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Original Article

Aerobic endurance of futsal athletes during the Covid-19 pandemic

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Abstract:
The high number of COVID-19 cases has a significant impact on sports sectors in Indonesia. During the COVID-19 pandemic, all Padang Futsal Academy athletes trained from their homes. As a result of large-scale social restrictions to stop the spread of the COVID-19 virus. This study aims to compare the VO_2Max of Padang Futsal Academy athletes before COVID-19 and after Padang Futsal Academy athletes exercise virtually at home during the covid-19 pandemic. All athletes in the Padang futsal academy club were the samples in this study. The research method used is a descriptive quantitative percentage. The research instrument is a multilevel fitness test to measure the VO_2Max of futsal athletes. This test is carried out on a flat field of 20 meters long and is characterized by cunning. Data on the aerobic endurance of the Padang futsal Academy athletes at Padang using the Multi stage Fitness Test (MSFT) instrument test. The results of the athlete's VO_2Max in February 2020, the average value of VO_2Max was 30.5 mL/Kg/minute, the highest value was 35.0 mL/kg/minute, the lowest VO_2Max value was 27.2 mL/kg/minute. The results of VO_2Max athletes in March 2021, the average value of VO_2Max is 28.5 mL/Kg/minute, the highest value is 31.4 mL/kg/minute, the lowest VO_2Max value is 25.2 mL/kg/minute. Data VO_2Max before COVID-19 shows that as many as 0 athletes (0%) are in the Superior class; as many as 0 athletes (0%) are in the Excellent class; as many as 2 athletes (16,7%) is in the Good class; as many as 7 athletes (58,3%) are in the Fair class; as many as 3 athletes (25%) are in the poor class; as many as 0 athletes (0%) are in the very poor class. Data VO_2Max During COVID-19 shows that as many as 0 athletes (0%) are in the Superior class; as many as 0 athletes (0%) are in the Excellent class; as many as 0 athletes (0%) is in the Good class; as many as 6 athletes (50%) are in the Fair class; as many as 6 athletes (0%) are in the poor class; as many as 6 athletes (50%) are in the very poor class. There is a decrease in the average VO_2Max of athletes after exercising from home.
Key Word: VO_2Max, Covid-19, female, impact, online training

Introduction

The World Health Organization (WHO) declared the Spread of the COVID-19 Virus a pandemic since March 11, 2020 (Terekhina, Batagovskaya, Sumak, & Anna, 2021). The COVID-19 pandemic has resulted in significant changes to human life. It has an impact on the environment and social life of the community (Hashimoto, Nakatani, Kida, & Nomura, 2021). This change is felt almost all over the world, including Indonesia. The high number of coronavirus cases significantly affected the economic, education and tourism sectors in various regions throughout Indonesia. In addition, sporting events were affected. Efforts to minimize the increase in the Covid-19 virus significantly affected sports and exercise training (Yeo, 2020). The same impact is also received by the sports sector both at the national and international levels; for example, important events having a delay to Summer 2020 (Yanguas et al., 2020). The pandemic changed the plans what have been prepared by coaches and athletes for the upcoming matches. These changes provide opportunities and challenges to sports actors and sports psychologists related to sports appearance, health, and physical activity (Schinke et al., 2020).

Large-scale social restrictions began in March 2020, all schools, non-essential offices, and sports halls were temporarily closed. Therefore, the Padang Futsal Academy athletes in Padang city practice independently at home. Physical and social distancing policies as an effort to stop the spread of COVID-19 (Ashadi et al., 2020). The challenge for coaches is to make changes to training methods so that athletes continue to train from home.

The COVID-19 pandemic has had a significant impact on human life. It also has an impact on the sports system in Indonesia. Athletes are not allowed to use public sports facilities to stop the spread of the COVID-19 virus, they must practice virtually. This sudden change resulted in many athletes having difficulty participating in virtual training programs and had an impact on their physical quality. VO2max of the Indonesian national team decreased during the virtual training program (Ariestika, Widiyanto, & Nanda, 2020).

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Futsal is a sport that requires players to have good physical, technical, tactical and mental condition. Futsal athletes must have good anaerobic and aerobic endurance because this sport has a high-intensity that demands maximum performance from its players. Every player must be able to move and recover quickly to be able to play at the maximum. Physical condition is essential to show maximum physical performance. Futsal players must be able to rapidly recover after high-intensity exercises because the rhythm and intensity of the game is very high and does not decrease during the match (Barbero-Alvarez JC et. al in (Ramos-Campo et al., 2016). Individual's aerobic fitness status is critical to the success in this game; aerobic fitness status is essential during recovery, delay fatigue and the rhythm of high-intensity movement can be maintained during play (Tomlin DL, Wenger HL: (Harrison et al., 2015).

Knowing the athlete's endurance profile is the first step that coaches should know before creating a training program for athletes. (Nilsson & Cardinale, 2018) researched about anaerobic and aerobic test performance based on different positions. This study conducted to determine the aerobic and anaerobic ability at different playing positions in elite male soccers players. (Barbero-Alvarez et al., 2015) examine the level of aerobic fitness in female futsal athletes. (Karahan, 2012) studied the anaerobic and aerobic performance of female futsal players using skill-based maximal intensity interval training. However, there are no studies on the aerobic endurance profile of female futsal athletes as long as the COVID-19 pandemic era. Thereupon, this study will check the VO_2Max of futsal athletes during the COVID-19 pandemic.

Aerobic endurance is very important in futsal. Thus, coaches must create an appropriate endurance training program for athletes. so that athletes can display the greatest performance in matches. Moreover, the athletes of the field of futsal academy will take part in the tournament within 3 months. Before making an exercise program, the coach must know the level of aerobic endurance of the futsal players after carrying out an independent training program during the pandemic as a reference in compiling and implementing an exercise program for preparation for PFA 2021 in Padang City.

Materials and Methods

The population in this study were 12 futsal academy angels players. In this study, the sampling technique used was saturated sampling. Thus, in this study, the sample included all 12 Padang futsal players. Aerobic endurance was evaluated using the bleep test/ Multi-stage finess test. The method in this research is descriptive quantitative. It does not modify or add data, only presents data obtained through research. Then, compare the VO_2Max data of futsal athletes before the COVID-19 pandemic and the VO_2Max data of futsal athletes after 1 year of covid-19. The data on the aerobic endurance of the Padang futsal academy athletes are presented in tables and graphs.

Results

Data on the aerobic endurance of the Padang futsal Academy athletes at Padang using the Multi stage Fitness Test (MSFT) instrument test. The results of the athlete's VO_2Max in February 2020, the average value of VO_2Max was 30.5 mL/Kg/minute, the highest value was 35.0 mL/kg/minute, the lowest VO_2Max value was 27.2 mL/kg/minute. The results of VO_2Max athletes in March 2021, the average value of VO_2Max is 28.5 mL/Kg/minute, the highest value is 31.4 mL/kg/minute, the lowest VO_2Max value is 25.2 mL/kg/minute. the details are in table 1.

Table 1. Athlete VO_2Max Comparison

Name	Before Covid-19	During Covid-19	Difference	Mean Difference
	Prediction VO_2Max	Prediction VO_2Max		
AP	31.4	30.2	1,2	2,0
AY	34.3	31.4	2,9	
MHP	35.0	30.6	4,4	
AR	28.7	25.2	3,5	
NT	29.1	26.8	2,3	
DH	31.8	30.2	1,6	
SO	29.8	29.1	0,7	
ND	27.2	27.2	0,0	
MS	30.6	28.7	1,9	
SS	31.0	29.5	1,5	
PF	29.1	26.0	3,1	
SA	28.0	27.2	0,8	

Based on table 1. there are differences mean in VO_2max results for all athletes. Further, Table 2. Shows the distribution of aerobic endurance level of Padang futsal academy angles players from Padang city Before Covid-19 and During Covid-19.

Table 2. Frequency distribution of the aerobic endurance level of Padang futsal academy

Interval Range	Before Covid-19		During Covid-19		Category
	Frequency	%	Frequency	%	
>41.0	0	0 %	0	0 %	Superior
37.0–41.0	0	0 %	0	0 %	Excellent
33.0–36.9	2	16,7 %	0	0 %	Good
29.0-32.9	7	58,3 %	6	50 %	Fair
23.6-28.9	3	25 %	6	50 %	Poor
<23.6	0	0 %	0	0 %	Very poor

Table 2 section of VO_2Max before COVID-19 shows that as many as 0 athletes (0%) are in the Superior class; as many as 0 athletes (0%) are in the Excellent class; as many as 2 athletes (16,7%) is in the Good class; as many as 7 athletes (58,3%) are in the Fair class; as many as 3 athletes (25%) are in the poor class; as many as 0 athletes (0%) are in the very poor class. As many as 7 out of a total of 12 Padang futsal academy players in Padang ciry are in the interval range of 29.0–32.9. Thus, the aerobic endurance level of Padang futsal academy angels players from Padang city is Fair category. Next, Table 2 section of VO_2Max During COVID-19 shows that as many as 0 athletes (0%) are in the Superior class; as many as 0 athletes (0%) are in the Excellent class; as many as 0 athletes (0%) is in the Good class; as many as 6 athletes (50%) are in the Fair class; as many as 6 athletes (0%) are in the poor class; as many as 6 athletes (50%) are in the very poor class. As many as 6 out of a total of 12 Padang futsal academy players in Padang city are in the interval range of 29.0–32.9 and 23.6-28.9. Thus, the aerobic endurance level of Padang futsal academy angels players from Padang city is Fair and Poor category.

Discussion

This study aims to compare the VO_2Max of athletes before COVID-19 and after athletes exercise virtually at home. These results are preliminary data for guidance in the preparation of training programs for the 2021 PFA match. Based on the results of the study in tables 1 and 2, there is a decrease in the average VO_2Max of athletes after exercising from home. Data on 12 athletes before covid-19 are 2 athletes (16,7%) in Good category; 7 athletes (58,3%) in fair category; 3 athletes (25%) in poor class. While, during the covid-19 are 6 athletes (50%) in Fair category; 6 athletes (0%) in poor category. So, the coach must create an exercise program that can increase the athlete's VO_2Max. Because in futsal sport VO_2Max is very important.

Research conducted by Kadir (2020) that the results of independent training carried out by athletes cannot maintain their VO_2Max status, there is a decrease in the average VO_2Max of female athletes by 23% and male athletes by 18% (Kadir, 2020). There is a decrease in the VO_2Max of Indonesian national team athletes (eg cricket, football, and volleyball) before and during the covid-19 pandemic. Data on 30 Indonesian Timas athletes before Covid-19 showed that the athletes' VO_2Max is 50% in the superior category, while during the Covid-19 pandemic, the data on 30 Indonesian Timas athletes is 40% in the good category (Ariestika et al., 2020).

Whereas, Futsal requires a good physical work component (Barbieri et al., 2016). Physical fitness is an important component in futsal and based on previous research shows that improving a good physical component is an important consideration for coaches when designing training programs for competitions (Moore et al., 2014). Moreover, fruitfulness in team sports (eg, football, basketball) is highly dependent on the high aerobic energy system that all players on the team have (Esco et al., 2014). This sport requires high-intensity physical activity, also accompanied by low-intensity physical activity, requires technical and tactical components in playing (Sparkes et al., 2018 in (Izzo, Cejudo, Baranda, & Giovannelli, 2021)

Aerobic endurance is a person's ability to do work in an aerobic atmosphere; also called the abilities of blood vessels, lungs and heart to use oxygen when performing an activity for a long period of time. Maximum aerobic capacity is also known as maximal oxygen (VO_2Max) which is the body's physiological interpretation parameter (Kusy & Zieliński, 2014). The maximum oxygen (VO_2Max) was avowed in both L/min and mL /kg/min (Wiley & Shaver, 2015). VO_2Max is a fundamental measure of exercise physiology and serves as a standard for comparison of aerobic capacity performance and endurance fitness (Swanwick & Matthews, 2018). Someone who has good physical fitness has higher VO_2Max value; thus, they can do more vigorous activities than those who are not physically fit (Safitri & Dieny, 2015).

The VO_2Max abilities of men and women are different. Gender differences may be essential for the performance and adaptation of individual training. After puberty, girls and boys begin to have many differences in body components. Girls have lower amounts of fat-free mass, less totsl body mass, and higher body fat. Male athletes have 10% higher VO_2Max compared to female athletes. Women exhibit VO_2Max that is approximately 10% lower than boys, this is a result of their lower hemoglobin concentration and their higher body fat percentage (Bompa & Buzzichelli, 2019). This occurs because women have lower haemoglobin concentrations and have more body fat. The VO_2Max value in male athletes is 70–85 mL/kg/min. In female athletes, the highest VO_2Max capacity ever reported was 68.4 mL/kg/min. in female athletes, the highest maximum oxygen intake ever reported was 68.4 mL/kg/min (Hermansen, L., and Andersen, K. L; (Higgs, 2013). To measure VO_2Max,

Katch, McArdle, Czula, and Pechar (2016) use the Balke treadmill test (mean = 2.29 L/min; 38.9 mL/kg/min) (Katch et al., 2016).

This aerobic endurance ability can be improved by providing an appropriate training program for each individual. Owing to the ability of each individual to respond to different training stimuli, aerobic endurance can be increased with an exercise program that is designed in accordance with the exercise principles (Karahan, 2012). Endurance training is divided into low-impact and high-impact aerobic exercise methods, both of which are effective methods for increasing physical endurance (Chovanec & Gröpel, 2020). High-intensity exercises can be used to increase VO_2Max in athletes (Moffatt et al., 2013). (Kalva-Filho et al., 2013) Finding a positive relationship between the relative intensity of VO_2max and repetitive sprint performance in soccer players.

The VO_2Max capacity of Padang futsal academy angels players in the city of Padang is inseparable from the role of the coach in providing appropriate training programs to increase the VO_2Max capacity of Padang futsal academy angels players in the city of Padang. The training program given to athletes must be adjusted to the initial abilities the athlete has. The key to adapting the aerobic exercise methodology is the time used to approach VO_2Max (Belfry et al., 2020). Aerobic and anaerobic endurance, which are important components in football matches, could be improved by providing an appropriate training program (Fortuna et al., 2018). The theoretical explanation as well as the results of the abovementioned research related to aerobic endurance provide an understanding of the importance of aerobic endurance for futsal athletes. Then, this information becomes a reference for coaches and athletes in an effort to increase aerobic endurance by referring to the methodology and science and technology in preparing training programs for the 2021 PFA competition.

Conclusions

Based on the obtained results and discussion of research results, there is a decrease in the VO_2Max of all athletes after exercising from home. So, the coach must create an exercise program that can increase the athlete's VO_2max. Because in futsal sport VO_2Max is very important. Before compiling a training program, the coach must measure the initial abilities of each athlete, which will serve as a benchmark for preparing training programs and to determine training targets to be achieved. Providing an independent training program at the home of each athlete is an opportunity and a challenge for coaches during the COVID-19 pandemic. The developed training program that is guided by methodology, science and technology will not provide a significant increase in performance if it is not performed according to predetermined rules.

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