



## Small Side Game Training Contribution of Volume Oxygen Maximum Football Players Elite Pro Academy

Hari Pamungkas<sup>a\*</sup>, Muhammad Nidomuddin<sup>b</sup>, Havid Yusuf<sup>c</sup>, Agusti Mardikaningsih<sup>d</sup>, Heru Syarli Lesmana<sup>e</sup>

<sup>a,b,c,d</sup> Universitas Insan Budi Utomo, Indonesia

<sup>e</sup> University of Innsbruck, Austria

**Correspondence:** [haripamungkas@budiutomomalang.ac.id](mailto:haripamungkas@budiutomomalang.ac.id)

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### Abstract

Small Side Games are a training method in which game situations are presented as real games, leading players to master technical, tactical and physical aspects. The research ability to maximize oxygen greatly affects performance of athletes in matches/games, because, with a poor physique, athlete's game can be detrimental to himself and team. The population of Bhayangkara U-18 men's football players consisted of 25 people, especially football in wading through EPA (Elite Pro Academy) competition. This study used experimental method with one-group pretest-posttest design. The analysis technique used in this study was t-test with a significance level was 0.05. The average VO<sub>2</sub>Max pre-test for U-18 was 45.01 ml/kg/min, while the post-test VO<sub>2</sub>Max average was 49.92 ml/kg/min. The average difference between the two was 4.90 ml/kg/min. Monitoring and evaluation, regularly assess players' VO<sub>2</sub>Max levels to track improvements and adjust the training program accordingly. Frequency and duration at least two to three times a week in the training schedule. Each session should last for 20-30 minutes to ensure sufficient training stimulus. Consider playing position, performance goals, and physiological capabilities when designing small-side game sessions.

**Keywords:** Elite pro academy; football player; physical performance; small side game; VO<sub>2</sub>Max

### 1. Introduction

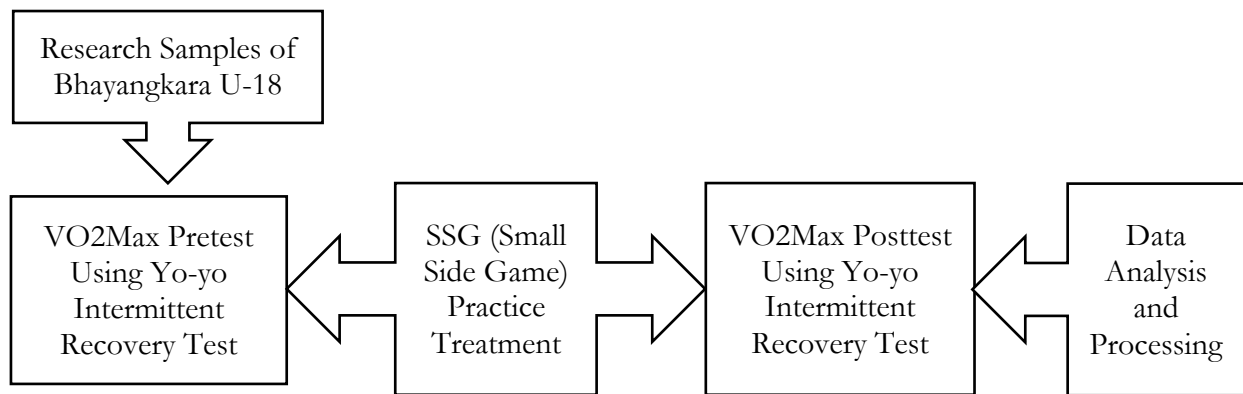
Small Side Games are a training method in which game situations are presented as real games, leading players to master technical, tactical and physical aspects. To improve players' performance, players must not only train physically and technically but also practice psychologically such as spirit, motivation, and confidence (Munir et al., 2023). Small-sided games are a way of practicing using a small-scale field to improve technique and tactics in football (Wardana et al., 2018). SSG is better than individual practice a form of football practice because it resembles a full-field game (Olthof et al., 2018). SSG also has a positive effect on tactical-technical skills, fitness, and psychological characteristics compared to other training strategies. The benefits of combining specific actions with fatigue and perceived pressure are comparable to the competitive climate of the game (Hammami & Bouhlel, 2017). The effect of Small Side Game training (SSG) on physical condition and specific skills related to team sports based on the level of play and season of competition (Sanchez et al., 2016). Football is a game that requires endurance for a long time. Endurance is important in the game of football because within 90 minutes or more, a player performs continuous physical activity with various forms of movement such as running, jumping, sliding, body charging and so on which requires high endurance (Nidomuddin et al., 2020).

The ability to maximize oxygen greatly affects the performance of athletes in matches/games, because, with a poor physique, the athlete's game can be detrimental to himself and the team. The goal of maximal oxygen is to improve not only lung function and circulation but also the work capacity of the heart (Arridho et al., 2021).  $\text{VO}_2\text{Max}$  shows the amount of oxygen consumed by the body, the units are expressed in liters or military, and the point "V" is a sign indicating that the volume of oxygen is expressed in the same time per minute (Pamungkas & Nidomuddin, 2019). Physical ability is measured to find out the extent to which the players can play optimally in a match (Pamungkas et al., 2022). The accumulation of lactic acid that occurs when using an anaerobic energy system can be neutralized by the amount of oxygen that enters the body with a high  $\text{VO}_2\text{Max}$  capacity (Paskalis et al., 2022). Explains that  $\text{VO}_2\text{Max}$  is the greatest speed of oxygen consumption and is an absolute measure of the greatest speed a person can provide ATP energy with aerobic metabolism (Umar, 2014). Maximum oxygen volume ( $\text{VO}_2\text{Max}$ ) is the maximum amount of oxygen that can be consumed during intense physical activity until fatigue eventually occurs. (Atsilah, 2022) The  $\text{VO}_2\text{Max}$  value depends on cardiovascular, respiratory, and hematological conditions and exercise ability. Continuous training lacks a rest period, whereas interval training has a recovery period during loading. It is believed that after their relaxation, the players' bodies are more ready for the upcoming loading (Bahtra et al., 2023).

Elite Pro Academy is an age group football league system managed, regulated, and controlled by Indonesia Football Association (PSSI) (Arianto, 2016). This system was launched in early 2018 and was held for the first time in 2018. Starting in 2018, the system will cover under 16 years, starting in 2019 under 18 years, and 20 years. Elite Pro Academy is held jointly with League 1. This competition is attended by 18 League 1 teams. Elite Pro Academy under the age group of 18 years was launched in 2019 (Hutajulu et al., 2022). One of the participants in this league is Bhayangkara U-18 based in Wibawa Mukti, Bekasi Regency. As one of the teams with the ambition to fight for the title, Bhayangkara U-18 players are required by law to have excellent physical condition with a very busy competition schedule. So, an exercise program that improves the body's aerobic ability must be given to the players to achieve the target. Based on the contribution of SSG or Small Side Game training and  $\text{VO}_2\text{Max}$  for Elite Pro Academy players, it is necessary to study the contribution of SSG to  $\text{VO}_2\text{Max}$  for Pro Elite Academy players. The contribution that will be studied is the effect of SSG training on  $\text{VO}_2\text{Max}$  in Elite Pro Academy players.

## 2. Method

The method used in this study was experimental using a one-group pretest post-test design. Where experimental research was conducted to determine the contribution of the treatment given to the subject. The population of Bhayangkara U-18 men's football players consisted of 25 players and the sample in this study was the total number of Bhayangkara U-18 players. The subjects of this study were all players who were the same age, as well as the same training pattern. In this study, the test was carried out twice, which were during the pretest (initial test) and post-test (final test). Training was conducted six days a week, with training duration of three hours a day. So that the results of the treatment were expected to be known more accurately because there was an influence between the conditions before and after being given treatment. The following is a picture of the research flowchart that were carried out.



**Figure 1. Small Side Game Training Contribution Research Flowchart**

The flowchart of this study used a sample of entire players Bhayangkara U-18, on a pretest using an instrument yo-yo intermittent recovery test to find out the initial condition of a player. Afterwards, all players were given the same treatment with the same pattern of training, intensity, and duration for three months. After the treatment, the entire players were assessed for post-test for maximum aerobic capacity positions, to be able to obtain an effect of treatment. The analysis technique used in this study was the t-test with a significant level of  $\alpha$  0.05, using the Excel formula.

### 3. Result

It is necessary to study the contribution that will be studied is the effect of SSG (Small Side Game) training on  $VO_2Max$  in Elite Pro Academy players. The purpose of this study was to describe the contribution of SSG Training conducted six days a week, duration of three hours which was carried out for three months by measuring  $VO_2Max$  using the yo-yo intermittent recovery test so that these parameters can be seen through improving the endurance conditions of Bhayangkara U-18 players. Based on the results obtained, the following is a classification of weight, height, and Body Mass Index (BMI) values with pre-test and post-test  $VO_2Max$  values on Bhayangkara U-18 players.

**Table 1. Height, weight, and BMI results for Bhayangkara U-18 players for 3 months**

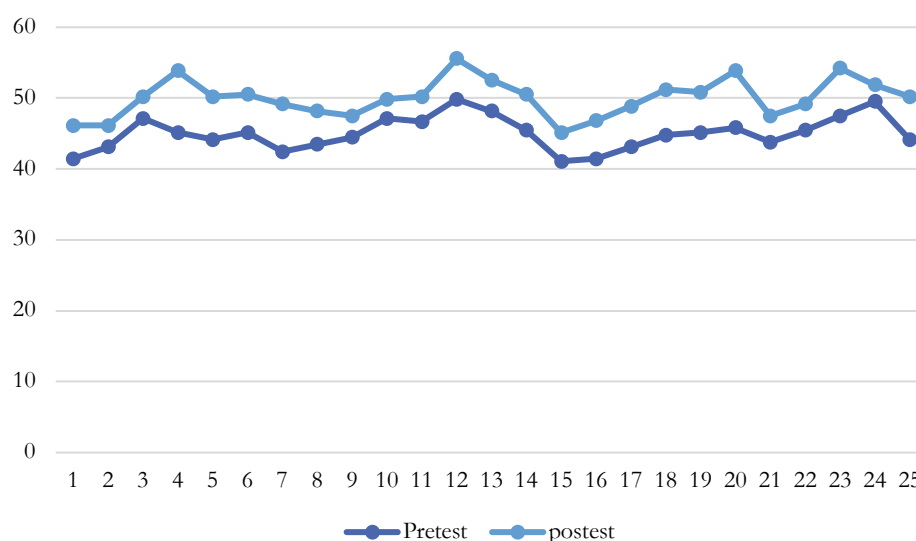
	Height	Weight	BMI
<b>Total</b>	42.05	1593	561.77
<b>Average</b>	1.68	63.72	22.47
<b>Max</b>	1.77	79	26.23
<b>Min</b>	1.6	50.5	19.72

Table showed that the height, weight, and BMI of the Bhayangkara U-18 players have a minimum height of 1.6 m, a max of 1.77 m, and an average of 1.68 m. At the same time, the weight is min 50.5 kg, a max of 79 kg, and an average of 63.72 kg. For BMI with a value of min 19.72, max 26.23, and average 22.47. The overall BMI of Bhayangkara U-18 players is in the normal category of 22.47.

**Table 2.  $VO_2Max$  results for Bhayangkara U-18 players for 3 months**

Test	Unit	U-18 Bhayangkara Players		Statistic	
		Pretest	Posttest	$\alpha$	t-Test
		Mean (SD)	Mean (SD)		
$VO_2Max$	ml/kg/min	43.83 (6.31)	50.43 (2.87)	0.05	0.00

Table 2 shows that the  $\alpha$  is 0.05 and the t-test is 0.00. With a significance level of probability t-test was 0.00 ( $p < 0.05$ ). This means that there is a significant effect on SSG (Small Side Game) training on  $VO_2\text{Max}$  and U-18 Bhayangkara Players. The average  $VO_2\text{Max}$  pre-test for U-18 was 43.83 ml/kg/min, while the post-test  $VO_2\text{Max}$  for U-18 average was 50.42 ml/kg/min. The average difference between the two is 6.59 ml/kg/min. Results from standard deviation on pre-test was 6.31 and at the time of posttest obtained was 2.87.



**Figure 1. Differences between  $VO_2\text{Max}$  Pretest and Posttest U-18 Bhayangkara Players**

The results of this study show data through pre-test treatment and post-test on U-18 Bhayangkara players. Changes in aerobic endurance conditions that can be increased by using the SSG (Small Side Game) treatment contribute to achieving successful sports achievements, especially football in wading through the EPA (Elite Pro Academy) competition for the age group under 18 years. The results of small-side game training can contribute to improving the physical condition of football players, including increasing  $VO_2\text{Max}$ . During the training, all participants were asked to defend and attack, and no goalkeepers (Halouani et al., 2017). This exercise can help increase a player's aerobic and anaerobic capacity, which in turn can influence the volume of  $O_2$  maximum. Although small-side game training can make a positive contribution to increasing the volume  $O_2$  maximum, it is important to note that other factors such as nutrition, adequate rest, other exercises, and a structured training program also play an important role in increasing football players'  $VO_2\text{Max}$ .

#### 4. Discussion

In football games, a good level of physical fitness is needed, where the  $VO_2\text{Max}$  value is one of the criteria in selecting the line-up. Higher  $VO_2\text{Max}$  of a player, higher cardiovascular ability of the player. If a player experiences fatigue easily, even if they only do light physical activity, they usually have a low volume  $VO_2\text{Max}$  value (Yola et al., 2020). The endurance that every football player has is greatly influenced by the training process carried out by the players and various other factors. Doing exercises according to the program given by the coach has a good impact on the player (Allsabab, 2021). The  $VO_2\text{Max}$  ability of football players is not optimal because many factors in training cause this. Maybe football players are not used to doing exercises that can increase aerobic endurance (Anggara & Subagio, 2021). This is one of the factors that become an obstacle in finding a game pattern that suits the anatomy of Indonesian society. To make their football players better and more successful. Also, it should turn to other studies and examine functional-motor status, psychological preparation as well as coach tactics and strategies in football players in analyzing whether there is room for team improvement (Gardasevic et al., 2019).

From the results of this study, the player's position using standard  $\text{VO}_2\text{Max}$  for each position shows that there are no goalkeepers, defenders, midfielders, or attackers that meet the  $\text{VO}_2\text{Max}$  standard in the reference norm (Gardasevic & Bjelica, 2020). The physical condition of good players will certainly make it easier for coaches to formulate strategies that follow the tactics to be used, this is very influential for the team if one of the players is less physical. Most teams in Indonesia will conduct pre-competition training camps in mountainous areas, hoping to increase their players' oxygen levels before facing competition.  $\text{VO}_2\text{Max}$  was observed in highland and lowland athletes during anaerobic training. Where the  $\text{VO}_2\text{Max}$  level of athletes training at altitude is better (Bafirman et al., 2023).

The high-intensity nature of Small Side Games places substantial demands on the cardiovascular system, making them effective in improving aerobic capacity. Research studies have shown that regular participation in Small Side Games leads to significant improvements in  $\text{VO}_2\text{Max}$  among football players. The intermittent nature of these games, involving short bursts of intense effort followed by brief periods of recovery, closely resembles the physiological demands of a real match. This type of training enhances the players' ability to sustain high-intensity efforts over an extended period, leading to improved aerobic fitness.  $\text{VO}_2\text{Max}$  is the gold standard for assessing cardio-respiratory endurance (Buttar et al., 2019).

Adjust the size of the playing area based on the desired training focus. Identified specific variants in the mitochondrial genome that were significantly more common in individuals characterized by low  $\text{VO}_2\text{Max}$  exercise capacity compared to others with high exercise capacity (Vellers et al., 2020). Progressive overload gradually increases the intensity and difficulty of the small-side games over time. Manipulate factors such as playing time, number of players, or field dimensions to create a progressive overload and continually challenge the players' aerobic fitness. Integration with incorporate technical skills training within the Small Side Games to enhance players' decision-making abilities and technical proficiency under fatigue. This combination will closely mimic the demands of real match situations. Small-side games are widely considered a powerful pedagogical tool, and over the past decade, their role in improving physical and physiological parameters has also been increasingly recognized (Clemente et al., 2021).

Monitoring and evaluation, regularly assess players'  $\text{VO}_2\text{Max}$  levels to track improvements and adjust the training program accordingly. Exercise intensity is measured as a percentage of  $\text{VO}_2\text{Max}$ , heart rate reserve (HRR),  $\text{VT}$ , maximum power ( $\text{Pmax}$ ), or maximum heart rate ( $\text{HRmax}$ ) (Williams et al., 2017). Consider using fitness tests specific to football, such as the Yo-Yo Intermittent Recovery Test or the 30-15 Intermittent Fitness Test. Individualization, tailor the training program to the specific needs and characteristics of each player. Consider their playing position, performance goals, and physiological capabilities when designing small-side game sessions. By implementing these recommendations, coaches, and trainers can optimize the training of elite pro football players, leading to improved  $\text{VO}_2\text{Max}$  and enhanced overall performance on the field.

Training (with a basic UEFA diploma and eight years of youth football coaching experience) two teams of five players of equal experience (two defenders two midfielders and one forward) three SSG teams in this order: 3v3 4v4 and 5v5 No goalkeeper competition (6 players in 3v3 only (1 defender 1 midfielder and 1 striker per team) 8 players in 4v4 (1 defender 2 midfielders and 1 striker per team) (Silva et al., 2016). Besides that, this training model can also affect all physical aspects of the player, to be able to get out of the opponent's pressure. With the hope of being able to hone skills in playing football both individually and as a team. The specific value of  $\text{VO}_2\text{Max}$  or training dose where central rather than peripheral adaptation mediates the increase in  $\text{VO}_2\text{Max}$  demonstrated in response (Astorino et al., 2017).

Small-side game practice is very good to use because it focuses more on players with the rules that apply. An appropriate training program will create athletes who are reliable in their time and don't get

hung up on the achievements of young athletes. Focus on achievement for coaching young players will damage the growth and mentality of athletes, it tends to overestimate aerobic capacity in those less fit and to underestimate it in the more fit (Dolezal et al., 2015). Do the exercise program gradually, starting with light, moderate, medium, and high loads (Pamungkas & Nidomuddin, 2018). Other factors that can affect body fat percentage and VO<sub>2</sub>Max such as nutritional patterns, lifestyle, and exercise patterns are not considered.

## 5. Conclusion

Elite professional football players can greatly increase their VO<sub>2</sub>Max through small-side game training. The goal of this training approach is to raise VO<sub>2</sub>Max, a crucial physiological measure that indicates an individual's maximum oxygen consumption during strenuous exercise. It is closely related to the aerobic fitness and endurance capacity of athletes. further research on Small Side Games can be conducted as matches or drills with a smaller number of players and a smaller playing area, offering several benefits for soccer players. These exercises simulate match-like conditions, which require players to make quick decisions, demonstrate technical skills, and make frequent changes of direction, according to the current philosophy of Indonesian football which emphasizes endurance, strength, and speed where players are required to be able to defend and attack and be able to make transitions from defense to attack or attack to defense.

Based on the findings and benefits of the Small Side Games exercise to increase VO<sub>2</sub>Max in elite professional soccer players, it is recommended that coaches and trainers include the exercise in their training program. Frequency and duration, include Small Side Games at least two to three times a week in a training schedule that aims not only to improve physicality but also to improve technique because in this training model players are required to perform movements with high intensity and touch the ball as often as possible. Each session should last for approximately 20-30 minutes to ensure sufficient training stimulus. Varied game formats, use a variety of small-sided game formats, including 3v3, 4v4, or 5v5, to challenge players' aerobic capacity while maintaining high intensity.

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