

INPLASY PROTOCOL

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None declared.

Effects of High-Intensity Interval Training on Strength and Speed and Endurance among Racket Sports Athletes : a Systematic Review

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Review question / Objective: The objective of this systematic review was to assess the effect of HIIT on improving strength and speed endurance sports performance in Racket Sports athletes.

Condition being studied: High-intensity interval training (HIIT) serves as an effective alternative to moderate- or low-intensity continuous exercise using intervals. It can improve variables related to an athlete's endurance and strength performance. In recent years, many projects have adopted HIIT as a mainstream training method, but there are few literature reports on the impact of Racket sport on HIIT's strength and endurance. From September 2022 to January 2023, we conducted a comprehensive search from PubMed, Scopus, and SClelo databases. We selected studies by PICOS and performed a systematic literature review according to PRISMA guidelines. Inclusion criteria were: (i) controlled trials (HIIT versus alternative training regimens) with a before-after design; (ii) young athletes (≤ 14 years); (iii) assessing variables related to endurance and athletic performance. Hedges' g effect sizes (ES) and associated 95% confidence intervals were calculated for comparing any results between the experimental (HIIT) and alternative training regimens. Research projects are sports such as tennis, squash, badminton and table tennis.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 17 February 2023 and was last updated on 17 February 2023 (registration number INPLASY202320080).

INTRODUCTION

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effect of HIIT on improving strength and speed endurance sports performance in Racket Sports athletes.

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METHODS

Search strategy: The literature search used 3 well-known academic databases: PubMed, Scopus and SCIELO. All keywords were searched using Mesh of PubMed and previous studies. Each database search title uses predefined keywords ("HIIT-related table tennis players" or "tennis" or "badminton" or "squash") and ("HIIT-related strength" or "speed") and ("endurance" or "table tennis player" or "tennis player" or "badminton player" or "squash player". The terms are combined with logical operators that can be used using a database search engine. In addition, the authors consulted experts in the field. The database search returned 27 records: 17 from PubMed, 9 from Scopus, and 1 from SCIELO. Filter by subject and abstract to remove duplicate citations. Finally, 11 articles considered to be very relevant were analyzed by reading the full

text. Therefore, we selected 11 articles for inclusion in this systematic review.

Participant or population: young athletes (≤ 14 years).

Intervention: High-intensity interval training (HIIT).

Comparator: Alternative training regimens.

Study designs to be included: (i) controlled trials (HIIT versus alternative training regimens) with a before-after design.

Eligibility criteria: This review, including population, intervention, comparison, outcome and study design (PICOS). In addition to the above screening criteria, studies meeting the following criteria were also included: (1) HIIT articles for sports with a racket; (2) The selected articles must be related to the improvement of strength and endurance of racket athletes. (3) The selected articles must be articles about racket athletes intervening through HIIT. Studies were limited to those involving young racket-sporting athletes defined as one of the following criteria: professional training, expert instruction, and early competition. Studies in other populations and studies of training for non-racket sports were excluded. Excludes conference abstracts, theses, dissertations and articles published in non-peer-reviewed journals.

Information sources: The database search returned 27 records: 17 from PubMed, 9 from Scopus, and 1 from SCIELO. Filter by subject and abstract to remove duplicate citations. Finally, 11 articles considered to be very relevant were analyzed by reading the full text. Therefore, we selected 11 articles for inclusion in this systematic review.

Main outcome(s): These 10 studies applied various HIIT or other training methods such as RST (repeated-sprint training), involving various intensities and durations, and various work-to-rest ratios. In racket sports, the training approach primarily applies a functional HIIT program along

with resistance training, including squats and jumps, as well as other exercises and sprints performed according to a typical HIIT protocol. Duration and corresponding interval intensities for all studies were as follows: (i) short intervals ~10-15 s performed at maximal sprint speed; (ii) medium duration intervals of 30 s-2 min performed at maximal sprint speed or 90-95 % HR max or 90-95% VO2 max; (iii) long intervals of 4-10 minutes, performed at 90-95% HR max or 90-95% VO2 max.

The 10 studies had an average intervention period of 6.5 weeks (range: 4 weeks to 8 weeks) and performed an average of 2.5 HIIT sessions per week (range: 1-4 sessions). For the alternative training protocol, the average duration of each HIIT session was 28 ± 15 min and 38 ± 24 min. In 3 out of 10 studies, the duration of the training session could not be assessed due to missing or inaccurate details.

Quality assessment / Risk of bias analysis:

The methodological quality of trials was assessed using the PEDro scale (Herbert, & Elkins, 2003). The PEDro scale assesses four key methodological features of a study: randomization, blinding, comparison between groups, and data analysis. It is based on the Delphi list developed by Verhagen et al. (De, 2009), which includes the following 11 items: specified eligibility criteria, randomization, concealed allocation, baseline comparability, blinded subjects, blinded therapist, blinded evaluators , adequate follow-up, analysis of intention to treat, comparison between groups, point estimates and variability. Two trained independent raters assessed the quality of trials in the PEDro database and conflicts were resolved by a third rater (Maher, Sherrington, Herbert, & Elkins, 2003). Scores on the PEDro scale range from 1 to 10; therefore, higher PEDro scores indicate higher quality. To determine the quality of the method, we used the following criteria: a PEDro score of <5 indicates poor quality, and 5 or more indicates good quality (De, 2009).

Strategy of data synthesis: Effect size (ES) (Hedges' g) and 95% confidence interval calculates the difference between the

means of the experiment and the alternative training protocol, divided by the mean standard deviation of the two groups. To optimize the calculation of ES, and estimate the standard deviation of Hedges' g, the standard deviations of the experimental and alternative training protocol sets at baseline were pooled. According to standard practice, ES values obtained are defined as 0.70 = large (Higgins and Green, 2011). The heterogeneity of the included studies was assessed using the I2 calculation (Becker, 2000).

Subgroup analysis: This study is a systematic literature review without subgroup analysis.

Sensitivity analysis: A total of 2 analysis modes were listed in this study. Firstly, considering that there may be differences in the individual level of athletes, the articles we analyze only select experienced athletes as subjects. In sensitivity analysis, "cognitive function score in Kihon scale = 0" is defined as better cognitive function. Secondly, the data is different because it is for holding the racket. Through the analysis results, we learned the relationship between HIIT and the movement of holding the racket.

Country(ies) involved: Malaysia.

Keywords: HIIT, Physical Training, Strength, Endurance, Racket Sports Athletes.

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