

# INPLASY

## The Effects of Yoga Practice on Cardiometabolic Health in Overweight and Obese Adults without Comorbidity: A Protocol for a Systematic Review and Meta-Analysis of Randomized Controlled Trials

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### ADMINISTRATIVE INFORMATION

**Support** - None.

**Review Stage at time of this submission** - Piloting of the study selection process.

**Conflicts of interest** - None declared.

**INPLASY registration number:** INPLASY2023100068

**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 20 October 2023 and was last updated on 20 October 2023.

### INTRODUCTION

**Review question / Objective** What are the effects of yoga practices on cardiometabolic risk factors, including blood pressure, blood lipid markers, blood glucose, inflammation, or oxidative stress among overweight or obese adults without comorbidity?

**Condition being studied** Obesity is a major global health concern, causing 5.02 million annual deaths, primarily due to cardiometabolic diseases associated with high body mass index (BMI). The prevalence of high BMI is projected to increase by 40% within a decade, highlighting the need for more effective prevention and treatment strategies. Regular physical activity has been recognized as a crucial component in addressing the obesity epidemic. Various forms of physical activity and

structured exercise have been found effective in managing obesity, although its adoption among overweight/obese adults remains lower. Body dissatisfaction and pain due to health impairments are common barriers to physical activity, while weight management and improved physical fitness are motivating factors. Low-intensity physical activity, such as yoga, could be a preferred option for overweight or obese individuals, as it can enhance physical fitness and reduce body fat. Furthermore, yoga offers potential cardiometabolic benefits, such as improved blood pressure, lipid profile, glucose regulation, and inflammation, making it a valuable option for addressing obesity-related health issues. However, existing studies on yoga's effects have not sufficiently considered high BMI as a moderating factor, warranting a systematic review and meta-analysis to assess the impact of yoga on cardiometabolic health parameters in adults with overweight/obesity.

## METHODS

### Search strategy Medline (OVID)

1. Yoga.sh.
2. yogic.tw.
3. yoga.tw.
4. asana.tw.
5. pranayam\*.tw.
6. dhyan\*.tw.
7. shavasan\*.tw.
8. meditation.tw.
9. mantra.tw.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. blood pressure.xm.
12. prehypertension.sh.
13. arterial pressure/
14. systol\*.tw.
15. diastol\*.tw.
16. bp response.tw.
17. bp change.tw.
18. bp increase.tw.
19. bp decrease.tw.
20. bp reduction.tw.
21. bp monitor\*.tw.
22. bp measurement\*.tw.
23. bp improv\*.tw.
24. hypertension.xm.
25. hypertensi\*.tw.
26. prehypertensi\*.tw.
27. 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26
28. ((plasma or blood) and glucose).mp. or blood glucose/ or (FBG or PPG or PBG or PPBG or glycaem\* or glycat\*).mp.
29. glucose metabolism disorders.xm.
30. hba1c.tw.
31. 28 or 29 or 30
32. lipoproteins.xm.
33. cholesterol.xm.
34. triglycerides.sh.
35. Lipid Metabolism Disorders.xm.
36. HDL.tw.
37. LDL.tw.
38. TG.tw.
39. VLDL.tw.
40. triacylglycer\*.tw.
41. TC.tw.
42. cholesterol\*.tw.
43. lipid\*.tw.
44. lipoprotein\*.tw.
45. Triglycerid\*.tw.
46. hypertriglyceridemia\*.tw.
47. Hypercholesterolemia\*.tw.
48. Hyperlipidemia\*.tw.
49. low-density lipoprotein\*.tw.
50. high-density lipoprotein\*.tw.
51. very-low-density lipoprotein\*.tw.
52. low density lipoprotein\*.tw.
53. high density lipoprotein\*.tw.
54. very-low-density lipoprotein\*.tw.
55. TAG.tw.
56. 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55
57. exp Inflammation/
58. c-reactive protein.mp. or exp C-Reactive Protein/
59. tumor necrosis factor.mp. or exp Tumor Necrosis Factor-alpha/
60. exp Interleukin-6/
61. interleukin.mp. or exp Interleukins/
62. IL-6.mp.
63. IL-1.mp. or exp Interleukin-1/
64. IL-10.mp. or exp Interleukin-10/
65. N-terminal pro-brain natriuretic peptide.mp.
66. NT-ProBNP.mp.
67. exp Leptin/ or leptin.mp.
68. resistin.mp. or Resistin/
69. omentin.mp. or exp Adipokines/
70. Thiobarbituric acid-reactive substances.mp. or exp Thiobarbituric Acid Reactive Substances/
71. malondialdehyde.mp. or exp Malondialdehyde/
72. MDA.mp.
73. F2-isoprostanes.mp. or exp F2-Isoprostanes/
74. F2-isoPs.mp.
75. oxidative stress.mp. or exp Oxidative Stress/
76. Lipid peroxidation.mp. or exp Lipid Peroxidation/
77. LIPOX.mp.
78. antioxidant.mp. or exp Antioxidants/
79. 3-Nitrotyrosine.mp.
80. 3-NT.mp.
81. Hydrogen peroxide.mp. or exp Hydrogen Peroxide/
82. exp Sulfhydryl Compounds/ or Sulfhydryl.mp.
83. Myeloperoxidase.mp. or exp Peroxidase/
84. MPO.mp. or exp Peroxidases/
85. POVPC.mp.
86. PGPC.mp.
87. Superoxide dismutase.mp. or exp Superoxide Dismutase/ or SOD.mp.
88. total antioxidant capacity.mp.
89. TAC.mp.
90. trolox equivalent antioxidant capacity.mp.
91. TEAC.mp.
92. Glutathione peroxidase.mp. or exp Glutathione Peroxidase/
93. Glutathione/ or Glutathione.mp.
94. Catalase.mp. or exp Catalase/
95. ascorbic acid.mp. or exp Ascorbic Acid/
96. Nitric oxide.mp. or exp Nitric Oxide/
97. Adenosine deaminase.mp. or exp Adenosine Deaminase/
98. 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 75 or 76 or 77 or 78 or 79 or 80 or 81 or

82 or 83 or 84 or 85 or 86 or 88 or 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96 or 97  
99. 27 or 31 or 56 or 98  
100. 10 and 99.

**Participant or population** We included both overweight and obese adult subjects (BMI Asian  $\geq 23$ , non Asian  $\geq 25$ ). Pregnant women or adults with chronic disease problems such as type 2 diabetes mellitus, chronic kidney disease, cancer, coronary artery disease, hypothyroidism, and chronic heart failure were excluded from our study.

**Intervention** The intervention examined in this study is yoga as a combination therapy for posture, breathing, and meditation, or posture and breathing as well as posture and meditation.

**Comparator** We will include a study if yoga was compared to inactive control or waiting-list control, or yoga was compared to other types of exercise. However, a study compared supplementation on yoga to yoga alone will be excluded. Yoga compared to inactive control or waiting-list control. Yoga compared to other type of exercise. Supplementation on yoga compared to yoga will be excluded.

**Study designs to be included** Randomised controlled trial.

**Eligibility criteria** There is no additional inclusion or exclusion criteria.

**Information sources** Six major databases (Medline/PubMed, Scopus, Embase, Web of Science, Cochrane Library, Sportdiscuss, and PsycInfo) and two clinical trial databases (WHO-IT CRP and clinicaltrials.gov).

**Main outcome(s)** We will consider studies that examine the following outcomes as continuous variables: blood pressure parameters (systolic, diastolic, and mean arterial pressure), lipid profile indicators (HDL, LDL, VLDL cholesterol, total cholesterol, triglycerides), glucose homeostasis markers (random blood glucose, post-prandial blood glucose, fasting blood glucose, HbA1c, HOMA-IR), inflammation indicators (CRP, hs-CRP, TNF- $\alpha$ , IL-1, IL-6, IL-10, NT-ProBNP, leptin, resistin, omentin), and pro- & anti-oxidant measures (e.g., MDA, lipid peroxidation, catalase, glutathione).

**Additional outcome(s)** None.

**Data management** There are two reviewers who will individually screen titles and abstracts. Reviewers will independently rate studies based on

inclusion and exclusion criterias as Yes for eligible studies, No for ineligible studies, and Maybe for unclear eligibility. If there are more than 5000 studies to be selected, the captured studies will be divided into two groups based on their first author alphabet. Each group will be screened by two independent reviewers. Any discrepancies will be resolved by a discussion facilitated by the third reviewers. Then, full-text of the studies will be screened for eligibility to be included in the review when categorized as Yes and Maybe. The third reviewer who is not involved in the screening will resolve the discrepancies. Reasons for exclusion in either first or second stage screening will be recorded. Two reviewers will independently conduct the data extraction using a predefined extraction form with the following fields : author/year, database, age range, mean age, gender proportion, sampling strategy, inclusion criteria, exclusion criteria, participants' previous physical activity habits, source of participant accrual, overall sample size and numbers in intervention and control groups, detail of the yoga (description, frequency, intensity, session duration, type of yoga, and duration of intervention), detail of the additional exercise intervention (description, frequency, intensity, session duration, and duration of intervention), detail of the comparison (description, frequency, intensity, session duration, and duration of intervention), if outcome assessment was blinded, outcomes assessed, participant attrition, adverse effects, statistical analysis, conclusions, funding sources, and indicators of study quality.

**Quality assessment / Risk of bias analysis** Two reviewers will independently evaluate the risk of bias of each individual study in the following domain: selection bias, performance bias, detection bias, attrition bias, reporting bias, and other bias; using the version 2 of the Cochrane risk of bias tool. Risk of bias table and graph will be reported.

**Strategy of data synthesis** All of the results were organized into summaries and synthesized qualitatively using an evidence table to describe significant interaction effects favoring the yoga group and the statistical significance for each outcome measure to indicate the effectiveness of yoga. The narrative summary presents the follow-up protocols, outcome measurements, and settings. Summary tables included study design, study characteristics including intervention, follow-up, study limitations, and the overall assessments of the body of literature. Results were organized by selection outcome (blood pressure, lipid profile, blood glucose, inflammation, or oxidative stress),

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which included relevant interventions and outcome change for each group of studies. However, all studies we synthesized from included studies are only published data, which may lead to an inherent problem of publication bias.

**Subgroup analysis** We will conduct subgroup analyses based on the presence of prehypertension or prediabetes as well as the kind of yoga.

**Sensitivity analysis** We will also conduct a sensitivity analysis by excluding studies with high risk of biases.

**Language restriction** English.

**Country(ies) involved** Indonesia, Greece, Malaysia, India.

**Keywords** physical activity, exercise, mind-body fitness, cardiovascular risk factors, metabolic health.

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