INPLASY PROTOCOL

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Review Stage at time of this submission: Completed but not published.

Conflicts of interest:
None declared.

High-Intensity Interval Training Improves physical morphology, Cardiopulmonary Fitness and Metabolic Risk Indicators of Cardiovascular Disease in Children and Adolescents: A Systematic Review and Meta-Analysis

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Review question / Objective: To systematically evaluate the safety and efficacy of high-intensity interval training in children and adolescents.

Condition being studied: There is growing evidence that physical inactivity in children and adolescents increases the prevalence of cardiovascular disease in adulthood and affects cognitive development, social interaction and even current and future health. Insufficient physical activity between children and adolescents is highly correlated with metabolic diseases in adulthood, especially increasing the risk of diseases such as metabolic obesity, type 2 diabetes mellitus (T2DM), cardiovascular disease (CVD), and cancer.

INTRODUCTION

Review question / Objective: To systematically evaluate the safety and efficacy of high-intensity interval training in children and adolescents.

Rationale: Eight databases were searched. Descriptive analysis of the efficacy and safety of high-intensity interval training on body shape, cardiorespiratory fitness, and metabolic risk markers for cardiovascular disease between children and adolescents.

Subgroup analysis was performed with age, participants, intervention time, and exercise frequency as covariates.

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METHODS

Participant or population: Children and adolescents aged 5 to 19 (Normal weight, obesity, disease, etc.)

Intervention: The control group received no intervention. The experimental group was high-intensity interval training, and the interventions had no specific requirements except for intensity (intensity ≥80%HRmax or ≥100robic speed or ≥80%VO2max).

Comparator: The control group received no intervention or mode of motion: PE class.

Study designs to be included: Randomized controlled trial (RCT) or controlled trial.

Eligibility criteria: P: Children and adolescents aged 5 to 19 (Normal weight, obesity, disease, etc.). I: The experimental group was high-intensity interval training, and the interventions had no specific requirements except for intensity (intensity ≥80%HRmax or ≥100robic speed or ≥80%VO2max). C: The control group received no intervention or mode of motion: PE class. O: body shape indicators, CRF indicators and cardiovascular disease metabolic risk indicators. S: Randomized controlled trial (RCT) or controlled trial.

Information sources: The computer retrieves PubMed, The Cochrane Library, Embase, Web of science, Science Direct, CNKI, WanFang and VIP databases. In addition, research published by Google Scholar was hand-searched. Randomized controlled and non-randomized controlled trials on the health efficacy and safety of HIIT between children and adolescents were collected.The retrieval time limit was from the establishment of the database to January 1, 2022. We employed the following MeSH terms: High-Intensity Interval Training, High-Intensity Interval, High-Intensity Intermittent, Adolescence, Teenagers, randomized controlled trial, RCT, etc.

Main outcome(s): Meta-analysis results showed that high-intensity interval training significantly improved cardiorespiratory fitness indicators (VO2max, SBP, DBP and HRmax) and cardiovascular disease metabolic risk indicators (TC, HDL-C). HIIT had no significant effect on body shape indicators (BMI, BF% and WC) and some cardiometabolic indicators (TG and LDL-C).

Quality assessment / Risk of bias analysis: A total of 47 studies were included in this meta-analysis, with reasonable overall risk bias and good quality papers.Egger's examined BMI, BF%, WC, VO2max, SBP, DBP, and HRmax and found that BF% was at risk of publication bias (p<0.05).

Strategy of data synthesis: Meta-analysis was performed using RevMan 5.3 and Stata 15.0 software. The measurement data used mean difference (MD) as the effect analysis statistics, and each effect amount provided its 95% confidence interval (CI). Sensitivity analysis of the included studies was performed to assess data robustness, and heterogeneity magnitude was evaluated in combination with I2: when I2< 25% is low heterogeneity, I2=25~50% is moderate heterogeneity, I2 >50% is high heterogeneity, the level of meta-analysis is set to α=0.05. If the heterogeneity between the results was not statistically significant, a fixed-effects model was used for meta-analysis; if there was statistical heterogeneity between the studies, a random-effects model was used for meta-analysis and subgroup analysis was used to analyze the sources of heterogeneity

further. Publication bias is graphically assessed by Egger's linear regression analysis.

Subgroup analysis: Substantial sources of heterogeneity can be explored through subgroup analyses. Due to differences in the age, participants, intervention time, and exercise frequency of HIIT intervention in children and adolescents included in the study, HIIT's assessment of body morphology, CRF and cardiovascular disease metabolic risk indicators may be affected. Therefore, subgroup analyses have performed that were based on the age (5~15 years old, ≥15 years old), participants (health, obesity, Else whose participants are not specified, not limited to healthy, obese people, etc.), intervention time (≤10 weeks, >10 weeks) and exercise frequency (≥3 times/week, <3 times/week).

Sensitivity analysis: The sensitivity results showed that the overall data were stable.

Country(ies) involved: China.

Keywords: High-Intensity Interval Training, Children, Adolescents, Somatotype, Cardiopulmonary fitness, Cardiovascular disease.

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