

The Effect of Small Sided Games Exercise and Vital Lung Capacity Toward VO₂max in Football Players Age 14-17

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Abstract

The players' aerobic endurance is insufficient, and as a result, they do not perform adequately during the competition. The purpose of this study was to analyze the effects of small-sided games with variations of 6vs6 (free touch) and 4vs4 (two touch), effects of high and low vital lung capacities, and interaction between Training methods and lung vital capacity on VO₂max. Method used a quasi-experimental pretest-posttest design, 20 the sample 20 participants age 14-17 years old. Independent variables are Small-sided games and vital lung capacity, and dependent variables a VO₂max. Multistage bleep test was employed as instrument for VO₂max. Anova used to data analysis. Results that: 1) the 6vs6 variation (free touch) obtained a mean of 43.3, while the 4vs4 variation (two touch) obtained a mean of 40.2 with a value of ($p=0.0030.05$). 2) With a value of ($p=0.000.05$), high vital lung capacity obtained a mean of 44.6 and low vital lung capacity obtained a mean of 38.8. 3) small sided games activity with variants of 6vs6 resulted in a mean of 45.9 while a mean of 40.8 resulted in a low vital lung capacity. Small sided games exercise with variations of 4vs. resulted in a mean of 36.9 with a value ($p=0.440>0.05$). Conclusion that VO₂max, practicing small-sided games 6vs6 version was better to practicing with the 4vs4 variation. VO₂max member with high vital lung capacity was preferable to one with a low vital lung capacity. There was no interaction of training method and vital lung capacity toward VO₂max.

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INTRODUCTION

Football requires an exceptional level of physical fitness to support the player's skills. Journal (Ridwan, 2020), A football player's physical condition is a need for improving and developing excellent sports performance. To achieve best performances, efforts must begin at an early age, such as the establishment of a football school (SSB). The football school (SSB) is a football organization dedicated to develop athletes' potential (Aprianova, 2016).

SSB has an important role and has a great responsibility for the future development of Indonesian football achievements, since it is through this football school that the seeds of reliable football players are sown (Susanto & Lismadiana, 2016). Journals (Fatahilah et al., 2017). argues that peak performance in sports may be achieved through a systematic, planned, consistent, and continuous coaching process. Porba Putra football school is one of the football schools located in East Lampung district.

SSB Porba Putra teaches students how to play good football by emphasizing basic techniques, tactics, and strategies for the game in order to achieve the highest level of achievement; additionally, it can develop generations that are physically fit and have character in order to develop into professional footballers. East Lampung Porba Putra SSB has achieved the following: 2nd Place Between SSB in 2017, 2nd Place Between SSB in 2018, and 3rd Place Between SSB in 2019.

Based on observations made during the competitive match, it was determined that there were issues, including the following: 1) In each match, players may attack early on, but by the last minute of the first half, they were exhausted; even in the second half, SSB Porba Putra's players were compelled to play exclusively defensively. 2) After a pass, players remain stationary, not seeking for an open space; in fact, several players are spotted wandering frequently, disrupting the game's structure. 3) When players lose a battle or possession of the ball, they frequently commit infractions to halt the opponent's offensive, a condition that the opponent uses to score goals. Apart from observations, the researchers conducted

interviews with coaches and learned that they were dissatisfied with their accomplishments thus far because they were only able to win two and three between SSBs and never at other high level contests. Additionally, the training program supplied thus far has not resulted in an improvement in physical condition, as the manner of physical exercise is limited to 12 minutes of jogging, and there is no special training program to support physical condition. As a result, researchers are recommended to conduct tests utilizing the MFT (Multistage Fitness Test) as a baseline to ascertain each player's level of endurance. It is known that of the 36 KU 14-17 players who took the test, 10 (28%) fell into the poor category, 23 (64%) into the moderate category, and 3 (8%) into the good category.

Technical training, tactics, and strategy are insufficient to improve a player's skills to play football; they should additionally engage in physical conditioning exercises such as extra cardiovascular endurance. Physical fitness is important and form the basis for developing football techniques, tactics, and strategies (Thompsett et al., 2016). The greater the VO₂max value, the more oxygen the body can use for metabolism, ensuring that the athlete has adequate endurance and stamina (Festiawan et al., 2020). VO₂max (maximum oxygen volume) is the greatest amount of oxygen that muscles can use in one minute to synthesize aerobic energy reserves. It is expressed in milliliters of oxygen per kilogram of body weight (Ilmiyanto & Budiwanto, 2017).

VO₂max is defined in the journal (A. T. Candra & Setiabudi, 2021) as the maximum volume of oxygen consumed and processed by an individual during intense physical exercise. To attain sporting success, effort and dedication are required in the form of planned, measured, and consistent training (Ulum, 2014). A good exercise is one that is created in a systematic and continuous manner, taking into account the features of the branch (Maryono et al., 2017). According to (Putra et al., 2015), coaches can use a variety of different types of exercise to help football players improve their VO₂max ability, including interval training, fartlek training, continuous training, and small sided games exercises.

Small sided games are exercises that increase players' technical, tactical, and physical mastery simultaneously (D. R. Saputra & Yenes, 2019). The implementation of small sided games in the skills training process can result in more effective improvement, as the coach will have an easier time supervising with a smaller field and fewer players. To maintain a high level of aerobic endurance, it is necessary to have a healthy vital lung capacity in order to absorb more oxygen. A spirometer is the instrument that can be used to determine the volume of air entering and exiting the lungs. The spirometer is a device that measures the flow of air into and out of the lungs and records the data as a volume per time graph (Syahda et al., 2016).

The lungs' vital capacity is defined as the volume of air taken in during inspiration divided by the volume of air released during expiration (Warganegara, 2015). Vital capacity is equal to the sum of the inspiratory reserve volume, the tidal volume, and the expiratory reserve volume, which ± 4600 ml. Techniques, tactics, and strategies will be ineffective if a player possesses insufficient aerobic endurance.

METHODS

This quantitative study was using a quasi-experimental method with pre-test and post-test.

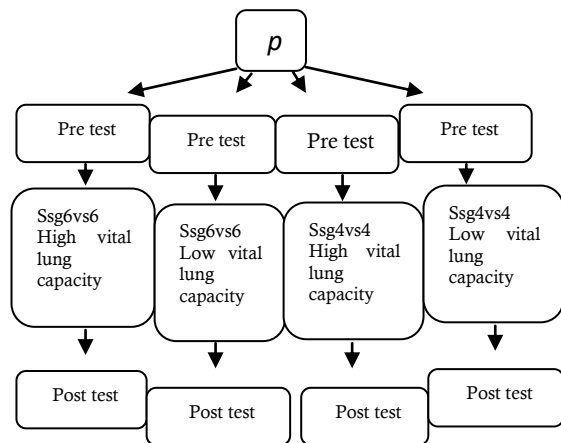


Figure 1. Research Design

This research took place over the course of a month and included 12 meetings; three meetings occurred in an one week. Pre-test, treatment, and post-test were the stages of data collection

procedures. In this study, the pre- and post-tests were conducted using a multistage bleep test. The sample for this study comprised twenty participants aged 14-17 years, with an average age of 15 years and a standard deviation of 0.945. With ordinal pairing, the sample will be separated into four groups (A-B-B-A). The variables in this study are all independent variables, included: X1: small-sided games with a high vital capacity (6vs6), X2: small-sided games with a low vital capacity (6vs6), X3: small-sided games with a high vital capacity (4vs4), and X4: small-sided 4vs4 games with a low vital lung capacity (4vs4).

VO2max was the dependent variable. The 6vs6 variant exercise in this study used a 45x35 meter field, while the 4vs4 variation exercise used a 30x20 meter field. The instrument used in this study measured VO2max with a multistage bleep test and vital lung capacity with a spirometer. The multistage bleep test was performed by having participants run back and forth at a distance of 20 meters while a "toot" sound is heard; each turn has a different level and level; the higher the level and feedback received by the player, the higher the VO2max result. While doing the spirometer test, the player inhales as forcefully and as much air as possible into the lungs and then exhales as hard as possible via the mouth piece spirometer; measures are taken three times and the best value is recorded.

The prerequisite test used the Kolmogorov-Smirnov normality test and the leavene's or F test for variance homogeneity. The data analysis technique to test the hypothesis was by using two-way analysis of variance (ANOVA).

RESULT AND DISCUSSION

Data collection was using pre test and post test. The results presented in the table below:

(ml/kg/min)

Training Methods	N	VO2max Pretest	Posttest	Sig
6vs6 high VLC	5	39.9 ±1.08	45.9±2.24	.002
6vs6 low VLV	5	34.9±1.68	40.8±1.61	.000
4vs4 high VLC	5	38.8±.93	43.4±2.02	.003
4vs4 low VLC	5	34.8±1.72	36.9±1.96	.004

P_{value} < 0,05, Paired Sample Test

VLC (vital lung capacity)

The findings of the pre- and post-tests showed an increase in VO₂max. The group exercising in small sided games with the 6vs6 variation with high vital lung capacity increased by 6.0, whereas the group with low vital lung capacity increased by 5.8. Meanwhile, the group participating in small-sided games exercise with the 4vs4 variation of high vital lung capacity increased by 4.6, while the group participating in low vital lung capacity increased by 2.1. Additionally, the table above showed that the pre- and post-test data obtained a value ($p=0.05$), indicating that there was a statistically significant difference between the pre- and post-test data.

Table 2. Hypothesis testing

Source	Mean square	F:	Sig.
Training methods (TM)	48.672	12.465	.003
Vital Lung Capacity (VLC)	168.200	43.076	.000
TM*VLC	2.450	.627	.440

$P_{value} < 0.05$. $a.R\ squared = .726$ ($adjusted\ R\ squared = .674$)

Table 2. Because the significant value for the first hypothesis was less than 0.05 ($p = 0.003$ 0.05), it can be argued that the effect of 6vs6 (free touch) and 4vs4 (two touch) variation training methods on VO₂max was different. The 6vs6 variation (free touch) practice method obtained an average VO₂max of 43.3, whereas the 4vs4 variation obtained an average VO₂max of 40.2, indicating that the 6vs6 variation (free touch) practice method was better than the 4vs4 variation (two touches) by a mean difference of 3.1.

Testing the second hypothesis showed a significant value of less than 0.005 ($p = 0.0000$ 0.05), indicating that the influence of high and low vital lung capacity on VO₂max was different. Players with a high vital lung capacity achieved an average VO₂max of 44.6, while those with a low vital lung capacity had an average VO₂max of 38.8, implying that players with a high vital lung capacity outperform those with a low vital lung capacity by a mean difference of 5.8.

The third hypothesis was tested and a significant value more than 0.05 ($p = 0.440 > 0.05$) was achieved, indicating that there was no interaction between exercise methods and lung vital capacity and VO₂max. The 6vs6 (free

touch) small sided games exercise method with a high vital lung capacity had an average VO₂max of 45.9; the 6vs6 (free touch) small sided games exercise method with a low vital lung capacity had an average VO₂max of 40.8; the small sided games variation 4vs4 (two touch) exercises with a low vital lung capacity have had an average VO₂max of 43.4; the small sided games variation 4vs4 (two touch) exercises which had low vital lung capacity VO₂max average of 36.9.

DISCUSSION

Small-sided games are recommended for training young football players because they give a strong stimulation for improving physical condition and playing technique (Katis & Kellis, 2009). According to (Mubarok, 2019) p layers were forced to move actively, such as running, chasing the ball, sparring opponents, moving their bodies and changing directions, which improved their speed and agility, so it was increasing their aerobic ability.

“Small sided games are perceived to be soccer specific, allowing an optimisation of training time since physical performance, technical skills and tactical awareness are developed concurrently” (Coutts, 2011). According to Mielke, 2007 in the journal (Putra et al., 2016) stated that playing on small courts is an effective way to maintain and improve physical fitness.

Players with a high vital lung capacity can take in more oxygen, preventing them from being fatigued and allowing them to perform optimally. While players with limited vital lung capacity lack oxygen that the lungs can accommodate, they were prone to fatigue. Journals (Panggraita et al., 2017) The vital lung capacity of an individual was related to the amount of oxygen available in the body. As a result, the greater an individual's lung capacity, the greater his aerobic endurance. Journal (Wulandari & Sulandjari, 2021) stated “Players who do not have a good VO₂max will experience a decrease in stamina and will affect playing performance on the field”.

The group with a greater vital lung capacity outperformed the group with a lower vital lung capacity. When performing aerobic endurance exercise, lung capacity has had an effect on the

amount of oxygen consumed during exercise, as more oxygen must be given to the working muscles. If the lungs can accommodate a greater volume of air, the more oxygen is available to be circulated throughout the body. This enabled aerobic metabolism to continue longer, allowing the body to perform various activities without experiencing significant fatigue. Regular exercise also helped maintain the lungs' vital capacity, however if a person's lungs were contaminated with harmful substances, lung work and essential lung capacity were immediately reduced.

CONCLUSION

In summary: 1). There was a difference between the effects of 6vs6 (free touch) and 4vs4 (two touch) variations on VO₂max; the 6vs6 variation of small sided games is greater to the 4vs4 variety. 2). There was a difference in the effect of high and low vital lung capacity on VO₂max; players with a high vital lung capacity perform better on VO₂max than players with a low vital lung capacity. 3). On VO₂max, there was no interaction between exercise type and vital lung capacity.

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