



Aerobic Vs. Anaerobic Training to Increase VO₂max Soccer Players

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Abstract

Soccer requires excellent physical fitness, including cardiorespiratory endurance known as maximum oxygen volume (VO₂max). Some exercise to improve soccer players VO₂max are aerobic exercise and anaerobic exercise. Aim of this study was to prove the efficiency of aerobic and anaerobic exercise to increase VO₂max. Subjects in this study were 22 soccer players aged 20 years. Subjects participated in a 16-meeting training program with group exercises, aerobic exercise and anaerobic exercise. Aerobic exercise used jogging variations and anaerobic exercise used sprint variations. Research instruments used Multistage Fitness Test (MFT) to determine VO₂max capacity. The significance value of aerobic and anaerobic exercise on VO₂max enhancement is 0.00 (p 0.05). The conclusion of this study is that aerobic exercise and anaerobic exercise can increase VO₂max soccer players, whereas no significant difference between aerobic and anaerobic exercise in VO₂max enhancement.

Keywords: *Aerobic Training; Anaerobic Training; VO₂max*

Introduction

Sports is one of the personal and community education that promotes physical activity as a conscious and systematic effort towards better personal development (Herdiyana & Prakoso, 2016). Another opinion on sports is the systematic process of activities that can encourage, develop and nurture one's physical and spiritual potential as individuals and members of society in the form of games, races, and ongoing physical activities to gain recreation and victory (Khamdani, 2010).

Soccer is one of the most popular sports in the world. Soccer is a sport of team play, so it requires good teamwork to get a win in a match (E. M. Park, Seo, & Ko, 2016). In addition, all soccer players must have excellent physical fitness to be able to get a good performance for a long time (Boone, Vaeyens, Steyaert, Bossche, & Bourgois, 2012).

The physical fitness components in football are very complex, such as cardiorespiratory endurance, called the maximum oxygen volume (VO₂max). VO₂max is the maximum oxygen volume for intensive activities (Nuarti, Huldani, & Asnawati, 2019). VO₂max is a "soul" for athletes' performance to improve good physical abilities (Debbian & Rismayanthi, 2016).

To improve the VO₂max of soccer players through systematic exercise, carefully, orderly, progressive, and follow the basic principles of exercise (Budi & Sugiharto, 2015). Some exercises to improve VO₂max are aerobic and anaerobic exercise. Aerobic exercise takes a long duration with low intensity. Aerobic exercise can increase endurance through increased oxidative enzymes, glycogen deposits in muscles, capillary vessels elasticity, increase stroke volume and lower heart rate (S. Park et al., 2010). While anaerobic exercises are carried out with a short time and high intensity. Anaerobic exercises can improve performance during both training and competition (García-Pinillos, Cámara-Pérez, Soto-Hermoso, & Latorre-Román, 2017); (Farley et al., 2016); (Koral, Oranchuk, Herrera, & Millet, 2018).

Aim of this study was to prove the efficiency of aerobic and anaerobic exercise to increase the VO₂max capacity. The results of this study are expected to be applied in each training program in an effort to improve the physical fitness of soccer players.

Methodology

Subjects in this study were 22 soccer players aged 20 years. Subjects were randomly divided into 2 groups, aerobics groups and anaerobic groups. Research instrument used a multistage fitness test (MFT) to determine VO₂max capacity.

Each subject pretested to measure VO₂max before exercise. Subjects participated in a 16-meeting training program with group exercises, aerobic exercise and anaerobic exercise. Aerobic exercise used jogging variations and anaerobic exercise used sprint variations. At the end of the training program, a posttest was conducted to measure VO₂max after exercise.

Data analysis used t-tests to compare aerobic group and anaerobic group data against VO₂max enhancement. Normality test using Saphiro-Wilk and homogeneity test using Levene with α value of 5%.

Results and Discussion

The results of the study were VO₂max. Measurements were taken 2 times, before and after treatment. The treatment were aerobic exercise and anaerobic exercise.

Table 1. VO₂max Measurement Results

Group	Pretest	Posttest	Δ VO₂max
Aerobic	7,7±1,44	8,17±1,49	0,47±0,11
Anaerobic	7,95±1,22	8,49±1,22	0,55±0,12

The results showed that VO₂max before treatment had almost the same mean values, 7.7 ± 1.44 L / min in the aerobic group and 7.95 ± 1.22 L / min in the anaerobic group. After treatment, mean values of VO₂max both groups showed an increase of 8.18 ± 1.49 L/min in the aerobic group and 8.49 ± 1.22 L/min in the anaerobic group. VO₂max increase in the anaerobic group had a greater mean value of 0.55 ± 0.12 L/min than in the aerobic group (0.48 ± 0.1 L/min).

Table 2. The Significance of Each Group's Different Tests

Group	Paired-Sample T Test	Independent Sample Test
Aerobic	0,00	0,191
Anaerobic	0,00	

The results of the data analysis showed that the value of significance in both groups using paired-sample t test is 0.00 ($p < 0.05$). This suggests that aerobic exercise and anaerobic exercise can increase the VO₂max capacity of soccer players. While the value of independent sample test significance is 0.191 ($p > 0.05$), it means that no significant difference between aerobic and anaerobic against the increase in VO₂max of soccer players.

VO₂max is the most complex systems that occurs in the body. VO₂max is a system that combines between the lungs, cardiovascular system and muscle system to pick up, transport and use oxygen (O₂) to produce muscle contractions (Poole & Jones, 2017) (Lundby, Montero, & Joyner, 2017). VO₂max measurements can be used to analyze the effects of a physical exercise program. People with good fitness have higher VO₂max scores and can do more activity. VO₂max is the volume of oxygen used during the charging of physical exercise with maximum capacity. Oxygen volume in liter size per minute or milliliters per-kilogram of body weight per minute.

This study shows that aerobic exercise can significantly increase vo₂max (sig = 0.00). The results of this study are supported by research conducted by (Farzaneh, Nia, Mehrtash, Mirmoeini, & Jalilvand, 2014) that aerobic exercise can increase VO₂max capacity in overweight women. Through aerobic exercise, the cardiovascular system will work more effectively, so that the muscle's ability to use oxygen will be greater (Watulingas, Rampengan, & Polii, 2013). Research conducted by (Candrawati, Sulistyoningrum, Bramantyo, & Pranasari, 2016) found that aerobic exercise can improve heart and lung endurance. Aerobic exercise can increase blood flow and disposal of metabolic residual substances faster, resulting in faster recovery capabilities and decreased fatigue levels (Palar, Wongkar, & Ticoalu, 2015).

Another exercise that can increase VO₂max is anaerobic exercises. The results of the data analysis showed that anaerobic exercise has a significance value of 0.00, means that anaerobic exercises can increase VO₂max soccer players. Other studies have also found that high intensity interval training (HIIT) can increase VO₂max capacity (Mallol et al., 2020) and muscle endurance (Menz et al., 2019). Anaerobic exercise can increase the effectiveness of the cardiovascular system (Patel et al., 2017), so that the ratio of oxygen consumption in contracting muscles also increases. The increase in anaerobic abilities is due to the exercise program that has been given so that the body can adapt. Regular physical activity, correct size and in a balanced time can lead to physiological adaptation of the organs of the body, so that the body can receive heavier loads and the body's organs can work more efficiently (Sözen & Akyıldız, 2018).

Aerobic exercise and anaerobic exercise can increase VO₂max soccer players. The two exercises has no significant difference in VO₂max enhancement (Δ VO₂max). The results of this study are similar to studies conducted by (Hutajulu, 2016) where both high intensity interval training (HIIT) and power training (HVT) can equally increase the maximum oxygen value in junior soccer players (Under-18s). However, in this study, anaerobic exercise had little advantage: a higher increase in VO₂max than an increase in VO₂max in aerobic exercise.

Conclusion

The conclusion based on the results of this study is that aerobic exercise as well as anaerobic exercise can increase VO₂max. Whereas no significant difference in VO₂max enhancement when aerobic exercise and anaerobic exercise were compared. The results of this study are expected to be a reference of athletes and coaches to increase VO₂max.

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