Supplementary material for

Acute Effects of "Exercise Snacks" During Prolonged Sitting on Hemodynamics and Peripheral Vascular Function: A Three-Level Meta-Analysis

1 Supplementary Method

1.1 Search Strategy

Table S1 Complete search strategy for each database

Data	Query
Cochrane Library	#1 (sedentary behaviour):ti,ab,kw or (sedentary behavior):ti,ab,kw or (prolonged sitting):ti,ab,kw or (sitting):ti,ab,kw or (rested):ti,ab,kw or (sedentary):ti,ab,kw #2 (exercise):ti,ab,kw or (walking):ti,ab,kw or (standing):ti,ab,kw or (physical activity):ti,ab,kw or (exercise snack):ti,ab,kw or (movement snack):ti,ab,kw or (snacktivity):ti,ab,kw or (exercise break):ti,ab,kw or (movement break):ti,ab,kw or (physical activity break):ti,ab,kw or (active break):ti,ab,kw or (short bout):ti,ab,kw or (intermittent physical activity):ti,ab,kw or (intermittent exercise):ti,ab,kw or (microbout):ti,ab,kw or (multiple bouts):ti,ab,kw or (accumulated exercise):ti,ab,kw or (accumulated physical activity):ti,ab,kw or (short bouts):ti,ab,kw #3 (breaks):ti,ab,kw or (intervals):ti,ab,kw or (breaking):ti,ab,kw or (break):ti,ab,kw or (intermittent):ti,ab,kw or (interrupting):ti,ab,kw or (short bouts):ti,ab,kw or (alternating):ti,ab,kw or (interrupt):ti,ab,kw or (fraction):ti,ab,kw or (intersperse):ti,ab,kw or (ejection fraction):ti,ab,kw #4 #1 and #2 and #3
Embase	#1. 'randomized controlled trial':ab,ti OR 'randomized':ab,ti OR 'placebo':ab,ti OR 'randomly':ab,ti OR 'rct':ab,ti OR 'controlled trial':ab,ti #2. 'exercise':ab,ti OR 'walking':ab,ti OR 'standing':ab,ti OR 'physical activity':ab,ti OR 'exercise snack':ab,ti OR 'movement snack':ab,ti OR 'snacktivity':ab,ti OR 'exercise break':ab,ti OR 'movement break':ab,ti OR 'physical activity break':ab,ti OR 'active break':ab,ti OR 'short bout':ab,ti OR 'short bouts':ab,ti OR 'intermittent physical activity':ab,ti OR 'intermittent exercise':ab,ti OR 'microbout':ab,ti OR 'multiple bouts':ab,ti OR 'accumulated exercise':ab,ti OR 'accumulated physical activity':ab,ti #3. 'sedentary behaviour':ab,ti OR 'sedentary behavior':ab,ti OR 'prolonged sitting':ab,ti OR 'sitting':ab,ti OR 'rested':ab,ti OR 'sedentary':ab,ti #4. 'breaks':ab,ti OR 'intervals':ab,ti OR 'breaking':ab,ti OR 'break':ab,ti OR 'interrupting':ab,ti OR 'intermittent':ab,ti OR 'short bouts':ab,ti OR 'alternating':ab,ti OR 'interrupt':ab,ti OR 'fraction':ab,ti OR 'intersperse':ab,ti OR 'ejection fraction':ab,ti #5. #1 AND #2 AND #3 AND #4
PubMed	("Sedentary Behavior"[MeSH Terms] OR sedentary[Title/Abstract] OR "sedentary behavior"[Title/Abstract] OR "sedentary behaviour"[Title/Abstract] OR "prolonged sitting"[Title/Abstract] OR sitting[Title/Abstract]) AND ("Exercise"[MeSH Terms] OR walking[Title/Abstract] OR standing[Title/Abstract] OR "physical activity"[Title/Abstract] OR "exercise snack*"[Title/Abstract] OR "movement snack*"[Title/Abstract] OR snacktivity[Title/Abstract] OR "exercise break*"[Title/Abstract] OR "movement break*"[Title/Abstract] OR "physical activity break*"[Title/Abstract] OR "active break*"[Title/Abstract] OR "short bout*"[Title/Abstract] OR "multiple bout*"[Title/Abstract] OR "accumulated exercise"[Title/Abstract] OR "accumulated physical activity"[Title/Abstract] OR ("movement"[Title/Abstract] AND snack*[Title/Abstract])) AND (break*[Title/Abstract] OR interrupt*[Title/Abstract] OR intermittent[Title/Abstract] OR

	interval*[Title/Abstract] OR alternating[Title/Abstract] OR intersperse*[Title/Abstract])
EBSCO	AB (("sedentary behaviour" OR "sedentary behavior" OR "prolonged sitting" OR sitting OR rested)) AND AB (exercise OR walking OR standing OR "physical activity" OR "exercise snack*" OR "movement snack*" OR snacktivity OR "exercise break*" OR "movement break*" OR "physical activity break*" OR "active break*" OR "short bout*" OR "intermittent physical activity" OR "intermittent exercise" OR microbout* OR "multiple bouts" OR "accumulated exercise" OR "accumulated physical activity") AND AB (break* OR interval* OR intermit* OR interrupt* OR "short bout*" OR alternating OR fraction* OR intersperse*) AND AB ((randomized OR randomly OR "randomized controlled trial" OR RCT OR "controlled trial"))
Web of science	(((((TS=(sedentary behaviour)) OR TS=(sedentary behavior)) OR TS=(prolonged sitting)) OR TS=(sitting)) OR TS=(rested)) OR TS=(sedentary) and Preprint Citation Index (Exclude – Database) ((((((((((((((((TS=(exercise)) OR TS=(walking)) OR TS=(standing)) OR TS=(physical activity)) OR TS=(exercise snack)) OR TS=(movement snack)) OR TS=(snacktivity)) OR TS=(exercise break)) OR TS=(movement break)) OR TS=(physical activity break)) OR TS=(active break)) OR TS=(short bout)) OR TS=(intermittent physical activity)) OR TS=(intermittent exercise)) OR TS=(microbout)) OR TS=(multiple bouts)) OR TS=(accumulated exercise)) OR TS=(accumulated physical activity) and Preprint Citation Index (Exclude – Database) ((((((((((((TS=(breaks)) OR TS=(intervals)) OR TS=(breaking)) OR TS=(break)) OR TS=(intermittent)) OR TS=(interrupting)) OR TS=(short bouts)) OR TS=(alternating)) OR TS=(interrupt)) OR TS=(fraction)) OR TS=(intersperse)) NOT TS=(ejection fraction)) (((((TS=(randomized)) OR TS=(randomised)) OR TS=(randomly)) OR TS=(Randomized Controlled Trial)) OR TS=(RCT)) OR TS=(controlled trial) and Preprint Citation Index (Exclude – Database)

1.2 Statistical Analysis

Effect sizes and variances are calculated in Excel, consistently with Aksayli et al[1]. Subsequent statistical analyses were conducted using the metafor package in R Version 4.4.0 (R Core Team 2024)[2].

1.2.1 Effect size Calculation

For continuous outcomes, the choice of effect size was determined by the consistency of measurement units across studies.

For hemodynamic indices (i.e., SBP, DBP, MAP, and HR) measured in consistent units where retaining original values facilitates clinical interpretation, the mean difference (MD) was selected as the effect size. Conversely, for peripheral vascular indices (i.e., FMD, shear rate, peripheral blood flow, and peripheral arterial diameter) susceptible to methodological variations (e.g., differences in scales, algorithms, or dimensions) and requiring cross-study comparability, the standardized mean difference (SMD) was employed. Specifically, Hedges' g was used to represent the SMD to correct Cohen's d for small-sample bias.

All effect sizes were derived from post-intervention (post-test) between-group differences, assuming independence between the experimental and control groups. Where necessary, effect directions were harmonized to ensure a consistent interpretation of positive and negative signs across studies. Effect sizes and their sampling variances were computed using the "escalc()" function within the metafor package in R (R Foundation for Statistical Computing, Vienna, Austria). Specifically, the argument measure="MD" was used for mean differences, and measure="SMD" (defaulting to vtype="LS") was used for standardized mean differences[2–4].

1.2.2 Meta-analysis

In our data, some studies reported multiple outcome variables or simultaneously reported results for the active and passive control groups, leading to dependence between effect sizes. To retain all effect sizes to enhance statistical power and address the dependency of effect sizes, it is necessary to use a multi-level or multi-variate approach[5–7]. Since most studies did not report correlations between variables needed by multivariate meta-analysis, we opted for a multi-level meta-analysis rather than a multivariate one. This method accounts for three levels of variance among effect sizes: sampling variance (level 1), the variance between effect sizes from the same study (level 2), and variance between studies (level 3).

First, we used a three-level model to compute the overall effect size. Following recommendations from previous research[5,8], we employed the "t" test and "REML" (Restricted Maximum Likelihood) method when using the rma.mv function. Because the included studies were inconsistent with participant characteristics and intervention features, and we aimed to generalize the results to a broader population, we employed a random effects model, according to the suggestion of model selection[9].

Secondly, we conducted an influence analysis to identify influential cases and assess their potential impact on the results[2]. An influential case was defined as the effect size whose exclusion from the analysis leads to considerable changes in the fitted model[2]. The meta-analytic models were thus run both with and without influential effect sizes.

Thirdly, we employed the Q statistics to examine the overall heterogeneity. Cochran's Q statistic is calculated as the sum of the squared deviations of each effect size from the overall effect size, weighted by the inverse of the variance[10]. Also, we used I2 to estimate the heterogeneity within levels 1, 2, and 3, assessing the distribution of variance across levels[8]. In addition, we employed two log-likelihood ratio tests to assess whether the three-level model represents the variability in our data better than a two-level model[8]. Specifically, we set the variance at level 2 to zero, then fitted a two-level model including only levels 3 and 1. Then, we compared the results of the full model (three-level model) and the two-level model (with level 2 variance set to zero). Afterward, we set the variance at level 3 to zero and again compared the results between the full model (three-level model) and the two-level model (with level 3

variance set to zero).

Fourthly, for moderator analyses, we used three-level mixed-effects models[9]. We used the Q test, an omnibus test, to determine if the subgroup differences are large enough not to be explainable by sampling error alone[5].

Fifthly, a cubic spline model was selected for multivariate regression analysis to examine the nonlinear relationship between the variables and effect size, with identifiers used as random factors to account for dependencies. The training session (continuous variable) refers to the total number of training sessions conducted. Training duration (continuous variable) was defined as the number of training sessions multiplied by the duration of each session, representing the total time participants were required to complete the training. We employed cubic spline linear regression models with three, four, and five knots, and compared these models using likelihood ratio tests to identify the best fit[11].

Lastly, to assess publication bias, we employed the funnel plot[12], Egger's regression test (Egger et al., 1997), and trim-and-fill[13]. The funnel plot and trim-and-fill are based on a two-level model where all effect sizes are treated as "independent," as the two methods have not yet been extended to multi-level models[14,15]. Egger's regression test simultaneously reported both the two and three-level models. In the three-level model, we utilized the predictor recommended by previous studies, which is $2\sqrt{N}$, where N is the total sample size of the study[14,15].

2 Supplementary Result

2.1 Characteristics of the studies

Table S2. General Characteristics and Participant Demographics of the Included Studies

Study ID	Country	Design	Outcome assessment time window	N(Female/ Male)	Age,mean±sd(years)	Body mass,mean±sd(kg)	BMI,mean±sd(kg/m²)	Health status
Qingyang_2025[16]	China	Randomized crossover; Washout NR	Acute (≤24 h)	18(0/18)	21±1.2	89.5±8.5	28.8±2.2	Adults with overweight/obesity
Masahiro_2022[17]	Japan	Randomized crossover; Washout 2–4 days	Acute (≤24 h)	20(10/10)	21±2	NR	21.5±1.6	Healthy adults
Nicholas_2017[18]	USA	Randomized crossover; Washout NR	Acute (≤24 h)	13(3/10)	38 ± 3	NR	29.7±1.0	Adults with overweight/obesity
Shilpa_2019[19]	Canada	Randomized crossover; Washout ≥5 days	Acute (≤24 h)	10(5/5)	24.7±2.9	NR	23.0±2.1	Healthy adults
Frances_2020[20]	Australia	Randomized crossover; Washout ≥6 days	Acute (≤24 h)	24(11/13)	61.5±7.8	94.0±13.4	32.6±3.5	Adults with type 2 diabetes and overweight/obesity
William_2019[21]	USA	Randomized crossover; Washout NR	Acute (≤24 h)	20(14/6)	21.7±2.9	NR	25.7±5.3	Healthy adults
S.E. _2015[22]	UK	Randomized crossover; Washout NR	Acute (≤24 h)	20(5/15)	24.0±6.1	75.2±17.5	25.0±4.2	Healthy adults
Alexander_2023[23]	USA	Randomized crossover; Washout ≥1 day	Acute (≤24 h)	15(0/15)	23±4	87.5±24.1	27.8±7.3	Healthy adults
Jessika_2023[24]	Brazil	Randomized crossover; Washout ≥48 h	Acute (≤24 h)	17(9/8)	26±6	65.9±14.8	22.4±3.6	Healthy adults
Gustavo_2021[25]	Brasil	Randomized crossover; Washout ≥48 h	Acute (≤24 h)	17(11/6)	29±10	69.8±16.4	25.1±5.1	Healthy adults
Billy_2018[26]	Germany	Randomized crossover; Washout ≥72 h	Acute (≤24 h)	12(7/5)	22±2	66.2±9.9	21.7±2.1	Healthy adults
Sophie_2019[27]	UK	Randomized crossover; Washout ≥7 days	Acute (≤24 h)	15(5/10)	35.8±10.2	74.5±11.9	25.5±3.2	Healthy adults
Paolo_2025[28]	Brazil	Randomized crossover; Washout ≥2 days	Acute (≤24 h)	27(25/2)	69.4±5.6	68.8±12.1	25.1±4.6	Healthy adults
Lee_2019[29]	USA	Randomized crossover; Washout ≤7 days	Acute (≤24 h)	20(14/6)	21.7±2.5	NR	25.5±6.1	Healthy adults
Zachary_2016[30]	USA	Randomized crossover; Washout ≥7 days	Acute (≤24 h)	9(7/2)	30±15	NR	28.7±2.7	Adults with overweight/obesity
Paul_2021[31]	Australia	Randomized crossover; Washout ≥4 days	Acute (≤24 h)	29(14/15)	66±12	88±20	31.2±6.4	Post-stroke adults
R.N._2014[32]	Australia	Randomized crossover; Washout 5–15 days	Acute (≤24 h)	19(8/11)	53.8±4.8	NR	31.2±3.9	Adults with overweight/obesity
Bethany_2017[33]	USA	Randomized crossover; Washout ≥7 days	Acute (≤24 h)	25(9/16)	42±12	NR	31.9±5.0	Adults with overweight/obesity and elevated BP (prehypertension/stage 1 hypertension)

Min_2020[34]	South Korea	Randomized crossover; Washout ≥72 h	Acute (≤24 h)	12(5/7)	23.5±2.9	68.5±10.5	23.4±2.7	Healthy adults
Dharini_2017[35]	USA	Randomized crossover; Washout ≥72 h	Acute (≤24 h)	10(5/5)	32±5	NR	30.3±4.6	Adults with overweight/obesity
Rachel_2018[36]	Australia	Randomized crossover; Washout ≥6 days	Acute (≤24 h)	19(8/11)	57±12	NR	30.6±3.4	Adults with overweight/obesity
Masahiro_2023[37]	Japan	Randomized crossover; Washout ≥48 h	Acute (≤24 h)	20(11/9)	21±1	NR	21.6±1.6	Healthy adults
Lisa_2021[38]	Netherlands	Randomized crossover; Washout 1–4 weeks	Acute (≤24 h)	24(19/5)	59.6±8.1	NR	30.2±2.5	Adults with overweight/obesity
Meredith_2021[39]	New Zealand	Randomized crossover; Washout ≥4 days	Acute (≤24 h)	18(7/11)	23.5±5.0	72.9±12.1	23.7±2.6	Healthy adults
Patrik_2016[40]	Australia	Randomized crossover; Washout ≥6 days	Acute (≤24 h)	19(9/10)	59.7±8.1	NR	31.5±4.7	Adults with overweight/obesity
Yvonne_2021[41]	Netherlands	Randomized crossover; Washout NR	Acute (≤24 h)	24(15/9)	65±5	NR	29.8±3.9	Older adults with elevated cardiovascular risk
Opie_2020[42]	UK	Randomized crossover; Washout ≥7 days	Acute (≤24 h)	12(7/5)	25±6	72.0±16.6	24.7±4.9	Healthy adults
Rachael_2018[43]	UK	Randomized crossover; Washout ≥6 days	Acute (≤24 h)	24(12/12)	M: 32.0±10.5 F: 39.5±10.3	M: 83.4±15.9 F: 68.8±16.2	M: 26.6±4.5 F: 24.8±5.1	Healthy adults
Saurabh_2015[44]	USA	Randomized crossover; Washout 2–7 days	Acute (≤24 h)	12(0/12)	24.2±4.2	NR	23.7±3.4	Healthy adults
Hannah_2021[45]	Canada	Randomized crossover; Washout ≥48 h	Acute (≤24 h)	10(0/10)	24±4	NR	24±2	Healthy adults
Takuma_2016[46]	USA	NR	Acute (≤24 h)	11(4/7)	26±1	76.8±6.1	25.0±1.1	Healthy adults
Sophie_2017[47]	UK	Randomized crossover; Washout NR	Acute (≤24 h)	10(4/10)	27.3±8.1	82.6±19.7	NR	Healthy adults
Song-Young_2022[48]	USA	Randomized crossover; Washout ≥7 days	Acute (≤24 h)	14(7/7)	23.6±2.3	NR	24.4±24.5	Healthy adults
Feng_2024[49]	CHINA	Randomized crossover; Washout ≥24 h	Acute (≤24 h)	24(13/11)	31±8	64±9	22.7±2.3	Healthy adults
Coralie_2018[50]	Australia	Randomized crossover; Washout ≥7 days	Acute (≤24 h)	19(9/10)	68.2±10.2	NR	29.9±5.1	Post-stroke adults
Teatske_2019[51]	Netherlands	Randomized crossover; Washout ≥6 days	Acute (≤24 h)	20(0/20)	19.2±0.6	72.9±9.4	22.2±2.5	Healthy adults

Note: "Study ID" refers to the identifier used in the standardized data-extraction worksheet for study tracking and consistency across analyses. These identifiers were retained from the extraction dataset and do not represent formal citation labels; NR = not reported; N = sample size; BMI = body mass index.

Table S3. Intervention Protocols and Sedentary Break Characteristics of the Included Studies

Study ID	Break protocol	Break duration (min)	Number of breaks (n)	Total break time (min)	Outcomes
Qingyang_2025	PS: 510 min (8.5 h) WALK1-INT: sitting 60 min, then a single 30-min walking bout WALK2-INT: sitting interrupted with 3-min light-intensity walking bouts every 45 min SRA-INT: sitting interrupted with 3-min bodyweight half-squat bouts every 45 min	WALK1:30 WALK2:3 SRA:3	WALK1:1 WALK2:10 SRA:10	30	SBP; DBP
Masahiro_2022	PS: 180 min (3 h) SRA-INT: sitting interrupted with 1-min light half-squats every 20 min	1	9	9	MAP; HR
Nicholas_2017	PS: 240 min (4 h) STAND-INT: sitting interrupted with 10-min standing bouts every 60 min PEDAL-INT: sitting interrupted with 10-min under-desk pedaling bouts every 60 min	4	10	40	FMD; SBP; DBP; HR;SR; PBF; PAD
Shilpa_2019	PS: 240 min (4 h) CYCLE-INT: sitting interrupted with a 3-min cycling bout every 60 min at 60/120/180 min	3	3	9	SBP; DBP; HR
Frances_2020	PS: 420 min (7 h) SRA1-INT: sitting interrupted with 3-min simple resistance activity bouts every 30 min SRA2-INT: sitting interrupted with 6-min simple resistance activity bouts every 60 min	SRA1: 3 SRA2: 6	SRA1: 14 SRA2: 7	42	FMD; PBF; SR; PAD
William_2019	PS: 180 min (3 h) SRA-INT: sitting interrupted with 10 seated calf raises every 10 min（metronome 20 beats/min ≈ 0.33 Hz; full ROM）	0.5	18	9	SBP; DBP; MAP; HR
S.E._2015	PS: 30 min STAND: sitting interrupted with one 2-min standing break at midpoint WALK: sitting interrupted with one 2-min treadmill walking break at 4 km/h SRA: sitting interrupted with one 2-min bodyweight resistance (calisthenics-style) set (squats, arm circles, calf raises, knees-to-elbows, lunges; metronome-guided, 8 reps per movement; ~3 s/rep cycle)	2	1	2	HR
Alexander_2023	PS: 180 min (3 h) STAND-INT (sit–stand desk): sitting interrupted with 10-min standing bouts every 30 min	10	6	60	SBP; DBP; MAP
Jessika_2023	PS: 180 min SRA-INT: sitting interrupted with 2-min isometric wall squats every 30 min (knee angle individualized)	2	6	12	FMD; PBF; PAD; SR; SBP; DBP
Gustavo_2021	PS: 180 min (3 h) WALK-INT: sitting interrupted with 2-min light walking every 30 min SRA-INT: sitting interrupted with 2-min isometric bilateral leg extensions every 30 min (30% MVC; knee 60°)	2	6	12	FMD; PAD; SR; PBF; SBP; DBP; HR
Billy_2018	PS: 60min SRA-INT: after 60 min sitting, perform a single 6-min SRA bout	6	1	6	HR
Sophie_2019	PS: 240 min (4 h) WALK1-INT: sitting interrupted with 2-min treadmill walking bouts every 30 min (self-selected speed; mean 3.6±0.9 km/h) WALK2-INT: sitting interrupted with 8-min treadmill walking bouts every 120 min (self-selected speed; mean 3.6±0.9 km/h)	WALK1: 2 WALK2: 8	WALK1: 8 WALK2: 2	16	FMD; PBF; SR; MAP; HR
Paolo_2025	PS: 180 min (3 h) WALK-INT: sitting interrupted with 2-min light walking every 30 min	2	6	12	SBP

	PS: 180 min (3 h)				
Lee_2019	SRA-INT: sitting interrupted with seated calf raises (10 reps) every cue at 0.33 Hz (20 bpm), full ROM PS: 480 min (8 h)	0.5	17	≈8.5	MAP; HR
Zachary_2016	STAND-INT: sitting interrupted with quiet standing bouts scheduled hourly (treadmill base, belt off) WALK-INT: sitting interrupted with treadmill walking bouts matched to STAND (1.0 mph; 0% grade) CYCLE-INT: sitting interrupted with cycling bouts matched to WALK (Monark ergometer ≈20 W; HR-matched) PS: 480 min (8 h)	increasing (min): 10, 10, 15, 15, 20, 20, 30, 30	8	150	SBP; DBP
Paul_2021	SRA-INT: sitting interrupted with 5-min bouts consisting of 20-s calf raises + 20-s mini-squats + 20-s marching in place (repeated ×5 within each bout); dose = 2 / 4 / 6 bouts per day PS: 420 min (7 h)	5	‘2/4/6	60	SBP; DBP
R.N._2014	WALK1-INT: sitting interrupted with 2-min treadmill walking bouts at 3.2 km/h every 20 min over 5 h WALK2-INT: sitting interrupted with 2-min treadmill walking bouts at 5.8–6.4 km/h every 20 min over 5 h PS: 440min	2	15	30	SBP; DBP; MAP
Bethany_2017	STAND-INT: alternate sitting and standing every 30 min using a sit–stand desk PS: 240 min (4 h)	30	8	240	SBP; DBP; MAP; HR
Min_2020	STAIR-INT: sitting interrupted with 5-min stair-climbing bouts every 60 min PS: 540 min (9 h)	5	4	20	FMD; PAD; SR; PBF; SBP; DBP; HR
Dharini_2017	WALK1-INT: a single 30-min continuous treadmill walking bout (~71% HRmax) (no repeated breaks) WALK2-INT: sitting interrupted with 2-min walking bouts every 20 min (~53% HRmax) WALK3-INT: sitting interrupted with 2-min bouts every 60 min (incline set to VO_2max-test max grade; ~79% HRmax) PS: 300 min (5 h)	WALK1:30 WALK2:2 WALK3:2	WALK1:1 WALK2:21 WALK3:8	WALK1:30 WALK2:42 WALK3:16	SBP; DBP; MAP
Rachel_2018	SRA-INT: sitting interrupted with 3-min bodyweight lower-limb exercise bouts every 30 min (video-paced; 1 rep/2 s; 3×20 s per exercise) PS: NR (uninterrupted seated)	3	9	≈27	FMD; PBF; SR; PAD
Masahiro_2023	SRA-INT: sitting interrupted with 1-min half-squats with calf raises every 20 min (~15 reps/min; metronome-paced; arms crossed; ~90° knee flexion; no isometric hold) PS: 240 min (4 h)	1	≈8	≈8	MAP; HR; PAD; PBF
Lisa_2021	CYCLE-INT: sitting interrupted with 5-min moderate-intensity cycling bouts every 30 min PS: 360 min (6 h)	5	8	40	SBP; DBP
Meredith_2021	WALK-INT: sitting interrupted with 2-min brisk walking bouts every 30 min (5 km/h; 10% incline) PS: 300 min (5 h)	2	12	24	PBF; SR; SBP; DBP
Patrik_2016	WALK-INT: sitting interrupted with 3-min light-intensity treadmill walking bouts every 30 min (3.2 km/h; 0% grade) (10 bouts; 30 min total) PS: 180 min (3 h)	3	10	30	SBP; DBP; HR
Yvonne_2021	WALK-INT: sitting interrupted with 2-min light-intensity walking bouts every 30 min	2	6	12	FMD; MAP; PAD; PBF

	PS: NR (minimize movement while seated; wheelchair used for transfers)				
Opie_2020	SRA-INT: sitting interrupted with 3-min bodyweight resistance bouts every 30 min (two sets of 20 s each: half-squats, upright wall push-ups, knee raises, calf raises; total 160 s exercise + 20 s transitions)	3	10	30	MAP
	PS: 360 min (6 h)				
Rachael_2018	WALK-INT: sitting interrupted with 20-min light-intensity treadmill-desk walking bouts every 60 min	20	6	120	SBP; DBP; MAP
	PS: 180 min (3 h; legs kept still)				
Saurabh_2015	WALK-INT: sitting interrupted with 5-min light walking bouts at 2 mph at 30, 90, and 150 min	5	3	15	FMD; PAD; SR
	PS: 510 min (8.5 h)				
Hannah_2021	STAIR-INT: hourly “stair snacks”: ascend 3 flights (55 steps) at brisk/all-out pace (~14–20 s)	0.23–0.33	8	≈1.9–2.7	FMD; SR; PAD; PBF
	PS: 180 min (3 h)				
Takuma_2016	FIDGETING-INT: one-leg fidgeting cycles (1 min on / 4 min off; heel taps & knee bouncing) while the contralateral leg remains still (control)	1	36	36	FMD; PBF; PAD
	PS: 86min				
Sophie_2017	SRA-INT: sitting interrupted with 2-min bodyweight resistance/calisthenics bouts every 20 min (five movements: squats, arm circles, calf raises, knees-to-elbows, forward lunges)	2	3	6	FMD; SR
	PS: 150 min（2.5 h prolonged sitting）				
Song-Young_2022	PEDAL-INT: sitting interrupted with 2-min bouts of low-intensity active leg movement every 30 min; performed on a foot elliptical at 1 Hz (60 cycles/min); participant pedaled at a preset workload 13 W; metronome-paced	2	5	10	SBP; DBP; MAP; HR; PBF; SR
	PS: 320min				
Feng_2024	WALK-INT: sitting interrupted with 2-min brisk walking bouts at 6.4 km/h every 20 min across the sitting periods	2	15	30	SBP; DBP
	PS: 480 min (8 h)				
Coralie_2018	SRA-INT: 3-min standing light-intensity bodyweight exercises every 30 min (marching in place, small squats, calf raises)	3	16	48	HR
	WALK-INT: sitting interrupted with 3-min light walking bouts every 30 min				
	PS: 300min				
Teatske_2019	STAND-INT: sitting interrupted with 10-min standing bouts every 60 min	10	4	40	HR

Note: “Study ID” refers to the identifier used in the standardized data-extraction worksheet for study tracking and consistency across analyses. These identifiers were retained from the extraction dataset and do not represent formal citation labels； SRA: Bodyweight resistance; FMD: flow-mediated dilation (%); SR: shear rate (s^{-1}); PBF: peripheral blood flow ($mL \cdot min^{-1}$); PAD: peripheral arterial diameter (mm); SBP: systolic blood pressure (mm Hg); DBP: diastolic blood pressure (mm Hg); MAP: mean arterial pressure (mm Hg); HR: heart rate ($beats \cdot min^{-1}$).

2.2 Flow-Mediated Dilation (FMD)

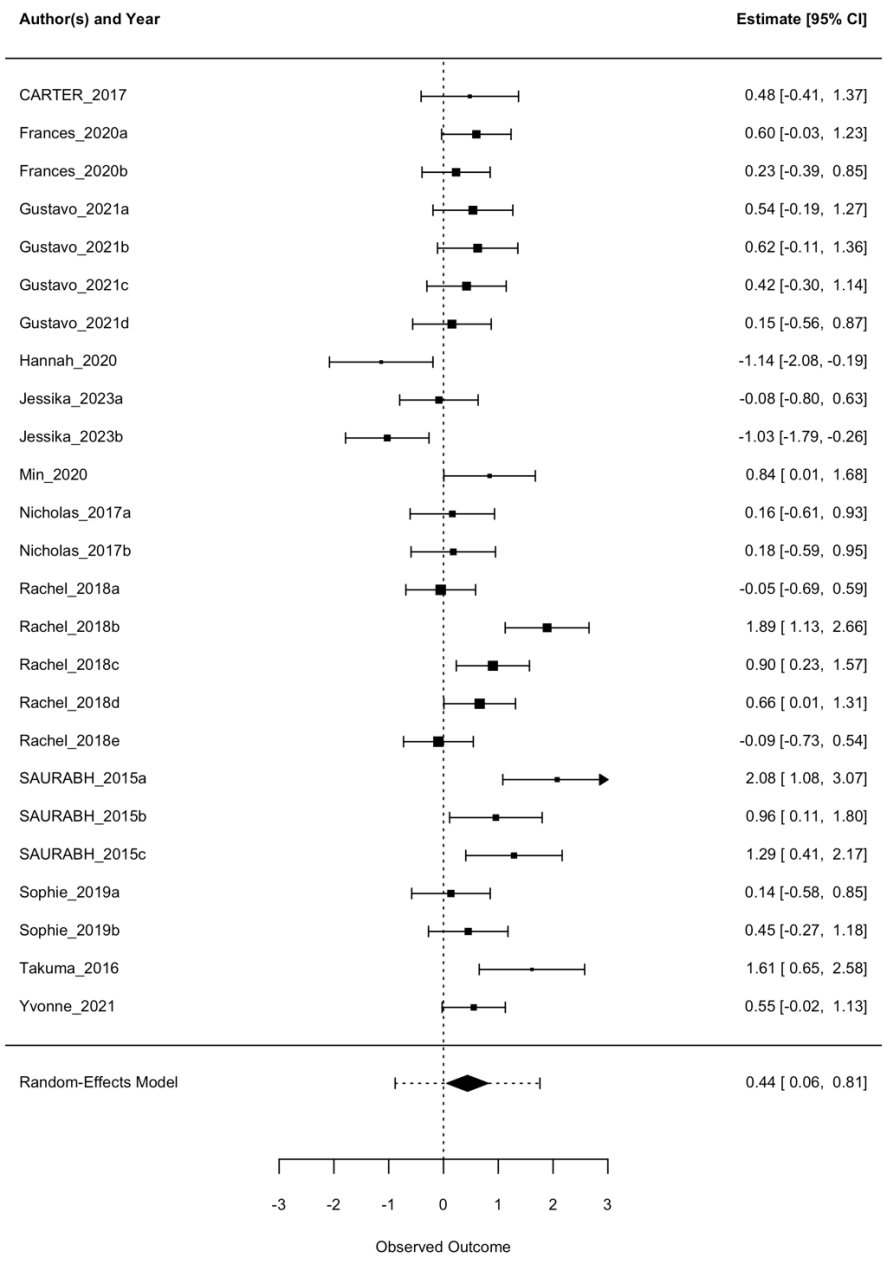

Fig S1. The forest plot of the effect of "Exercise Snacks" on FMD (no outliers).

Note: CI, confidence interval; RE model, random-effects model; the numbering following the references represents the order of the effect sizes within the study. For example, (Gustavo_2021)-d signifies the fourth effect size that the study contributed.

2.3 Shear Rate (SR)

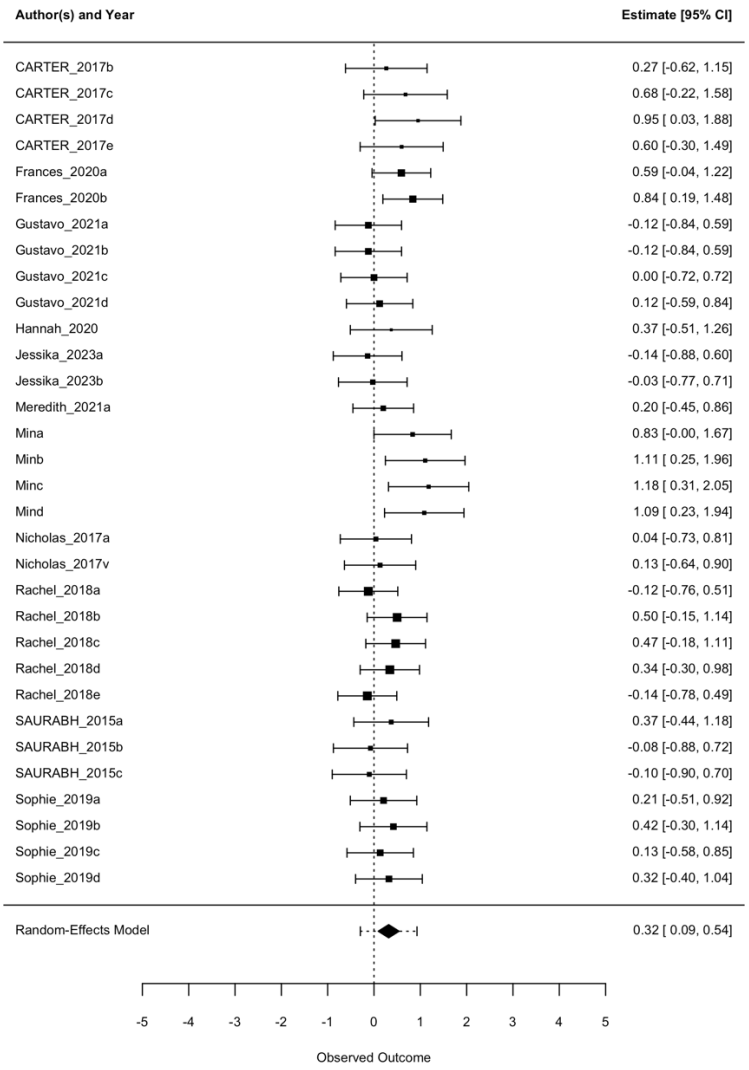

Fig S2. The forest plot of the effect of "Exercise Snacks" on SR (no outliers).

Note: CI, confidence interval; RE model, random-effects model; the numbering following the references represents the order of the effect sizes within the study.

2.4 Peripheral Blood Flow (PBF)

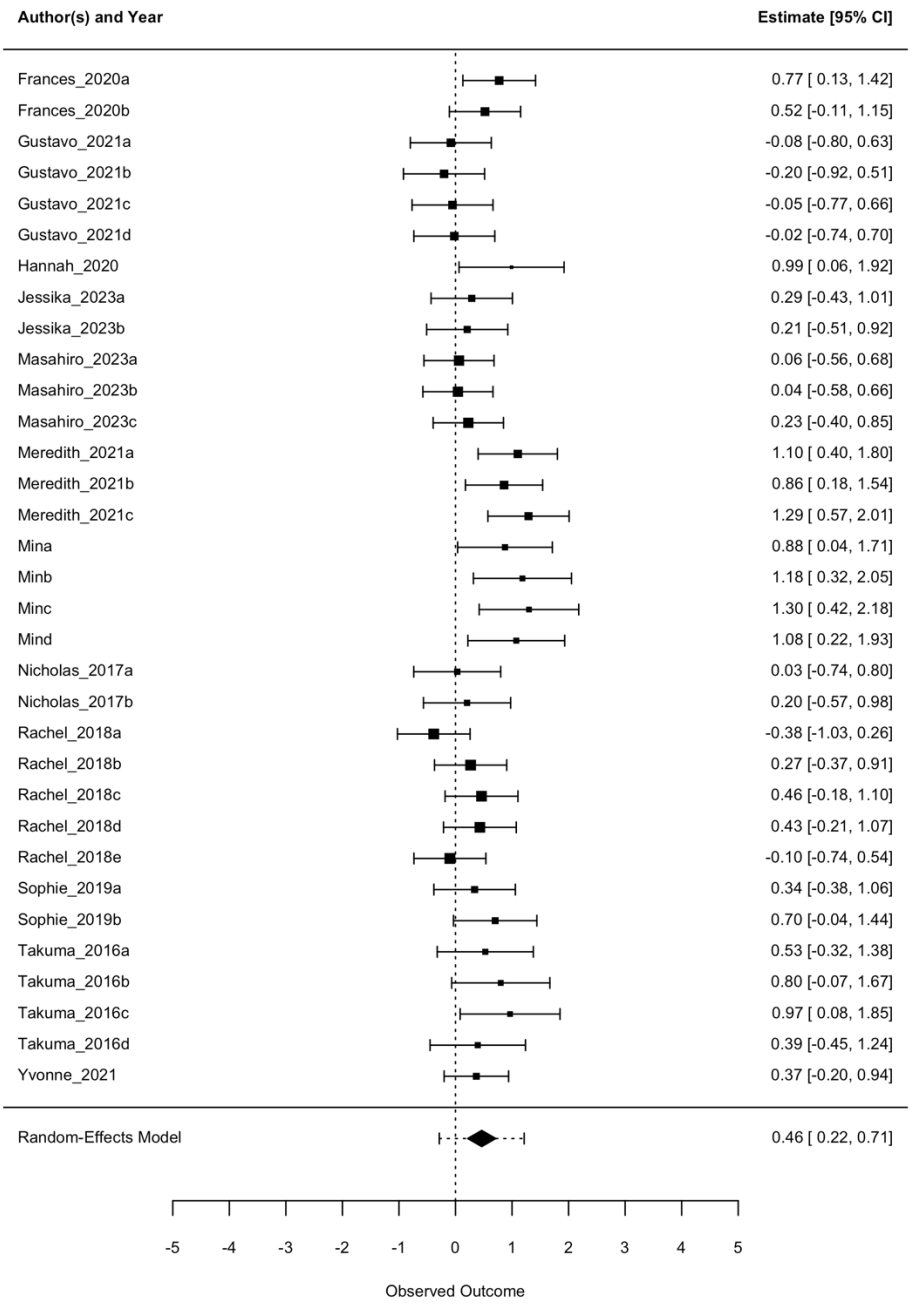

Fig S3. The forest plot of the effect of "Exercise Snacks" on PBF (no outliers).

Note: CI, confidence interval; RE model, random-effects model; the numbering following the references represents the order of the effect sizes within the study.

2.5 Systolic Blood Pressure (SBP)

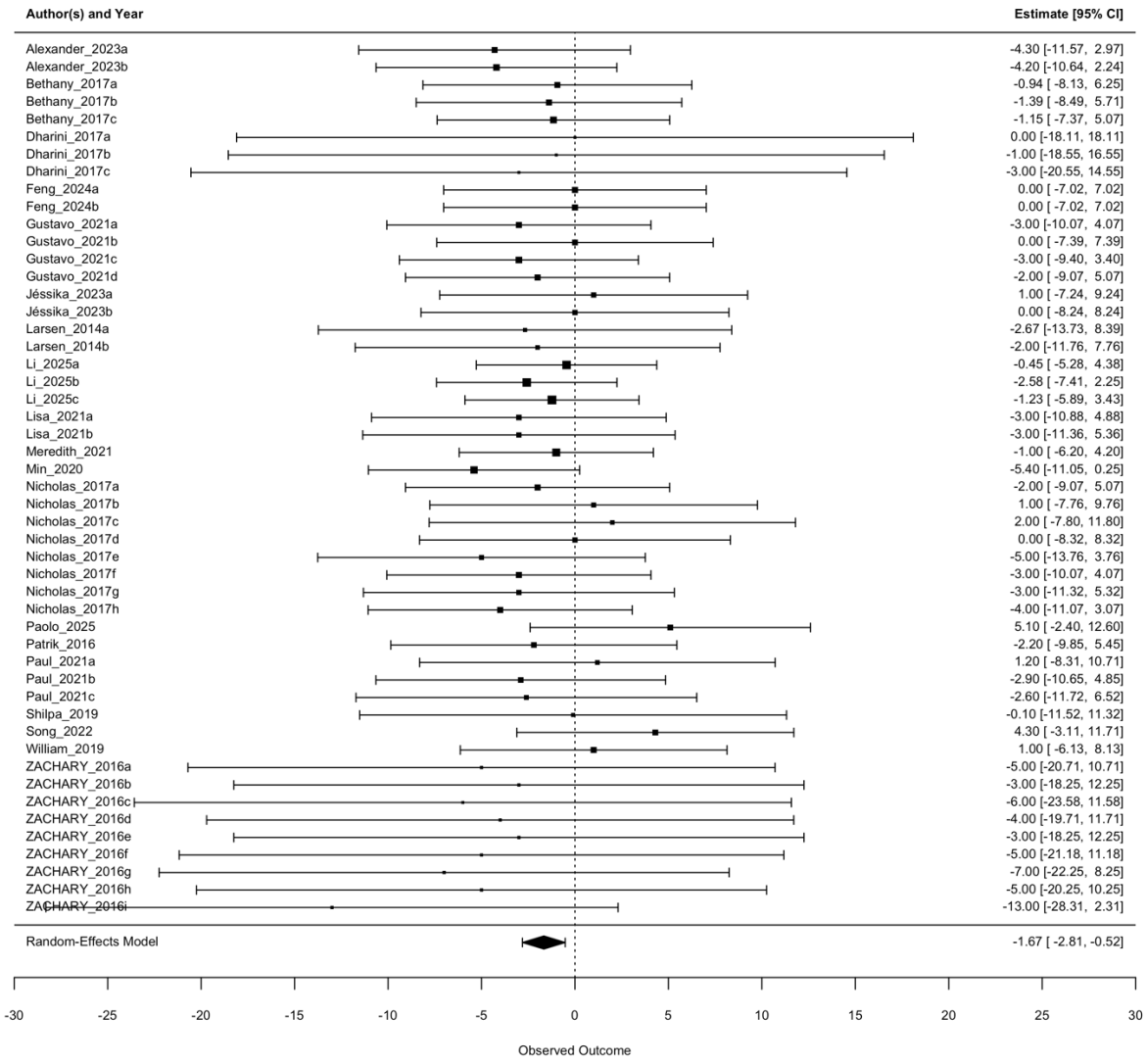

Fig S4. The forest plot of the effect of "Exercise Snacks" on SBP (no outliers).

Note: CI, confidence interval; RE model, random-effects model; the numbering following the references represents the order of the effect sizes within the study

2.6 Heart Rate (HR)

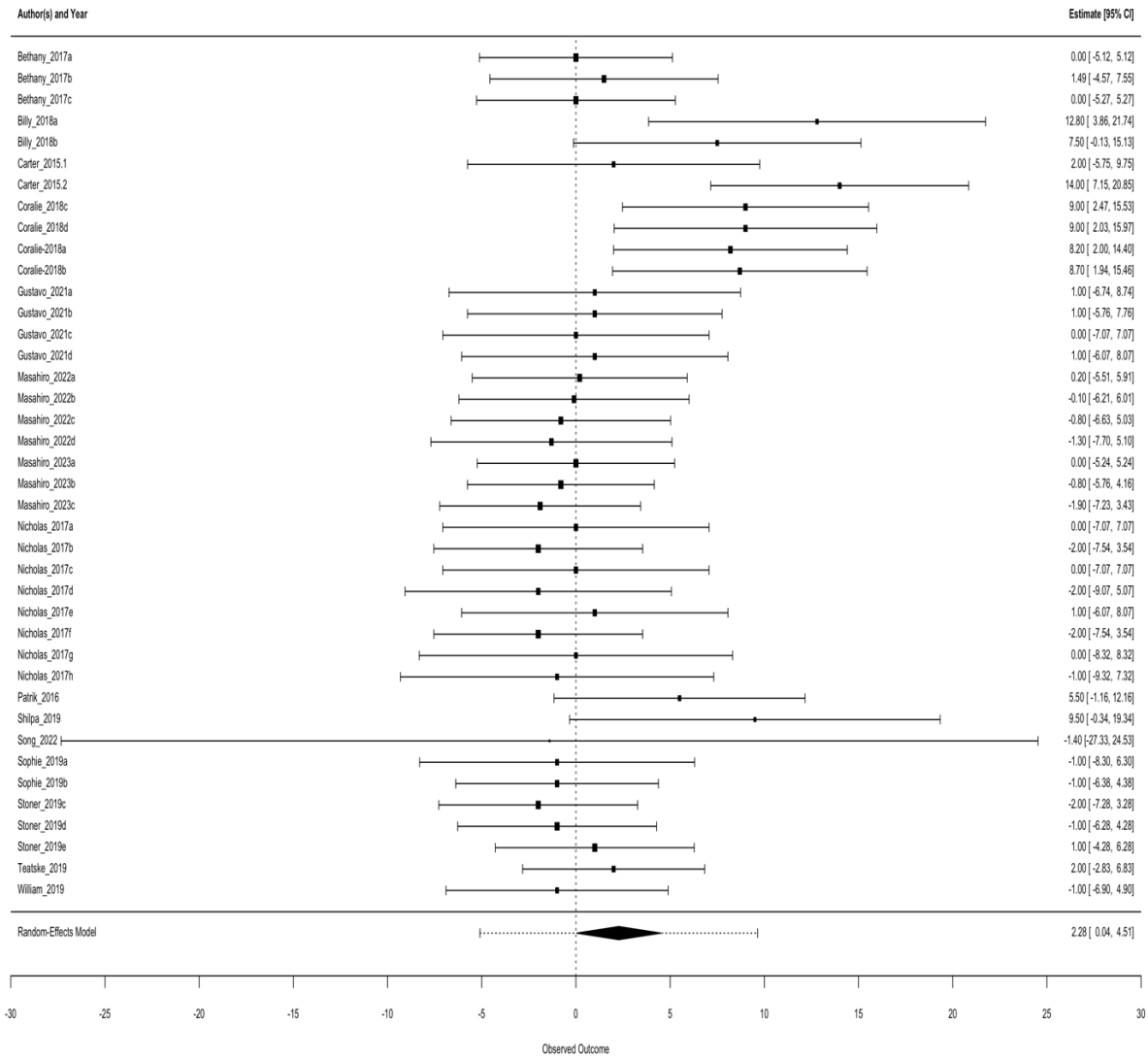

Fig S5. The forest plot of the effect of "Exercise Snacks" on HR (no outliers).

Note: CI, confidence interval; RE model, random-effects model; the numbering following the references represents the order of the effect sizes within the study

Table. S4 The results of moderators of the effect of "Exercise Snacks" on HR

Moderator (subgroup)	K	Hedges'g	95%CI	F	df	P	Level2 variance (I^2)	Level3 variance (I^2)
Health status				0.83	1	0.37	<1%	53.34%***
Health	33	1.83	[-0.61, 4.26]			0.14		
Clinical population (comorbid)	7	4.51	[-0.95, 9.98]			0.1		
Weight status				0.008	1	0.93	<1%	56.55%***
Non-obese	23	2.23	[-0.69, 5.16]			0.13		
Obese	17	2.44	[-1.43, 6.31]			0.21		
Interruption frequency				1.27	2	0.29	<1%	50.61***
Every 20 minutes	10	-0.67	[-4.91, 3.57]			0.75		
Every 30 minutes	14	2.97	[-0.67, 6.61]			0.11		
Every 60 minutes	12	3.65	[-0.68, 7.97]			0.1		
Mode				1.1	3	0.36	<1%	54.96**
Walking	8	4.34	[0.66, 8.02]			0.02		
Bodyweight resistance (SRA)	17	2.26	[-0.80, 5.33]			0.14		
Standing	9	-0.35	[-4.58, 3.88]			0.87		
Under-desk pedaling	5	-0.12	[-5.90, 5.65]			0.97		

Note: CI, confidence interval; k represents the number of effect sizes; n represents the sample size; *p < 0.05, **p < 0.01, *** p < 0.001

2.7 Mean Arterial Pressure (MAP)

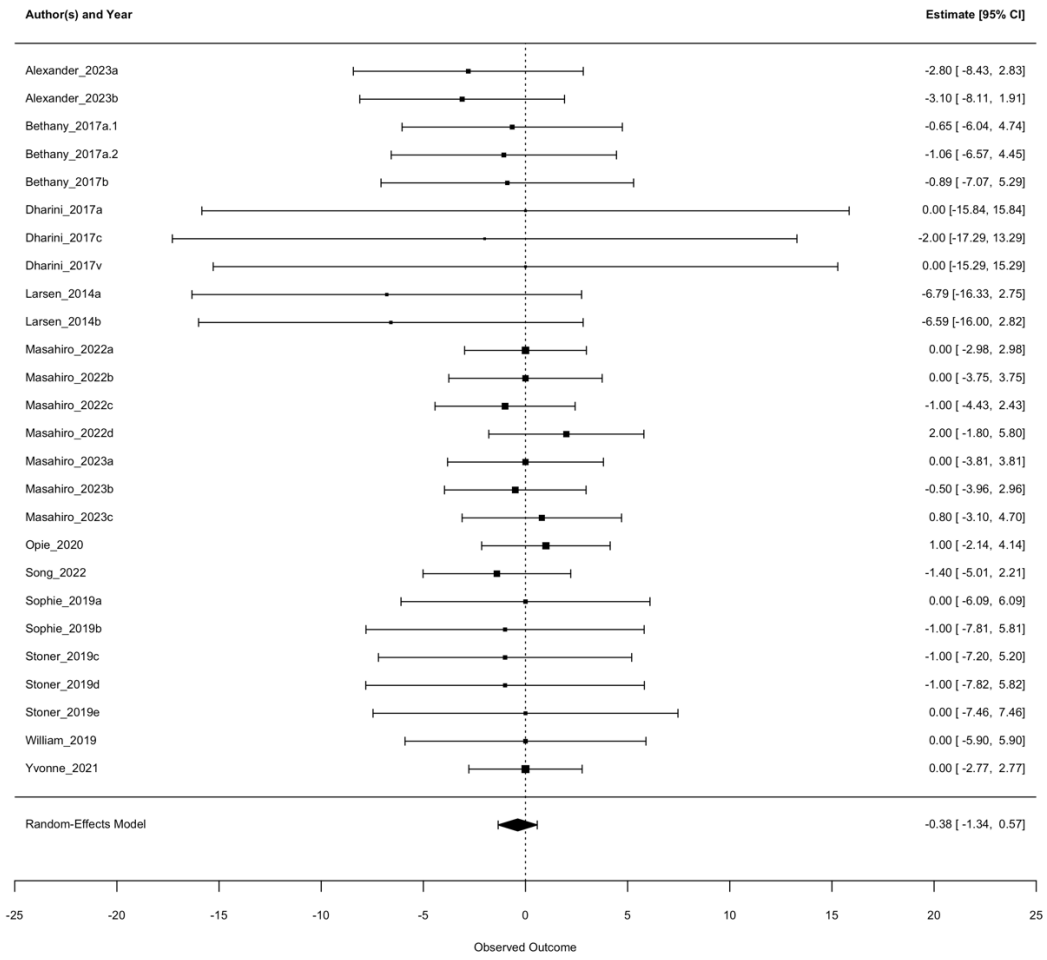

Fig S6. The forest plot of the effect of "Exercise Snacks" on MAP (no outliers).

Note: CI, confidence interval; RE model, random-effects model; the numbering following the references represents the order of the effect sizes within the study

Heterogeneity and Variance Decomposition: Variance decomposition revealed that the total variation was almost entirely attributable to sampling error (Level 1 variance accounted for approximately 100%), while both within-study (Level 2) and between-study (Level 3) variances were negligible. Likelihood ratio tests also did not indicate that adding Level 2 or Level 3 variance components significantly improved model fit (all $P > 0.49$, Figure 4 (main text)), suggesting that MAP effects were generally consistent across studies. Although a two-level model would have been adequate to fit the data in this instance, the three-level framework was retained as the primary reporting model given that some studies reported multiple effect sizes, creating a nested data structure.

Moderator Variables and Meta-Regression: Moderator and meta-regression analyses identified no significant moderating effects of age, BMI, duration per break, total number of breaks, total accumulated break time, or total sitting time under experimental conditions on MAP effects (all $P > 0.05$; Table S5/Figure S11).

Publication Bias: The funnel plot appeared generally symmetrical (Figure S17). Egger's regression test did not reach statistical significance (two-level: $t(24) = -1.35$, $P = 0.19$; multi-level: $t(24) = -0.13$, $P = 0.90$), (Figure S17). Trim-and-fill (R_0) analysis suggested three potentially missing effect sizes on the left side; however, the pooled effect size remained non-significant after imputation (adjusted MD = -0.16 mm Hg, 95% CI [-1.05, 0.72]; $P = 0.73$), showing limited difference from the unadjusted result (MD = -0.38 mm Hg; $P = 0.42$). Collectively, while there may be some risk of publication bias for MAP outcomes, its impact on the overall conclusion appears minimal.

Table. S5 The results of moderators of the effect of "Exercise Snacks" on MAP

Moderator (subgroup)	K	Hedges'g	95%CI	F	df	P	Level2 variance (I2)	Level3 variance (I2)
Age group (years)				1.21	1	0.28	<1%	<1%
Young adults	20	-0.24	[-1.32, 0.84]			0.65		
Middle-aged adults	5	-1.98	[-5.09, 1.12]			0.2		
Weight status				0.29	1	0.6	<1%	<1%
Non-obese	16	-0.24	[-1.34, 0.86]			0.65		
Obese	10	-0.83	[-2.79, 1.14]			0.39		
Interruption frequency				0.17	1	0.67	<1%	<1%
Every 20 minutes	13	-0.2	[-1.53, 1.12]			0.75		
Every 30 minutes	9	-0.6	[-2.1, 0.91]			0.42		
Mode				1.11	2	0.35	<1%	<1%
Walking	8	-0.84	[-3.13, 1.45]			0.46		
Bodyweight resistance (SRA)	12	0.16	[-1.06, 1.38]			0.79		
Standing	5	-1.77	[-4.38, 0.83]			0.17		

Note: CI, confidence interval; k represents the number of effect sizes; n represents the sample size; *p < 0.05, **p < 0.01, *** p < 0.001

2.8 Diastolic Blood Pressure (DBP)

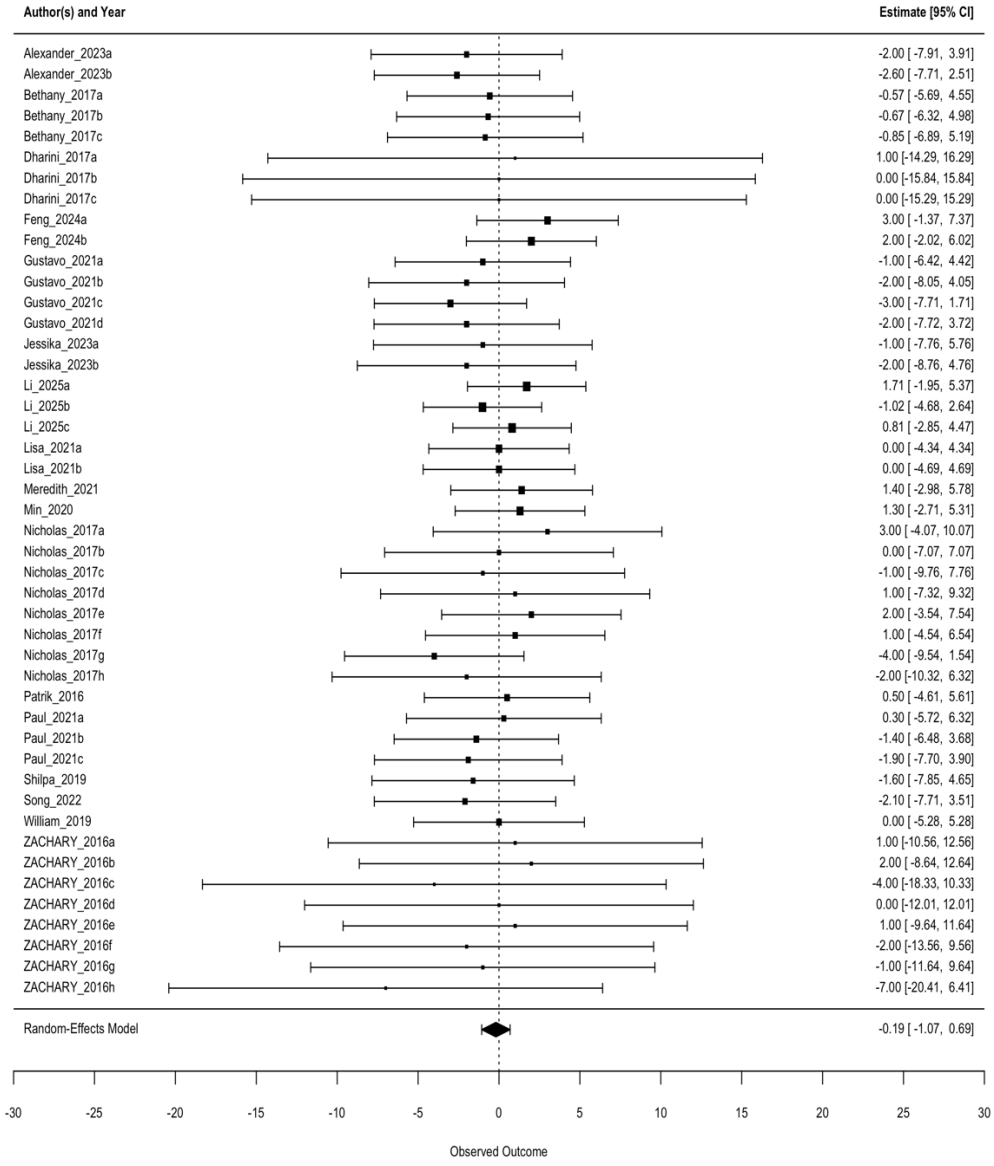

Fig S7. The forest plot of the effect of "Exercise Snacks" on DBP (no outliers).

Note: CI, confidence interval; RE model, random-effects model; the numbering following the references represents the order of the effect sizes within the study

Heterogeneity and Variance Decomposition: After excluding outliers, variance decomposition revealed that the total variation was almost entirely attributable to sampling error (Level 1 variance accounted for approximately 100%), while both within-study and between-study variances approached zero. Likelihood ratio tests also did not indicate that introducing Level 3 variance significantly improved model fit ($P > 0.49$; Figure 4 [main text]), suggesting a high degree of consistency in DBP effects across studies. Although a statistically simpler model would have been adequate to fit the data, the three-level framework was retained as the primary reporting model to account for the nested structure of the effect sizes.

Moderator Variables and Meta-Regression: Moderator and meta-regression analyses identified no significant moderating effects of age, BMI, duration per break, total number of breaks, total accumulated break time, or total sitting time under experimental conditions on DBP effects (all $P > 0.05$; Table S6/ Figure S10).

Publication Bias: The funnel plot indicated a degree of asymmetry (Figure S17). However, Egger's regression test did not detect significant small-study effects (two-level: $t(44) = -1.02$, $P = 0.31$; multi-level: $t(48) = -0.49$, $P = 0.63$; Figure S17). Trim-and-fill(R_0) analysis suggested two potentially missing studies on the left side; however, the pooled effect size remained non-significant after imputation (adjusted MD $\approx$ -0.15 mm Hg, 95% CI [-0.99, 0.70]; P =

0.73). This showed limited difference from the observed value (MD = -0.19 mm Hg; P = 0.66), suggesting that publication bias had a minimal impact on the overall conclusion for this outcome.

Table. S6 The results of moderators of the effect of "Exercise Snacks" on DBP

Moderator (subgroup)	K	Hedges'g	95%CI	F	df	P	Level2 variance (I2)	Level3 variance (I2)
Health status				0.4	1	0.53	<1%	<1%
Health	40	-0.08	[-1.02, 0.87]			0.87		
Clinical population (comorbid)	6	-0.87	[-3.21, 1.47]			0.46		
Age group (years)				0.01	1	0.94	<1%	<1%
Young adults	37	-0.11	[-1.12, -0.9]			0.83		
Middle-aged adults	6	-0.2	[-2.33, 1.93]			0.85		
Weight status				0.07	1	0.79	<1%	<1%
Non-obese	14	-0.34	[-1.75, 1.07]			0.63		
Obese	32	-0.1	[-1.22, 1.02]			0.86		
Interruption frequency				0.53	1	0.47	<1%	<1%
Every 30 minutes	16	-0.97	[-2.35, 0.41]			0.16		
Every 60 minutes	20	-0.18	[-1.91, 1.55]			0.83		
Mode				0.72	1	0.58	<1%	<1%
Walking	13	0.79	[-0.76, 2.33]			0.31		
Bodyweight resistance (SRA)	9	-0.93	[-2.74, 0.87]			0.3		
Standing	12	-0.62	[-2.67, 1.44]			0.55		
Cycling	6	-0.71	[-3.41, 1.99]			0.6		
Under-desk pedaling	5	-0.89	[-3.61, 1.83]			0.51		

Note: CI, confidence interval; k represents the number of effect sizes; n represents the sample size; *p < 0.05, **p < 0.01, *** p < 0.001

2.9 Peripheral Arterial Diameter (PAD)

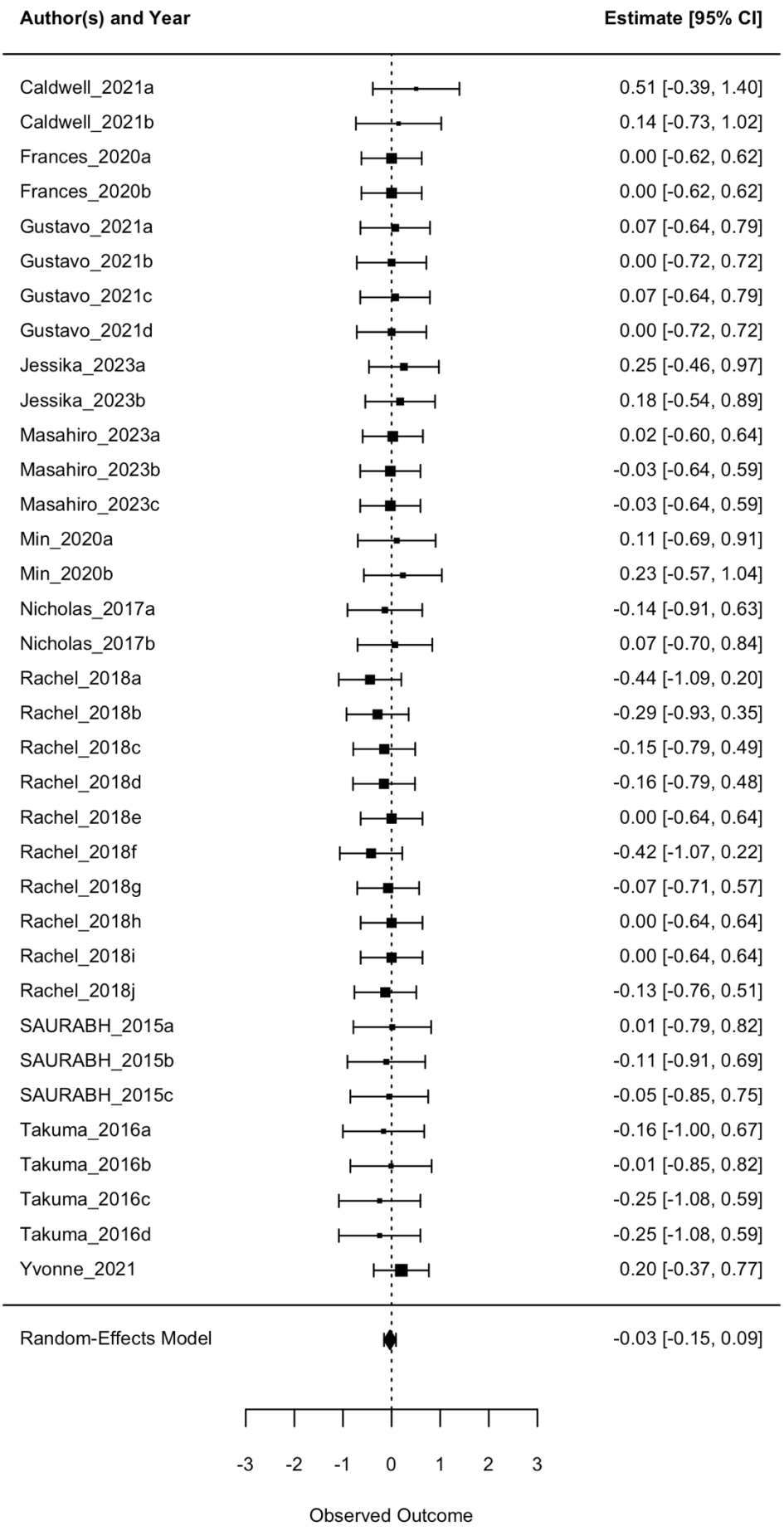

Fig S8. The forest plot of the effect of "Exercise Snacks" on PAD (no outliers).

Note: CI, confidence interval; RE model, random-effects model; the numbering following the references represents the order of the effect sizes within the study

Heterogeneity and Variance Decomposition: Variance decomposition revealed that the total variation was almost entirely attributable to sampling error (Level 1 variance accounted for approximately 100%), while both within-study (Level 2) and between-study (Level 3) variances approached zero. Likelihood ratio tests also did not indicate significant deterioration in model fit when Level 2 or Level 3 random-effects variances were constrained to zero (all $P > 0.49$; Figure 4 [main text]), suggesting minimal additional heterogeneity between or within studies. Although a statistically simpler model would have been adequate to fit the data in this instance, the three-level framework was retained as the primary reporting model to account for the nested structure arising from studies reporting multiple effect sizes. Results remained consistent between the three-level and two-level models.

Moderator Variables and Meta-Regression: Moderator analyses identified no significant differences across subgroups for categorical variables, including sex, age, weight status, interruption modality, and frequency (all $P > 0.05$; Table S7). Similarly, meta-regression detected no significant associations between vascular diameter effects and age, BMI, duration per break, total number of breaks, total accumulated break time, or total sitting time under experimental conditions (Figure S15).

Publication Bias: The funnel plot appeared generally symmetrical (Figure S18). Egger's regression test did not detect significant small-study effects (two-level: $t(33) = 0.58$, $P = 0.57$; multi-level: $t(33) = 0.59$, $P = 0.56$; Figure S18), and trim-and-fill(R_0) analysis indicated no missing effect sizes. Collectively, the risk of publication bias for peripheral vascular diameter outcomes appears low.

Table. S7 The results of moderators of the effect of "Exercise Snacks" on PAD

Moderator (subgroup)	K	Hedges'g	95%CI	F	df	P	Level2 variance (I2)	Level3 variance (I2)
Sex				0.41	1	0.53	<1%	<1%
Male only	5	0.08	[-0.3, 0.47]			0.66		
Mixed sex	30	-0.04	[-0.17, 0.08]			0.48		
Age group (years)				2.16	1	0.15	<1%	<1%
Young adults	22	0.03	[-0.14, 0.20]			0.73		
Middle-aged adults	10	-0.16	[-0.37, 0.05]			0.12		
Weight status				1.21	1	0.28	<1%	<1%
Non-obese	10	0.03	[-0.13, 0.21]			0.69		
Obese	15	-0.1	[-0.27, 0.07]			0.26		
Interruption frequency				0.15	1	0.71	<1%	2.84%
Every 30 minutes	21	-0.02	[-0.19, 0.15]			0.8		
Every 60 minutes	7	0.04	[-0.28, 0.38]			0.77		
Mode				0.48	1	0.49	<1%	<1%
Walking	6	0.05	[-0.26, 0.36]			0.76		
Bodyweight resistance (SRA)	19	-0.07	[-0.23, 0.09]			0.37		

Note: CI, confidence interval; k represents the number of effect sizes; n represents the sample size; *p < 0.05, **p < 0.01, *** p < 0.001

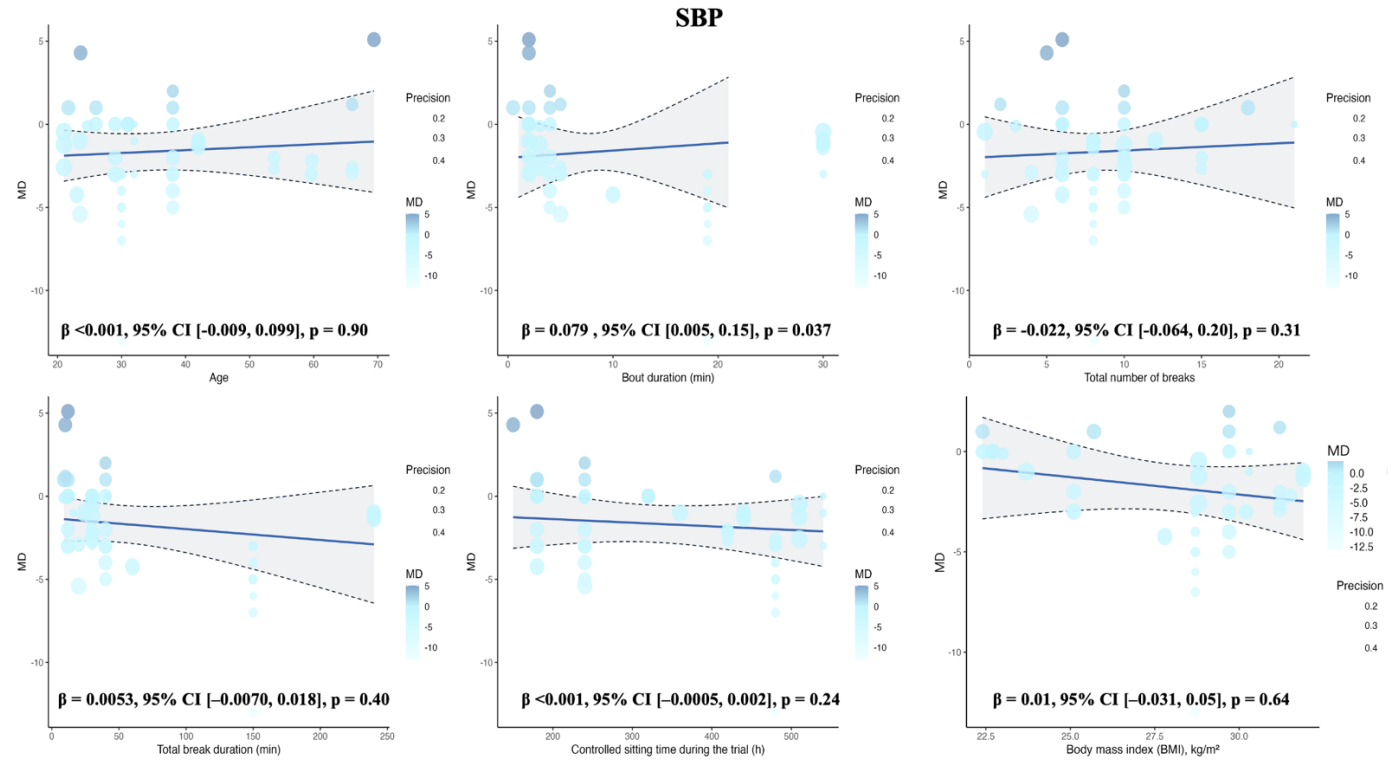

Figure S9. Meta-regression analysis of the effects of "Exercise Snacks" on systolic blood pressure (SBP).

Note: Each bubble represents one study, with bubble size proportional to study precision. The solid blue line shows the fitted regression, and dashed lines represent the 95% confidence or prediction intervals. Panels display relationships between SBP change (mean difference, MD) and potential moderators, including mean age, duration per break, total number of breaks, total accumulated break time, total sitting time under experimental conditions, and mean body mass index (BMI).

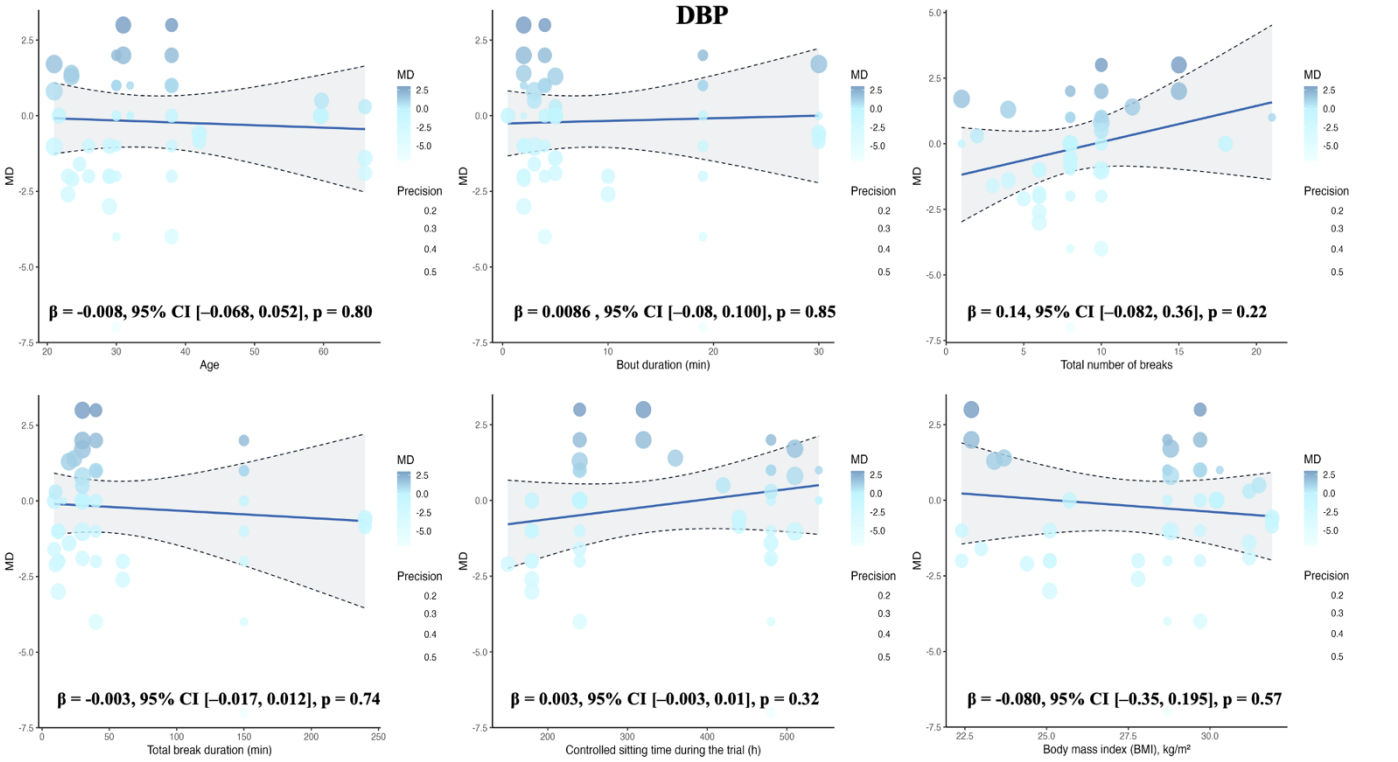

Figure S10. Meta-regression analysis of the effects of "Exercise Snacks" on diastolic blood pressure (DBP).

Note: Each bubble represents one study, with bubble size proportional to study precision. The solid blue line shows the fitted regression, and dashed lines represent the 95% confidence or prediction intervals. Panels display relationships between DBP change (mean difference, MD)

and potential moderators, including mean age, duration per break, total number of breaks, total accumulated break time, total sitting time under experimental conditions, and mean body mass index (BMI).

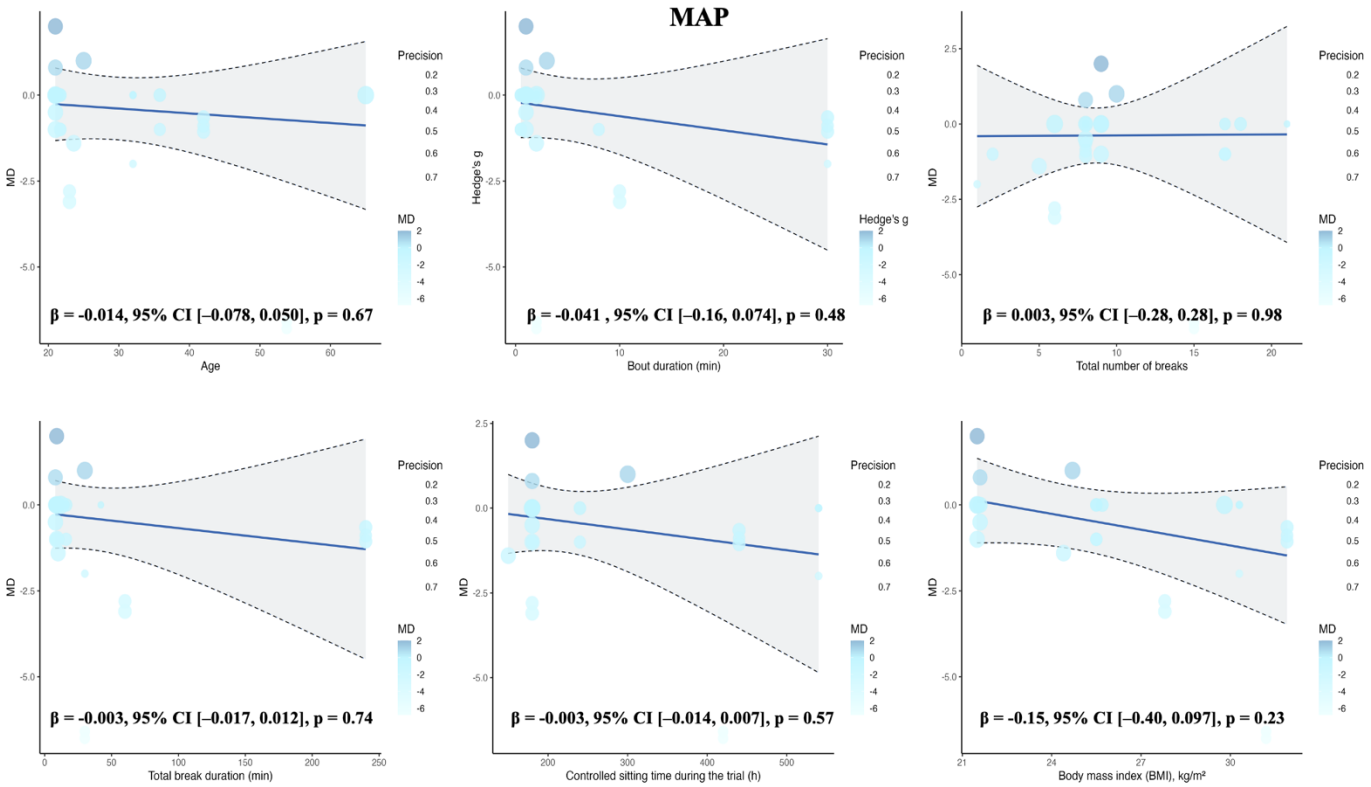

Figure S11. Meta-regression analysis of the effects of "Exercise Snacks" on mean arterial pressure (MAP).

Note: Each bubble represents one study, with bubble size proportional to study precision. The solid blue line shows the fitted regression, and dashed lines represent the 95% confidence or prediction intervals. Panels display relationships between MBP change (mean difference, MD) and potential moderators, including mean age, duration per break, total number of breaks, total accumulated break time, total sitting time under experimental conditions, and mean body mass index (BMI).

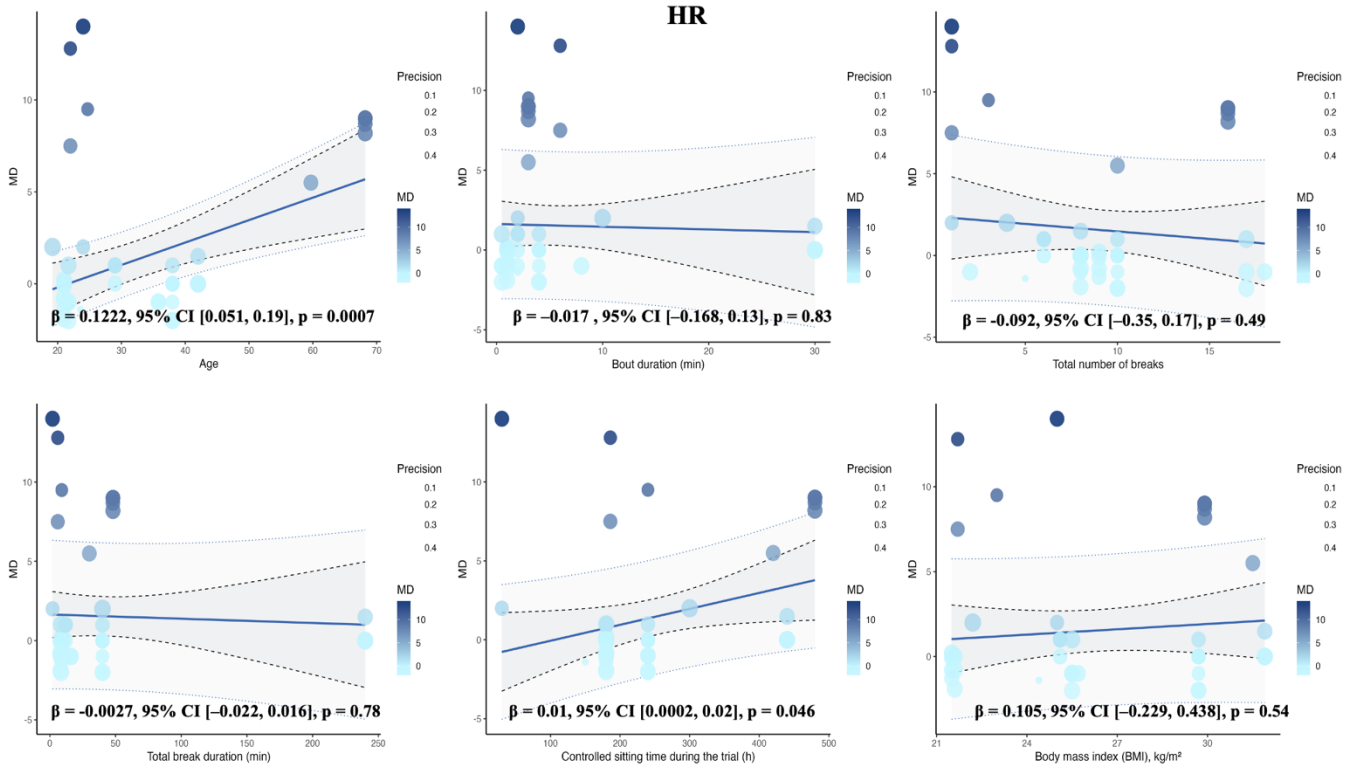

Figure S12. Meta-regression analysis of the effects of "Exercise Snacks" on heart rate (HR).

Note: Each bubble represents one study, with bubble size proportional to study precision. The solid blue line shows the fitted regression, and dashed lines represent the 95% confidence or prediction intervals. Panels display relationships between HR change (mean difference, MD)

and potential moderators, including mean age, duration per break, total number of breaks, total accumulated break time, total sitting time under experimental conditions, and mean body mass index (BMI).

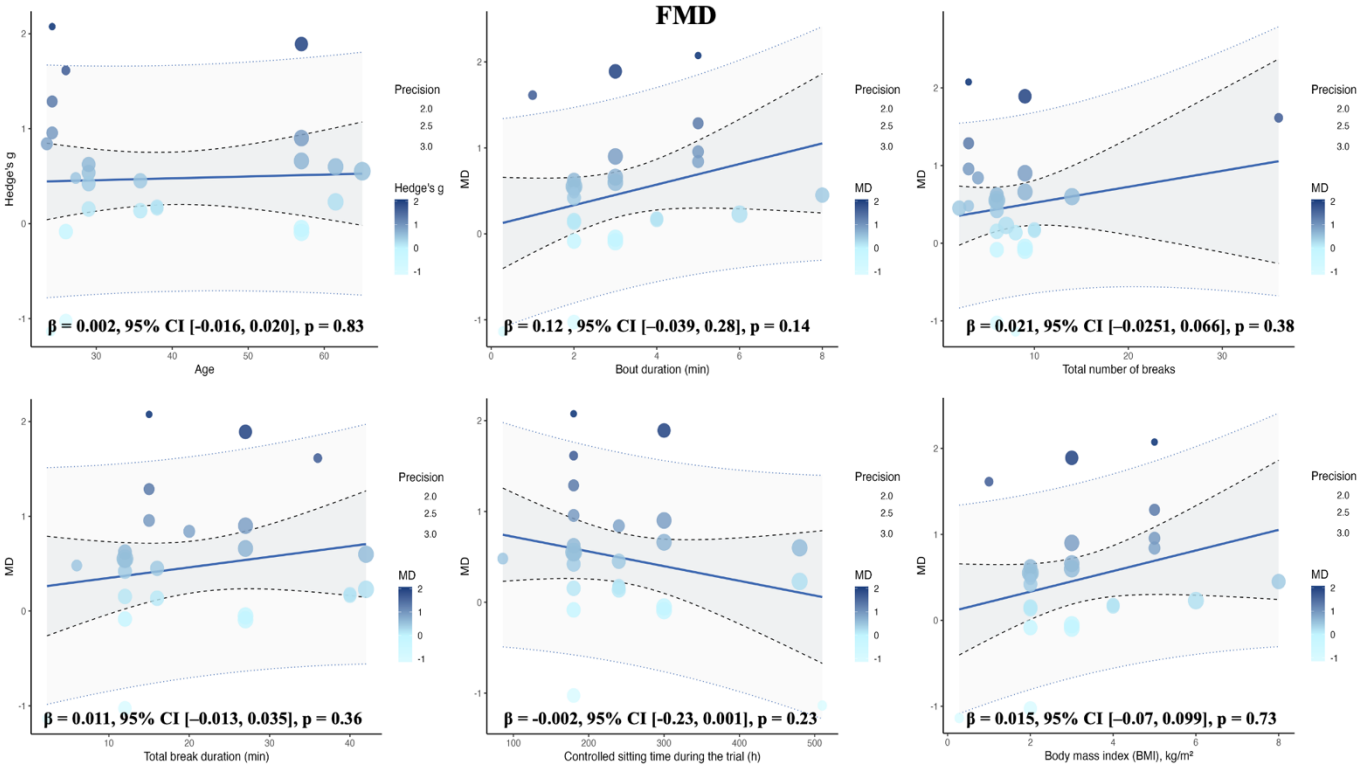

Figure S13. Meta-regression analysis of the effects of "Exercise Snacks" on Flow-Mediated Dilation (FMD).

Note: Each bubble represents one study, with bubble size proportional to study precision. The solid blue line shows the fitted regression, and dashed lines represent the 95% confidence or prediction intervals. Panels display relationships between FMD change (Hedge's g) and potential moderators, including a mean age, duration per break, total number of breaks, total accumulated break time, total sitting time under experimental conditions, and mean body mass index (BMI).

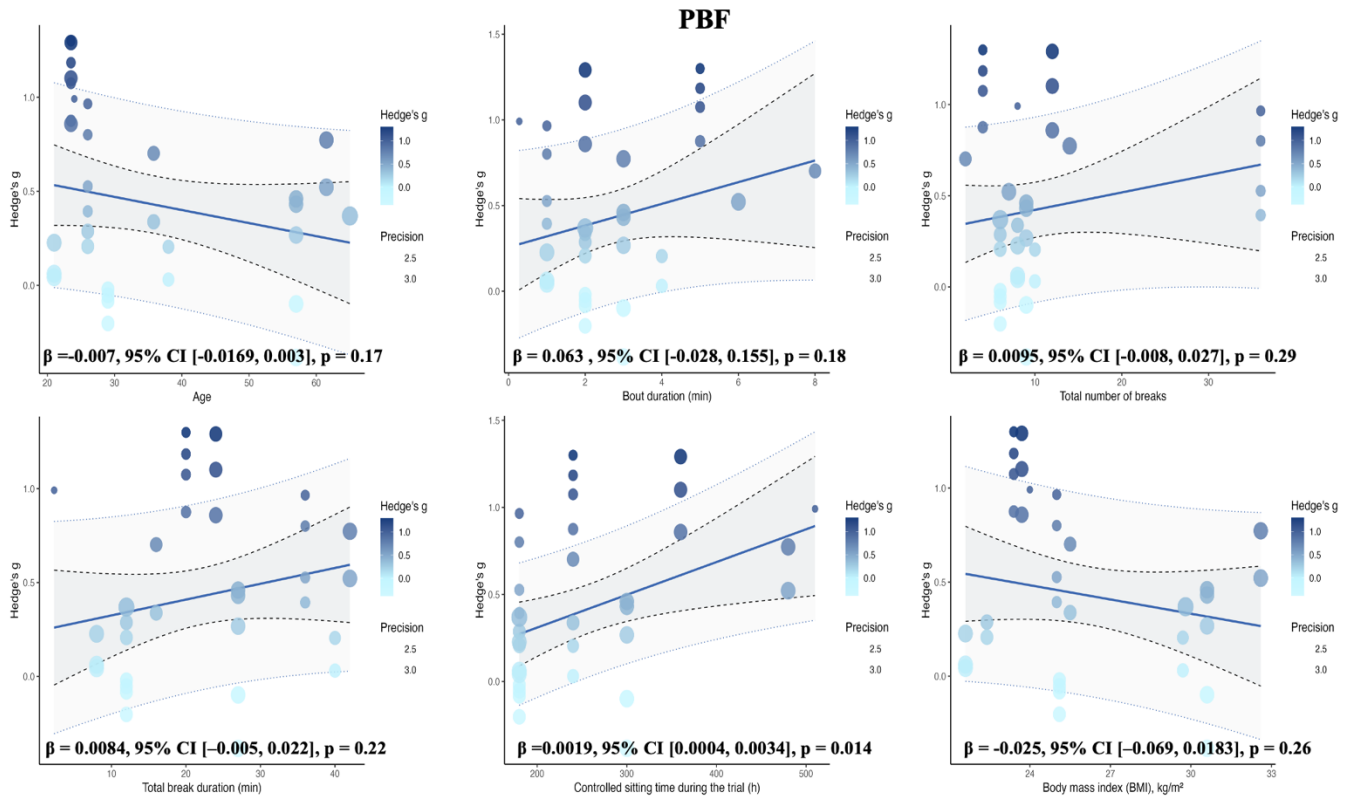

Figure S14. Meta-regression analysis of the effects of "Exercise Snacks" on Peripheral Blood Flow (PBF).

Note: Each bubble represents one study, with bubble size proportional to study precision. The solid blue line shows the fitted regression, and dashed lines represent the 95% confidence or prediction intervals. Panels display relationships between PBF change (Hedge's g) and

potential moderators, including mean age, duration per break, total number of breaks, total accumulated break time, total sitting time under experimental conditions, and mean body mass index (BMI).

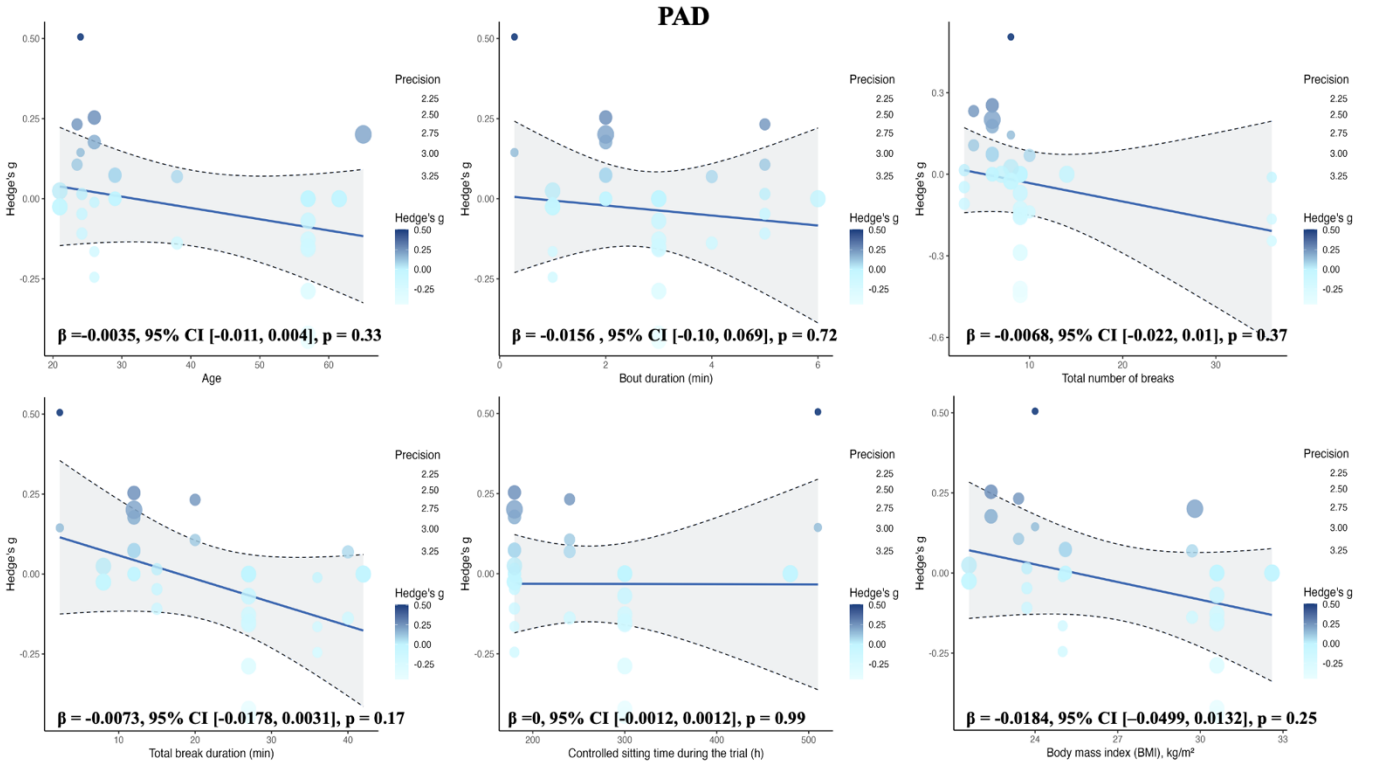

Figure S15. Meta-regression analysis of the effects of "Exercise Snacks" on Peripheral Arterial Diameter (PAD).

Note: Each bubble represents one study, with bubble size proportional to study precision. The solid blue line shows the fitted regression, and dashed lines represent the 95% confidence or prediction intervals. Panels display relationships between PAD change (Hedge's g) and potential moderators, including mean age, duration per break, total number of breaks, total accumulated break time, total sitting time under experimental conditions, and mean body mass index (BMI).

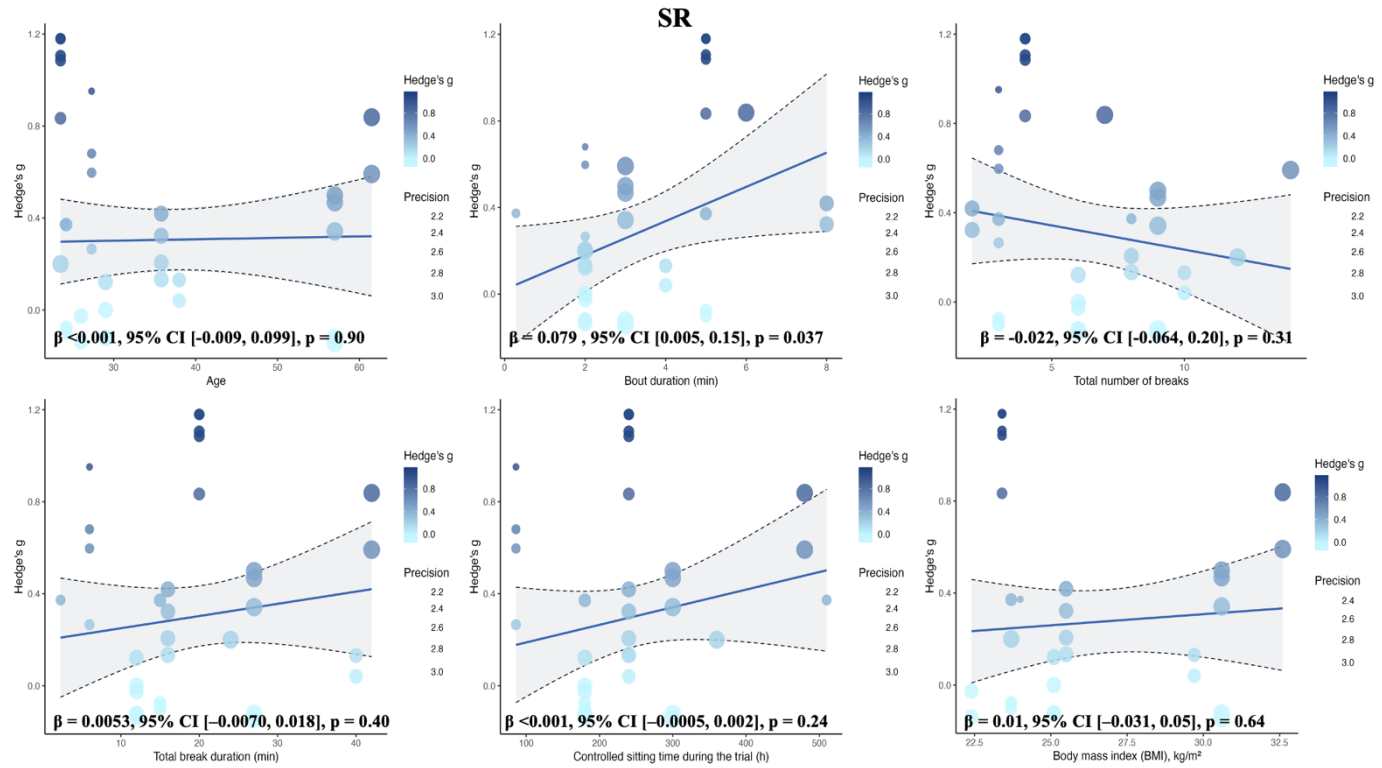

Figure S16. Meta-regression analysis of the effects of "Exercise Snacks" on Shear Rate (SR).

Note: Each bubble represents one study, with bubble size proportional to study precision. The solid blue line shows the fitted regression, and dashed lines represent the 95% confidence or prediction intervals. Panels display relationships between SR change (Hedge's g) and potential

moderators, including mean age, duration per break, total number of breaks, total accumulated break time, total sitting time under experimental conditions, and mean body mass index (BMI).

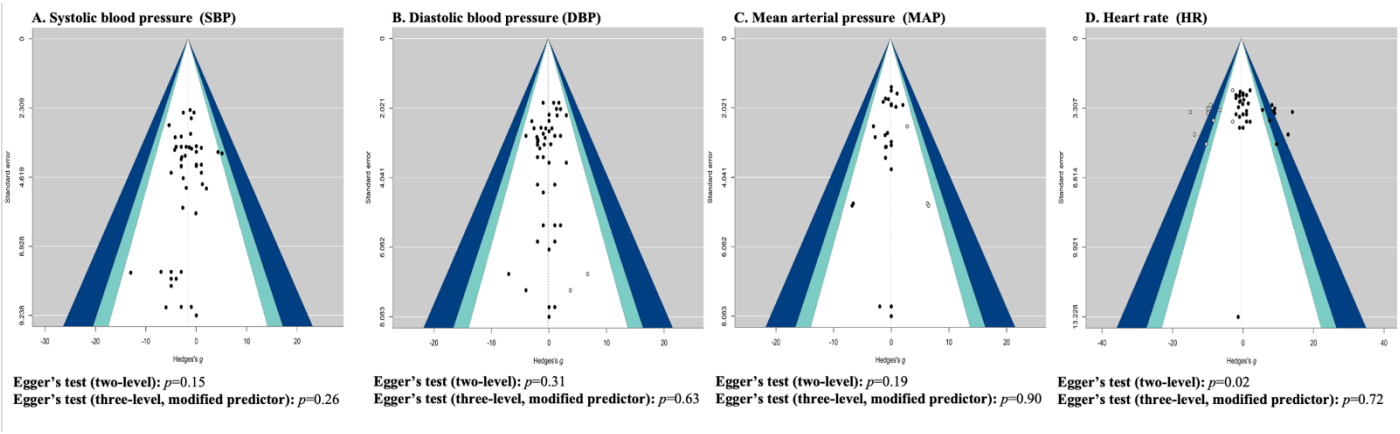

Figure S17. Funnel plots of included studies for SBP, DBP, MAP, and HR.

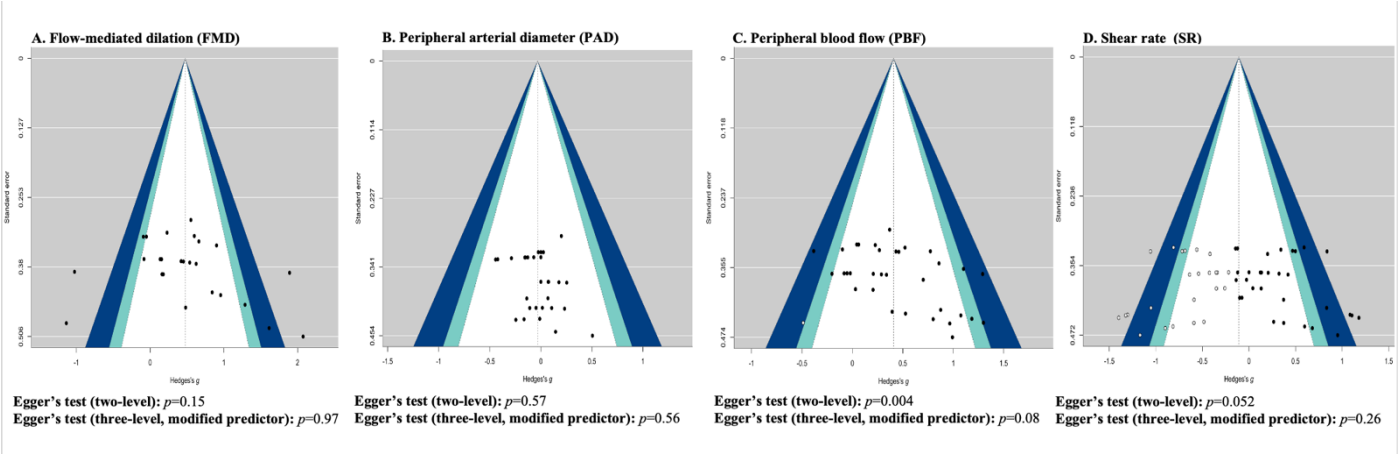

Figure S18. Funnel plots of included studies for FMD, PAD, PBF, and SR

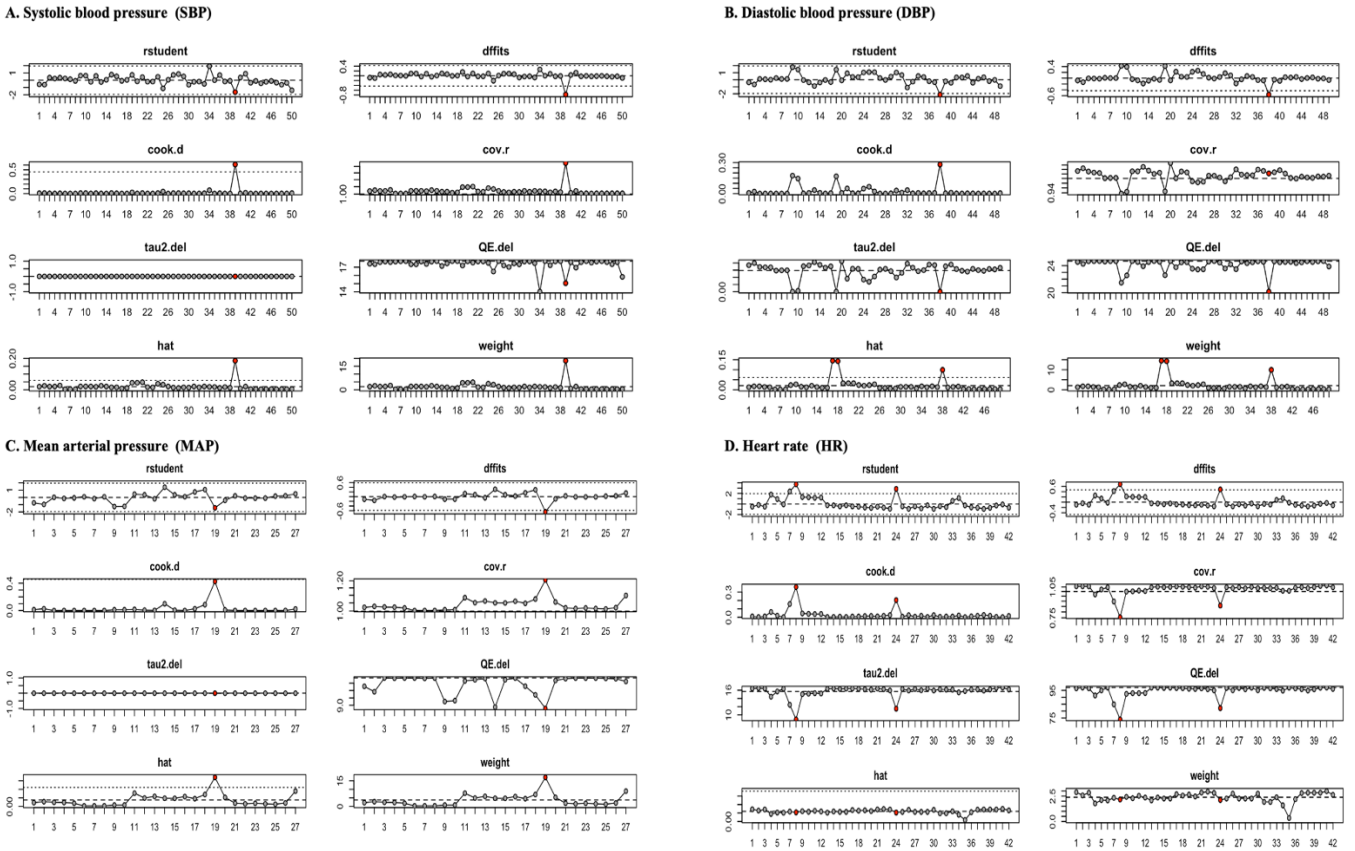

Figure S19. Results of the influence analysis for SBP, DBP, MAP, and HR, with influential cases in red

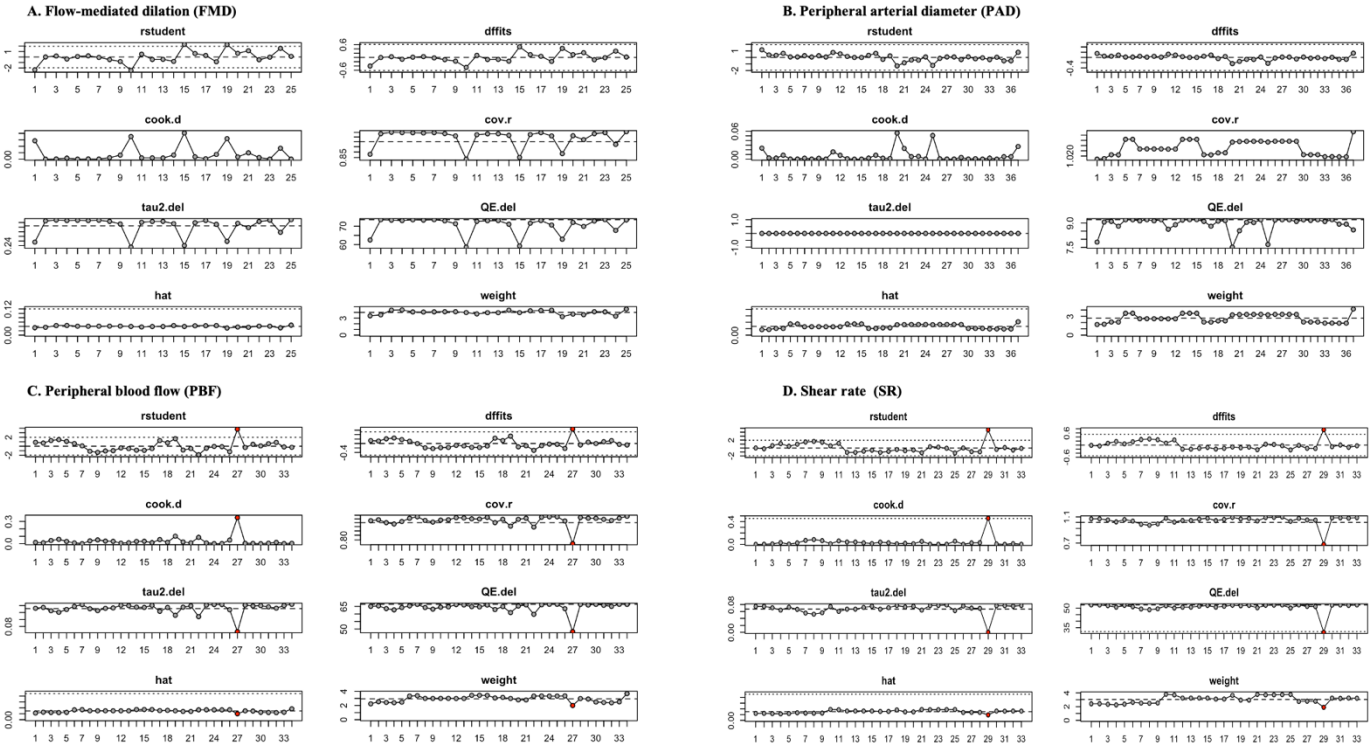

Figure S20. Results of the influence analysis for FMD, PAD, PBF, and SR, with influential cases in red

Table S8. Summary table of risk-of-bias assessments for included studies, generated using the RoB 2 tool (McGuinness & Higgins, 2021)

Study ID	D1	D2	D3	D4	D5	overall
Qingyang_2025	Some concerns	Low	Low	Low	Some concerns	Some concerns
Masahiro_2022	Some concerns	Some concerns	Low	Low	Some concerns	Some concerns
Nicholas_2017	Some concerns	Some concerns	Low	Low	Some concerns	Some concerns
Shilpa_2019	High	High	Some concerns	Low	Low	High
Frances_2020	Some concerns	Some concerns	Low	Low	Low	Some concerns
William_2019	Low	Low	Low	Low	Some concerns	Low
S.e._2015	High	High	Low	Low	Some concerns	High
Alexander_2023	Some concerns	Some concerns	Low	Low	Some concerns	Some concerns
Jessika_2023	Low	Some concerns	Low	Low	Some concerns	Some concerns
Gustavo_2021	Some concerns	Some concerns	Low	Some concerns	Low	Some concerns
Billy_2018	Some concerns	Some concerns	Low	Some concerns	Low	Some concerns
Sophie_2019	Some concerns	Some concerns	Low	Low	Some concerns	Some concerns
Paolo_2025	Some concerns	Some concerns	Low	Some concerns	Low	Some concerns
Lee_2019	Low	Some concerns	Low	Low	Low	Some concerns
Zachary_2016	Low	Some concerns	Low	Low	Low	Some concerns
Paul_2021	High	Some concerns	Some concerns	Low	Low	High
R.N._2014	Low	Some concerns	Low	Some concerns	Low	Some concerns
Bethany_2017	Low	Some concerns	Low	Some concerns	Low	Some concerns
Min_2020	Some concerns	Some concerns	Low	Low	Low	Some concerns
Dharini_2017	Some concerns	Some concerns	Some concerns	Low	Low	Some concerns
Rachel_2018	Low	Some concerns	Low	Low	Low	Some concerns
Masahiro_2023	Some concerns	Some concerns	Low	Low	Low	Some concerns
Lisa_2021	Some concerns	Some concerns	Low	Low	Low	Some concerns
Meredith_2021	Low	Some concerns	Low	Low	Low	Some concerns
Patrik_2016	Low	Some concerns	Low	Low	Low	Some concerns
Yvonne_2021	Some concerns	Some concerns	Low	Low	Low	Some concerns
Opie_2020	Some concerns	Some concerns	Low	Low	Low	Some concerns
Rachael_2018	Some concerns	Some concerns	Low	Low	Low	Some concerns
Saurabh_2015	Some concerns	Some concerns	Low	Low	Low	Some concerns
Hannah_2021	Some concerns	Some concerns	Low	Low	Low	Some concerns
Takuma_2016	Low	Low	Low	Low	Low	Low
Sophie_2017	Low	Low	Low	Low	Low	Low
Song-Young_2016	Low	Low	Low	Low	Low	Low
Feng_2024	Low	Some concerns	High	Low	Low	Some concerns
Coralie_2018	Low	Some concerns	High	Low	Low	Some concerns
Teatske_2019	Low	Some concerns	High	Low	Low	Some concerns

Note:

Domains

D1 Randomisation process

D2 Deviations from the intended interventions

D3 Missing outcome data

D4 Measurement of the outcome

D5 Selection of the reported result.

"Study ID" refers to the identifier used in the standardized data-extraction worksheet for study tracking and consistency across analyses. These identifiers were retained from the extraction dataset and do not represent formal citation labels;

Table S9 Certainty of evidence

Outcome measures	Total participants	Quality assessment					Hedges' g (95% CI)	GRADE*
		Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations		
Systolic blood pressure (SBP)	1617 (20 RCTs)	serious	no serious	no serious	no serious	no serious	-1.67 (-2.81, -0.52)	⊕⊕⊕O **Moderate**
Diastolic blood pressure (DBP)	1553 (19 RCTs)	serious	no serious	no serious	no serious	no serious	-0.19 (-1.07, 0.69)	⊕⊕⊕O **Moderate**
Mean arterial pressure (MAP)	970 (13 RCTs)	serious	no serious	no serious	no serious	no serious	-0.38 (-1.34, 0.58)	⊕⊕⊕O **Moderate**
Heart rate (HR)	1460 (16 RCTs)	serious	serious	no serious	serious	reporting bias	2.28 (0.04, 4.51)	⊕OOO **Very low**
Flow-mediated dilation (FMD)	768 (12 RCTs)	no serious	serious	no serious	no serious	no serious	0.44 (0.06, 0.81)	⊕⊕⊕O **Moderate**
Peripheral arterial diameter (PAD)	1108 (11 RCTs)	serious	no serious	no serious	no serious	no serious	-0.03 (-0.15, 0.09)	⊕⊕⊕O **Moderate**
Peripheral blood flow (PBF)	1070 (13 RCTs)	no serious	serious	no serious	no serious	no serious	0.46 (0.22, 0.71)	⊕⊕⊕O **Moderate**
Shear rate (SR)	950 (12 RCTs)	serious	serious	no serious	serious	no serious	0.32 (0.09, 0.54)	⊕OOO **Very low**

*According to the GRADE (Grading of Recommendations Assessment, Development and Evaluation) evidence criteria:

High certainty: We are very confident in the estimated effect.

Moderate certainty: We have moderate confidence in the estimated effect.

Low certainty: Our confidence in the estimated effect is limited.

Very low certainty: We have very little confidence in the estimated effect.

RCTs: randomized controlled trials.

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