	bariatric operation*:ti,ab,kw (Word variations have been searched)	189
#17	bariatric procedure*:ti,ab,kw (Word variations have been searched)	466
#18	bariatric post:ti,ab,kw (Word variations have been searched)	259
#19	bariatric patient*:ti,ab,kw (Word variations have been searched)	1163
#20	gastric band*:ti,ab,kw (Word variations have been searched)	575
#21	gastric imbrication*:ti,ab,kw (Word variations have been searched)	6
#22	gastric sleeve:ti,ab,kw (Word variations have been searched)	366
#23	gastric stapl*:ti,ab,kw (Word variations have been searched)	165
#24	gastric resection*:ti,ab,kw (Word variations have been searched)	1096
#25	gastric reduction*:ti,ab,kw (Word variations have been searched)	2004
#26	("gastroileal" or "jejunoileal" or "biliopancreatic" or "gastric" or "stomach") next "bypass":ti,ab,kw (Word variations have been searched)	1241
#27	malabsorpti* procedure*:ti,ab,kw (Word variations have been searched)	102
#28	malabsorpti* surg*:ti,ab,kw (Word variations have been searched)	59
#29	"lap band":ti,ab,kw (Word variations have been searched)	25
#30	"LAGB":ti,ab,kw (Word variations have been searched)	79
#31	"LSG":ti,ab,kw (Word variations have been searched)	209
#32	(RYGB* or "roux en y"):ti,ab,kw (Word variations have been searched)	886
#33	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32	12371
#34	MeSH descriptor: [Exercise] explode all trees	21105

#35	MeSH descriptor: [Exercise Therapy] explode all trees	11776
#36	MeSH descriptor: [Physical Education and Training] explode all trees	1561
#37	MeSH descriptor: [Exercise Movement Techniques] explode all trees	1928
#38	MeSH descriptor: [Weight Reduction Programs] explode all trees	495
#39	MeSH descriptor: [Motor Activity] explode all trees	23129
#40	exercis*:ti,ab,kw (Word variations have been searched)	64032
#41	physic* activ*:ti,ab,kw (Word variations have been searched)	32142
#42	physic* fit*:ti,ab,kw (Word variations have been searched)	6378
#43	(walk* or jog* or swim* or "weight lift*"):ti,ab,kw (Word variations have been searched)	18688
#44	(physic* or strength* or resist* or "circuit" or "weight" or aerob* or "cross" or "endurance" or structur*) near/4 train*:ti,ab,kw (Word variations have been searched)	15644
#45	#34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44	97240
#46	#33 and #45	675

Table 3. EMBASE search strategy

Search	Query	Items found
#1	'bariatric surgery'/exp	33,837
#2	'gastric band'/exp	1,045
#3	'gastric banding'/exp	6,634
#4	'sleeve gastrectomy'/exp	9,514
#5	'laparoscopic sleeve gastrectomy'/exp	1,641
#6	'biliopancreatic bypass'/exp	2,856
#7	'gastrectomy'/exp	54,363
#8	'gastric bypass surgery'/'	19,189
#9	'roux y anastomosis'/exp	11,309
#10	'gastroenterostomy'/exp	2,981
#11	'obes* surg*':ab,ti	1,601
#12	'weight loss surg*':ab,ti	1,243
#13	'weight reduction surg*':ab,ti	126
#14	'antiobes* surg*':ab,ti	23
#15	'metabolic surg*':ab,ti	1,090
#16	'gastric surg*':ab,ti	2,709
#17	'bariatric operation*':ab,ti	1,097
#18	'bariatric surg*':ab,ti	23,030
#19	'bariatric procedure*':ab,ti	3,876
#20	'gastric band*':ab, 6,378	6,378
#21	'gastric imbrication*':ab,ti	11
#22	'gastric sleeve':ab,ti	597
#23	'gastric stapl*':ab,ti	189
#24	'gastric resection*':ab,ti	4,746
#25	'gastric reduction*':ab,ti	100
#26	'jejunoileal bypass':ab,ti	924
#27	'biliopancreatic bypass':ab,ti	61
#28	'gastric bypass':ab,ti	17,282
#29	'stomach bypass':ab,ti	11
#30	'malabsorpti* procedure':ab,ti	93
#31	'malabsorpti* surg*':ab,ti	79
#32	'lap band':ab,ti	484
#33	lagb:ab,ti	2,109
#34	lsg:ab,ti	3,657
#35	rygb*:ab,ti OR 'roux en y':ab,ti	16,052
#36	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22	99,496

	OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35	
#37	'exercise'/exp	298,429
#38	'aerobic exercise'/exp	12,300
#39	'physical activity'/exp	346,284
#40	'training'/exp	77,500
#41	'physical education'/exp	12,317
#42	exercis*:ab,ti	340,838
#43	'physic* activ*':ab,ti	125,608
#44	'physic* fit*':ab,ti	10,662
#45	walk*:ab,ti OR jog*:ab,ti OR swim*:ab,ti OR 'weight lift*':ab,ti	179,538
#46	#46. 'physic* train*':ab,ti	9,793
#47	'strength* train*':ab,ti	5,472
#48	'resist* train*':ab,ti	7,623
#49	'circuit train*':ab,ti	286
#50	'weight train*':ab,ti	1,165
#51	'aerob* train*':ab,ti	3,136
#52	'cross train*':ab,ti	622
#53	'endurance train*':ab,ti	6,726
#54	'structur* train*':ab,ti	1,106
#55	#37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54	892,693
#56	'randomized controlled trial'/exp	498,272
#57	#36 AND #55 AND #56	142

Table 4. Ovid search strategy

Search	Query	Items found
1.	exp Bariatric Surgery/	21485
2.	exp Biliopancreatic Diversion/	921
3.	exp Gastric Bypass/	7858
4.	exp GASTROENTEROSTOMY/	11162
5.	exp Gastrectomy/	32297
6.	exp Anastomosis, Roux-en-Y/	3263
7.	"obes* surg*".ab,ti.	969
8.	"weight loss surg*".ab,ti.	733
9.	"weight reduction surg*".ab,ti.	95
10.	"antiobes* surg*".ab,ti.	22
11.	"metabolic surg*".ab,ti.	541
12.	"gastric surg*".ab,ti.	2073
13.	"bariatric operation*".ab,ti.	616
14.	"bariatric surg*".ab,ti.	12690
15.	"bariatric procedure*".ab,ti.	1759
16.	"gastric band*".ab,ti.	3457
17.	"gastric imbrication*".ab,ti.	4
18.	"gastric sleeve".ab,ti.	162
19.	"gastric stapl*".ab,ti.	123
20.	"gastric resection*".ab,ti.	3794
21.	"gastric reduction*".ab,ti.	73
22.	"jejunoileal bypass".ab,ti.	810
23.	"biliopancreatic bypass".ab,ti.	58
24.	"gastric bypass".ab,ti.	9330
25.	"stomach bypass".ab,ti.	14
26.	"malabsorpti* procedure".ab,ti.	44
27.	"malabsorpti* surg*".ab,ti.	41
28.	"lap band".ab,ti.	247
29.	"LAGB".ab,ti.	1034
30.	"LSG".ab,ti.	1544
31.	"rygb*".ab,ti.	2580
32.	"roux en y".ab,ti.	9209
33.	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32	66935
34.	exp EXERCISE/	166772
35.	exp "Physical Education and Training"/	13053
36.	exp RESISTANCE TRAINING/	6494

37.	"exercis*".ab,ti.	258920
38.	"physic* activ*".ab,ti.	94979
39.	"physic* fit*".ab,ti.	8419
40.	"weight lift*".ab,ti.	1179
41.	"walk*".ab,ti.	100469
42.	"jog*".ab,ti.	2124
43.	"swim*".ab,ti.	35212
44.	"physic* train*".ab,ti.	7154
45.	"strength* train*".ab,ti.	4412
46.	"resist* train*".ab,ti.	6565
47.	"circuit train*".ab,ti.	210
48.	"weight train*".ab,ti.	1020
49.	"aerob* train*".ab,ti.	2202
50.	"cross train*".ab,ti.	490
51.	"endurance train*".ab,ti.	5433
52.	"structur* train*".ab,ti.	728
53.	34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52	498208
54.	randomized controlled trial.pt. or randomized.mp. or placebo.mp.	803734
55.	33 and 53 and 54	165

Table 5. The CINAHL search strategy

Search	Query	Items found
S1	(MH "Bariatric Surgery+")	6,252
S2	(MH "Bariatric Patients")	249
S3	(MM "Gastroenterostomy+")	1,502
S4	TI "bariatric surg*" OR AB "bariatric surg*" OR TI "metabolic surg*" OR AB "metabolic surg*" OR TI "antiobesity surg*" OR AB "antiobesity surg*" OR TI "weight loss surg*" OR AB "weight loss surg*" OR TI "weight reduction surg*" OR AB "weight reduction surg"	1,128
S5	TI "gastric band*" OR AB "gastric band*" OR TI "gastric bypass" OR AB "gastric bypass" OR TI "gastric surg*" OR AB "gastric surg*" OR TI "gastric imbrication*" OR AB "gastric imbrication*" OR TI "gastric sleeve" OR AB "gastric sleeve"	940
S6	TI "gastroileal bypass" OR AB "gastroileal bypass" OR TI gastrojejunostom* OR AB gastrojejunostom* OR TI "sleeve gastrectom*" OR AB "sleeve gastrectom*" OR TI gastroplast* OR AB gastroplast* OR TI "biliopancreatic diversion" OR AB "biliopancreatic diversion"	526
S7	TI "biliopancreatic bypass" OR AB "biliopancreatic bypass" OR TI "malabsorpti* procedure*" OR AB "malabsorpti* procedure*" OR TI "malabsorpti* surg*" OR AB "malabsorpti* surg*" OR TI "lap band" OR AB "lap band" OR TI LAGB OR AB LAGB	98
S8	TI LSG OR AB LSG OR TI RYGB* OR AB RYGB* OR TI "roux en y" OR AB "roux en y"	651
S9	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8	2,694
S10	(MH "Exercise+")	89,602
S11	(MH "Therapeutic Exercise+")	43,740
S12	(MH "Resistance Training")	3,043
S13	(MH "Physical Education and Training+")	2,723
S14	(MH "Physical Education and Training+")	2,723
S15	(MH "Physical Activity")	29,923
S16	(MH "Motor Activity+")	10,572
S17	TI exercis* OR AB exercis* OR TI "physic* activ*" OR AB "physic* activ*" OR TI "physic* fit*" OR AB "physic* fit"	35,795
S18	S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17	52,391
S19	(MH "Prognosis+")	330,298
S20	(MH "Study Design+")	1,051,786
S21	TX random*	245,160
S22	S19 OR S20 OR S21	532,048
S23	S9 AND S18 AND S22	71

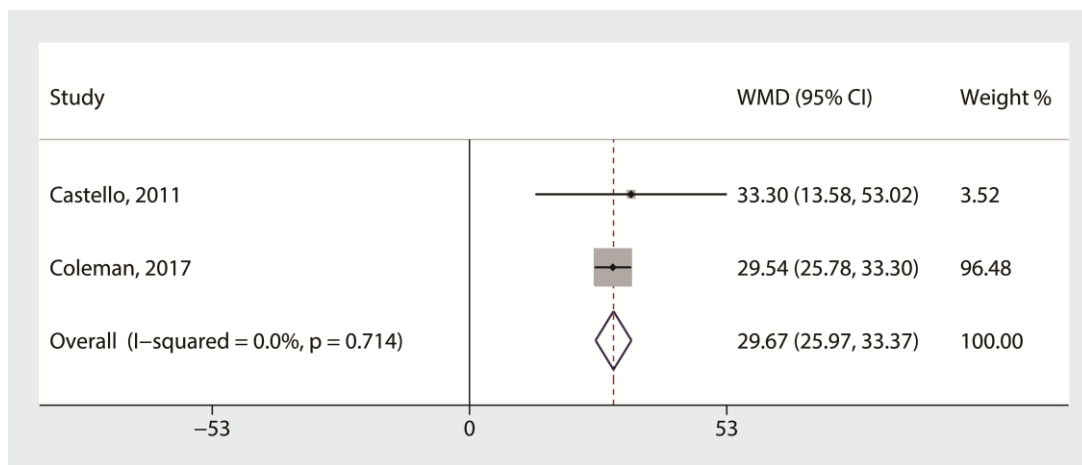


Fig. 1. Mean change in 6-minute walk distance (6MWD) (m) after exercise intervention vs. non-exercise treatment after bariatric surgery.

Table 6. Summary of synthetic exercise intervention outcomes

Outcome	Mean Difference [95% CI]	P-value	I ² (%)
Body weight	−1.94 [−3.18, −0.69]	0.002	51.0
BMI	−0.40 [−0.81, 0.00]	0.05	44.0
BF%	−1.93 [−4.06, 0.20]	0.08	92.8
FM	−3.35 [−7.99, 1.29]	0.16	94.8
FFM	0.53 [−1.88, 2.94]	0.67	71.0
Waist circumference	−5.25 [−10.48, −0.03]	0.05	93.5
Hip circumference	−3.91 [−11.09, 3.26]	0.28	87.5
6MWD	29.67 [25.97, 33.37]	<0.00001	0.0
SBP	−4.12 [−6.68, −1.55]	0.002	6.0
DBP	−3.56 [−8.61, 1.48]	0.17	83.0
HR	−4.39 [−8.11, −0.68]	0.02	0.0

Note: BMI = body mass index; BF% = percentage of total body fat; FM = fat mass; FFM = fat free mass; 6MWD = 6-minute walk distance; SBP = systolic blood pressure, DBP = diastolic blood pressure; HR = heart rate.

–Table 7. GRADE analysis: quality assessment and summary of findings

Physical exercise compared to no exercise for patients following bariatric surgery						
Patient or population: patients following bariatric surgery						
Settings: hospital / at home						
Intervention: Physical exercise						
Comparison: no exercise						
Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	No exercise	Physical exercise				
Body weight Follow-up: 3-18 months		The mean body weight in the intervention groups was 1.94 lower (3.18 to 0.69 lower)		347 (8 studies)	□□□□ moderate ¹	
BMI Follow-up: 3-18 months		The mean bmi in the intervention groups was 0.40 lower (0.81 lower to 0 higher)		259 (5 studies)	□□□□ moderate ¹	

Body fat% Follow-up: 3-6 months		The mean body fat% in the intervention groups was 1.93 lower (4.06 lower to 0.2 higher)	107 (4 studies)	□□□□ low ^{1,2}
Fat mass Follow-up: 3-12 months		The mean fat mass in the intervention groups was 3.35 lower (7.99 lower to 1.29 higher)	186 (3 studies)	□□□□ low ^{1,2,3}
Fat free mass Follow-up: 3-6 months		The mean fat free mass in the intervention groups was 0.53 higher (1.88 lower to 2.94 higher)	58 (2 studies)	□□□□ very low ^{1,2,3,4}
Waist circumference Follow-up: 3-6 days		The mean waist circumference in the intervention groups was 5.25 lower (10.48 to 0.03 lower)	198 (4 studies)	□□□□ low ^{1,2,3}
Hip circumference Follow-up: 3-6 months		The mean hip circumference in the intervention groups was 3.91 lower (11.09 lower to 3.26 higher)	70 (3 studies)	□□□□ very low ^{1,2,3,4}
6MWD Follow-up: 3-12 months		The mean 6mwd in the intervention groups was 29.67 higher (25.97 to 33.37 higher)	65 (2 studies)	□□□□ low ^{1,2}

Systolic blood pressure Follow-up: 3-18 months		The mean systolic blood pressure in the intervention groups was 4.12 lower (6.68 to 1.55 lower)	229 (4 studies)	□□□□ low ^{1,3}
Diastolic blood pressure Follow-up: 3-18 months		The mean diastolic blood pressure in the intervention groups was 3.56 lower (8.61 lower to 1.48 higher)	229 (4 studies)	□□□□ very low ^{1,2,3,4,5}
Resting heart rate Follow-up: 3-18 months		The mean resting heart rate in the intervention groups was 4.39 lower (8.11 to 0.68 lower)	94 (3 studies)	□□□□ low ^{1,3,5}

*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.

1. Total sample size is less than 400
2. The significant heterogeneity with a large I^2 value
3. The 95% CI around the pooled effect is wide
4. The included trial had high risk of performance bias for not blinding the participants

5. Due to high risk of publication bias
