

INPLASY PROTOCOL

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Effects of High-Intensity Interval Training on Selected Indicators of Physical Fitness among Male Team Sports Athletes: A Systematic Review and Meta-Analysis

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Review question / Objective: This systematic review aims to comprehensively and innovatively analyze the existing literature to examine the effectiveness of HIIT on oxygen consumption performance among male team sports athletes. **Condition being studied:** The research area of this study is the training intervention of physical fitness of athletes in team sports. It is known that physical fitness is the basic sports guarantee for team sports, especially for sports with intense confrontations on the same field, such as, hockey, basketball, soccer, field hockey, etc. High-intensity interval training is a very effective training tool to improve the sprinting ability, maximum oxygen uptake, and vertical jumping ability of team athletes. Through a systematic review, the effects of high-intensity interval training on the physical quality of athletes in team sports are summarized to further explore the scientific and reasonable training contents and methods.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 11 January 2023 and was last updated on 17 April 2024 (registration number INPLASY202310028).

Conflicts of interest: The article is free from any conflicts of interest, ensuring impartiality and integrity in its content.

INTRODUCTION

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effective training tool to improve the sprinting ability, maximum oxygen uptake, and vertical jumping ability of team athletes. Through a systematic review, the effects of high-intensity interval training on the physical quality of athletes in team sports are summarized to further explore the scientific and reasonable training contents and methods.

METHODS

Search strategy: (“high-intensity interval training” OR “high-intensity intermittent training” OR “HIIT”) AND (“male” OR “men”) AND (“male team athletes” OR “handball” OR “basketball” OR “soccer” OR “football”) AND (“physical performance” OR “maximal oxygen uptake” OR “VO₂max” OR “aerobic capacity” OR “repeated sprint ability”).

Participant or population: Aged 14–26 years, male team sports athletes.

Intervention: High-intensity interval training includes short, high-intensity repetitions of sprint training, interval training, hypoxic or normoxic training, but does not include moderate or ground-intensity interval training. High-intensity interval training.

Comparator: The control athletes participated in regular training or performed other forms of aerobic training, such as moderate intensity interval training, small-sided game training, and training with different interval times.

Study designs to be included: This review includes human randomized controlled clinical trials (RCTs). According to our study design, included studies should focus on the effects of high-intensity interval training on team-sport athletes interventions compared with no specific exercise intervention or other exercise interventions.

Eligibility criteria: Population: This study included male team sports athletes, regardless of age and competition level, with no specific restrictions and good health.

Interventions: Exercise interventions should have lasted 4–9 weeks. The intervention program consisted of alternating between interval running and repetitive sprint training, incorporating interspersed active or passive recovery periods. The exercises primarily involved sprinting without assistive devices. To minimize confounding effects, this study excluded a hybrid training modality that combined HIIT with plyometric or functional modalities. HIIT and control groups were subjected to identical training regimens and durations.

Comparison: The control group should have undergone small-sided games (SSGs) or routine technical and tactical training, excluding HIIT.

Outcomes: The study outcomes should have encompassed the impact of at least one HIIT on the participants' aerobic capacity or repetitive sprinting ability. Aerobic capacity was assessed by measuring maximal oxygen uptake (VO₂max), the Yo-Yo intermittent recovery test (YYIRT), and velocity at 30”–15” interval fitness test (VIFT), while repetitive sprinting capacity was evaluated using a short shuttle run. To meet the inclusion criteria, the studies should have reported pre- and post-test values for treatment effects or relevant test metrics. Studies focusing solely on sport-specific technical skills were excluded.

Study design: This review included only randomized controlled trials that satisfied the predetermined inclusion criteria.

Information sources: A comprehensive search was conducted using four well-known scientific databases: PubMed, SCOPUS, Web of Science, and SPORT Discus. In addition, screening was conducted using Google Scholar (Alphabet Inc., Mountain View, CA, USA) to identify noteworthy recent studies.

Main outcome(s): The meta-analysis showed statistically significant enhancements in maximal oxygen uptake (VO₂max) in six studies (ES, 0.19 – 0.74; $p < 0.005$), Yo-Yo intermittent recovery test (YYIRT) performance in six studies (ES, 0.20 – 2.07; $p = 0.009$), repetitive sprint ability

total time (RSAtotal) in five studies (ES, 0.18 – 1.33; $p < 0.001$), and the best and average times for repeated sprint ability (RSAbest and RSAMEAN) in four studies (ES, 0.47 – 1.50; $p < 0.001$). However, the two studies did not report any significant differences in velocity intermittent fitness test (VIFT) outcomes (ES: -0.08, -0.27; p value: 0.87, 0.443, respectively) between the experimental and control groups. Moreover, one study did not report any significant differences in maximal aerobic speed (MAS) (ES = 0.41, $p = 0.403$).

Quality assessment / Risk of bias analysis:

Two independent evaluators (YY and FQ) used the PEDro scale to evaluate the potential bias of studies that met the predetermined inclusion criteria. The results were cross-checked by a third evaluator (MB), leading to a unanimous consensus. The PEDro scale, which can be accessed online at <https://pedro.org.au/wp-content/uploads/PEDro.scale.pdf>, is an extremely reliable tool primarily designed for assessing the quality of randomized controlled trials available on PEDro.

Strategy of data synthesis: A comprehensive meta-analysis software package (version 3) was used for data analysis.

Subgroup analysis: Subgroup analyses were performed for different types of high-intensity interval training interventions, mainly including different aspects of sprint interval training, repetitive running training, short interval training and long interval training, as well as other aspects not mentioned.

Sensitivity analysis: Sensitivity analysis was conducted by deleting each study individually to evaluate the quality and consistency of the results.

Language restriction: English.

Country(ies) involved: China.

Keywords: High-intensity interval training, physical fitness, male team sports, oxygen consumption performance.

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