# Effect of Small Side Games 3x3 on Oxygen Saturation (SpO2) in Extra-Curricular Participants Basketball SMK 1 Semarang

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Abstract: 3x3 small-sides games are a form of training that is often used in various sports, including basketball, to improve the technical and physical skills of athletes. In 3x3 games, the field used is smaller and the number of players involved is less than in regular games, so the intenity of the games tends to be higher. This condition can affect various physiological parameters, one of wich is oxygen saturation (SpO2). Oxygen Saturation (SpO2) is an important indicator that shows hiw effectively oxygen is transported by the blood throughout the body. This parameter is often used to measure the fitness and health condition of athletes, especially in the context of intense exercise. Changes in SpO2 during exercise ac provide important information about the body's adaptation to physical and cardiovascular stress. The method in this study used Quasy-experimental field with Pre-test one group research design. The source of data taken is oxygen saturation before and after playing small sides games 3x3 using a pluse oxymeter. The results of the Paired Sample Test obtained a value of 0.003(<0.05). the conclusion in this study small sides games 3x3 has a posotove effect on oxygen saturation (SpO2) in extracurricular basketball participants. An increase in SpO2 indicates that this exercise can improve the effeciency of the respiratory system and bloodi circulation, which in turn can improve athlete performance on the field.

Keywords: Small Side Games, 3x3, SPO2, Basketball



## INTRODUCTION

The game of basketball requires excellent physicl condition. It is very important for the coach to know the condition of his athlete in order to prepare the athlete to be able to develop properly (Gómez-Carmona et al., 2021). So basketball athletes must have good physical condition so that the level of effciency of heart and lung function in reciving oxygen does not experience excessive fatigue (Hudain et al., 2023)athletes who have good endurance have efficient circulation. Efficient circulation means that blood can flow smoothly throughout the body, carrying oxygen and nutrients to working myscles and removing metabolic waste product quickly. This is especially important in intense physical activities such as basketball,

where the demand for oxygen and nutrients increases dramatically (Febriani & Suhartini, 2024).

Good endurance allows athletes to maintain their optimal performance throughout a match, even under demanding physical conditions. With good blood circulation, the athlete's body can more effectively manage oxygen and energy, which helps delay the onset of fatigue. (Mourgan et al., 2024). This is not only important for maintaining individual performance but also crucial for the succes of the team as a whole. Coaches have an important role in ensuring that athletes achieve and maintain high levels of endurance. To this end, a good understanding of each athlete's physical condition is neceddary. Careful monitoring of heart and lung conditions can helm identify the body's leve; of efficiency in managing oxygen during physical activty. Efficient heart an lung function can prevent excessive fatigue and maintain athlete performance (Hudain et al., 2023).

Based on the biochemistry of energy formation, physical exercise is divided into two namely aerobic and anaerobic physical exercise (Saptono et al., 2021). Aerobic physical exercise is an exercise that depands on the availability of oxygen, while anaerobic exercise is an exercise that does not require oxygen assistance and relies on energy stored in the muscles and the results of the glycolysis process (Koutlas et al., 2023). Heart work will increase according to how much physical exercise we do (Suwanto et al., 2021). When doing physical ec]xercise, the muscle's need for oxygen increases form the normal state, this causes the need for muscle and oxygen (Rompas et al., 2020).

Structired and specific training, such as Small Side Games (SSG) 3x3, can be an effective solution to achieve thus. Small sides game (SSG) 3x3 is an increasingly popular training methode in basketball (Clemente, 2016). Ssg 3x3 involves games with three players pn each team, creating a more intensive and competitive training environment (Arslan et al., 2022). This game format allows athletes to train in situations closer to actual match conditions, with a focus on improving individual skills and game tactics (Arslan et al., 2022). SSG 3x3 demands quick responses, dynamic movement and close teamwork, all within a smaller space and shoter time. This partice not only hones technical skills but alsoimproves players physical endurance (McCormick et al., 2012).

Oxygen saturation (SpO2) is the percentage of hemoglobin bound to oxygen in the ateries. Most of the oxygen (O2) in the blood is transported by binding to hemoglobin oxygen is taken up by the blood through the lungs and bind to hemoglobin. He more oxygen that diffuses into the lungs and blind hemoglobin, the higher the SpO2 value. In the body of a normal person, the SpO2 value range from 95-100% (Kaprawi et al., 2016). Oxygen saturation refers to the raio between pxygen in the blood and hemoglobin (Haddad et al., 2024).

Low SpO2 values in athletes can be caused by several factors. Including excessive physical fatigue, suboptimal breathing techiques, or certain anthopometric

characteristics such assmall lung size (Cabanas et al., 2024; Zeng et al., 2023).

Athletes who havr good oxygen saturation values can achieve maximum endurance during competition, allowing them to maintain peak performance longer and recover faster form fatigue(Eroğlu et al., 2018). Thus, atletes can compete more effectively and increase their cances of victory. Heart rate and oxygen levels have a role when competing, if the heart rate is faster, the oxygen demand in the body also increased(Irianto et al., 2023).

Blood oxygen saturation levels and the factors that influence body oxygenation during physical activity and exercise have become interesting research topics in the field of sports science. Based on this statement, the researcher aimed to investigate whether there was a significant change in the oxygen saturation level of extracurricular basketball participants form SMK Negeri 1 Semarang before and after they played a 3x3 basketball match.

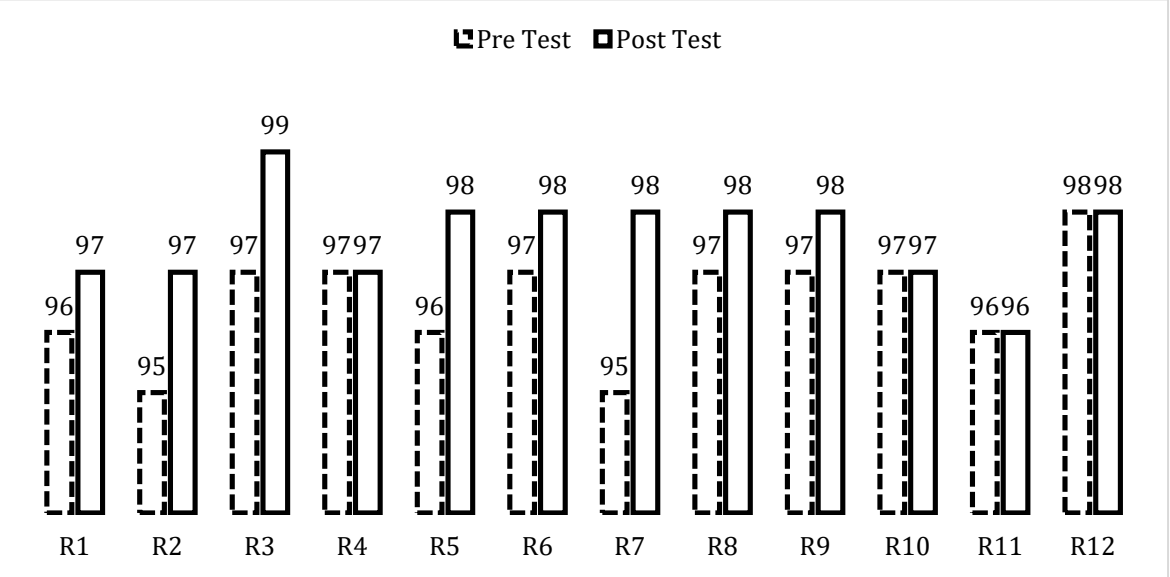
## METHOD

In this study, the type of research used was quantitative with descriptiv methods. Repsondents in this study were 12 male basketkball extracurricular students, the age of the respondents was 16.08 ± 0.69 Years, , height 166.58 ± 0.69 Cm, weight 55.98 ± 9.87 Kg, and body mass index 20.13 ± 2.75). This research was conducted at the basketball court of State Vocational High School 1 Semarang City on October 2023.

This type of research used Quasy-experimental field with pre-post one group research design (Sugiyono, 2017). The data source taken oxygen saturation before and after playing 3x3 basketball. The procedure in this study is that firs the participants are collected and by filling their biodata and given the procedures and sequences that will be carried out. Second, a pre-tes measuring air saturation using pluse oxymeter was carried out before playing 3x3 basketball match . the last stage participants took post-test data on air aturation levels using pluse oxymeter (Oh et al., 2024). In this study using descriptive statistics to presents the mean and standard deviation. Data normality test was performed using the Shapiro-wilk Test. For the homogeneity test using the Levene Test and the difference test using the Paired Samples T Test. The significance level used was 0.05. all analysis was carried out using SPSS Software.

## RESULTS

There were 12 male respondents with an averae oxygen saturation value before the 3x3 was 96.50 % and increased after the 3x3 match to 97.59%. figure 1 in detail illustrates the comparison of pre-test and post-test results of air saturation levels. This increase show that intense physical activity during the 3x3 match contributed positively to the increase in blood oxygen levels.




**Picture 1.** Differences in SpO2 pre-test and post-test results

**Tabel 1.** Descriptive statistics

| Statistic | Pre | Post |
|---|---|---|
| Mean | 96,5 | 97,6 |
| Median | 97 | 98 |
| Mode | 97 | 98 |
| Std. Devation | .905 | 793 |
| Variance | .818 | .629 |
| Kurtosis | -.326 | . 333 |
| Range | 3 | 3 |
| Minimum | 95 | 96 |
| Maximum | 98 | 99 |
| Sum | 1158 | 1171 |

**Tabel 2.** Data normality test of SpO2 pre-test result and SpO2 Post-tes results

| o. | Variabel | N | Normality Statistic | Sig | kesimpulan |
|---|---|---|---|---|---|
| *Pre Test:* | | | | | |
| | SpO2 | 12 | 0.867 | 0.060 | Normal |
| *Post Tes:* | | | | | |
| | SpO2 | 12 | 0.875 | 0.077 | Normal |

Based on the normality test presented in table 2, the data obtained during the pretest has a significance value of 0.060 or a value greater than 0.050, the data can be categorized as normally distributed data. Im addition, based on the post-test data, where the significance value obtained is 0.077,this value is also greater 0.050, so this data also categorized as normallu distributed data. The results of this

normality test are important because it ensures that the data analyzed meet the basic assumptions for further statistical analysis.

**Tabel 3.** Homogeneous Test Results

| o | Variabel | Df | siq | Kesimpulan |
|---|---|---|---|---|
| | Tingkat saturasi udara (SpO2) | 12 | 0.823 | Homogen |

In Table 3, the homogeneity test results show a significance value of 0.823 or more than 0.005, so the data can be categorized as homogeneous data. Data homogeneity is important because it indicates that the variability between groups of pre-test data and post-test data similar, so that the basic assumptions for conducting further statistical analysis are met. With homogeneous data, it can ensure that any differences found by uncontrolled variations but form the intervention of condition being tested, inthis case is small sides games 3x3.

**Tabel 4.** *T-Paired* test Results

| o | Variable | Mean | Sd | T | Sig | Kesimpulan |
|---|---|---|---|---|---|---|
| | Tingkat Saturasi Udata | -1.083 | 0.996 | -3.767 | 0.003 | Berpengaruh |

In Table 4, the Paired Sample Test results show a significance values (2-tailed) of 0.003, this value is much smaller than the threshold of 0.05, which means there is a significant effect between the pre-test and post-test scores.

## DISCUSSION

This study aims to determine the effects before and after playing 3x3 games in basketball on body air saturation. Basketball is a game with two teams with each consisting of 5 players by trying to put the ball into the opponent's ring (Bao & Bai, 2024). This game a requires players to try to get the ball into the opponent's ring as much as possible. As a basketball players on the field rely on movements in the form of speed, agility, hand strenght and strenght (Faza Annasai, 2023). 3x3 is a form of small sides games in basketball that presents more rapid movement movements that require a good physicological response (Sarah G. T. Bredt, 2020). The 3x3 rules are slightly different from normal basketball, including a shorter match duration and the use of faster attack times. The 3x3 format demands high individual skills, strong teamwirk and quick decisions due to more limited space and fewer players at the time of play (Oproescu et al., 2023). According to (Krzysztof Kocot, 2020) the body when doing any spot the need for oxygen in the body will automatically increase. From the statement above, it can be said that the 3x3 game ini basketball requires food individual techniques, strong body stamina, and good teamwork.

The results of this study indicate an increae in air saturation values between pre-test and post-test values. Table 3 identifies that the results of the paired sample

test show a significance values (sig) of 0.003, ehich is smaller than the threshold of 0.005 significance value between air saturation values before and after athletes play 3x3 games. In other words, values in the athletes bodies. This show that the intensity and dynamics of the 3x3 game can increase the respiratory capacity and oxygen efficiency in the athletes bidy, providing emprirical evidence that the 3x3 game not only trains the skills of playing basketball but also improves aspects of physical healy, especially in term of respiratory function. This is the same as research conducted in greece by (Nikolaos Koutlianos, 2020) namely in rowing atlhetes with a minimu training experience of 2 years aged 18-23 years getting the results that when rowing at the 7th minute there was an increase in oxygen saturation in each atlhete. This agrees with research conducted in italy by (Fancesco Coscia, 2020) in triathlon athletes after doing cycle ergometer test the level of air saturation significancly increased. This is also the same as reasearch conducted by (Tugay Yilmaz, 2018) in turkey, namely in judo athletes after performing plyometric movements, the value of air saturatiob increased.

When doing small sides games 3x3, the oxygen saturation level in the players bodies tends to increase. This happens because the 3x3 format requires players to work harder by making quick movements and playing at a high intensity. with only there players on each team, more limited space forces each player to be activity involved in every aspect of the game, both in defense and offense. Fast movements and quick position changes require a increases. Thus small sides games 3x3 can be considered as an effective game ti improve the overall health and fitness of players.

## CONCLUSION

In this study, there was a significant difference in the level of air saturation value (SpO2) in ectra-curricular basketball participants of SMK Negeri 1 Semarang before and after doing small sides games 3x3 basketball. SpO2 measurements were taken before and after doing small sides games 3x3 using the Pluse oxymeter. There was a significant increase in SpO2 values after the participants completed the 3x3 match. This increase indicates that the intensive physical activity that occurred during the game ws able to increase the efficiency of the respiratoty system dan blood oxygenation in participants. This study thus highlihhts the potential of small side games as an effective training methode to improve physical fitness and athletic performance students.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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