



# Effects of Short and Intermediate Interval Training on VO<sub>2</sub>max in Male School Futsal Players

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## Abstract

### Objectives:

This study aimed to determine the effect of short interval training and intermediate interval training on increasing the VO<sub>2</sub>max of male futsal extracurricular athletes at SMK Sinar Husni 2 TR in 2026.

### Materials and Methods:

The method used in this study was an experimental method involving treatment in the form of short interval training and intermediate interval training. The population consisted of 30 male futsal athletes. The sample consisted of 12 athletes selected using a random sampling technique.

### Results:

Based on the results of the Beep Test (multistage shuttle run test), the pre-test showed that 8 athletes (67%) were categorized as moderate and 4 athletes (33%) were categorized as very poor. Meanwhile, the post-test results showed that 1 athlete (8%) was categorized as good, 9 athletes (76%) as fairly good, 1 athlete (8%) as moderate, and 1 athlete (8%) as poor, indicating an improvement in VO<sub>2</sub>max.

### Conclusions:

The study concluded that short interval training and intermediate interval training increased the cardiorespiratory endurance (VO<sub>2</sub>max) of male futsal extracurricular athletes at SMK Sinar Husni 2 TR in 2026.

**Keywords:** Short Interval Training; VO<sub>2</sub>max; Intermediate Interval.

## Introduction

Nowadays, sports have become an important part of people's lives. Sports activities not only function as a means of recreation but also serve as a necessity for maintaining and improving physical health. When sports activities are carried out regularly, systematically, and in accordance with proper training principles, they can provide benefits for physical fitness and mental balance. In addition, sports activities also play a role in developing positive individual characteristics, such as sportsmanship, discipline, honesty, and competitive spirit. Through proper sports development, individuals and community groups are expected to be able to develop their potential and achieve optimal performance in sports.

To achieve maximum sports performance, comprehensive and continuous preparation involving various supporting components is required. These components include physical condition, technical skills, tactical application, psychological readiness, and game strategy. Among these components, physical condition is a fundamental factor that greatly determines an athlete's ability to perform at their best. Technical mastery, tactical application, and mental stability are more effective when supported by good physical condition. One important component of physical condition is cardiorespiratory endurance or VO<sub>2</sub> Max, which reflects the body's ability to absorb and utilize oxygen during high-intensity physical activity.

This endurance capacity serves as a fundamental basis in various sports, particularly team sports that require continuous physical activity. Several team sports, such as soccer, volleyball, futsal, and basketball, require a high level of endurance so that athletes can



maintain their performance throughout a match. In futsal, endurance plays a crucial role because the game is fast-paced and dynamic and requires players to perform intensive movements within relatively short periods. Therefore, futsal players are required to have excellent physical condition, particularly cardiorespiratory endurance, to maintain their speed, stamina, and effectiveness throughout the match.

Optimal physical condition requires appropriate training methods and a training program designed systematically and carefully. The training program should be developed by considering training principles in order to effectively improve athletes' physical abilities. In sports achievement development, physical conditioning training plays a very important role because it serves as the foundation for the comprehensive development of athletes' abilities. According to Harsono in the Indonesian National Sports Committee (1997–2007), physical conditioning training is a very important part of an athlete development program, particularly for athletes preparing for competition. Therefore, physical conditioning programs must be carefully planned, implemented systematically, and carried out with discipline so that training objectives can be achieved optimally.

One of the main objectives of a physical conditioning program is to improve endurance, particularly the functional capacity of the cardiovascular and respiratory systems, commonly referred to as  $VO_2$  Max. This capacity is essential for supporting prolonged physical activity at a certain intensity. According to Sajoto (1988), physical condition is a fundamental aspect of efforts to improve athletic performance. The components of physical condition are closely interrelated and cannot be separated, either in their development or maintenance. Therefore, physical conditioning should be carried out comprehensively and continuously through a planned and systematic training program. Endurance is one of the crucial components that affects an athlete's performance during sports activities. This aspect reflects the body's ability to sustain physical work over a certain period without experiencing excessive fatigue. Harsono (1988) emphasized that endurance is the body's capacity to perform training or physical activities for a sufficiently long duration without a significant decline in performance after the activity has ended.

Futsal is one of the sports that requires a high level of physical endurance, particularly cardiorespiratory endurance. This sport is quite popular among the general public, especially among students and university students. Futsal is similar to soccer; however, it is played on a smaller field, with fewer players and different rules. Each futsal team consists of five players who work together to score goals against the opposing team using their feet or other permitted parts of the body in accordance with the rules of the game. Murhananto (2006) stated that futsal is the international term for a form of soccer played indoors. The term futsal originates from the Spanish word *futbol* and the Portuguese word *futebol*, both of which refer to soccer. As public interest in this sport has increased, many schools have adopted futsal as an extracurricular activity, serving as a means of fostering students' interests and developing their talents in sports.

In Medan, various sports extracurricular activities are organized in schools, one of which is the boys' futsal extracurricular program at SMK Sinar Husni Medan. This extracurricular activity is conducted on the futsal court located within the school premises at Jalan Veteran Gang Utama Pasar V, Medan. The futsal extracurricular program was established in 2008 as a platform for students who have an interest in and enthusiasm for futsal. Since its establishment, the activity has aimed to develop students' sports abilities while also serving as a means of fostering futsal achievement within the school environment.

As an active futsal team that participates in various interschool competitions in Medan and its surrounding areas, the boys' futsal extracurricular team at SMK Sinar Husni still faces several challenges, particularly those related to the players' physical condition. One



of the main problems frequently encountered is low cardiorespiratory endurance or  $\text{VO}_2$  Max. This condition causes the players' stamina to decline relatively quickly, affecting their concentration and game performance on the court. When physical condition begins to deteriorate, players tend to become fatigued more quickly, which ultimately affects their ability to implement strategies and maintain game intensity.

This problem was observed when the boys' futsal team participated in the Piala Series Regional Sumatera Utara championship in 2025. During the tournament, the team was unable to achieve optimal results because some players experienced a decline in physical condition during the matches. Decreased endurance caused a reduction in players' concentration, which affected the overall effectiveness of the team's performance. Consequently, the team suffered defeat and was unable to advance to the next stage of the competition.

After participating in the championship, the boys' futsal team took part in several other futsal tournaments held in Medan. Based on experiences from several matches, it was found that the players' cardiorespiratory endurance remained one of the aspects requiring particular attention in the training program. To obtain a clearer picture of this condition, a preliminary test was conducted through observation to measure the players'  $\text{VO}_2$  Max levels. The initial measurement results indicated that the physical fitness level of the futsal extracurricular participants was relatively low. The majority of students, particularly those in levels 4 and 5, were categorized as "very poor," with an average  $\text{VO}_2$  Max value of approximately 32.17. Meanwhile, only two students from level 8 achieved the "moderate" category, with  $\text{VO}_2$  Max values above 40. These conditions indicate that most team members still have suboptimal aerobic capacity, requiring a more structured and systematic training program to improve physical fitness, particularly cardiorespiratory endurance.

In this study, the sample consisted of all members of the boys' futsal extracurricular team at SMK Sinar Husni, totaling 20 individuals. Field observations indicated that the players' cardiorespiratory endurance was still relatively low. Of the 20 athletes studied, 18 athletes (approximately 90%) were categorized as "very poor," while only 2 athletes (approximately 10%) were categorized as "moderate." This condition was presumably related to the absence of a specific training program focused on improving cardiorespiratory capacity. In addition, the players had not undertaken training specifically designed to develop the aerobic capacity required in futsal.

Based on observations and an interview conducted on January 13, 2026, with the head coach of the SMK Sinar Husni extracurricular futsal team, Aditya Dieva Tuahri, it was found that the players' cardiorespiratory endurance still needed improvement. The futsal team routinely conducts training both before competitions and during periods outside competition. Under normal conditions, training is conducted twice a week. However, when the team is preparing to participate in a competition, the training frequency is usually increased to three times a week.

## **Materials and Methods**

### **Study Design**

The method used in this study was an experimental method involving treatment in the form of short interval training and intermediate interval training. The population consisted of 30 male futsal athletes.

### **Study Participants**

The study population consists of 20 members of the Sinar Husni High School futsal extracurricular team; a total of 12 individuals were selected to serve as the sample for this research.



### Study Organization

The research instrument used to collect data was the Beep Test (multistage shuttle run test) to estimate the athletes' cardiorespiratory endurance ( $VO_2\max$ ).

### Statistical Analysis

Data collected from the pre-test and post-test were analyzed using a normality test and a paired t-test for statistical hypothesis testing to determine whether the research hypothesis could be accepted or rejected. The paired t-test was used to compare the effects of short interval training and intermediate interval training on the cardiopulmonary endurance ( $VO_2\max$ ) of the study subjects.

### Results

This study aims to determine the effects of Short Interval Training and Intermediate Interval Training on improving the cardiorespiratory endurance ( $VO_2\max$ ) of the boys' futsal team at SMK Sinar Husni 2 TR Medan in 2026. The research findings are derived from pre-test and post-test data regarding the impact of these training methods on  $VO_2\max$  improvement.

In this study,  $VO_2\max$  levels for the boys' futsal team at SMK Sinar Husni 2 TR were measured using the beep test (multi-stage fitness test). The results regarding the  $VO_2\max$  of the boys' futsal team at SMK Sinar Husni 2 TR are presented in the table below:

Table 1.  $VO_2\max$  statistics for the boys' futsal team at SMK Sinar Husni 2 TR

| Information           | <i>Pretest</i> | <i>Posttest</i> |
|-----------------------|----------------|-----------------|
| <i>Mean</i>           | 37,03          | 46,62           |
| <i>Median</i>         | 40,80          | 47,10           |
| <i>Mode</i>           | 42             | 47,1            |
| <i>Std. Deviation</i> | 8,002          | 5,147           |
| <i>Minimum</i>        | 22,80          | 35,40           |
| <i>Maximum</i>        | 44,50          | 54,30           |

Table 2. Description of  $VO_2\max$  Results for the Men's Futsal Extracurricular Team at SMK Sinar Husni 2 TR

| Criteria   | <i>Pretest</i> |                   | <i>Posttest</i> |                   |
|------------|----------------|-------------------|-----------------|-------------------|
|            | frequency      | <i>Percentage</i> | frequency       | <i>Percentage</i> |
| Very well  | 0              | 0                 | 0               | 0                 |
| Good       | 0              | 0                 | 1               | 8.3               |
| Kinda Good | 0              | 0                 | 9               | 75.0              |
| Currently  | 7              | 58.3              | 1               | 8.3               |
| Not enough | 1              | 8.3               | 1               | 8.3               |
| Very less  | 4              | 33.3              | 0               | 0                 |
| Jumlah     | 12             | 100               | 12              | 100               |

The  $VO_2\max$  diagram for the SMK Sinar Husni 2 TR Boys' Futsal extracurricular team is shown in the image below:

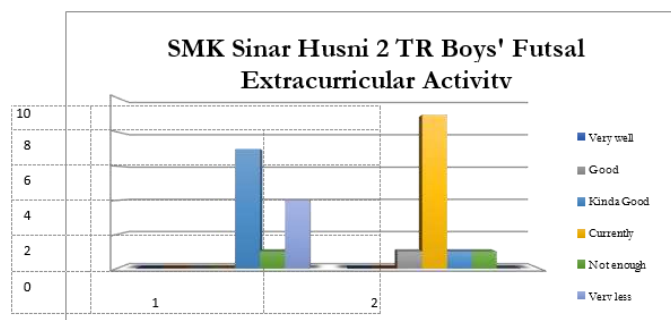


Figure 1. VO<sub>2</sub> max Data Diagram for the Men's Futsal Extracurricular Team at SMK Sinar Husni 2 TR

## Discussion

This study aimed to determine the effect of Short Interval Training and Intermediate Interval Training on improving cardiorespiratory endurance (VO<sub>2</sub> Max) among the boys' futsal extracurricular team at SMK Sinar Husni 2 TR. The study was conducted by providing treatments in the form of Short Interval Training and Intermediate Interval Training. Data were measured twice, namely before and after the treatment, to determine the effects of implementing Short Interval Training and Intermediate Interval Training. Based on the paired t-test analysis, conclusions could be drawn regarding the effect of Short Interval Training and Intermediate Interval Training on improving cardiorespiratory endurance (VO<sub>2</sub> Max) among the boys' futsal extracurricular team at SMK Sinar Husni 2 TR. The analysis showed that Short Interval Training and Intermediate Interval Training had an effect on improving cardiorespiratory endurance (VO<sub>2</sub> Max) among the boys' futsal extracurricular team at SMK Sinar Husni 2 TR Medan.

Short Interval Training is one of the training methods used to improve cardiorespiratory endurance; however, the distance and duration are reduced or shortened. According to Akhmad (2013:48), "Short Interval Training is performed for 15 seconds to 2 minutes and primarily develops anaerobic endurance through short-distance sprinting activities." This training is performed similarly to conventional interval training, but its implementation is modified by shortening the distance and reducing the duration with the aim of improving cardiorespiratory endurance. This training also focuses on physical conditioning because Short Interval Training uses maximal running techniques (sprinting). Since it uses a short running distance with short rest intervals, Short Interval Training emphasizes fast and maximal running techniques.

Short Interval Training and Intermediate Interval Training were shown to have a significant effect on improving cardiorespiratory endurance (VO<sub>2</sub> Max). Based on the analysis, the mean VO<sub>2</sub> Max score in the pre-test was 37.03, while the mean score in the post-test was 46.62. Thus, the mean VO<sub>2</sub> Max increased significantly. This indicates a significant improvement in VO<sub>2</sub> Max before and after the implementation of Short Interval Training and Intermediate Interval Training. This finding can be explained by Akhmad (2013:48), who stated that "endurance training consists of several forms, namely Short Interval Training, Intermediate Interval Training, and Long Interval Training."

## Conclusions

The study concluded that short interval training and intermediate interval training increased the cardiorespiratory endurance (VO<sub>2</sub>max) of male futsal extracurricular athletes at SMK Sinar Husni 2 TR in 2026.

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#### **Conflict of Interest**

The authors declare no conflict of interest.

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