

# INPLASY

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## A Systematic Review and Meta-Analysis of High-Intensity Interval Training on Peak Power Output and Peak Oxygen Uptake in Patients with Chronic Obstructive Pulmonary Disease: Subgroup and Meta-Regression Exploration of Randomized Control Trials

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## ADMINISTRATIVE INFORMATION

**Support** - Data analysis.

**Review Stage at time of this submission** - Data analysis.

**Conflicts of interest** - None declared.

**INPLASY registration number:** INPLASY202640032

**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 9 April 2026 and was last updated on 9 April 2026.

## INTRODUCTION

**Review question / Objective** To analyze the effects of high-intensity interval training on cardiopulmonary exercise testing outcomes in individuals with chronic obstructive pulmonary disease, and to examine whether training-related factors and participant characteristics are associated with the observed effects.

**Rationale** Chronic obstructive pulmonary disease is characterized by persistent airflow limitation and remains a major global health burden, with a prevalence ranging from 6.8% to 11.7%. High-intensity interval training, involving repeated high-intensity exercise interspersed with recovery periods, has been shown to improve exercise tolerance and reduce dyspnea in individuals with chronic obstructive pulmonary disease. However, findings across studies remain inconsistent, likely due to variations in training protocols (e.g., recovery type) and participant characteristics. Therefore, this systematic review and meta-analysis aimed to evaluate the effects of high-

intensity interval training on cardiopulmonary exercise testing outcomes and to examine the influence of training-related factors and participant characteristics using subgroup and meta-regression analyses.

**Condition being studied** Eligibility criteria were defined based on participants, interventions, comparators, and outcomes. Studies including individuals with chronic obstructive pulmonary disease were eligible. The intervention consisted of repeated bouts of high-intensity exercise interspersed with either passive rest or low- to moderate-intensity activity, typically performed on a treadmill or cycle ergometer. Control groups did not receive such training. Outcomes included changes in aerobic capacity and peak power output assessed by cardiopulmonary exercise testing.

## METHODS

**Search strategy** Key search terms included variations of interval training ("aerobic interval

training,” “high-intensity interval training,” “high-Intensity intermittent training”) combined with terms related to chronic obstructive pulmonary disease ( “chronic obstructive pulmonary disease” and “chronic obstructive lung disease”). Searches covered all records from database inception through April 2026.

**Participant or population** Chronic obstructive pulmonary disease.

**Intervention** High-intensity interval training.

**Comparator** Continuous training, usual care, or inactive control.

**Study designs to be included** Randomized controlled trials.

**Eligibility criteria** Studies were eligible if they were randomized controlled trials involving adults with chronic obstructive pulmonary disease, included high-intensity interval training as a standalone or combined intervention, and had at least one comparator group not receiving such training.

**Information sources** Two reviewers (L.-H.L. and K.-W.K.) conducted screenings across multiple databases, including PubMed, Medline-Ovid, Scopus and Web of science. The search employed the following keywords: (“aerobic interval training,” “high-intensity interval training,” “high-Intensity intermittent training”) AND (“chronic obstructive pulmonary disease” and “chronic obstructive lung disease”).

**Main outcome(s)** Cardiopulmonary exercise testing outcomes (peak oxygen uptake and peak power output).

**Data management** Data extraction was performed independently by two reviewers, capturing information on participant characteristics, study design, intervention and comparator protocols, and outcome measures. Special attention was given to confirming the direction of outcome scales in each study to ensure accurate interpretation of effect estimates.

**Quality assessment / Risk of bias analysis** The methodological quality of the included randomized controlled trials was evaluated using the Risk of Bias 2 tool, which assesses potential bias across domains including the randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting.

**Strategy of data synthesis** Given the variability in intervention protocols across studies, data were synthesized using a random-effects model in Comprehensive Meta-Analysis software (version 4; Biostat, Englewood, NJ, USA). Analyses were primarily based on pre–post change scores. Statistical significance was set at a two-sided  $p$  value  $< 0.05$ . Effect sizes were calculated as standardized mean differences using Hedges’  $g$  and interpreted as small (0.2), moderate (0.5), or large (0.8). Between-study heterogeneity was assessed using Cochran’s  $Q$  test and the  $I^2$  statistic, with  $I^2$  values of approximately 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively.

**Subgroup analysis** Subgroup analyses were performed based on recovery type (active vs. passive) and type of control condition.

**Sensitivity analysis** The stability of the pooled estimates was assessed using leave-one-out sensitivity analyses, whereby each study was removed in turn to determine its impact on the overall results.

**Language restriction** No language limit.

**Country(ies) involved** Taiwan (R.O.C).

**Keywords** High-Intensity Interval Training, Chronic Obstructive Pulmonary Diseases, Exercise Test, Meta-Analysis.

#### Contributions of each author

Author 1 - Hui-Wen Hsu - Conceptualization; Literature search; Methodology; Formal analysis; Data extraction; Writing – Original Draft.

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