

Table S1 Search strategy

Databases	Steps	Search terms	Results
PubMed	#1	('covid'[Title/Abstract] OR 'coronavirus'[Title/Abstract])	385,336
	#2	('cardiorespiratory fitness'[Title/Abstract] OR 'physical fitness'[Title/Abstract] OR 'cardiopulmonary fitness'[Title/Abstract] OR 'fitness performance'[Title/Abstract] OR 'cardiorespiratory performance'[Title/Abstract])	47,696
	#3	#1 AND #2 Sort by: Best Match	509
CINAHL	#S1	AB 'covid' OR AB 'coronavirus'	61,966
	#S2	AB cardiorespiratory fitness OR AB physical fitness OR AB cardiopulmonary fitness OR fitness performance OR AB cardiorespiratory performance	13,227
	#S3	(AB #S1) AND (AB #S2)	122
Scopus	#1	TITLE-ABS-KEY ('covid' OR 'coronavirus')	577,065
	#2	TITLE-ABS-KEY ('cardiorespiratory fitness' OR 'physical fitness' OR 'cardiopulmonary fitness' OR 'fitness performance' OR 'cardiorespiratory performance')	52,182
	#3	#1 AND #2	652
Embase	#1	'covid'/exp 'covid' OR 'coronavirus':ab,ti	397,868
	#2	'cardiorespiratory fitness' OR 'physical fitness' OR 'cardiopulmonary fitness' OR 'fitness performance' OR 'cardiorespiratory performance':ab,ti	34,632
	#3	#1 AND #2	463

Databases	Steps	Search terms	Results
Cochrane	#1	('covid'):ti,ab,kw OR ('coronavirus'): ti,ab,kw	15,530
	#2	('cardiorespiratory fitness'): ti,ab,kw OR ('physical fitness'):ti,ab,kw OR ('cardiopulmonary fitness'):ti,ab,kw OR ('fitness performance'):ti,ab,kw OR ('cardiorespiratory performance'):ti,ab,kw	10,329
	#3	#1 AND #2	147

Table S2 Excluded studies

References	Reason for exclusion
ACTRN12622000742774 (2022) [56]	Protocol
Ahmed (2020) [57]	Protocol
Anastasio (2022) [58]	Observational study
Aparisi (2021) [59]	Observational study
Arena (2021) [60]	Review
Azmodeh (2022) [61]	Observational study
Back (2022) [10]	Observational study
Baricich (2021) [62]	Observational study
Bellmunt (2021) [63]	Protocol
Blokland (2020) [64]	Observational study
Bohn (2021) [65]	Investigating in older adults without post- and long-COVID-19 infection
Botek (2022) [66]	No exercise intervention
Brandenburg (2021) [67]	Observational study
Brawner (2021) [68]	No CRF outcome
Cafiero (2021) [69]	Observational study
Cancino-López (2021) [70]	Observational study
Christensen (2021) [71]	Observational study

References	Reason for exclusion
Cramer (2020) [72]	Observational study
CTRI (2021) [73]	Protocol
Cuenca-Zaldivar (2022) [74]	No CRF outcome
Debeaumont (2021) [75]	Observational study
Delevatti (2022) [76]	Protocol
Drks (2022) [77]	Protocol
Fereydounnia (2022) [78]	No exercise intervention
Gattoni (2022) [79]	Observational study
Geijerstam (2021) [80]	Observational study
Ekblom-Bak (2021) [11]	Observational study
Hail University Poly Clinic (2022) [81]	Protocol
Hekmatikar (2021) [82]	Protocol
Hermann (2020) [83]	Investigating in participants without post- and long-COVID-19 infection
Heubel (2020) [84]	Protocol
Jafarnezhadgero (2022) [85]	Observational study
Jimeno-Almazán (2021) [86]	Observational study
Jimeno-Almazán (2022) [87]	Observational study
Kisiel (2022) [88]	Observational study
Ladlow (2022) [12]	Observational study

References	Reason for exclusion
Millet (2022) [89]	Observational study
Milovancev (2021) [90]	Observational study
Mitropoulos (2022) [91]	Observational study
Pleguezuelos (2023) [92]	Unavailable numerical data
Schaeffer (2022) [93]	Observational study
Skjørten (2021) [94]	Observational study
Stavrou (2022) [95]	Observational study
Trapé (2021) [96]	Protocol
Williamson (2021) [97]	No full text
Windt (2022) [98]	Unavailable numerical data
Wood (2022) [99]	Observational study
Xiong (2021) [100]	Observational study

Table S3 A revised Cochrane risk-of-bias tool for randomized trials (RoB 2)

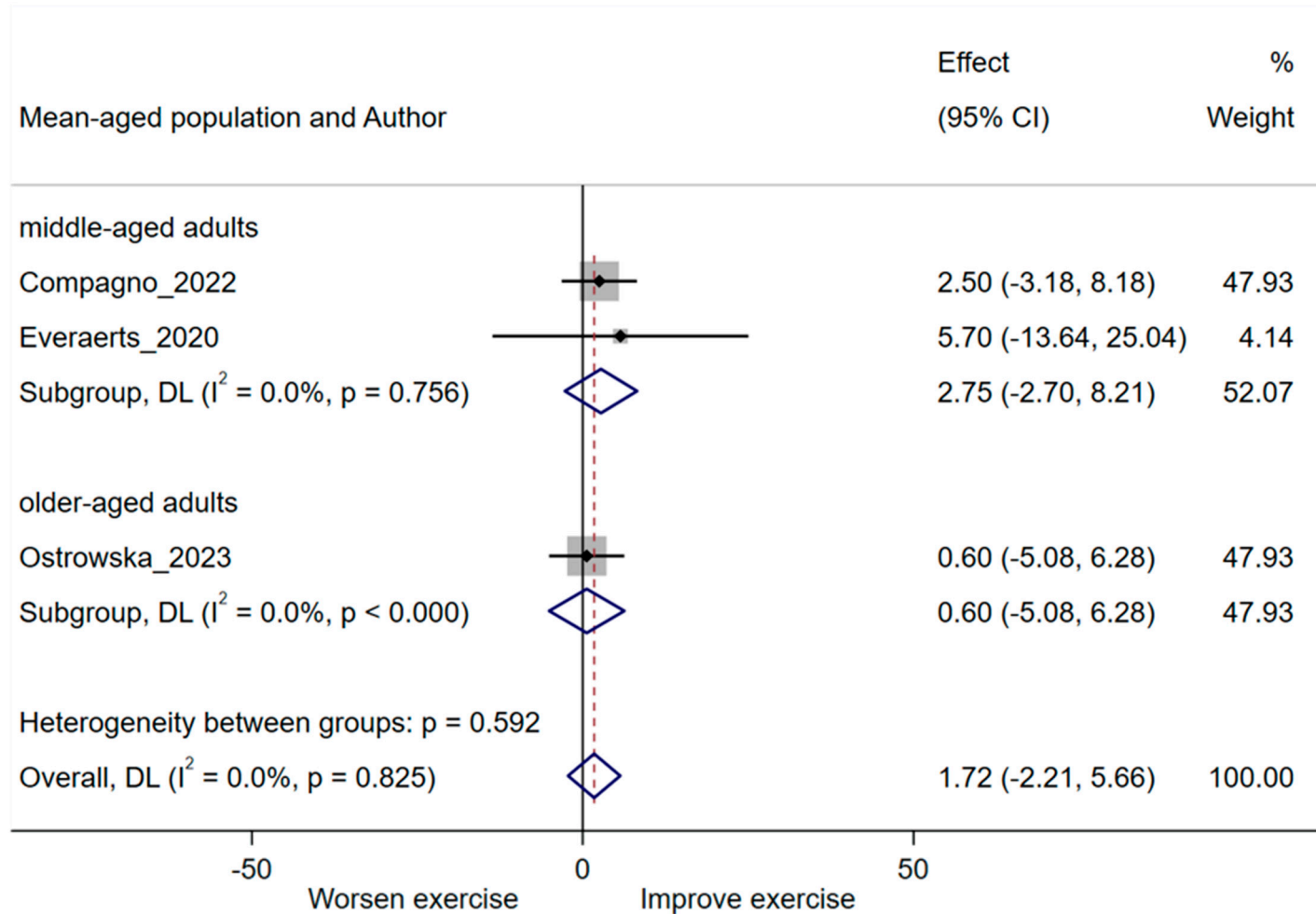
Author (year)	RoB 2						
	Domain 1: Risk of bias arising from the randomization process	Domain 2: Risk of bias due to deviations from the intended interventions (<i>effect of assignment to intervention</i>)	Domain 2: Risk of bias due to deviations from the intended interventions (<i>effect of adhering to intervention</i>)	Domain 3: Missing outcome data	Domain 4: Risk of bias in measurement of the outcome	Domain 5: Risk of bias in selection of the reported result	Overall risk of bias
Amaral (2022) [21]	+	-	+	+	+	+	-
Furtado (2023) [39]	+	-	-	+	-	-	-
Li (2021) [40]	+	+	+	+	+	+	+
Longobardi (2023) [41]	+	+	+	+	+	+	+
Jimeno-Almazán (2023) [29]	+	?	+	+	-	+	-

Judgement: -, High; ?, Unclear; +, Low

Table S4 Risk of bias in non-randomized studies-of interventions (ROBINS-I)

Author (year)	ROBINS-I							
	Domain 1: Bias due to confounding	Domain 2: Bias in selection of participants into the study	Domain 3: Bias in classification of interventions	Domain 4: Bias due to deviations from intended interventions	Domain 5: Bias due to missing data	Domain 6: Bias in measurement of outcomes	Domain 7: Bias in selection of the reported result	Overall bias
Ahmed (2022) [20]	L	L	L	L	L	M	L	M
Calvo-Paniagua (2022) [22]	L	L	L	L	L	L	L	L
Compagno (2022) [23]	L	L	L	L	L	M	L	M
Everaerts (2020) [42]	L	L	L	L	L	M	L	M
Gloeckl (2021) [43]	L	L	L	L	L	M	L	M
Ostrowska (2023) [44]	L	L	L	NI	L	L	L	M
Stavrou (2021) [45]	L	L	L	L	L	M	L	M

Judgement: L, Low; M, Moderate; NI, No information



NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Figure S1 Subgroup analysis of non-randomized controlled trials by mean-aged population. CI, confidence interval; Effect, weighted mean difference; VO_{2peak} , peak oxygen consumption [23,42,44].

Figure S2 Subgroup analysis for 6MWD

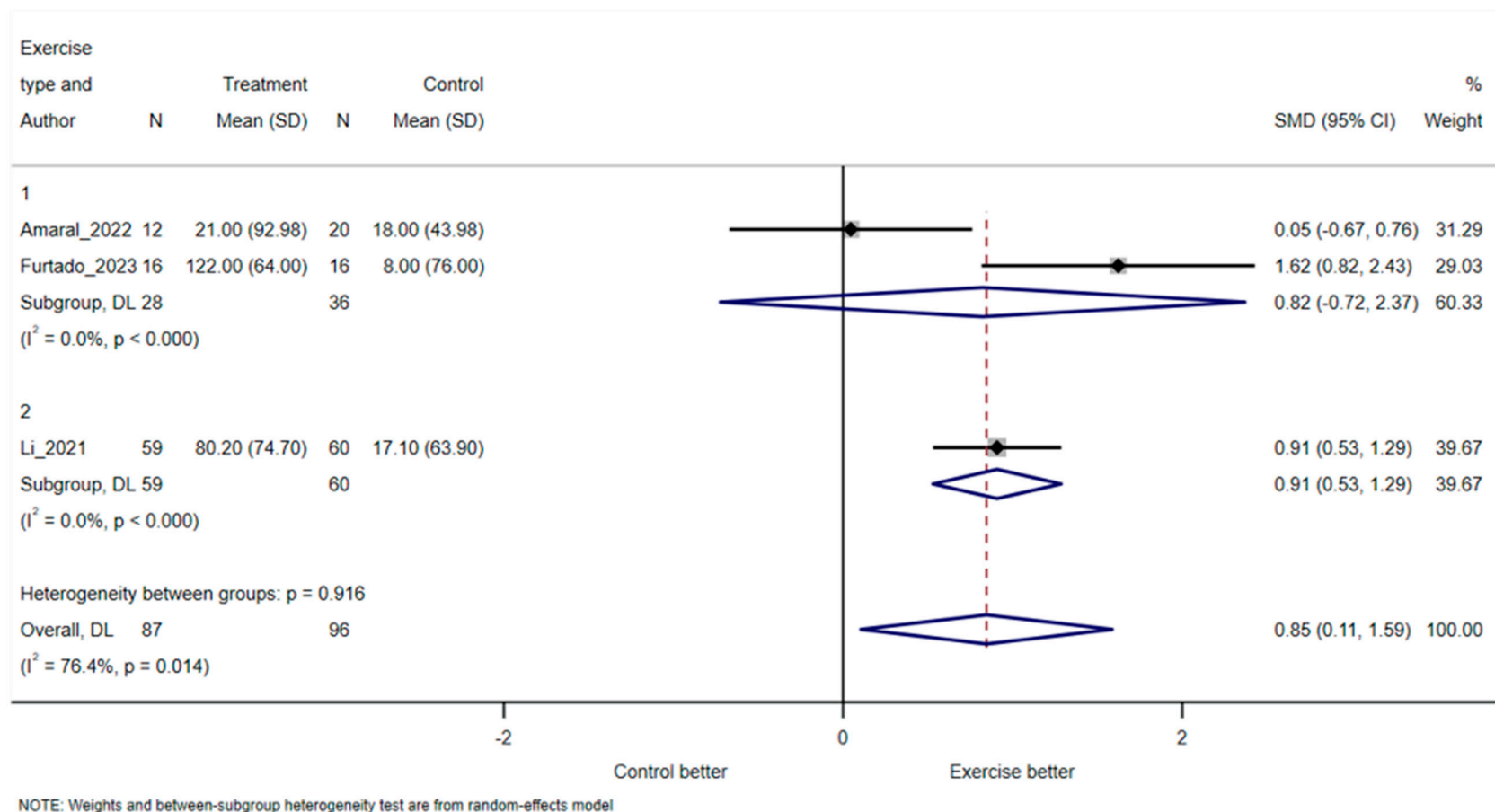


Figure S2a Subgroup analysis of randomized controlled trials by exercise type. CI, confidence interval; N, number of participants; SD, standard deviation; 6MWD, six-minute walk distance; SMD, standardized mean difference; 1, aerobic plus resistance exercise; 2, aerobic combined with resistance and respiratory exercise [21,39,40].

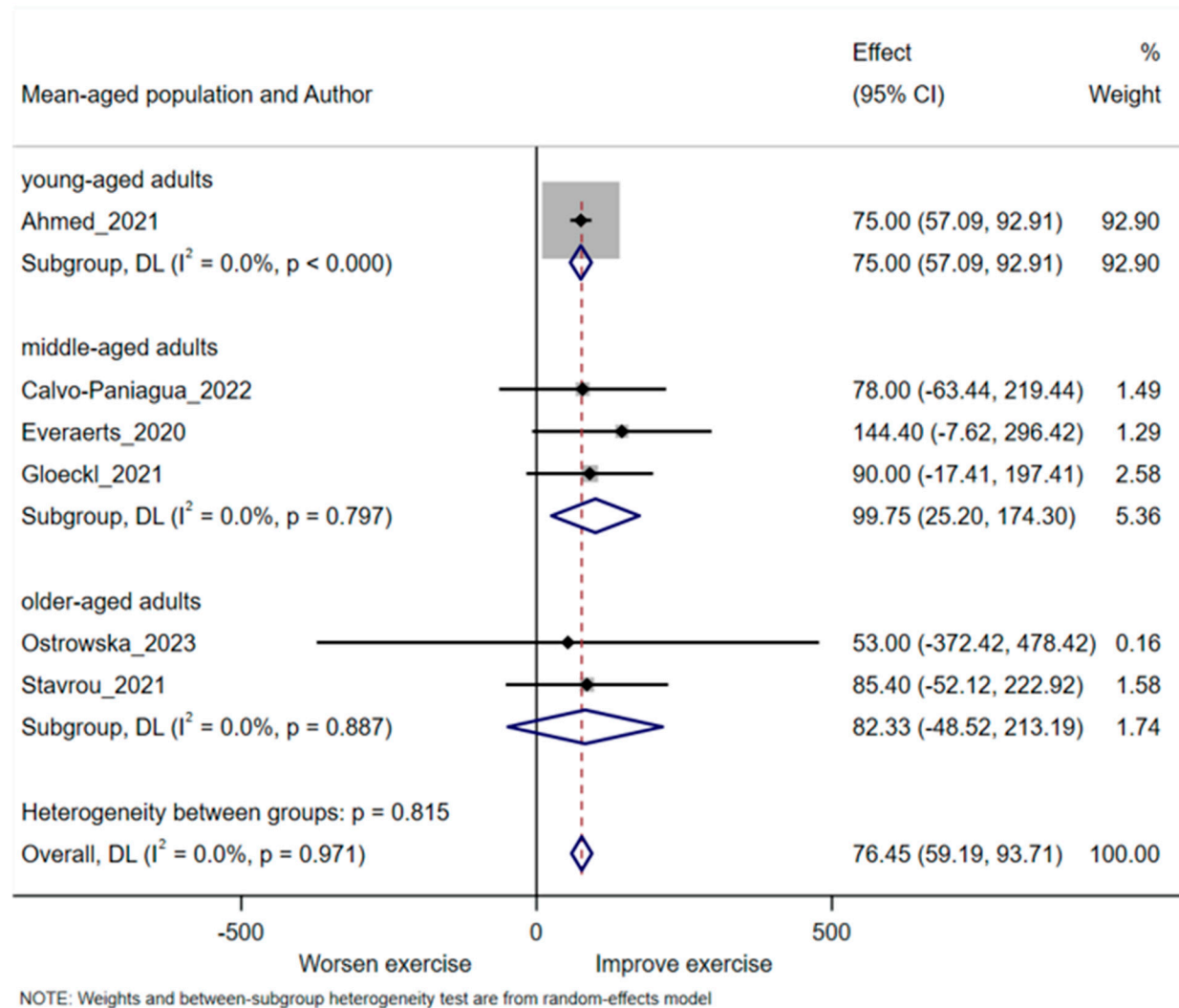


Figure S2b Subgroup analysis of non-randomized controlled trials by mean-aged population. CI, confidence interval; Effect, weighted mean difference; 6MWD, six-minute walk distance [20,22,42,43,44,45].

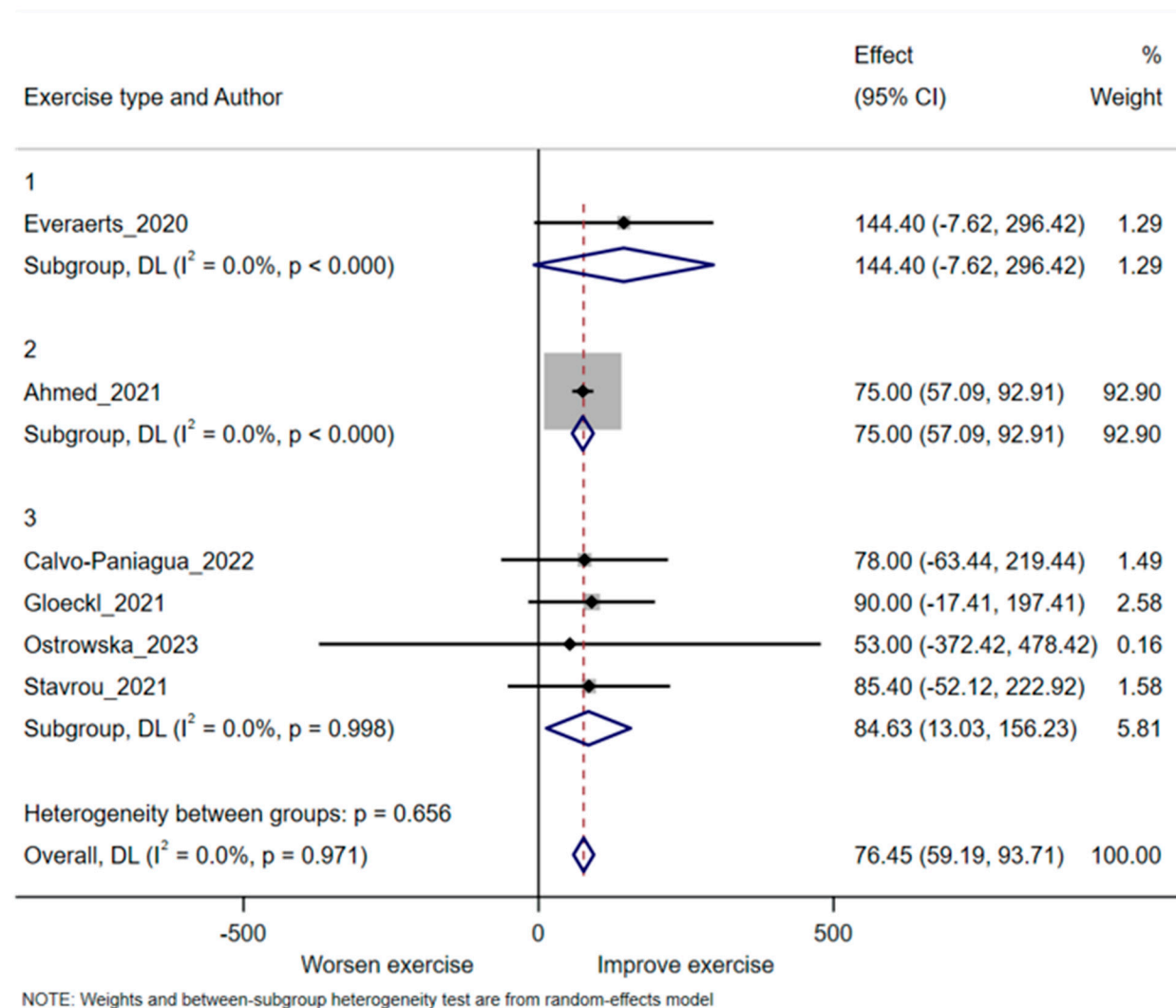


Figure S2c Subgroup analysis of non-randomized controlled trials by exercise type. CI, confidence interval; Effect, weighted mean difference; 6MWD, six-minute walk distance; 1, aerobic plus resistance exercises; 2, aerobic plus respiratory exercises; 3, aerobic combined with resistance and respiratory exercises [20,22,42,43,44,45].

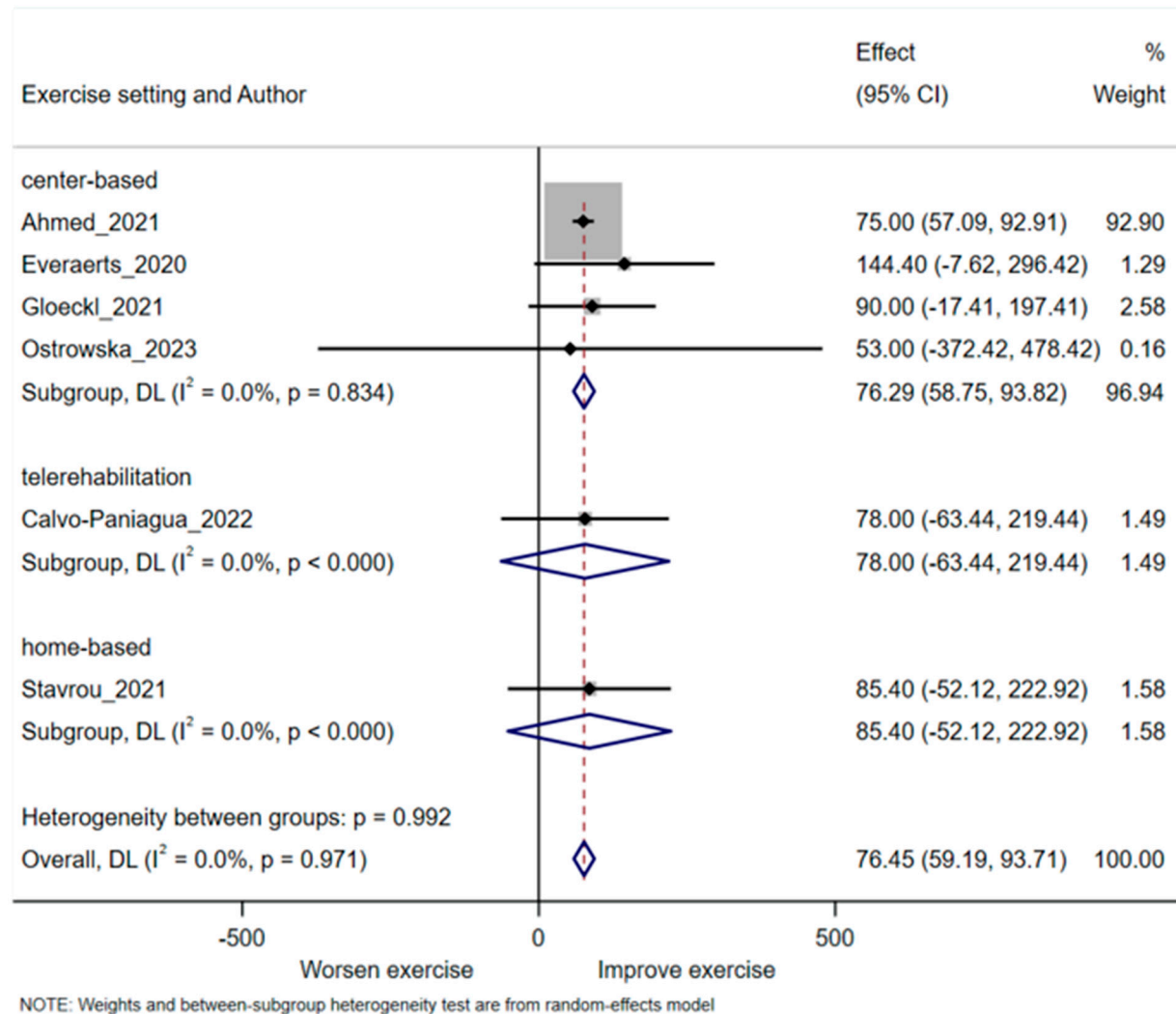
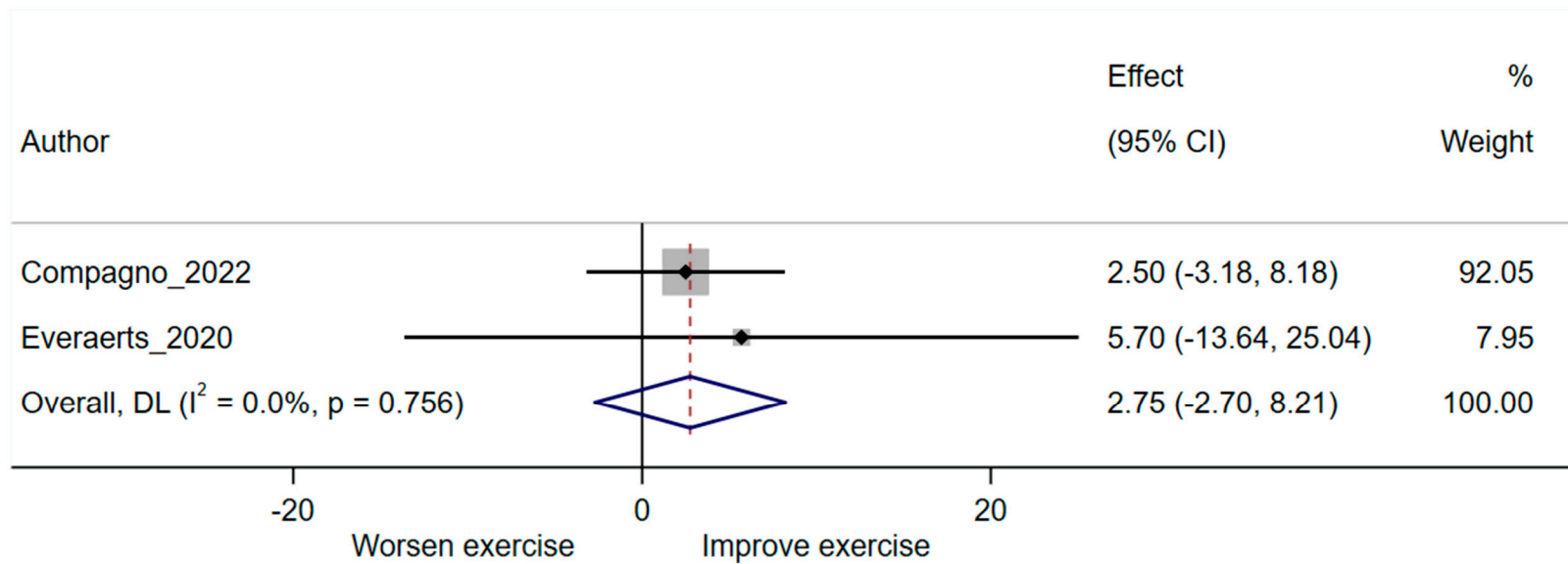


Figure S2d Subgroup analysis of non-randomized controlled trials by exercise setting. CI, confidence interval; Effect, weighted mean difference; 6MWD, six-minute walk distance [20,22,42,43,44,45].



NOTE: Weights are from random-effects model

Figure S3 Sensitivity analysis of non-randomized controlled trials for VO_{2peak} after omitting Ostrowska et al., 2023. CI, confidence interval; Effect, weighted mean difference; VO_{2peak} , peak maximum consumption [23,42].

Figure S4 Sensitivity analysis for 6MWD

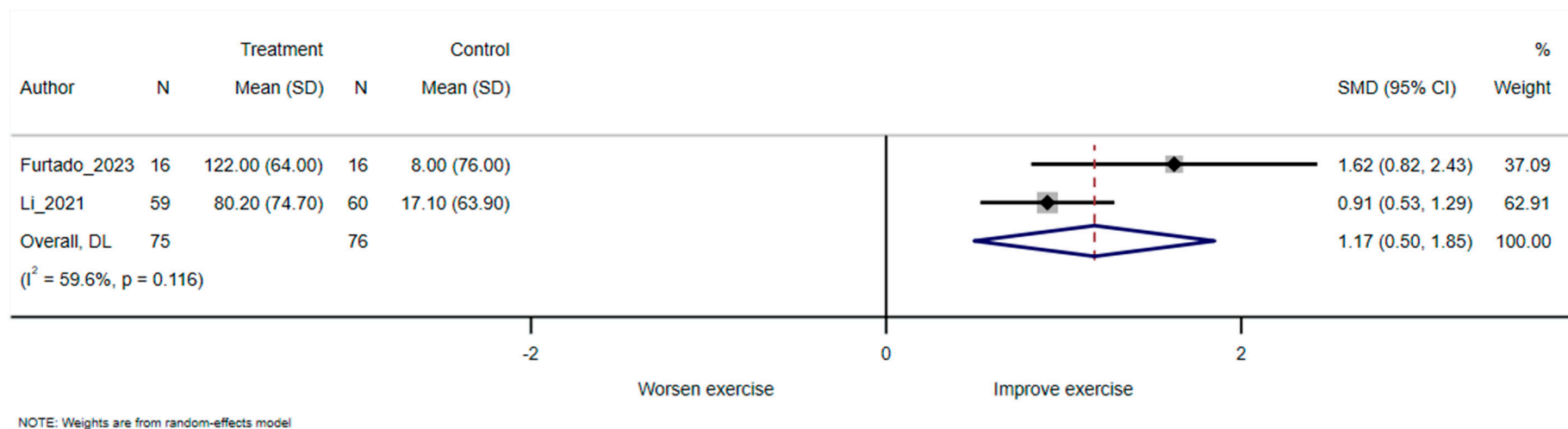
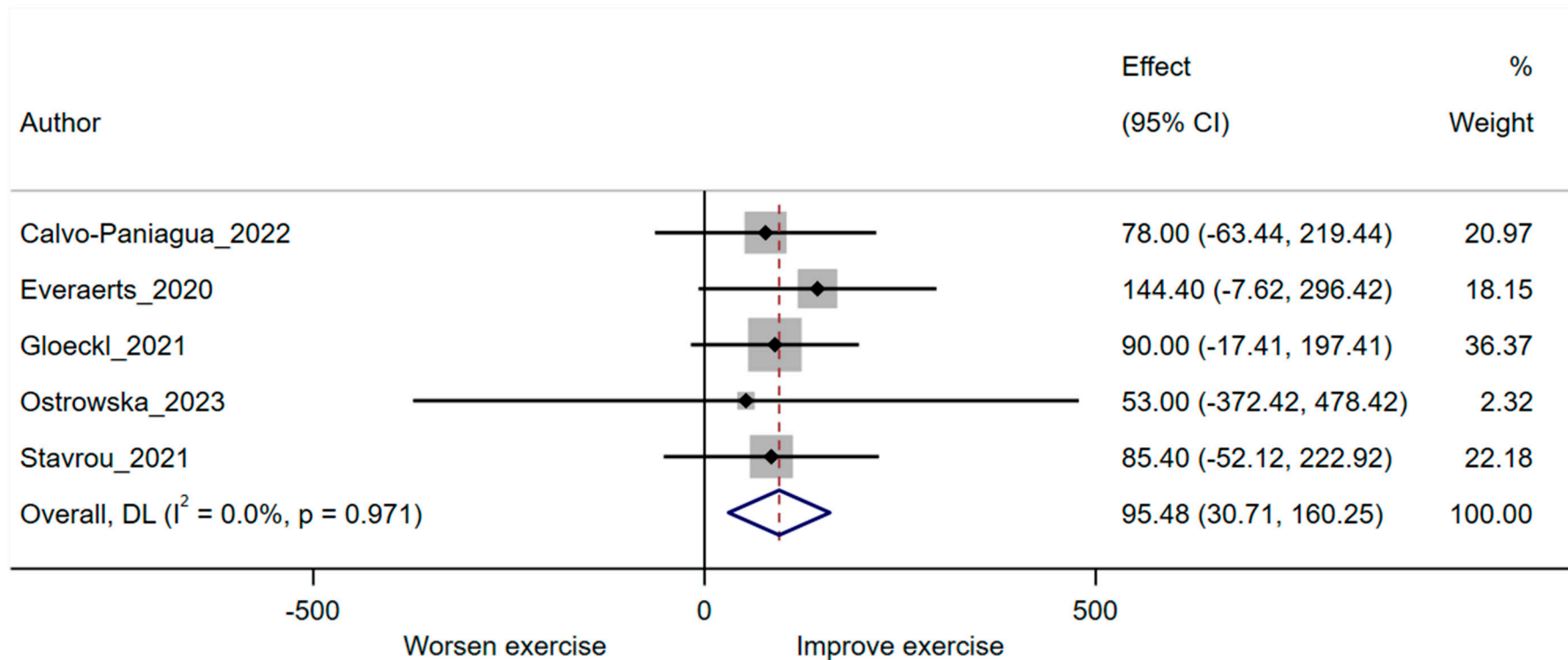


Figure S4a Sensitivity analysis of randomized controlled trials for 6MWD after omitting Amaral et al., 2022. CI, confidence interval; N, number of participants; SD, standard deviation; SMD, standardized mean difference; 6MWD, six-minute walk distance [39,40].

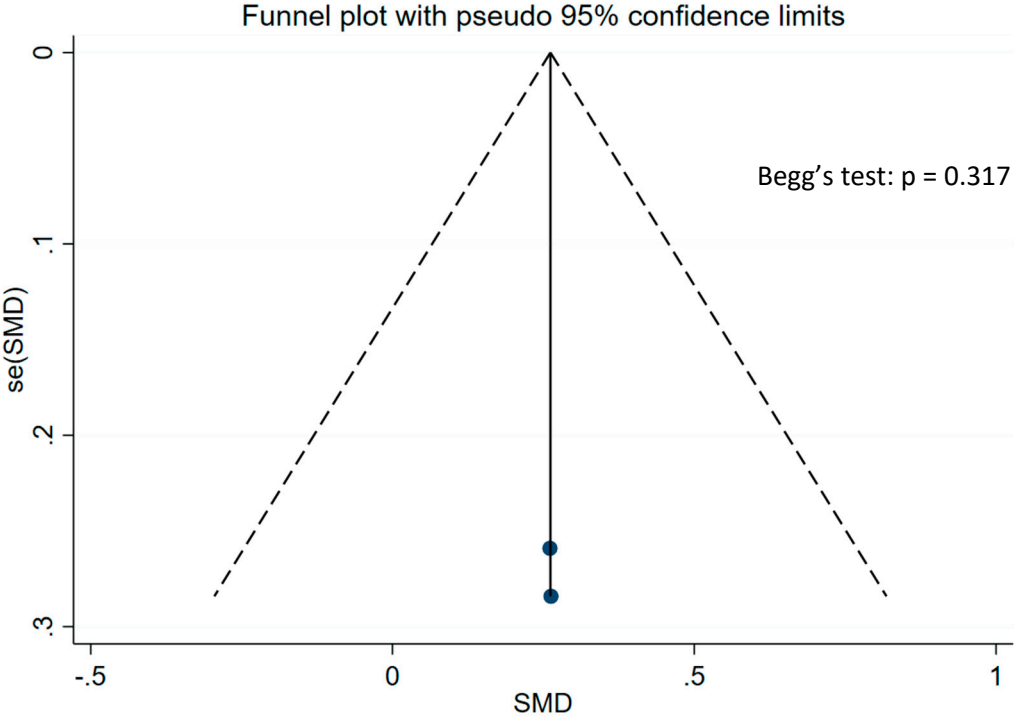


NOTE: Weights are from random-effects model

Figure S4b Sensitivity analysis of non-randomized controlled trials for 6MWD after omitting Ahmed et al., 2021. CI, confidence interval; Effect, weighted mean difference; 6MWD, six-minute walk distance [22,42,43,44,45].

Figure S5

a)



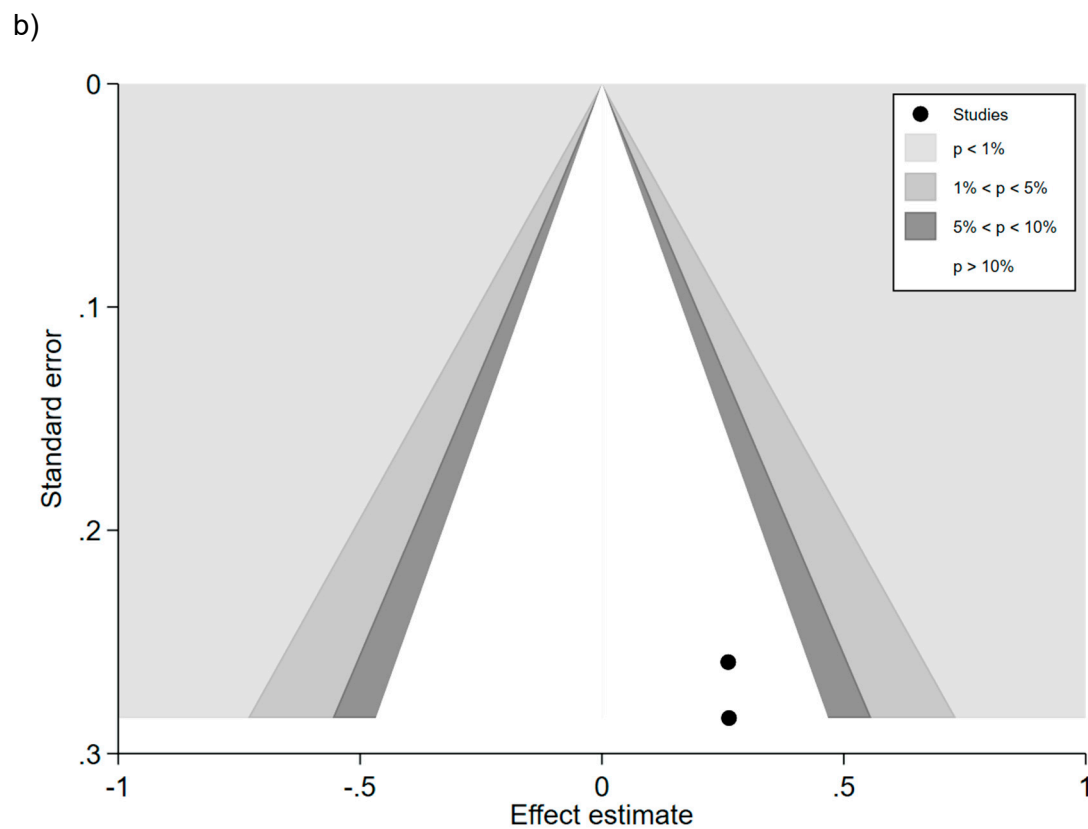
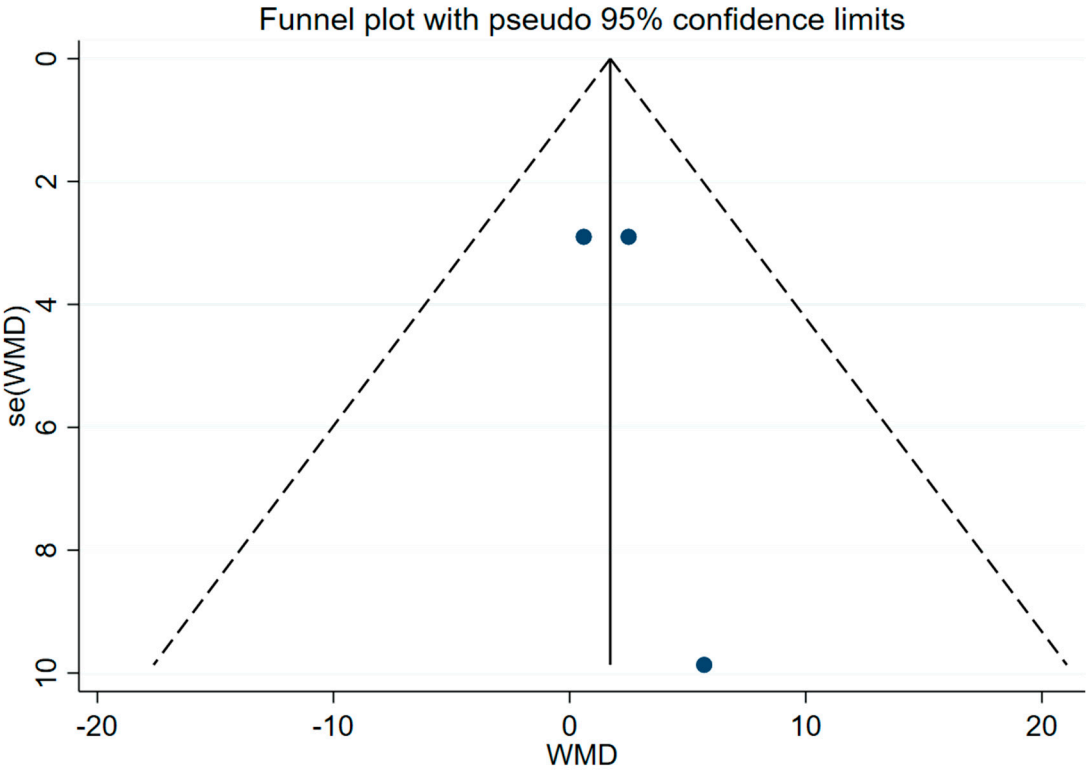


Figure S5. Publication bias of randomized controlled trials for VO_{2peak} . a) Funnel plot and Begg's test; b) Contour-enhanced funnel plot

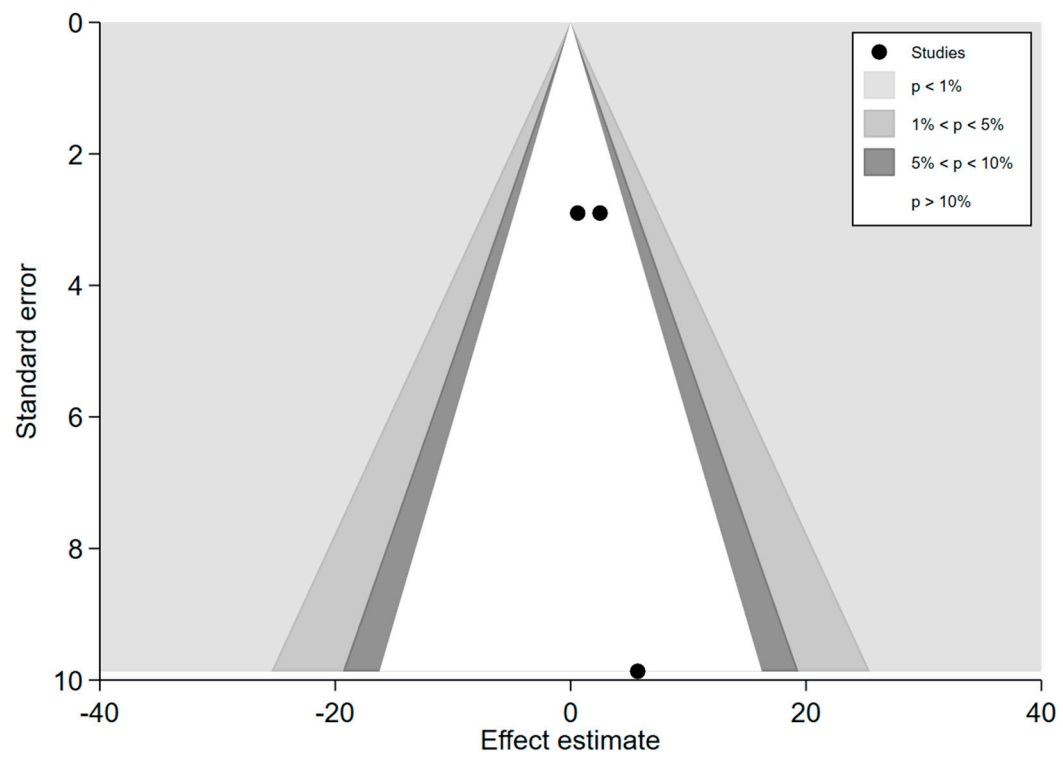
CI, confidence interval; se, standard error; SMD, standard mean difference; VO_{2peak} , peak oxygen consumption

Figure S6

a)



b)



c)

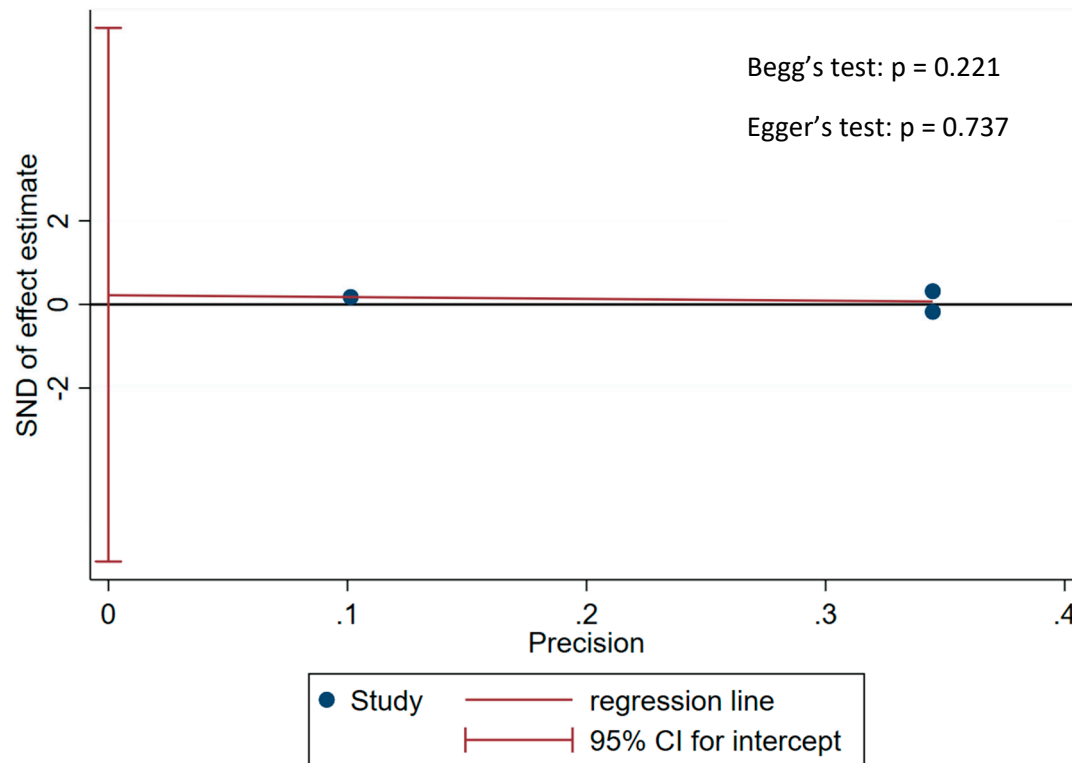
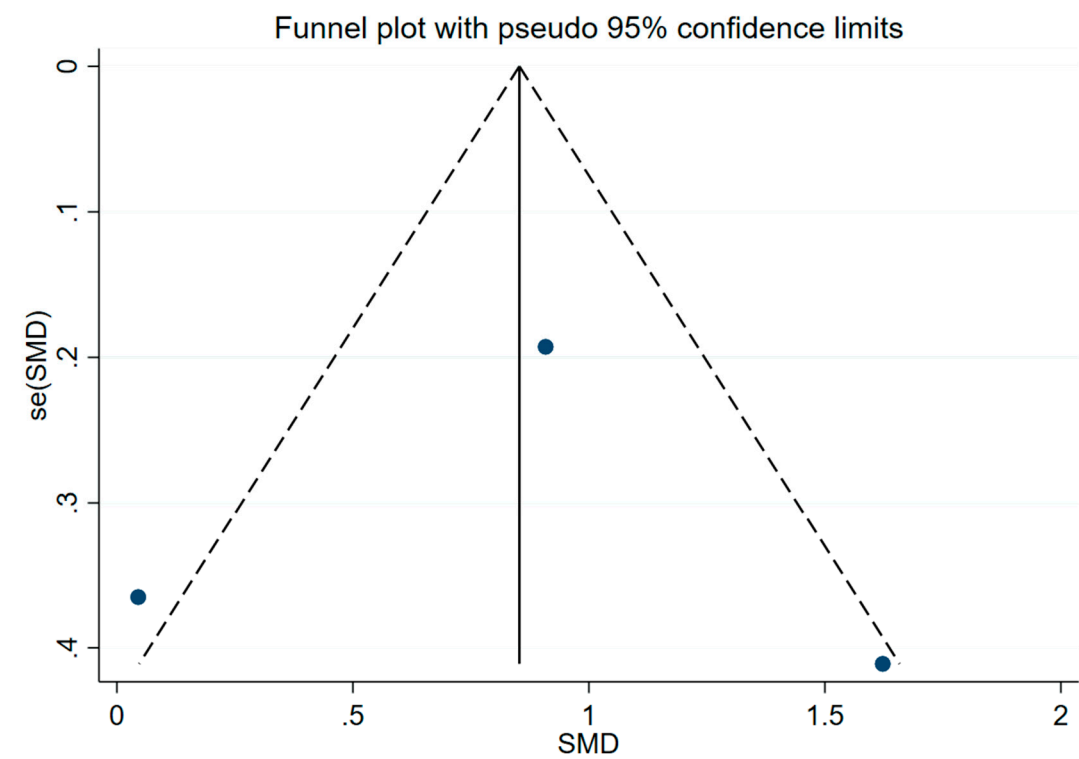


Figure S6. Publication bias of non-randomized controlled trials for VO_{2peak} . a) Funnel plot; b) Contour-enhanced funnel plot; c) Egger's graph and Begg's test

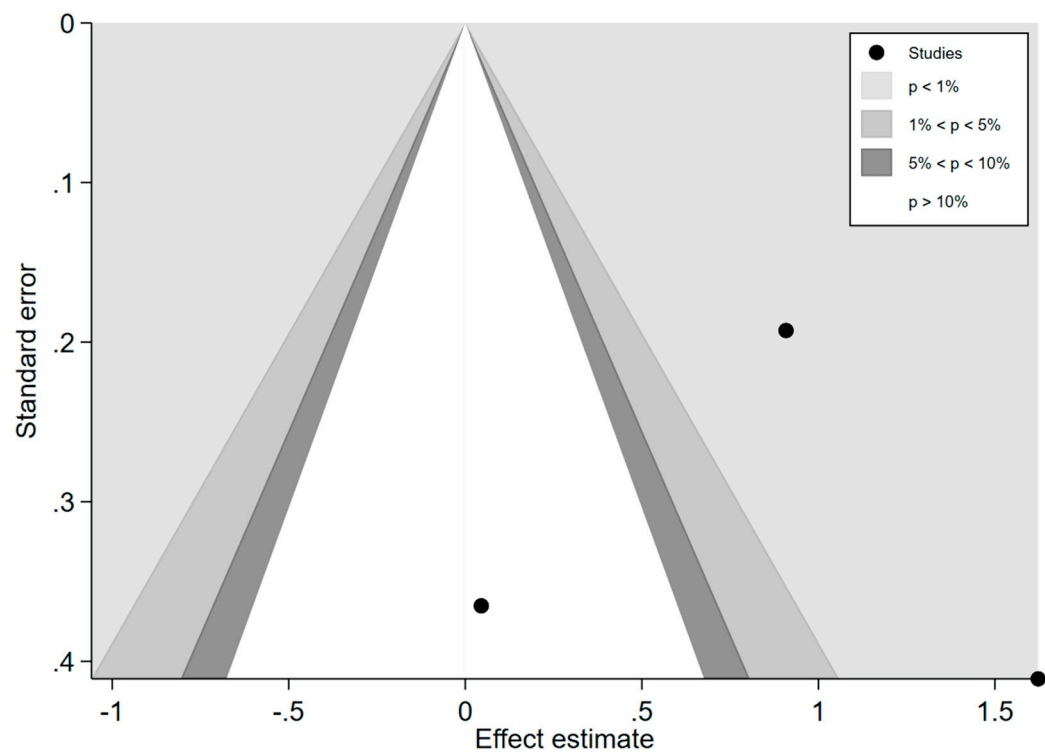
CI, confidence interval; se, standard error; SND, standard normal deviate; WMD, weighted mean difference; VO_{2peak} , peak oxygen consumption

Figure S7

a)



b)



c)

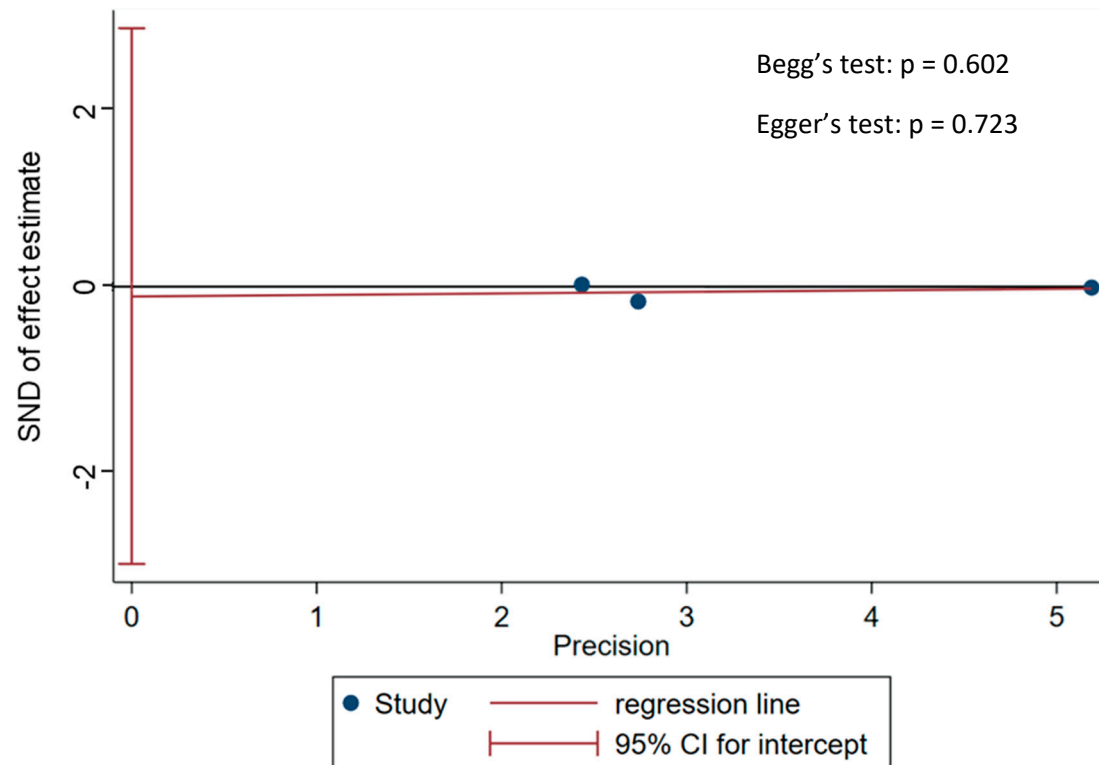
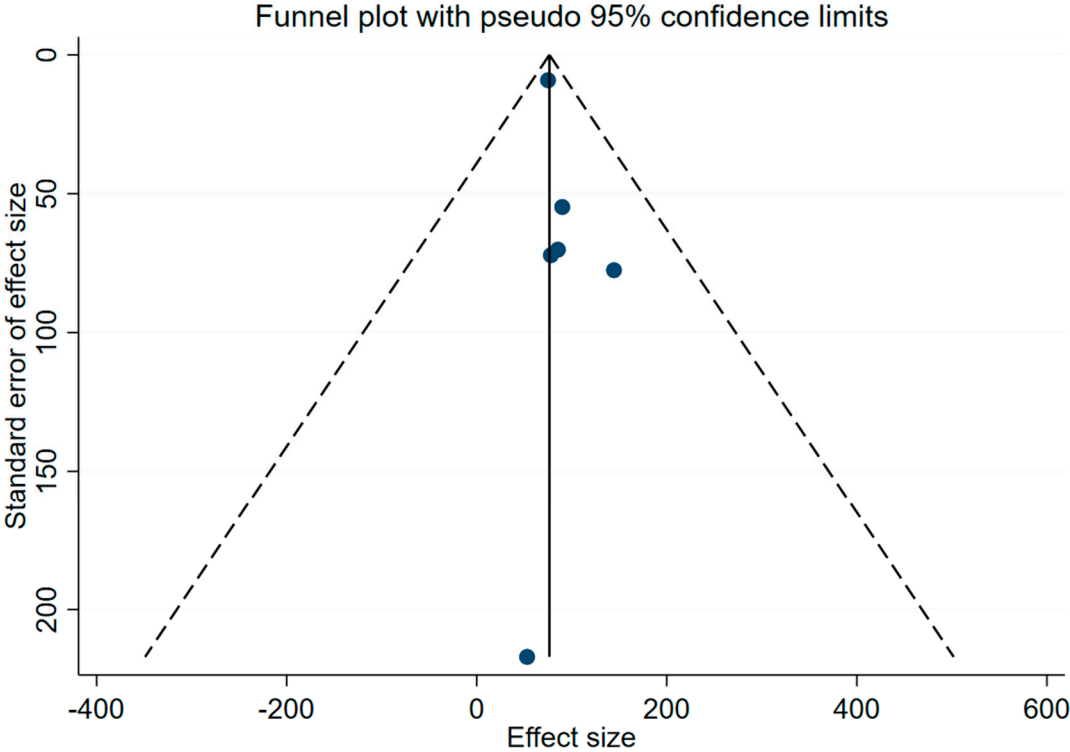


Figure S7. Publication bias of randomized controlled trials for 6MWD. a) Funnel plot; b) Contour-enhanced funnel plot; c) Egger's graph and Begg's test

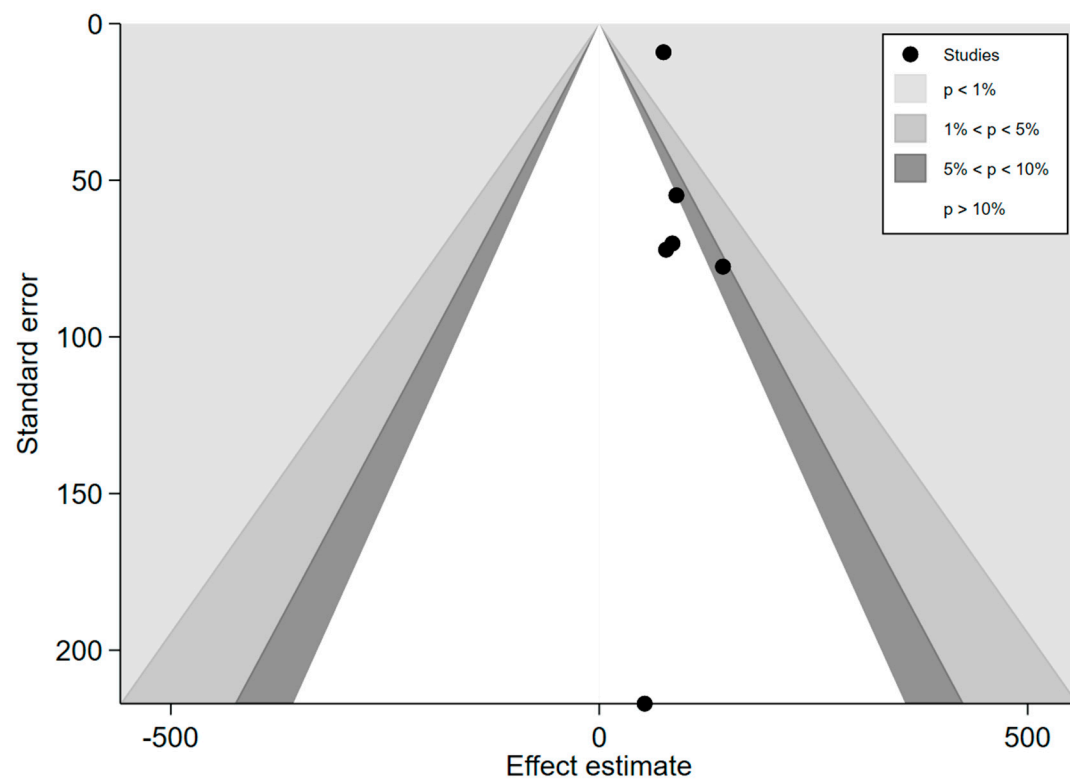
CI, confidence interval; se, standard error; SMD, standardized mean difference; SND, standard normal deviate; 6MWD, six-minute walk distance

Figure S8

a)



b)



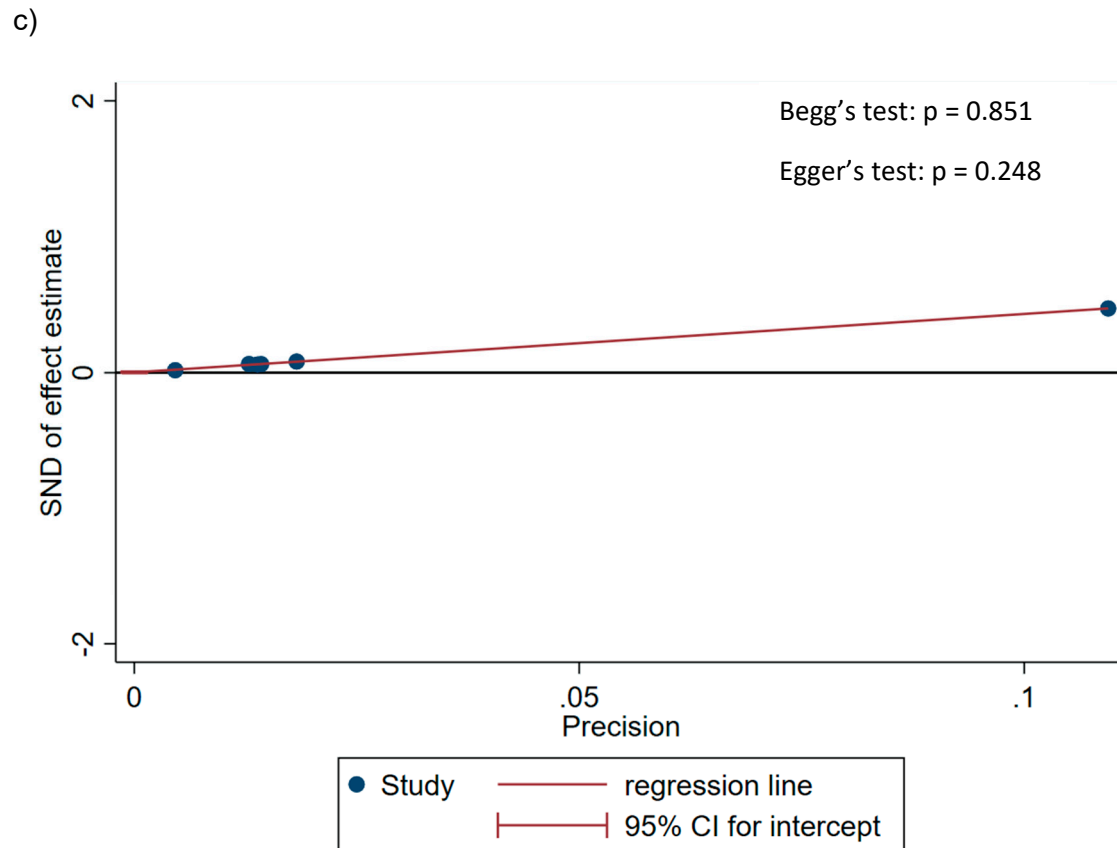


Figure S8. Publication bias of randomized controlled trials for 6MWD. a) Funnel plot; b) Contour-enhanced funnel plot; c) Egger's graph and Begg's test

CI, confidence interval; se, standard error; SMD, standardized mean difference; SND, standard normal deviate; 6MWD, six-minute walk distance