La Medicina del Lavoro

Reviews, commentaries, perspectives

Med. Lav. 2025; 116 (6): 18179
DOI: 10.23749/mdl.v116i6.18179

Effectiveness of Occupational Health Promotion Programs on Cardiometabolic risk factors: A Systematic Review and Three-Level Meta-Analysis

SUPPLEMENTARY MATERIAL

Table S1. Search strings on different electronic databases: PubMed, Embase, Web of Science.

PubMed

#1	((("Health Promotion"[Mesh] OR "Health Promotion"[Title/Abstract] OR "Health Education"[Mesh] OR "Total Worker Health"[Title/Abstract] OR "Health Education*"[Title/Abstract] OR "Health Program*"[Title/Abstract] OR "Health improvement"[Title/Abstract] OR "Health Behavior"[Mesh] OR "Health Behavior"[Title/Abstract] OR "Health Campaign*"[Title/Abstract] OR (Wellness Program*[Title/Abstract]) OR "Wellbeing Program*"[Title/Abstract] OR "Health Enhancement"[Title/Abstract] OR "Risk Reduction Behavior"[Mesh] OR "Lifestyle Risk Reduction*"[Title/Abstract] OR "Healthy People Programs"[Mesh] OR "Health Incentive Program*"[Title/Abstract]) OR (Education Program*[Title/Abstract]))
#2	(("Work"[Mesh] OR "Workplace"[Mesh] OR "Workplace*"[Title/Abstract] OR "Job Site"[Title/Abstract] OR "Work-site"[Title/Abstract] OR "Work Site"[Title/Abstract] OR "Occupations"[Mesh] OR (Occupation*[Title/Abstract]) OR "Occupational Groups"[Mesh] OR (Occupational Groups*[Title/Abstract]) OR (Work Force*[Title/Abstract]) OR (Worker*[Title/Abstract]) OR (Work Staff*[Title/Abstract]) OR "Occupational Environment"[Title/Abstract] OR (Occupational Health Service*[Title/Abstract]) OR "Working Environment"[Title/Abstract] OR "Health Surveillance"[Title/Abstract]))
#3	("Blood Pressure"[Mesh] OR "Waist Circumference"[Mesh] OR (Waist Circumference[Title/Abstract]) OR "Body Mass Index"[Mesh] OR "Body Mass Index"[Title/Abstract] OR "Hematologic Tests"[Mesh] OR "Hematologic Tests"[Title/Abstract] OR (Blood Test*[Title/Abstract]) OR (Hematological Test*[Title/Abstract]) OR (Blood Analys*[Title/Abstract]) OR "Smoking Reduction"[Mesh] OR "Smoking Reduction"[Title/Abstract] OR "Smoking Cessation"[Mesh] OR "Smoking Cessation"[Title/Abstract] OR "Cholesterol*"[Mesh] OR "Body Weight"[Mesh] OR (Body Weight*[Title/Abstract]) OR "Triglycerides"[Mesh] OR (Triglycerid*[Title/Abstract]) OR "Weight Loss"[Mesh] OR "Weight Loss"[title/abstract] OR "Waist-Hip Ratio"[Mesh] OR "Diabetes Mellitus, Type 2/Prevention and Control"[Mesh] OR "Blood Glucose"[Mesh] OR "Blood Glucose"[title/abstract] OR "Hyperglycemia/Prevention and Control"[Mesh] OR "Insulin Resistance/Prevention and Control"[Mesh] OR "Cardiovascular Diseases/Prevention and Control"[Mesh] OR "Cholesterol/Blood"[Mesh] OR "Heart Diseases/Prevention and Control"[Mesh] OR "Exercise"[Mesh] OR "Exercise"[title/abstract] OR "Physical Activit*"[title/abstract]))
#4	**#1 AND #2 AND #3**

Embase

#1	'blood pressure':ti,ab OR 'waist circumference':ti,ab OR 'body mass':ti,ab OR 'blood examination':ti,ab OR 'blood analysis':ti,ab OR 'smoking reduction':ti,ab OR 'smoking cessation':ti,ab OR 'cholesterol':ti,ab OR 'body weight':ti,ab OR 'triacylglycerol':ti,ab OR 'body weight loss':ti,ab OR 'waist hip ratio':ti,ab OR 'diabetes mellitus':ti,ab OR 'glucose blood level':ti,ab OR 'hyperglycemia':ti,ab OR 'insulin resistance':ti,ab OR 'cardiovascular disease':ti,ab OR 'heart disease':ti,ab OR 'exercise':ti,ab OR 'physical activity':ti,ab'
#2	'work':ti,ab OR 'workplace':ti,ab OR 'occupation':ti,ab OR 'named groups by occupation':ti,ab OR 'workforce':ti,ab OR 'worker':ti,ab OR 'occupational health service':ti,ab OR 'work environment':ti,ab OR 'health survey':ti,ab
#3	'health promotion':ti,ab OR 'health education':ti,ab OR 'health program':ti,ab OR 'health behavior':ti,ab OR 'education program':ti,ab
#4	**#1 AND #2 AND #3**

Web of Science

#1	(TI=(health promotion)) OR AB=(health promotion)) OR TI=(health education)) OR AB=(health education)) OR TI=(total worker health)) OR AB=(total worker health)) OR TI=(health program)) OR AB=(health program)) OR TI=(Health Behavior)) OR AB=(Health Behavior)) OR TI=(Health Campaign)) OR AB=(Health Campaign)) OR TI=(Wellness Program)) OR AB=(Wellness Program)) OR TI=(Wellbeing Program)) OR AB=(Wellbeing Program)) OR TI=(Risk Reduction Behavior)) OR AB=(Risk Reduction Behavior)) OR TI=(Lifestyle Risk Reduction)) OR AB=(Lifestyle Risk Reduction)) OR TI=(Healthy People Programs)) OR AB=(Healthy People Programs)
#2	(TI=(work)) OR AB=(work)) OR TI=(workplace)) OR AB=(workplace)) OR TI=(occupation)) OR AB=(occupation)) OR TI=(occupational groups)) OR AB=(occupational groups)) OR TI=(job site)) OR AB=(job site)) OR TI=(work force)) OR AB=(work force)) OR TI=(worker)) OR AB=(worker)) OR TI=(work staff)) OR AB=(work staff)) OR TI=(Occupational Environment)) OR AB=(Occupational Environment)) OR TI=(Occupational Health Service)) OR AB=(Occupational Health Service)) OR TI=(Working Environment)) OR AB=(Working Environment)) OR TI=(Health Surveillance)) OR AB=(Health Surveillance))
#3	(TI=(Blood Pressure)) OR AB=(Blood Pressure)) OR TI=(Waist Circumference)) OR AB=(Waist Circumference)) OR TI=(Body Mass Index)) OR AB=(Body Mass Index)) OR TI=(Blood Tests)) OR AB=(Blood Tests)) OR TI=(Blood Analysis)) OR AB=(Blood Analysis)) OR TI=(Smoking Reduction)) OR AB=(Smoking Reduction)) OR TI=(Smoking Cessation)) OR AB=(Smoking Cessation)) OR TI=(Body Weight)) OR AB=(Body Weight)) OR TI=(Triglycerides)) OR AB=(Triglycerides)) OR TI=(Weight Loss)) OR AB=(Weight Loss)) OR TI=(Waist-Hip Ratio)) OR AB=(Waist-Hip Ratio)) OR TI=(Diabetes)) OR AB=(Diabetes)) OR TI=(Blood Glucose)) OR AB=(Blood Glucose)) OR TI=(Hyperglycemia)) OR AB=(Hyperglycemia)) OR TI=(Insulin Resistance)) OR AB=(Insulin Resistance)) OR TI=(Cardiovascular Diseases)) OR AB=(Cardiovascular Diseases)) OR TI=(Cholesterol)) OR AB=(Cholesterol)) OR TI=(Heart Diseases)) OR AB=(Heart Diseases)) OR TI=(Disease Management)) OR AB=(Disease Management)) OR TI=(Exercise)) OR AB=(Exercise)) OR TI=(Physical Activity)) OR AB=(Physical Activity))
#4	**#1 AND #2 AND #3**

Table S2. PICOS framework – inclusion and exclusion criteria.

	INCLUSION CRITERIA	EXCLUSION CRITERIA
P – POPULATION	Adult workers	Non-workers (general population, patients, etc.)
I – INTERVENTION	Health promotion interventions in workplaces related to cardiovascular risk factors	No intervention applied
C – COMPARISON	Workers who have not joined health promotion programs in the workplace	No comparison group
O – OUTCOME	Objective parameters related to cardiovascular risk factors	Health promotion programs targeting other health risks
S – STUDY DESIGN	Case control studies (RCT and Quasi-Experimental)	Other than case-control studies

Table S3. Study assumptions for SEs and Ess calculation.

Author, year	Outcome(s)	Assumption
Arrogi et al, 2019[23]	BMI, body fat %, WC	None
Asfar et al, 2021[24]	Smokers %	None
Barranco-Ruiz et al, 2019[25]	BMI, body weight, TOT-Chol, TG, SBP, DBP, body fat %, FBG, WHR	None
Clemes et al, 2022[26]	BMI, weight, TOT-Chol, HDL, LDL, TG, body fat %, WC, HbA1C	None
Day et al, 2019	Weight	None
Diaz-Benito et al, 2021[27]	BMI, weight, WC	r= 0.5 between baseline and follow-up samples in intervention and control groups
Fang et al, 2019[28]	BMI, weight, TOT-Chol, HDL, LDL, TG, SBP, DBP, body fat %, WC, FBG	r= 0.9 between baseline and follow-up samples in intervention and control groups
Garcia-Rojas et al, 2021[29]	SBP, DBP	None
Gerodimos et al, 2021[30]	SBP, DBP, body fat %	r= 0.5 between baseline and follow-up samples in intervention and control groups
Gimenez et al, 2024[31]	BMI, weight, TOT-Chol, HDL, LDL, TG, WC, FBG, HbA1C	r= 0.9 between baseline and follow-up samples in intervention and control groups
Guirado et al, 2024[32]	BMI, weight, TOT-Chol, HDL, LDL, TG, WC, FBG	None
Hassani et al, 2020[33]	BMI, weight, body fat %, FBG, HbA1C	None
Hee Woo et al, 2019[34]	BMI, TOT-Chol, HDL, LDL, TG, SBP, DBP, WC, FBG	r= 0.9 between baseline and follow-up samples in intervention and control groups
Hu et al, 2023[35]	SBP, DBP, smokers %	None
Iturriaga et al, 2019[36]	BMI, body fat %	r= 0.9 between baseline and follow-up samples in intervention and control groups
Jorvand et al, 2020[37]	TOT-Chol, HDL, LDL, TG, FBG	r= 0.5 between baseline and follow-up samples in intervention and control groups
Karatrantou et al, 2020[38]	SBP, DBP, body fat %	r= 0.5 between baseline and follow-up samples in intervention and control groups
Kim et al, 2023[39]	Smokers %	None
Kim et al, 2022[40]	TOT-Chol, HDL, LDL, TG, FBG	r= 0.9 between baseline and follow-up samples in intervention and control groups
Koch et al, 2022[41]	SBP, DBP	r= 0.9 between baseline and follow-up samples in intervention and control groups
Kong et al, 2022[42]	BMI, WC, WHR	None
Kotejoshyer et al, 2021[43]	BMI, body fat %	None
Kugathasan et al, 2023[44]	BMI, weight	r= 0.9 between baseline and follow-up samples in intervention and control groups
Lennefer et al, 2020[45]	BMI	r= 0.5 between baseline and follow-up samples in intervention and control groups
Ma et al, 2021[46]	BMI, body fat %	r= 0.9 between baseline and follow-up samples in intervention and control groups
Mahdavi-Roshan et al, 2020[47]	BMI, weight, WC	None

Maphong et al, 2021[48]	SBP, DBP, WC	r= 0.9 between baseline and follow-up samples in intervention and control groups
Mat Azmi et al, 2022[49]	TOT-Chol, HDL, LDL, TG, FBG	r= 0.9 between baseline and follow-up samples in intervention and control groups
Moon et al, 2024[50]	BMI, TOT-Chol, HDL, SBP, DBP, WC, FBG, HbA1C	r= 0.5 between baseline and follow-up samples in intervention and control groups
Nagata et al, 2022[51]	BMI, weight, LDL, SBP, DBP, WC, HbA1C	r= 0.9 between baseline and follow-up samples in intervention and control groups
Nahm et al, 2020[52]	BMI, weight, SBP, DBP, body fat %	r= 0.9 between baseline and follow-up samples in intervention and control groups
Ozaki et al, 2019[53]	BMI, weight	None
Raymond et al, 2019[54]	BMI, TOT-Chol, HDL, LDL, TG, WC, HbA1C	r= 0.5 between baseline and follow-up samples in intervention and control groups
Rigotti et al, 2020[55]	Smokers %	None
Röhling et al, 2020[56]	BMI, weight, TOT-Chol, HDL, LDL, TG, SBP, DBP, body fat %, WC, FBG, HbA1C	None
Ruettger et al, 2022[57]	BMI, weight, TOT-Chol, HDL, LDL, TG, SBP, DBP, body fat %, WC, HbA1C	None
Ryu et al, 2021[58]	BMI, TOT-Chol, HDL, LDL, TG, SBP, DBP, body fat %, WC	r= 0.9 between baseline and follow-up samples in intervention and control groups
Saavedra et al, 2020[59]	BMI, weight, TOT-Chol, HDL, LDL, TG, SBP, body fat %, WHR	r= 0.9 between baseline and follow-up samples in intervention and control groups
Shakerian et al, 2023[60]	BMI, body fat %, WHR	r= 0.9 between baseline and follow-up samples in intervention and control groups
Song et al, 2019[61]	BMI, TOT-Chol, HDL, SBP, DBP, FBG	None
Thorndike et al, 2021[62]	BMI, weight, TOT-Chol, HDL, LDL, TG, SBP, DBP, WC, HbA1C	None
Van de Ven et al, 2023[63]	BMI, weight, smokers %	r= 0.9 between baseline and follow-up samples in intervention and control groups
Wang et al, 2020[64]	SBP, DBP, smokers %	None
Wilson et al, 2022[65]	BMI, weight, SBP, DBP, body fat %, WC, WHR	r= 0.5 between baseline and follow-up samples in intervention and control groups

BMI = Body Mass Index; TOT-Chol = Total Cholesterol; HDL = High-Density Lipoprotein; LDL = Low-Density Lipoprotein; TG = Triglycerides; SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; WC = Waist Circumference; FBG = Fasting Blood Glucose; HbA1C = Glycated Haemoglobin; WHR = Waist-to-Hip Ratio.

Table S4. Quality assessment criteria.

Criterion	Range	Score	Description
Design	0-1	1	if randomised trial
		0	if quasi-experimental design of any kind
Assessment of intervention	0-1	1	if the intervention has been clearly defined and measured
		0	if the intervention has not been clearly defined and measured
Assessment of outcome	0-1	1	if the outcome has been clearly defined and measured
		0	if the outcome has not been clearly defined and measured
Control for confounding	0-1	1	if RCT or sufficient/appropriate control for major confounders
		0	if insufficient control for major confounders
Evidence of selection bias	0-1	1	if absence of evidence for selection bias
		0	If substantial presence of evidence for selection bias

Table S5. Numbers of studies investigating different outcomes.

Outcome	**N. of studies**
BMI (kg/m2)	30
Weight (kg)	19
Total Cholesterol (mg/dL)	16
HDL Cholesterol (mg/dL)	16
LDL Cholesterol (mg/dL)	15
Triglycerides (mg/dL)	11
Systolic Blood Pressure (mmHg)	20
Diastolic Blood pressure (mmHg)	19
Body fat (%)	16
Waist circumference (cm)	17
Glucose (mmol/L)	11
Smoking (%)	5

Table S6. Quality assessment of included studies.

FIRST AUTHOR	YEAR	QUALITY ASSESSMENT						
		A	B	C	D	E	TOT	SCORE
Arrogi et al	2019	0	1	1	0	1	3	Low
Asfar et al	2021	1	1	1	1	1	5	High
Barranco-Ruiz et al	2019	1	1	1	1	0	4	High
Clemes et al	2022	1	1	1	1	1	5	High
Day et al	2019	1	1	1	1	0	4	High
Diaz-Benito et al	2021	1	1	1	1	0	4	High
Fang et al	2019	1	1	1	1	1	5	High
Garcia-Rojas et al	2021	0	1	1	1	0	3	Low
Gerodimos et al	2021	1	1	1	1	1	5	High
Gimenez et al	2024	1	1	1	1	0	4	High
Guirado et al	2024	1	1	1	1	0	4	High
Hassani et al	2020	1	1	1	1	1	5	High
Hee Woo et al	2019	1	1	1	1	0	4	High
Hu et al	2023	1	1	1	1	1	5	High
Iturriaga et al	2019	1	1	1	1	0	4	High
Jorvand et al	2020	1	1	1	0	0	3	Low
Karatrantou et al	2020	1	1	1	1	0	4	High
Kim et al	2023	0	1	1	1	1	4	Low
Kim et al	2022	1	1	1	1	0	4	High
Koch et al	2022	1	1	1	1	1	5	High
Kong et al	2022	1	1	1	1	1	5	High
Kotejoshyer et al	2021	1	1	1	1	1	5	High
Kugathasan et al	2023	0	1	1	1	0	3	Low
Lennefer et al	2020	1	1	1	1	0	4	High
Ma et al	2021	1	1	1	1	0	4	High
Mahdavi-Roshan et al	2020	0	1	1	1	1	4	High
Maphong et al	2021	0	1	1	0	0	2	Low
Mat Azmi et al	2022	0	1	1	0	0	2	Low
Moon et al	2024	0	1	1	0	0	2	Low
Nagata et al	2022	0	1	1	0	0	2	Low
Nahm et al	2020	1	1	1	1	0	4	High
Ozaki et al	2019	1	1	1	1	1	5	High
Raymond et al	2019	0	1	1	0	0	2	Low
Rigotti et al	2020	1	1	1	1	1	5	High
Röhling et al	2020	1	1	1	1	1	5	High
Ruettger et al	2022	1	1	1	1	1	5	High
Ryu et al	2021	0	1	1	1	1	4	High
Saavedra et al	2020	0	1	1	0	0	2	Low
Shakerian et al	2023	1	1	1	1	0	4	High
Song et al	2019	1	1	1	1	1	5	High
Thorndike et al	2021	1	1	1	1	1	5	High
Van de Ven et al	2023	1	1	1	1	0	4	High
Wang et al	2020	1	1	1	1	1	5	High
Wilson et al	2022	0	1	1	0	0	2	Low

Table S7. Aggregate characteristics of included studies.

Publication details		Workers' details		Workplace characteristics		Intervention characteristics	
Geographic area		**Total participants**	**49813**	**Setting**		**Duration (months)**	9.8 ± 13.4
Asia	17 (39%)	N cases	32457 (%)	Hospital	9 (20%)	**Area of intervention**	
Europe	15 (34%)	N controls	17356 (	Industry	9 (20%)	Physical activity	38/44 (86%)
North America	8 (18%)	Median sample size	110 (16-24396)	Tertiary	16 (36%)	Dietary habits	21/44 (48%)
Other	4 (9%)	Mean age	41.0 ± 5.4	Mixed/unspecified	10 (23%)	Smoking reduction	8/44 (18%)
Year of publication		**Gender (male%)**	54.5 ± 33.6	**Number of sites**	6.6 (±9.7)	Stress management	6/44 (14%)
≥ 2022	28 (64%)	**Designation**		**Company dimension**		Alcohol drinking	2/44 (5%)
< 2022	16 (36%)	White collar	32 (73%)	Large	24 (54%)	Sleep hygiene	1/44 (2%)
Study design		Blue collar	4 (9%)	Medium	6 (14%)	**Modality of intervention**	
RCT	30 (68%)	Mix/unspecified	8 (18%)	Unspecified	14 (32%)	In-person	19/44 (43%)
Quasi-experimental	14 (32%)	**Health status**				Web-Online	4/44 (9%)
Randomization (for 30 RCTs)		Healthy	18 (41%)			Mixed	21/44 (48%)
Cluster	7 (23%)	CV risk factors	11 (25%)			**Single vs multiple areas of intervention**	
Individual	23 (77%)	Mixed	15 (34%)			Multiple	19 (43%)
Study quality						Single	25 (57%)
Low	27 (61%)					**Main author of the intervention**	
High	17 (39%)					Physician	15 (34%)
						Other sanitary	2 (5%)
						Other	27 (61%)
						N intervention/months	14.2 (13.7)
						Mangement involvement	
						Yes	10 (23%)
						No	34 (77%)
						Economic incentives	
						Yes	10 (23%)
						No	34 (77%)

Figure S1. Forest plot of weight.

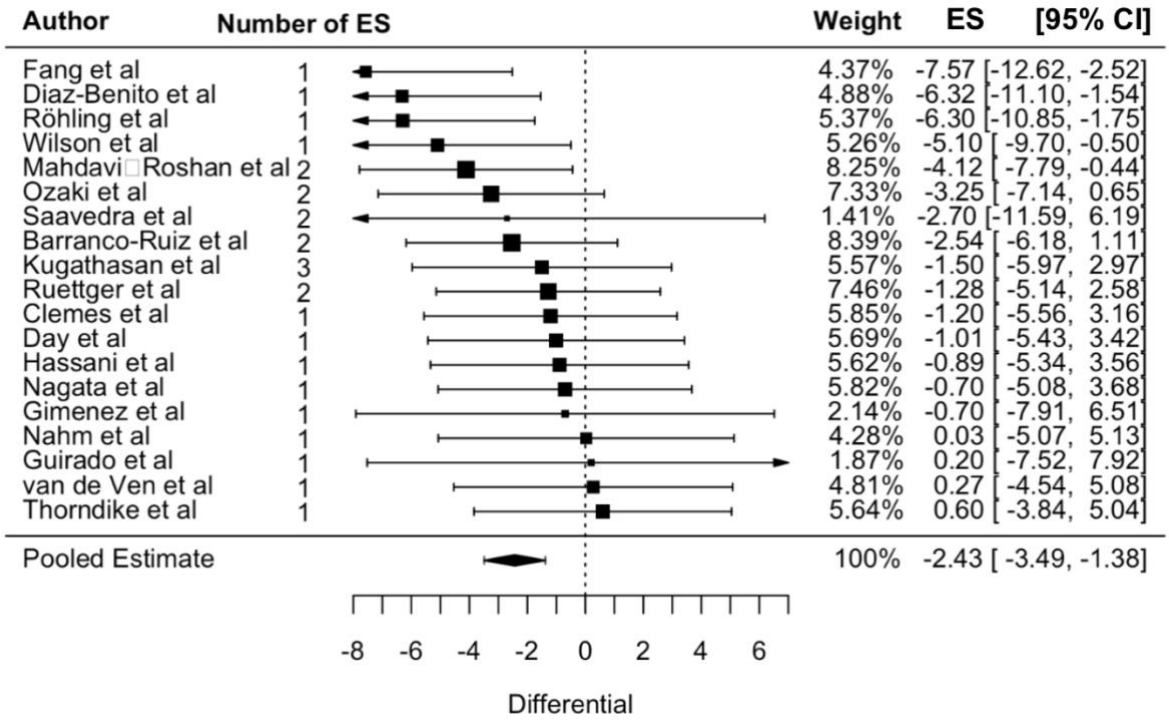

Figure S2. Forest plot of body fat.

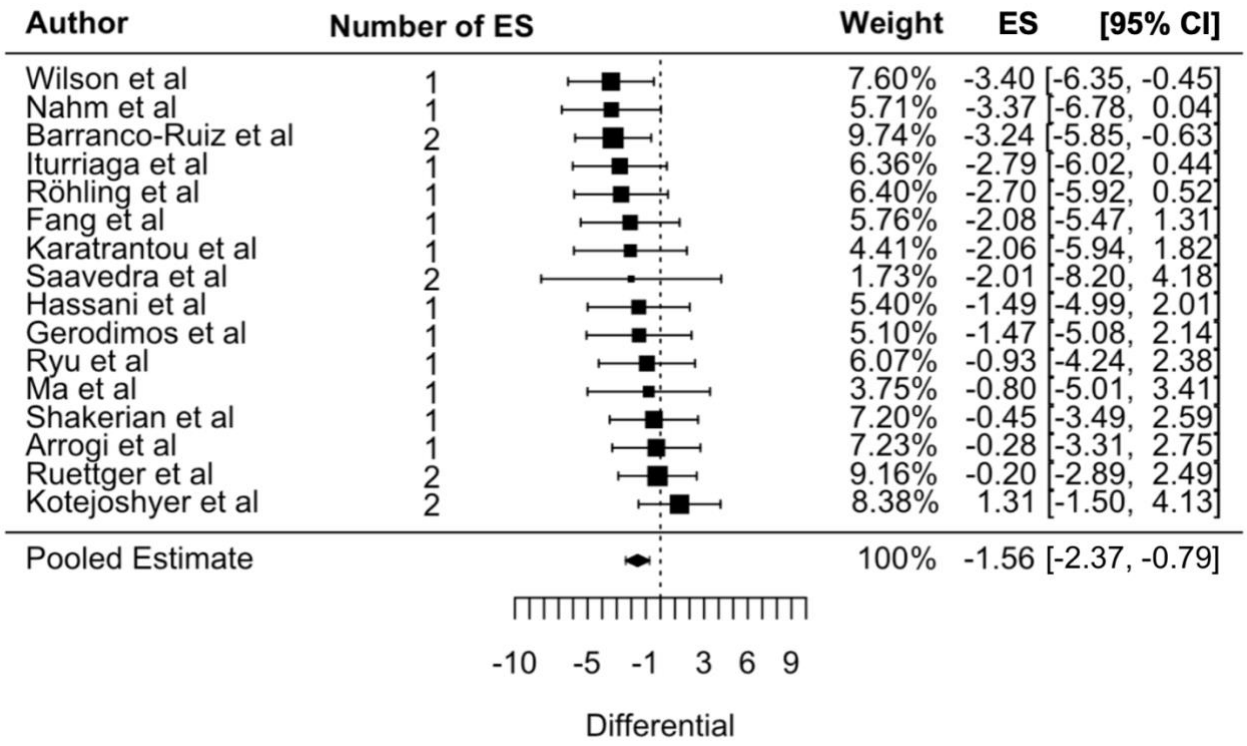

Figure S3. Forest plot of waist circumference.

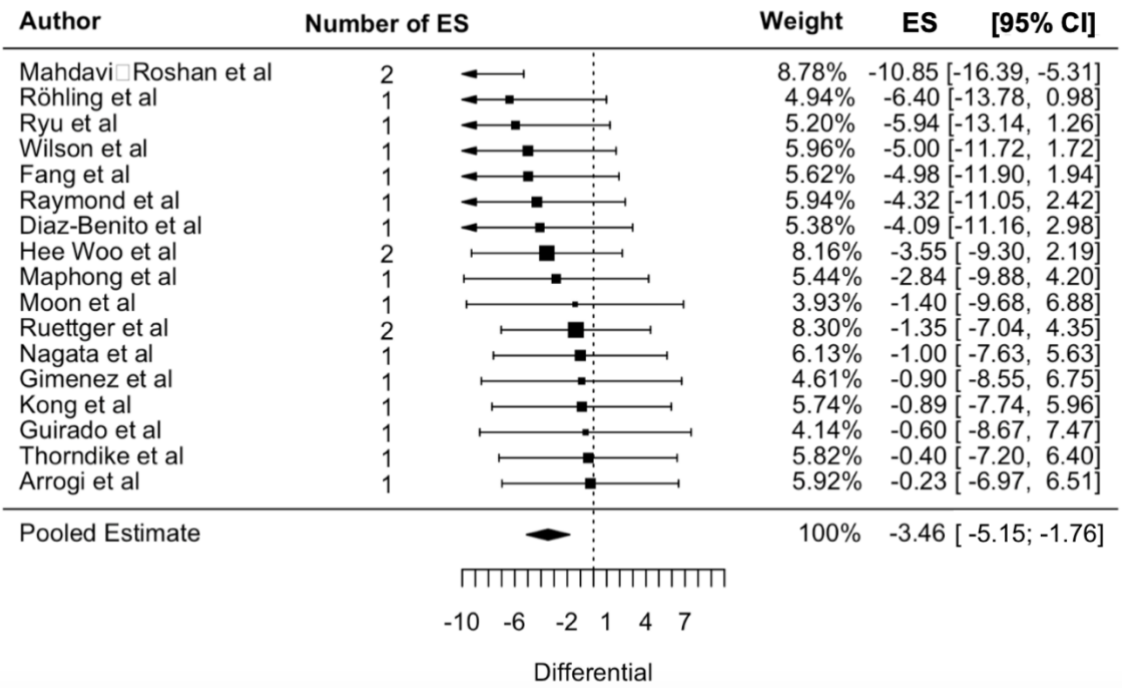

Figure S4. Forest plot of total cholesterol.

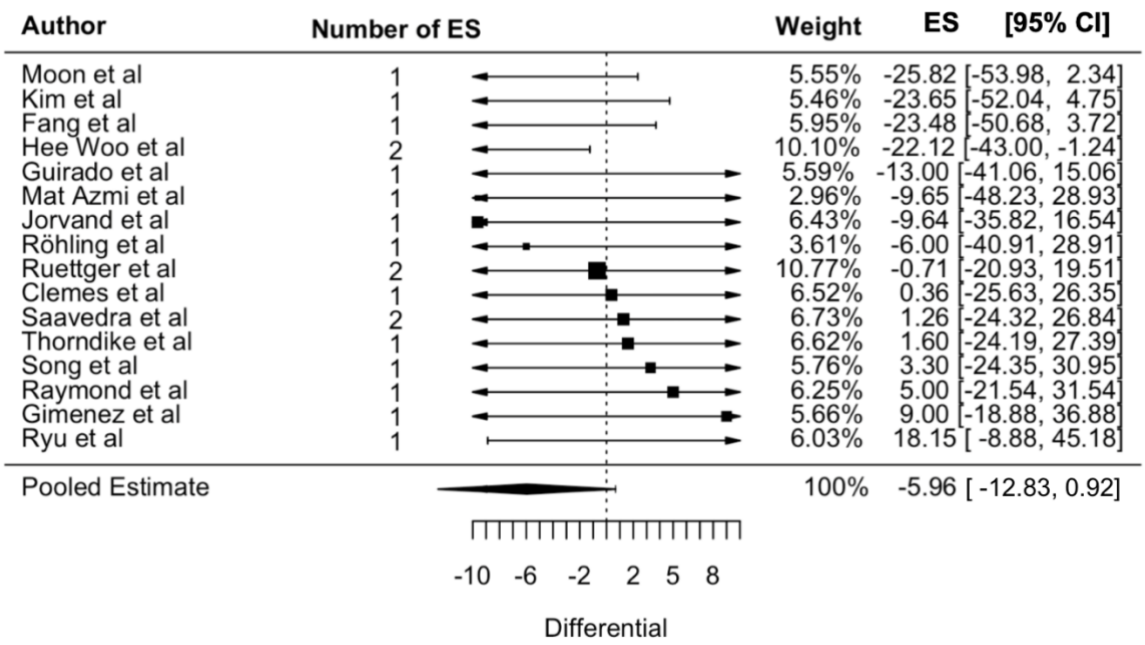

Figure S5. Forest plot of HDL cholesterol.

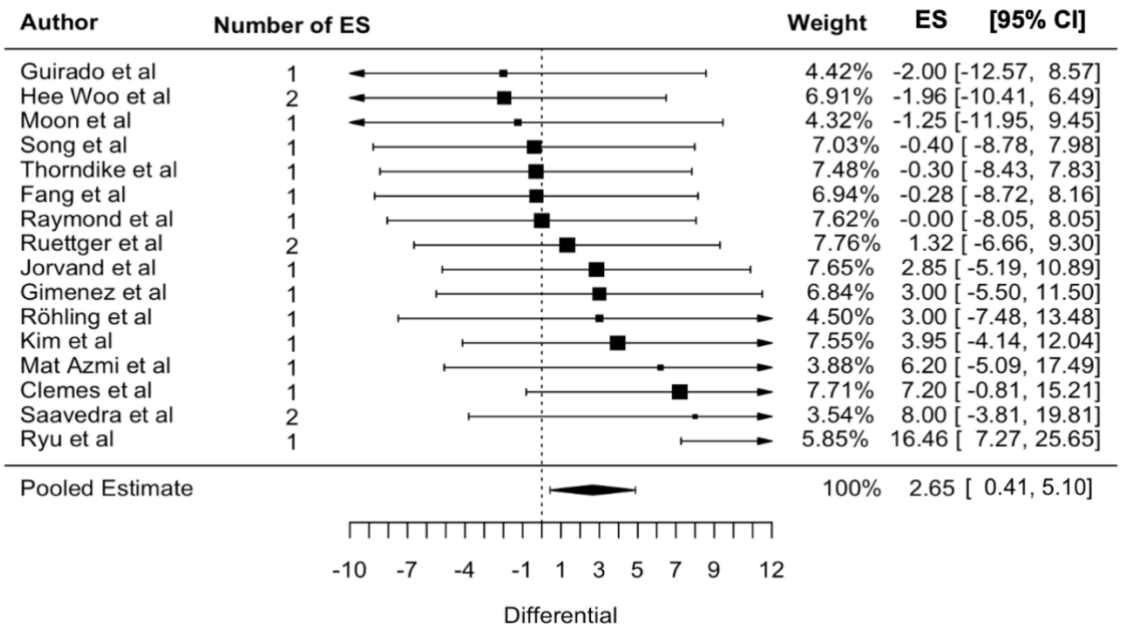

Figure S6. Forest plot of LDL cholesterol.

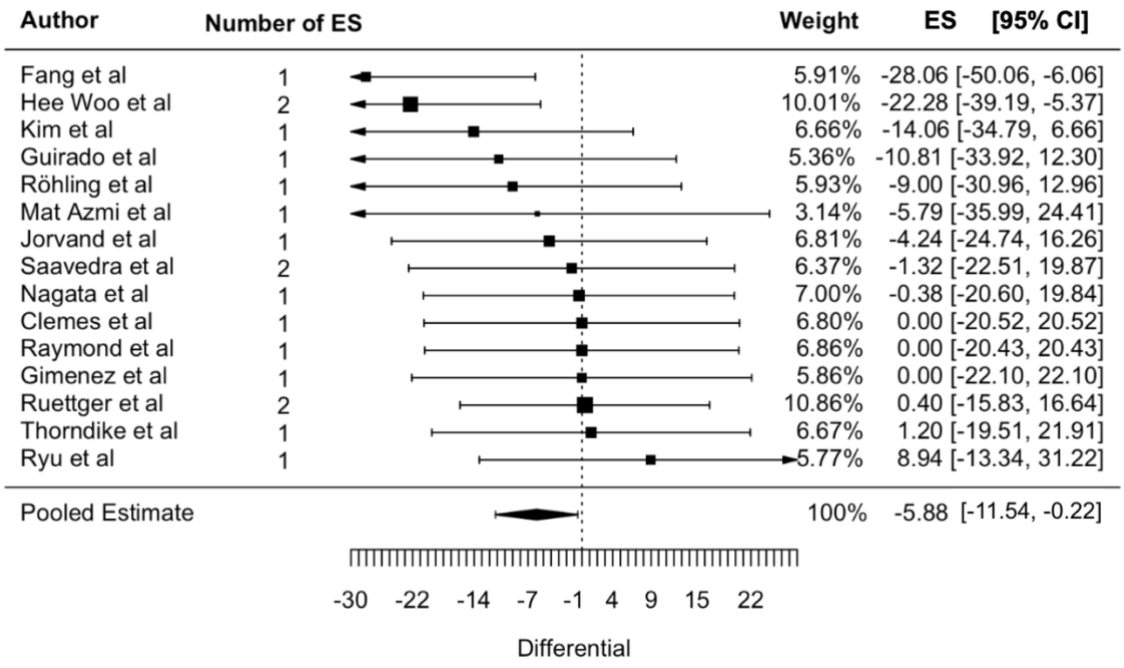

Figure S7. Forest plot of DBP.

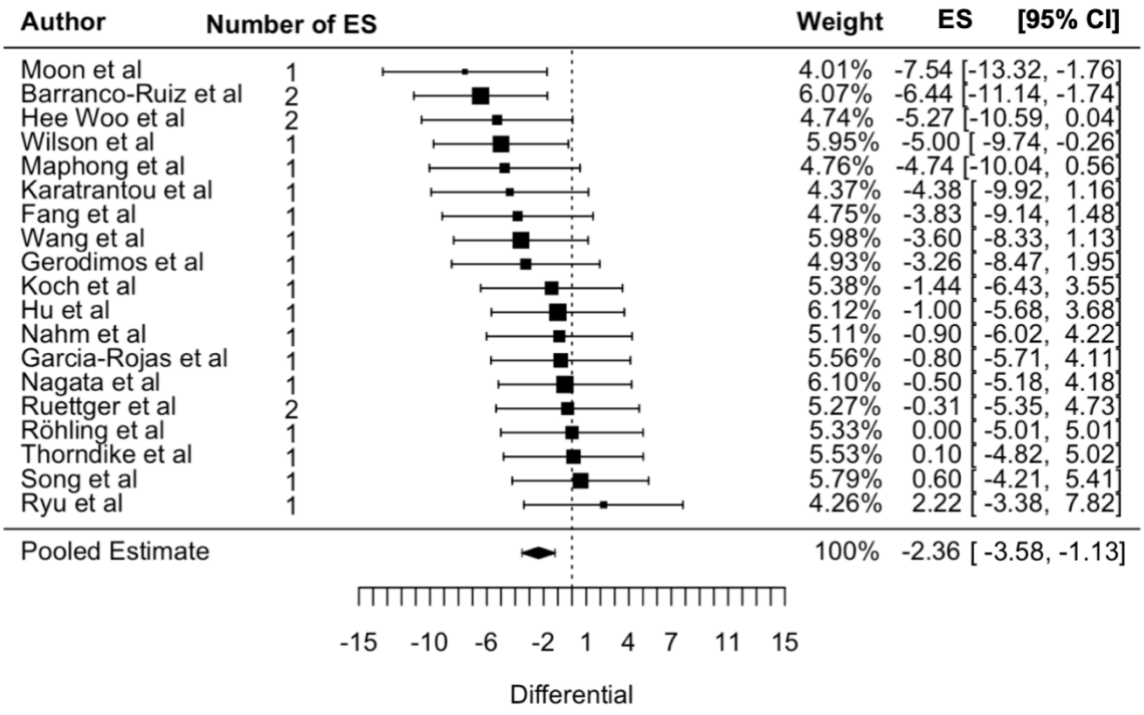

Figure S8. Forest plot of FBG.

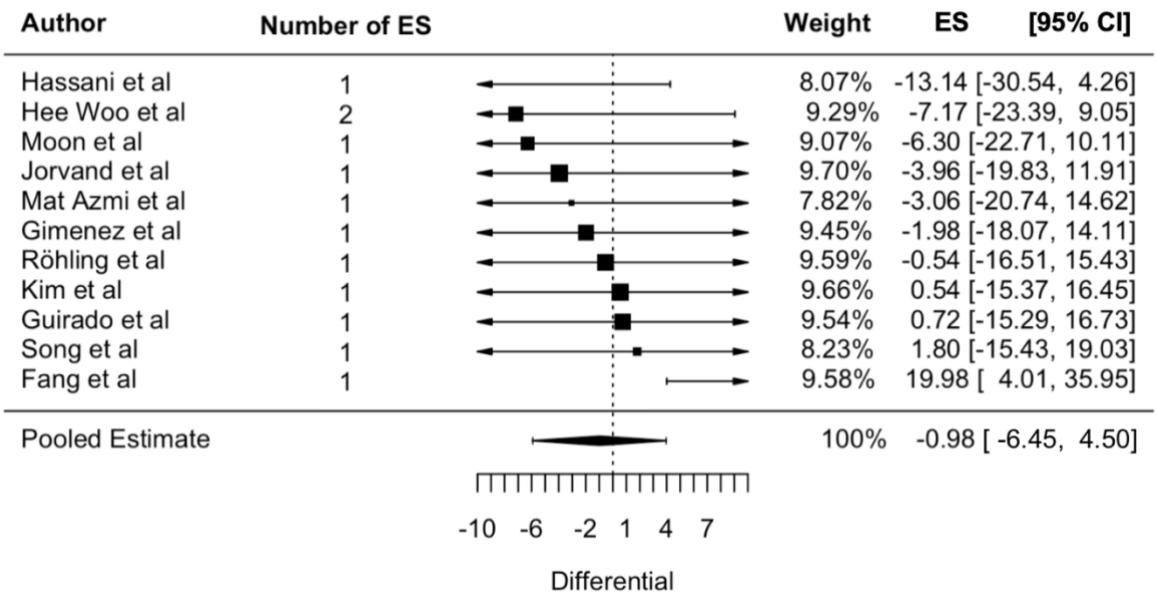

Figure S9. Forest plot of triglycerides.

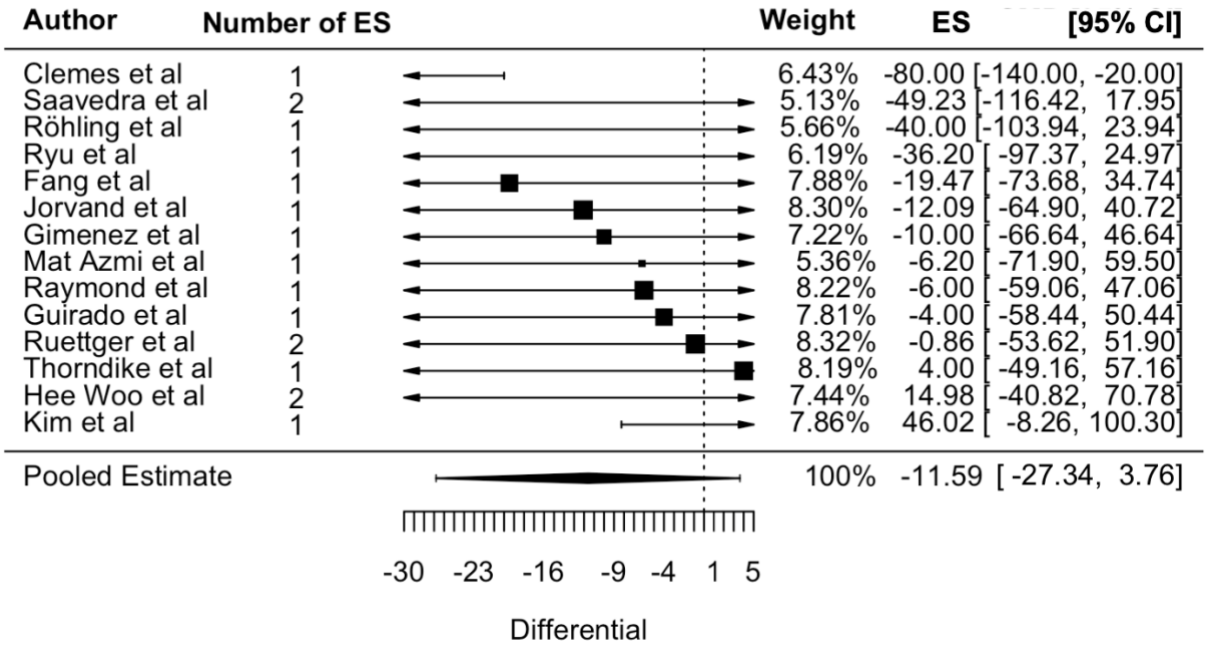

Figure S10. Forest plot of smoking habit.

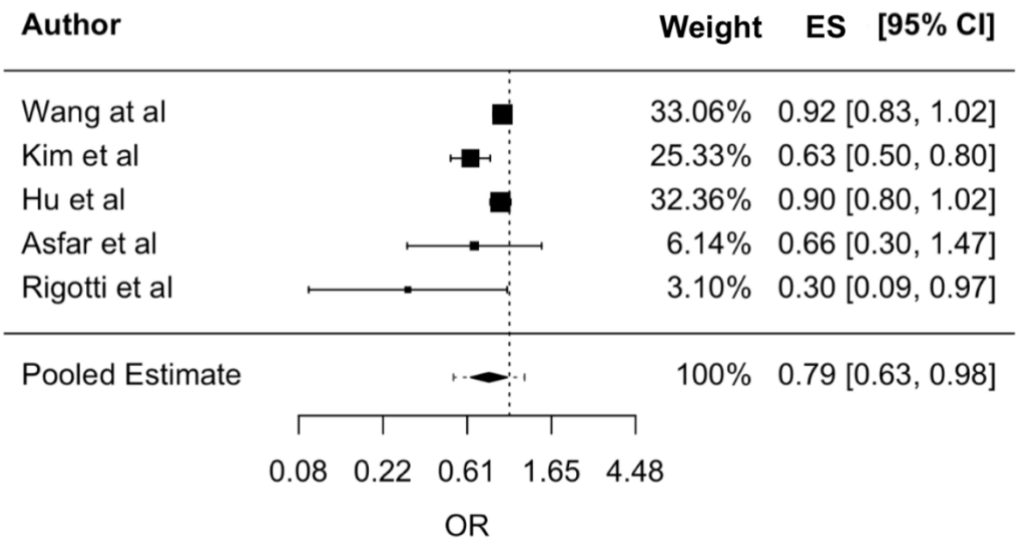

Table S8. Stratified meta-analyses and univariate meta-regressions results from three-levels random effects models.

	BMI (kg/m²)		Weight (kg/m²)		Body fat (%)		Total Cholesterol (mg/dL)		LDL Cholesterol (mg/dL)		HDL Cholesterol (mg/dL)	
	n ES	β (95% CI)	n ES	β (95% CI)	n ES	β (95% CI)	n ES	β (95% CI)	n ES	β (95% CI)	n ES	β (95% CI)
Overall estimate	39	**-0.63 (-0.92; -0.34)**	26	**-2.44 (-3.42; -1.44)**	20	**-1.58 (-2.37; -0.79)**	19	-5.96 (-12.84; 0.92)	**18**	**-5.88 (-11.54; -0.21)**	19	**2.75 (0.41; 5.10)**
Study Design												
RCT	26	-0.49 (-0.81; -0.18)	17	-2.60 (-3.49; -1.02)	26	-1.53 (-2.48; -0.58)	12	-7.88 (-15.73; -0.04)	11	-9.05 (-15.76; -2.33)	12	1.61 (-1.15; 4.38)
Quasi-experimental	13	-0.92 (-1.52; -0.33)	9	-2.84 (-4.84; -0.85)	13	-1.66 (-3.37; 0.06)	7	-2.46 (-14.26; 9.35)	7	-0.17 (-9.19; 8.85)	7	5.05 (1.11; 9.00)
Test of group difference (p.value)		0.214		0.610		0.869		0.461		0.113		0.150
Geographic region												
North America	8	0.02 (-0.59; 0.62)	5	-0.69 (-3.20; 1.81)	2	1.33 (-0.32; 2.99)	6	3.25 (-10.94; 17.46)	2	0.59 (-14.85; 16.03)	3	-0.23 (-0.40; 8.31)
Asia	15	-0.95 (-1.36; -0.49)	8	-2.79 (4.76; -1.00)	6	**-1.47 (-2.52; -0.42)**	7	**-**15.28 (-24.72; -5.50)	7	-11.53 (-20.06; -3.00)	7	3.42 (-0.54; 7.39)
Europe	12	-0.40 (-0.98; 0.07)	9	-2.62 (-4.50; -0.74)	9	**-1.27 (-2.16; -0.38)**	8	-3.03 (-13.04; 6.98)	8	-3.18 (-2.694; 0.625)	8	3.93 (-0.40; 8.31)
Other	4	-1.14 (-1.99; -0.28)	4	-3.14 (-5.85; -0.43)	3	**-3.30 (-4.48; -2.11)**	1	9.00 (-1.72; 19.72)	1	0.000 (-8.96; 8.96)	1	3.00 (-6.52; 12.52)
Test of group difference (p.value)		0.051		0.458		**0.001**		0.086		0.352		0.602
Workplace setting												
Industry	8	-0.45 (-1.05; 0.16)	3	-2.66 (-5.45; 0.12)	6	-1.25 (-2.28; -0.27)	2	-10.21 (-36.45; 16.03)	1	-28.06 (-48.80; -7.32)	2	-0.34 (-2.236; 1.549)
Healthcare	7	-1.19 (-2.17; -0.24)	5	-3.07 (- 5.35; -0.80)	2	-2.33 (-3.51; -1.15)	6	-8.26 (-21.29; 4.77)	6	-9.298 (-17.18; -0.71)	6	1.41 (-0.542; 3.175)
Tertiary	17	-0.53 (-0.93; -0.14)	14	-1.82 (-3.31; -0.31)	11	-1.24 (-2.52; 0.03)	9	-2.73 (-11.42; 5.95)	9	-0.56 (-7.86; 6.73)	9	5.41 (0.733; 8.848)
Various	3	-0.643 (-1.25; -0.03)	3	-2.13 (-4.87; 1.09)	0		2	-8.86 (-36.92; 19.20)	2	-6.920 (-20.70; 6.68)	2	1.96 (-1.917; 5.829)
Test of group difference (p.value)		0.603		0.780		0.840		0.867		0.079		0.296
Dimension ef enterprise												
Large	23	-0.65 (-1.05; -0.24)	12	-2.27 (-3.83; -0.71)	13	-1.42 (-2.50; -0.32)	11	-7.50 (-15.61; 1.36)	10	-5.40 (-12.67; 2.10)	11	0.79 (-0.48, 2.06)
Medium	6	-0.34 (-0.68; 0.00)	4	-3.30 (-6.66; 0.06)	4	-1.37 (-3.74; 0.98)	3	9.48 (-9.14; 28.10)	3	3.67 (-12.78; 20.13)	3	**13.83 (9.01; 18.66)**
Test of group difference (p.value)		0.257		0.562		0.973		0.100		0.292		**0.001**
Job designation												
Blue collar	5	-0.37 (-1.17;0.43)	4	-1.17 (-3.29; 0.94)	4	-0.54 (-2.24; 1.15)	3	-0.15 (-2.74; 2.44)	3	0.255 (-13.26; 13.78),	3	4.27 (-2.34; 10.89)
White collar	30	-0.74 (-1.11; -0.38)	21	-2.89 (- 3.94; -1.85)	16	-1.84 (-2.72; -0.94)	14	-9.23 (-17.76; -0.69)	14	-7.92 (-14.52; -1.32)	14	3.07 (0.02; 6.12)
Mixed	3	-0.00 (-1.02; 1.00)	1	0.270 (-4.27; 4.81)	0		1	3.30 (-6.80; 13.40)	0		1	-0.40 (10.15; 9.35)
Test of group difference (p.value)		0.314		0.165		0.174		0.483		0.265		0.702

Only pathological												
Yes	12	**-1.45 (-2.00; -0.90)**		-3.73 (-5.47; -1.98)	7	-1.69 (-3.75; 0.37)	3	**-22.52 (-36.59; -8.63)**	6	**-24.17 (-33.09; -15.24)**	5	-0.58 (6.79; 5.63)
No	24	**-0.38 (-0.67; -0.08)**		-1.19 (-3.03; -0.90)	9	-1.53 (-2.44; -0.62)	16	-2.52 (-8.93; 3.80)	10	-2.16 (-6.11; 1.78)	12	3.29 (0.79; 5.78)
Test of group difference (p.value)		**0.001**		0.073		0.885		**0.014**		**0.001**		0.239
Modality of intervention												
In person	13	-0.61 (-1.16; -0.05)	7	-2.89 (-5.21; -0.57)	13	-1.45 (-2.54; -0.36)	5	-6.86 (-14.85; 1.13)	5	-9.151 (-21.023; 2.270)	5	0.07 (-4.17; 6.18)
Web	1	-0.23 (-1.01; 0.55)	1	-1.01 (-5.58; 3.57)	0		2	-15.52 (-29.07; -1.97)	2	-9.029 (-18.653; 0.595)	2	3.40 (-3.04; 9.84)
Mixed	25	-0.65 (-1.01; -0.29)	18	-2.39 (-3.65; -1.12)	7	-1.522 (-3.01; -0.42)	11	-4.08 (-12.80; 4.63)	11	-4.223 (-11.057; 2.611)	12	3.28 (0.12; 6.44)
Test of group difference (p.value)		0.625		0.747		0.742		0.496		0.643		0.716
Author of intervention												
Physician	13	**-0.75 (-1.25; -0.25)**	10	-3.03 (-4.90; -1.15)	4	-2.98 (-4.03; -0.64)	9	-11.04 (-21.05; -1.03)	8	-10.220 (-18.39; -1.80)	9	0.84 (-2.46; 4.14)
Other sanitary	3	**-1.60 (-2.55; -0.65)**	3	-2.76 (-5.75; 0.23)	1	-1.49 (-5.03; 2.05)	0		0		0	
Other	23	**-0.39 (-0.76; -0.02)**	13	-1.94 (-3.44; -0.45)	15	-1.24 (-2.25; -0.41)	10	-1.20 (-8.60; 6.21)	10	-2.645 (-10.06; 4.34)	10	4.28 (1.29; 7.27)
Test of group difference (p.value)		**0.049**		0.632		0.456		0.121		0.181		0.121
Economic incentives												
Yes	11	-0.21 (-0.76; 0.34)	6	-0.50 (-2.36; 1.34)	0		5	-6.64 (-21.82; 8.54)	5	-7.24 (-17.81; 3.33)	5	-0.38 (-4.26; 3.50)
No	28	-0.79 (-1.13; -0.42)	20	**-2.99 (-3.99; -2.00)**	20		14	-5.85 (-21.82; 8.54)	13	-5.063 (-12.30; 1.68)	14	4.03 (1.50; 6.55)
Test of group difference (p.value)		0.086		**0.002**				0.927		0.751		0.060
Planning involvement of management												
Yes	10	-0.35 (-0.95; 0.26)	4	-0.90 (-3.98; 2.10)	4	-1.29 (-2.73; 0.16)	4	-2.15 (-21.99; 17.69)	3	2.14 (-11.90; 16.19)	4	5.30 (-2.81; 13.58)
No	29	-0.70 (-1.05; -0.35)	22	-2.64 (-3.69; -1.53	16	-1.48 (-2.41; -0.56)	15	-7.22 (-13.85; -0.59)	15	-7.46 (-13.21; -1.71)	15	2.06 (0.48; 3.47)
Test of group difference (p.value)		0.315		0.300		0.740		0.635		0.205		0.246
Study quality												
Low	13	-0.921 (-1.52; -0.36)	10	-2.26 (-3.49; 1.03)	14	-1.66 (-3.30; -0.03)	7	-2.46 (-14.26; 9.35)	9	-5.696 (-14.590; 3.199)	9	5.06 (1.11; 9.00)
High	26	-0.49 (-0.81; -0.18)	16	-2.84 (-4.84; -0.85)	6	-1.40 (-2.31; -0.48)	12	-7.88 (-15.73; -0.04)	9	-6,206 (-12.520; 0.108)	10	1.61 (-1.15; 4.38)
Test of group difference (p.value)		0.241		0.610		0.896		0.453		0.927		0.150
Duration of intervention (cat)												
< 3 months	21	**-0.93 (-1.33; -0.52)**	14	-3.35 (-4.63; -2.06)	10	**-2.14 (-3.08; -1.00)**	11	-8.77 (-19.54; 1.68)	11	-8.930 (-17.267; -0.593)	11	3.47 (-0.15; 7.09)
4 - 12 months	9	-0.57 (-1.11; -0.02)	7	-1.97 (-3.55; -0.40)	8	**-1.62 (-2.63; -0.62)**	4	-8.912 (-17.06; 1.76)	4	-4.294 (-10.904; 2.315)	4	1.68 (-2.62; 8.04)
> 12 months	9	-0.04 (-0.61; 0.54)	5	-0.85 (-2.96; 1.25)	2	1.39 (-0.92; 4.00)	4	2.51 (0.193; 3.107)	3	0.249 (-1.825; 2.234)	4	2.71 (-2.99; 6.35)

Test of group difference (p.value)		**0.047**		0.105		**0.034**		**0.027**		0.435		0.858
Mean age (p.value)	33	-0.03 (0.408)	23	0.03 (0.787)	17	-0.07 (0.410)	16	0.22 (0.735)	15	-0.16 (0.691)	16	-0.138 (0.582)
N intervention/month (p.value)	39	-0.01 (0.197)	26	-0.10 (0.846)	20	-0.02 (0.930)	19	0.00 (0.981)	18	0.17 (0.359)	19	**0.122 (0.025)**
Males (%) (p.value)	35	0.01 (0.177)	25	-0.006 (0.667)	19	0.02 (0.106)	19	0.03 (0.706)	16	0.06 (0.216)	17	-0.006 (0.837)
Study size (p.value)	37	0.00 (0.234)	24	0.00 (0.269)	19	0.01 (0.072)	19	0.01 (0.256)	18	0.002 (0.427)	19	-0.002 (0.247)

**Results in bold indicate statistical significance at 5% level.*

Table S8. continued

	Waist Circumference (cm)		**Glucose (mg/dL)**		**Diastolic blood pressure (mmHg)**		**Systolic blood pressure (mmHg)**		**Triglycerides**	
	n ES	**β (95% CI)**	**n ES**	**β (95% CI)**	**n ES**	**β (95% CI)**	**n ES**	**β (95% CI)**	**n ES**	**β (95% CI)**
Overall estimate	20	**-3.45 (-5.15; -1.76)**	12	-1.56 (-6.28; 3.17)	22	**-2.36 (-3.58; -1.13)**	24	**-3.75 (-5.68; -1.81)**	17	-11.78 (-27.32; 3.74)
Study Design										
RCT	11	-2.57 (-4.87; -0.28)	11	0.29 (-6.27; 6.85)	16	-2.23 (-3.75; -0.72)	16	-3.02 (-5.41; -0.63)	11	-5.19 (-23.07; 12.70)
Quasi-experimental	9	-4.50 (-6.93; -2.07)	3	-4.49 (-15.39; -6.40)	6	-2.63 (-4.91; -0.36)	8	-5.12 (-8.44; -1.81)	6	-11.738 (-18.49; -4.98)
Test of group difference (p.value)		0.240		0.422		0.764		0.298		0.502
Geographic region										
North America	2	-2.37 (-6.28; 1.451)	1	1.80 (-5.04; 8.64)	2	0.35 (-3.09; 3.80)	2	0.95 (-0.67; 2.57)	2	-1.14 (-10.94; 8.65)
Asia	10	-4.42 (-7.62; -2.86)	7	-2.43 (-10.59; 5.73)	10	-2.63 (-4.36; -0.91)	10	-3.87 (-6.49; -0.91)	6	0.16 (-21.56; 25.61)
Europe	6	-2.39 (-4.14; -0.27)	3	-0.12 (-1.74; 1.50)	6	-1.74 (-4.07; 0.58)	8	-3.49 (-5.72; -0.41)	8	-28.13 (-47.62; -2.58)
Other	2	-3.19 (-8.70; 2.30)	1	-1.98 (-4.93; 0.97)	4	-4.19 (-6.94; -1.43)	4	-6.63 (-10.75; -3.43)	1	-10.00 (-30.91; 10.91)
Test of group difference (p.value)		0.731		0.608		0.203		0.231		0.387
Workplace setting										
Industry	2	-2.55 (-7.19; 2.12)	3	3.72 (-15.76; 22.03)	3	-1.24 (-4.51; 2.01)	3	-1.40 (-3.57; 0.87)	1	-19.47 (-32.45; -6.49)
Healthcare	7	-5.06 (-8.07; -2.97)	5	-3.39 (-5.99; -1.14)	6	-1.73 (-4.26; 0.79)	6	-1.83 (-4.26; 0.73)	6	-2.90 (-14.633; 8.82)
Tertiary	15	-2.57 (-5.54; 0.39)	3	-2.82 (-7.31; 2.24)	11	-3.11 (-5.01; -1.21)	13	-5.52 (-8.03; -2.51)	8	-24.67 (-46.81; -2.53)
Various	1	-4.32 (-12.02; 3.39)	1	0.54 (-1.18; 2.26)	2	-2.29 (-4.82; 0.27)	2	-3.23 (-8.23; 1.76)	2	19.68 (-31.29; 70.66)
Test of group difference (p.value)		0.645		0.753		0.691		0.300		0.170
Dimension ef enterprise										
Large	14	-3.64 (-5.90; -1.38)	7	-3.81 (-6.24; -1.39)	18	-2.47 (-3.86; -1.07)	18	-4.02 (-6.24; -1.77)	9	-3.26 (-11.05; 4.52)
Medium	3	-3.56 (-8.20; 1.07)	1	-13.14 (-20.41; -5.87)	2	0.19 (-3.84; 4.21)	4	-1.47 (-6.79; 3.85)	3	**-42.29 (-70.98 -13.62)**

Test of group difference (p.value)		0.975		0.078		0.207		0.369		**0.015**
Job designation										
Blue collar	3	-0.88 (-5.43; 3.66)	1	-13.14 (-20.41; -5.87)	2	-0.33 (-2.48; 1.82)	2	-0.23 (-3.33; 2.91)	3	-25.30 (-75.24; 24.63)
White collar	16	-3.86 (-5.78; -1.93)	10	-0.84 (-5.97; 4.29)	16	-3.23 (-4.63; -1.84)	18	-4.55 (-6.73; -2.38)	13	-6.59 (-20.96; 7.79)
Mixed	0		1	1.80 (-5.04; 8.64)	3	-1.35 (-3.73; 1.01)	3	-2.11 (-5.86; 1.57)	0	
Test of group difference (p.value)		0.221		0.377		0.463		0.449		0.408
Only pathological										
Yes	8	**-6.14 (-8.92; -3.35)**	4	0.64 (-10.50; 11.78)	6	-4.10 (-6.41; -1.79)	6	-5.80 (-9.55; -2.05)	3	-0.58 (-6.79; 5.63)
No	12	**-2.45 (-4.26; -0.65)**	8	-1.59 (-8.36; 5.17)	16	-1.76 (-3.09; -0.43)	16	-3.02 (-5.24; -0.79)	14	3.29 (0.79; 5.78)
Test of group difference (p.value)		**0.03**		0.710		0.083		0.199		0.239
Modality of intervention										
In person	3	-3.56 (-7.90; 0.84)	3	3.33 (-7.97; 14.64)	9	-4.09 (-7.00; -1.18)	11	-4.46 (-6.63; -2.28)	5	-11.76 (-21.48; -2.04)
Web	0		2	-1.71 (-15.14; 11.71)	0		0		2	16.612 (-40.330; 73.555)
Mixed	17	-3.43 (-5.34; -1.52)	7	-3.44 (-10.98; 5.13)	13	-3.44 (-6.16; -0.72)	13	-3.133 (-5.850; -0.416)	10	-11.935 (-29.291; 5.421)
Test of group difference (p.value)		0.952		0.605		0.304		0.738		0.626
Author of intervention										
Physician	8	**-3.58 (-4.858; -2.321)**	5	0.77 (-11.79; 9.61)	8	-4.21 (-5.33; -1.88)	10	-2.88 (-5.34; -0.43)	8	-5.94 (-2.46; 4.54)
Other sanitary	2	**-10.85 (-14.19; -7.50)**	1	-13.14 (-20.41; -5.87)	0		0		0	
Other	10	**-2.04 (-3.72; -0.36)**	6	-0.39 (-1.14; 1.02)	14	-3.07 (-3.44; -0.53)	14	-4.35 (-6.85; -1.86)	9	4.97 (1.72; 8.22)
Test of group difference (p.value)		**0.001**		0.376		0.560		0.410		0.099
Economic incentives										
Yes	6	-2.187 (-5.14; 0.84)	3	-4.86 (-11.09; 1.37)	5	-1.07 (-3.65; 1.50)	5	-1.08 (-3.85; 0.74)	4	2.73 (-6.81; 2.26)
No	14	-4.223 (-6.38; -2.06)	9	-0.59 (-6.43; 5.25)	17	-2.72 (-4.09; -1.34)	19	**-4.76 (-6.77; -2.76)**	13	-16.59 (-33.85; 0.65)
Test of group difference (p.value)		0.278		0.737		0.832		**0.034**		0.055
Planning involvement of management										
Yes	5	-2.97 (-5.09; -0.85)	2	-5.53 (-9.38; -1.69)	4	-2.64 (-5.59; 0.30)	4	-6.79 (-11.18; -2.39)	3	-12.77 (-30.78; 5.23)
No	12	-3.81 (-5.83; -1.79)	10	-0.99 (-6.52; 4.53)	18	-2.29 (-3.69; -0.89)	20	-3.06 (-5.13; -0.99)	14	-9.53 (-25.45; 6.39)
Test of group difference (p.value)		0.736		0.516		0.254		0.125		0.791
Study quality										
Low	11	-4.51 (-6.93; -2.07)	2	-4.14 (-5.43; -2.84)	8	-2.67 (-4.91; -0.35)	8	-5.12 (-8.44; -1.81)	6	-11.74 (-18.49; -4.98)
High	9	-2.57 (-4.86; -0.28)	9	1.477 (-3.930; 6.883)	14	-2.23 (-3.75; -0.72)	16	-3.02 (-5.41; -0.63	11	-5.19 (-23.07; 12.70)

Test of group difference (p.value)		0.241		0.422		0.746		0.297		0.502
Duration of intervention (cat)										
< 3 months	13	-4.38 (-6.52; -2.23)	9	-1.15 (-8.27; 4.36)	10	-2.50 (-4.37; -0.92)	12	-3.89 (-6.73; -1.04)	10	-12.67 (-25.64; 0.31)
4 - 12 months	5	-2.37 (-5.14; 1.49)	2	-1.73 (-6.15; 2.67)	8	-3.32 (-5.26; -0.95)	8	-5.26 (-8.67; -1.85)	4	7.55 (-17.03; 32.13)
> 12 months	2	-1.82 (-6.23; 1.45)	1	1.80 (-5.04; 8.64)	4	-1.03 (-3.57; 1.55)	4	-1.24 (5.34; 2.86)	3	-25.59 (-75.74; 24.56)
Test of group difference (p.value)		0.368		0.951		0.426		0.309		0.291
Mean age (p.value)	16	-0.06 (0.790)	9	**0.46 (0.000)**	18	0.01 (0.939)	20	0.01 (0.939)	14	1.09 (0.603)
N intervention/month (p.value)	20	-0.02 (0.655)	12	-0.07 (0.681)	22	-0.02 (0.555)	24	-0.02 (0.555)	17	0.10 (0.849)
Males (%) (p.value)	18	0.03 (0.177)	12	-0.06 (0.467)	20	0.02 (0.058)	22	0.02 (0.058)	15	-0.17 (0.388)
Study size (p.value)	19	0.01 (0.362)	12	0.00 (0.700)	21	0.000 (0.408)	23	0.000 (0.408)	17	0.00 (0.888)

**Results in bold indicate statistical significance at 5% level.*

Figure S11. Funnel plot of BMI. (Eggers' test p.value=0.799)

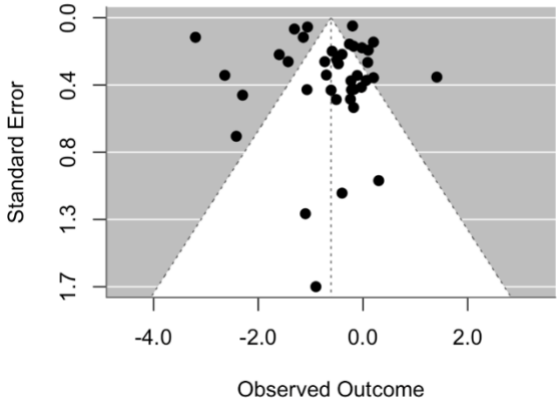

Figure S12. Funnel plot of weight. (Eggers' test p.value=0.845)

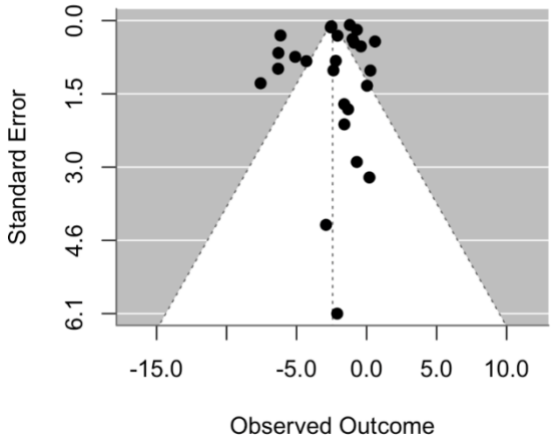

Figure S13. Funnel plot of body fat. (Eggers' test p.value=0.998)

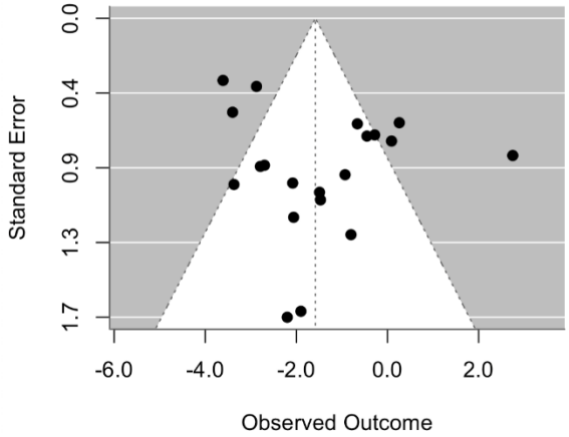

Figure S14. Funnel plot of total cholesterol. (Eggers' test p.value=0.711)

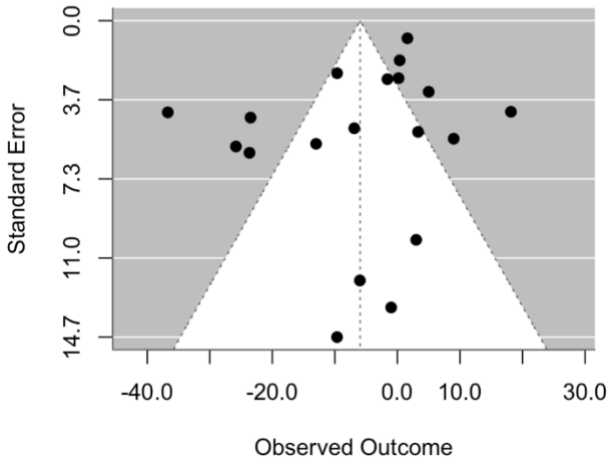

Figure S15. Funnel plot of HDL cholesterol. (Eggers' test p.value = 0.345)

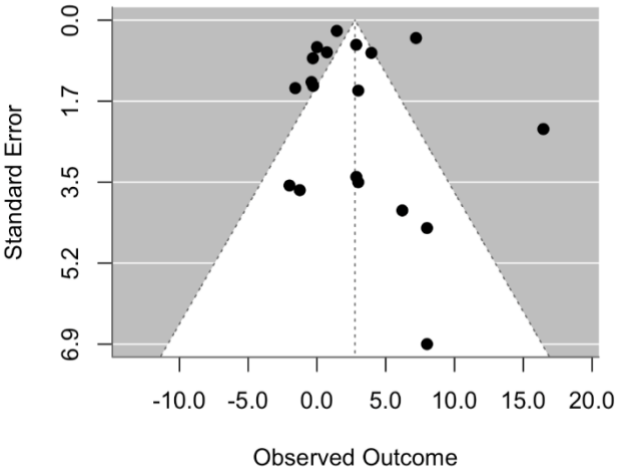

Figure S16. Funnel plot of LDL cholesterol. (Eggers' test p.value = 0.645)

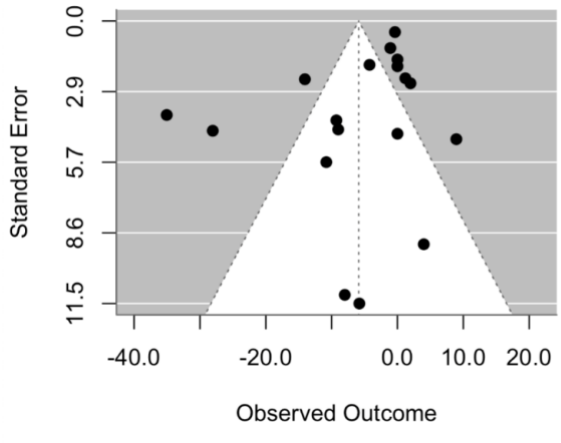

Figure S17. Funnel plot of DBP (Eggers' test p.value = 0.342)

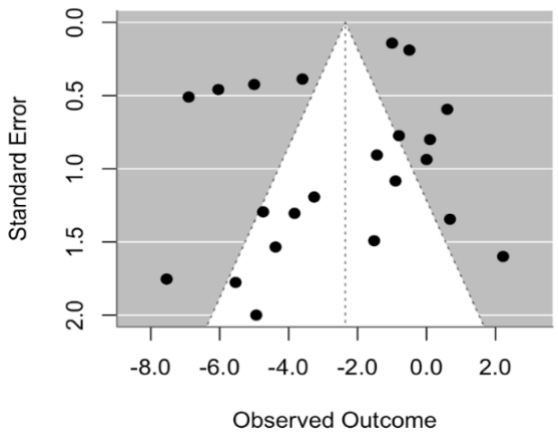

Figure S18. Funnel plot of waist circumference. (Eggers' test p.value = 0.330)

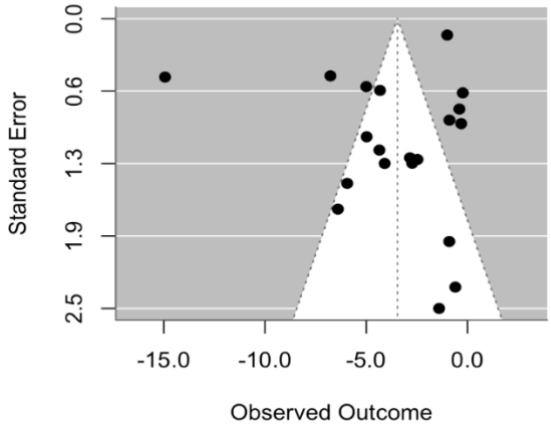

Figure S19. Funnel plot of SBP. (Eggers' test p.value = 0.447)

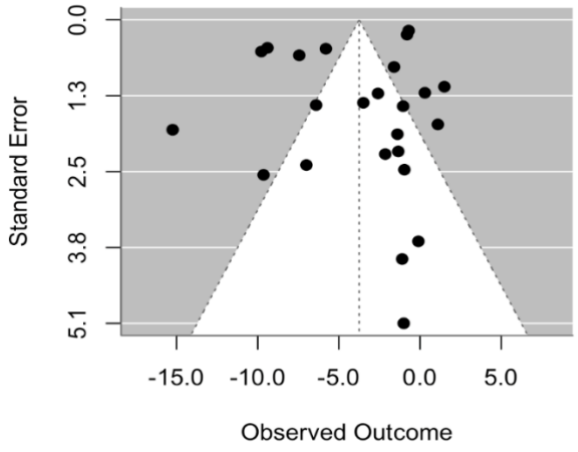

Figure S20. Funnel plot of triglycerides. (Eggers' test p.value=0.037)

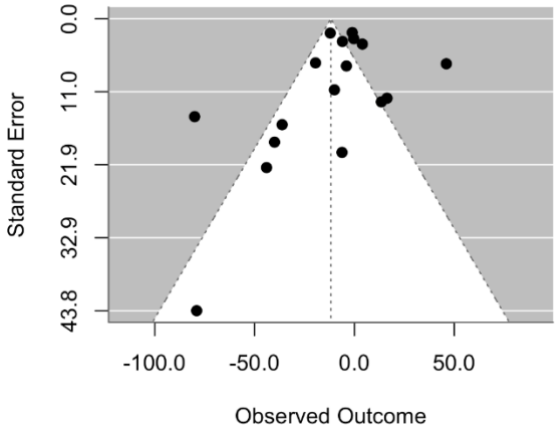

Figure S21. Funnel plot of glucose. (Eggers' test p.value=0.107)

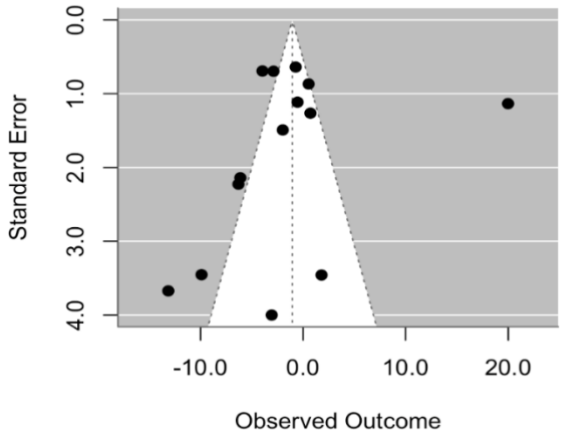

Figure S22. Funnel plot of smoking cessation. (Eggers' test p.value=0.006)

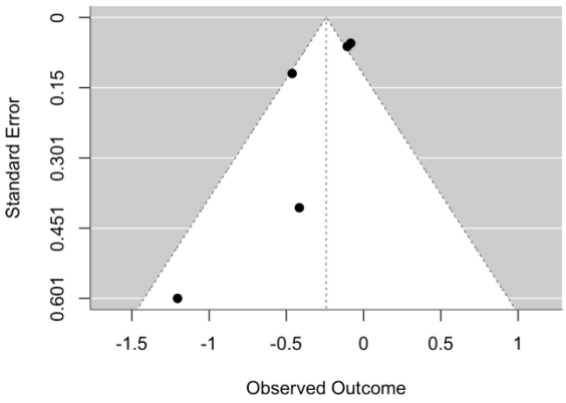

Table S9. Summary of GRADE ratings and justifications for downgrading.

	BMI: MODERATE ⊕⊕⊕◯		Weight: MODERATE ⊕⊕⊕◯		Body fat: HIGH ⊕⊕⊕⊕	
	Rating	**Rationale**	**Rating**	**Rationale**	**Rating**	**Rationale**
Risk of Bias	0	Most of the included studies (23/30) are of low risk of bias, and RCTs (20/30). Given the overall high methodological quality, we did not downgrade the evidence for risk of bias.	0	4/19 studies were at high risk of bias, particularly due to risk of confounding bias. However, most information is from studies at low risk of bias.and plausible bias is unlikely to seriously alter the results. No serious limitations do not downgrade.	0	3/16 studies were at high risk of bias, particularly due to risk of confounding bias. However, most information is from studies at low risk of bias.and plausible bias is unlikely to seriously alter the results. Hence, we did not downgrade the quality of evidence.
Indirectness	-1	Some studies (7/30) targeted individuals with specific conditions (obesity/hypertension/hypercholesterolemia). The focus on particular subgroups may reduce the applicability of the findings to a broader population. As such, the results may not fully represent individuals without these conditions, potentially limiting the generalizability and external validity of the evidence. Moreover, substantial heterogeneity was observed in subgroup analysis according to health status of participants. Thus, we downgraded for indirectedness.	-1	6 out of 19 studies targeted individuals with specific conditions (obesity/hypertension/hypercholesterolemia). The focus on particular subgroups may limit the generalizability and external validity of the evidence. A borderline statistical significance was found in subgroup analysis according to health status of participants. Thus, we downgraded for indirectedness.	0	4 out of 19 studies targeted individuals with specific conditions (obesity/hypertension/hypercholesterolemia). However, no statistically significant hererogeneity was found in in subgroup analysis according to health status of participants. Thus, we did not downgrade for indirectedness.
Inconsistency	0	We did not downgrade for inconsistency because the point estimates did not vary widely across studies, and there was overlap in the confidence intervals. Although the statistical test for heterogeneity was significant, the I^2 value of 31% indicates only moderate between-study heterogeneity, which is not large enough to warrant a downgrade for inconsistency.	0	Level 3 I^2 value is 20.7%, indicating low heterogeneity and although the point estimates varied across studies, the confidence intervals were overlapping. Hence, we did not downgrade for inconsistency.	0	Although between-study heterogeneity was high (63%), the point estimates remained relatively consistent across studies, and the confidence intervals showed substantial overlap. This suggests that despite statistical heterogeneity, the overall direction and magnitude of the effect were not highly variable, reducing concerns about inconsistency.
Imprecision	0	We did not downgrade for imprecision because the confidence intervals around the effect estimate were narrow.	0	We did not downgrade for imprecision because the confidence intervals around the effect estimate were not overly wide.	0	We did not downgrade for imprecision because the confidence intervals around the effect estimate were narrow.
Publication bias	0	The rating was not downgraded due to publication bias because the visual inspection of the funnel did not indicate concerning evidence of asymmetry, and the p.value of Egger test was not significant (p=0.799).	0	The rating was not downgraded due to publication bias because the visual inspection of the funnel plot did not indicate concerning evidence of asymmetry, and the p.value of Egger test was not significant (p=0.845).	0	The rating was not downgraded due to publication bias because the visual inspection of the funnel plot did not indicate concerning evidence of asymmetry, and the p.value of Egger test was not significant (p=0.998).
Large magnitude	0	While the results suggest a notable effect, the possible presence of indirectedness prevents us from rating up the quality of evidence.	0	While the effect size appears meaningful, indirectedness prevents an upgrade for large magnitude of effect.	0	The certainty of the evidence is already rated as high, thus no further upgrading is required. Moreover, it is difficult to unambiguously determine what constitutes a large magnitude of effect in terms of body fat reduction.
Dose response	0	The included studies do not systematically examine different levels of intervention intensity. Even if some studies provided an intervention-response relationship, the heterogeneity across studies makes it difficult to detect a consistent pattern.	0	The included studies do not systematically assess different levels of intervention intensity to establish a dose-response pattern.	0	The included studies do not systematically assess different levels of intervention intensity to establish a dose-response pattern.
Residual confounding	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.	0	There is no strong indication that residual confounding would have led to an underestimation of the effect.	0	There is no strong indication that residual confounding would have led to an underestimation of the effect.

	Waist Circumference: MODERATE ⊕⊕⊕◯		Total Cholesterol: VERY LOW ⊕◯◯◯		HDL cholesterol MODERATE ⊕⊕⊕◯	
	Rating	**Rationale**	**Rating**	**Rationale**	**Rating**	**Rationale**
Risk of Bias	0	6/17 studies were at high risk of bias. However, most information is from studies at low risk of bias.and plausible bias is unlikely to seriously alter the results. No serious limitations do not downgrade.	0	4/16 studies were at high risk of bias, especially due to a lack of control for confounding. However most evidence came from studies at low risk of bias studies and plausible bias is unlikely to alter results.	0	5/16 studies were at high risk of bias, especially due to a lack of control for confounding. However most evidence came from studies at low risk of bias studies and plausible bias is unlikely to alter results.
Indirectness	-1	Four studies targeted individuals with specific conditions (obesity/hypertension/hypercolesterolemia). Subgroup analysis according to health conditions of participants revealed signifcant heterogeneity. As a result, we downgraded the quality of evidence for indirectness.	-1	Only two studies focused solely on obese individuals. However, significant difference in subgroup analysis supports the downgrade for indirectedness.	0	Three studies focused solely on obese individuals. No significant difference in subgroup analysis was found. Hence, we did not downgrade for indirectedness.
Inconsistency	0	We did not downgrade for inconsistency because the point estimates did not vary widely across studies, and there was overlap in the confidence intervals. Although the statistical test for heterogeneity was significant, the I^2 value of 36% indicates only moderate between-study heterogeneity, which is not large enough to warrant a downgrade for inconsistency.	-1	The point estimates varied greatly across studies, suggesting inconsistency in the effect. Hence, we downgraded by one level	-1	We downgraded due to inconsistency because of high between study heterogeneity (I^2 =96%) and consistent variability across point estimates.
Imprecision	0	We did not downgrade for imprecision because the confidence interval around the effect estimate was narrow.	-1	We downgraded the quality of evidence for imprecision because the confidence intervals around the effect estimate were wide, indicating uncertainty in the precision of the results.	0	We did not downgrade for imprecision because the confidence interval around the effect estimate was narrow.
Publication bias	0	The rating was not downgraded for publication bias because visual inspection of the funnel plot did not show significant asymmetry, except for one outlier. Additionally, the Egger test did not yield a significant p-value (p = 0.330), further supporting the absence of publication bias.	0	The rating was not downgraded due to publication bias because the visual inspection of the funnel did not indicate concerning evidence of asymmetry, and the p.value of Egger test was not significant (p=0.711).	0	The rating was not downgraded due to publication bias because the visual inspection of the funnel did not indicate concerning evidence of asymmetry, and the p.value of Egger test was not significant (p=0.345).
Large magnitude	0	While the results suggest a notable effect, the possible presence of risk of bias and indirectedness prevents us from rating up the quality of evidence.	0	There weren't sufficient conditions to support a rating up of the quality of evidence.	0	There weren't sufficient conditions to support a rating up of the quality of evidence.
Dose response	0	The included studies do not systematically examine different levels of intervention intensity.	0	The included studies do not systematically examine different levels of intervention intensity. Even if some studies provided an intervention-response relationship, the heterogeneity across studies makes it difficult to detect a consistent pattern.	0	The included studies do not systematically examine different levels of intervention intensity.
Residual confounding	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.

	LDL cholesterol: VERY LOW ⊕◯◯◯		DBP: HIGH ⊕⊕⊕⊕		SBP: HIGH⊕⊕⊕⊕	
	Rating	**Rationale**	**Rating**	**Rationale**	**Rating**	**Rationale**
Risk of Bias	0	5/15 studies were at high risk of bias, especially due to lack of control for confounding. However, since most studies were at low risk of bias we did not downgrade the quality of evidence.	0	5/19 studies were at high risk of bias, particularly due to risk of confounding bias. However, we did not downgrade the quality of evidence because most studies were at low risk of bias and plausible bias would unlikely affect the results.	0	5/20 studies were at high risk of bias, particularly due to risk of confounding bias. However, we did not downgrade the quality of evidence because most studies were at low risk of bias and plausible bias would unlikely affect the results.
Indirectness	-1	3/15 studies focused solely on obese individuals. We also found significant differences in subgroup analysis by the health status of participants. Hence, we did not downgrade for indirectedness.	0	Four studies targeted individuals with specific conditions (obesity/hypertension/hypercholesterolemia). Subgroup analysis according to health conditions of participants did not reveal significant heterogeneity. As a result, we did not downgrade the quality of evidence for indirectness	0	Four studies targeted individuals with specific conditions (obesity/hypertension/hypercholesterolemia). Subgroup analysis according to health conditions of participants did not reveal significant heterogeneity. As a result, we did not downgrade the quality of evidence for indirectness
Inconsistency	-1	Between-study heterogeneity was low (I^2 = 25%). However, the consistent variability across point estimates indicated potential inconsistency in the direction and magnitude of effects. As a result, the certainty of evidence was downgraded for inconsistency.	0	Between study heterogeneity was high ((I^2 =94%). However, point estimates were consisent and confidence intervals were overlapping. Hence no dowgrade was made.	0	Between study heterogeneity was high (I^2 =84%). However, point estimates were consisent and confidence intervals were overlapping. Hence no dowgrade was made.
Imprecision	-1	We downgraded the quality of evidence for imprecision because the confidence intervals around the effect estimate were wide, indicating uncertainty in the precision of the results.	0	We did not downgrade for imprecision because the confidence intervals around the effect estimate were narrow.	0	We did not downgrade for imprecision because the confidence intervals around the effect estimate were narrow.
Publication bias	0	The rating was not downgraded due to publication bias since the visual inspection of the funnel did not indicate concerning evidence of asymmetry, and the p.value of Egger test was not significant (p=0.645).	0	The rating was not downgraded due to publication bias because the visual inspection of the funnel did not indicate concerning evidence of asymmetry, and the p.value of Egger test was not significant (p=0.342).	0	The rating was not downgraded due to publication bias because the visual inspection of the funnel did not indicate concerning evidence of asymmetry, and the p.value of Egger test was not significant (p=0.447).
Large magnitude	0	There weren't sufficient conditions to support a rating up of the quality of evidence.	0	The certainty of the evidence is already rated as high, thus no further upgrading is required. Moreover, it is difficult to unambiguously determine what constitutes a large magnitude of effect in terms of blood pressure.	0	The certainty of the evidence is already rated as high, thus no further upgrading is required. Moreover, it is difficult to unambiguously determine what constitutes a large magnitude of effect in terms of blood pressure.
Dose response	0	The included studies do not systematically examine different levels of intervention intensity.	0	The included studies do not systematically examine different levels of intervention intensity.	0	The included studies do not systematically examine different levels of intervention intensity.
Residual confounding	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.

	Glucose: LOW ⊕⊕◯◯		Tryglycerides: VERY LOW ⊕◯◯◯		Smoking: LOW ⊕⊕◯◯	
	Rating	**Rationale**	**Rating**	**Rationale**	**Rating**	**Rationale**
Risk of Bias	0	3/11 studies were rated as having a high risk of bias. Most evidence came from studies with low risk of bias. Consequently, evidence was not downgraded for risk of bias.	0	4/11 studies were rated as having a high risk of bias. Most evidence came from studies with low risk of bias. Consequently, evidence was not downgraded for risk of bias.	0	Only one out of five studies was assessed as having a high risk of bias. Therefore, the certainty of evidence was not downgraded for risk of bias.
Indirectness	0	3/11 studies targeted individuals with specific health conditions (e.g., obesity, hypertension, or hypercholesterolemia). However, subgroup analyses based on participants' health status did not reveal significant heterogeneity in effect estimates. Therefore, the certainty of evidence was not downgraded for indirectness	0	3/11 studies targeted individuals with specific health conditions (e.g., obesity, hypertension, or hypercholesterolemia). Subgroup analyses on participants' health status did not reveal significant heterogeneity in effect estimates. Therefore, the certainty of evidence was not downgraded for indirectness	-1	A downgrade was applied due to indirectness, as there were substantial differences in the nature of the smoking interventions.
Inconsistency	-1	Between-study heterogeneity was high (I^2 = 97%). Moreover, there was consistent variability across point estimates, and confidence intervals were not consistently overlapping. As a result, the certainty of evidence was downgraded for inconsistency.	-1	Between-study heterogeneity was high (I^2 = 97%), and point estimates varied greatly, with confidence intervals not overlapping. As a result, the certainty of evidence was downgraded for inconsistency.	0	Between-study heterogeneity was high (I^2 = 77%), indicating substantial variability in the results. Despite this, all point estimates across the studies suggested a reduction in smoking, and the confidence intervals overlapped, indicating a consistent trend in the overall results. Therefore, the certainty of the evidence was not downgraded for inconsisteny.
Imprecision	-1	We downgraded the quality of evidence for imprecision because the confidence intervals around the effect estimate were wide, indicating uncertainty in the precision of the results.	-1	We downgraded for imprecision because the confidence intervals around the effect estimate were wide.	0	We did not downgrade for imprecision because the confidence intervals around the effect estimate were narrow.
Publication bias	0	The rating was not downgraded due to publication bias. Although some asymmetry was observed in the funnel plot, it was not considered substantial. Moreover, the Egger test did not indicate significant small study effects (p = 0.107), supporting the decision not to downgrade the certainty of evidence for publication bias.	-1	The rating was downgraded due to publication bias because the visual inspection of the funnel indicated evidence of asymmetry, and the p.value of Egger test was significant (p=0.037).	-1	The rating was downgraded due to publication bias because the visual inspection of the funnel indicated evidence of asymmetry, and the p.value of Egger test was significant (p=0.006).
Large magnitude	0	The pooled effect size was not significant.	0	The pooled effect size was not significant.	0	There weren't sufficient conditions to support a rating up of the quality of evidence.
Dose response	0	The included studies do not systematically examine different levels of intervention intensity.	0	The included studies do not systematically examine different levels of intervention intensity.	0	The included studies do not systematically examine different levels of intervention intensity.
Residual confounding	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.	0	We did not upgrade the evidence for plausible residual confounding because there is no indication that residual confounding is likely to have substantially reduced effect.

Table S10. PRISMA Checklist.

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	p. 1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	p. 1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	p. 3
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	p. 3
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	p. 4
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	p. 3
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	p. 1 (Supplementary material)
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	p. 4
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	p. 4
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	p. 5
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	p. 4-5
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	p. 5
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	p. 6
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	p. 5-6
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data	p. 5-6

		conversions.	
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	p. 5-6
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	p. 5-6
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	p. 5-6
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	p. 5-6
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	p. 5-6
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	p. 5
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	p. 6
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	p. 6
Study characteristics	17	Cite each included study and present its characteristics.	p. 6-10
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	p. 9-11
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	p. 12-13
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	p. 12-13
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	p. 12-13
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	p. 14
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	p. 12-13
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	p. 1
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	p. 15
	23b	Discuss any limitations of the evidence included in the review.	p. 17

	23c	Discuss any limitations of the review processes used.	p. N/A
	23d	Discuss implications of the results for practice, policy, and future research.	p. 17-18
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	p. 3
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	N/A
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/A
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	p.
Competing interests	26	Declare any competing interests of review authors.	p. 18
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	p. 18

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021; 372:n71. doi: 10.1136/bmj.n71.