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Comparison of Morning Training and Evening Training on VO2Max of Futsal Athletes at SMA Negeri 4 Makassar

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ABSTRACT

This study aims to analyze the effect of sports implementation time, namely morning and evening, on the VO2Max of futsal athletes at SMA Negeri 4 Makassar. Formulation of the problem What is the difference in the VO2Max value of futsal athletes at SMA Negeri 4 Makassar who exercise in the morning compared to those who exercise in the evening? This research uses a quantitative approach with experimental methods. The research sample consisted of 10 futsal athletes who exercised in the morning and 10 athletes who exercised in the evening. The data obtained were analyzed using statistical tests with a significance value of P<0.05. The research results showed that the average VO2Max value of athletes who exercised in the morning was 37.8700, while athletes who exercised in the evening had an average VO2Max of 36.2100. The statistical test results showed a P value of 0.00 (P<0.05), which indicated a significant difference between the two groups. The difference in VO2 Max between morning and evening exercise is 1.6600, which shows that morning exercise tends to provide better VO2 Max results than evening exercise. From the results of this research, it can be concluded that the timing of sports has an influence on the VO2 Max of futsal athletes at SMA Negeri 4 Makassar. Exercise done in the morning is more effective in increasing VO2 max capacity compared to exercise in the evening.

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A. Conception and design of the study;
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INTRODUCTION

Exercise is a physical activity that offers numerous health benefits, particularly in improving physical fitness. One of the key indicators of physical fitness is VO_2Max (Maximum Oxygen Volume), which reflects the body's capacity to consume oxygen during intense physical activity. In the world of sports, especially for futsal athletes, a high VO_2Max level is crucial for endurance, speed, and overall performance during matches. The timing of exercise is often a topic of debate in the fitness world, especially regarding the effectiveness of morning versus evening workouts (Atty et al., 2024).

Morning exercise has several unique benefits that contribute to the improvement of VO_2Max. In the morning, the air tends to be fresher and contains fewer pollutants,

allowing the respiratory system to function more optimally. Additionally, exercising in the morning helps activate metabolism earlier, enhances fat burning, and trains the heart and lungs to work more efficiently. However, since body temperature is still relatively low in the morning, muscles and joints may be less flexible, making proper warm-ups essential to reduce the risk of injury. Some studies suggest that consistent cardiovascular training in the morning, such as running or cycling, can improve aerobic capacity. Furthermore, morning exercise can also provide psychological benefits, such as increased energy and focus throughout the day, which indirectly supports the sustainability of a training program aimed at boosting VO_2Max (Barbosa et al., 2024).

On the other hand, exercising in the evening also has its advantages in enhancing VO_2Max. At night, body temperature is generally higher than in the morning, which means muscles are more flexible and physical performance can be more optimal. This condition allows individuals to engage in higher-intensity workouts, such as interval training or strength training, which can accelerate VO_2Max improvement. Moreover, some studies indicate that athletic performance tends to be better in the late afternoon to evening due to more stable levels of hormones such as testosterone and cortisol. This can support better endurance and recovery after training. However, one downside of evening exercise is the potential disruption of sleep patterns, especially if performed too close to bedtime.

Morning exercise is believed to boost metabolism and provide more energy for daily activities. Meanwhile, evening exercise is considered more optimal for some individuals because the higher body temperature in the afternoon or evening enhances muscle flexibility and performance. However, there is still limited research specifically comparing the effects of exercise timing on VO_2Max, particularly for high school-level futsal athletes. SMA Negeri 4 Makassar has several futsal athletes who regularly train to enhance their performance. However, it is not yet certain whether morning training is more effective than evening training in improving the VO_2Max of these athletes. Therefore, this study aims to compare the effects of morning and evening exercise on the VO_2Max of futsal athletes at SMA Negeri 4 Makassar.

Both morning and evening exercise have their advantages in increasing VO_2Max. Morning exercise relies more on efficient oxygen utilization in a fresher environment, while evening exercise allows for higher-intensity training due to a more optimal body temperature. The best time for exercise depends on individual preferences, daily schedules, and bodily responses. Nonetheless, consistency and the right training methods remain the key factors in enhancing overall aerobic capacity.

Futsal is a sport that demands high physical fitness, especially in terms of cardiovascular endurance. One of the main indicators of cardiovascular fitness is VO2Max, which is the body's maximum capacity to consume oxygen during intensive physical activity (Lhaksana, 2011). VO2Max plays a very important role in determining an athlete's performance, especially in sports that require high intensity such as futsal. Training time is one factor that can influence increasing VO2 max. Generally, exercise can be done in the morning or evening, depending on the individual's schedule and

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condition. Morning exercise is often associated with a fresher body condition and a cooler environment, while evening exercise allows the body to carry out activities with muscles that are more flexible after being active all day. However, there are still differences of opinion regarding the effectiveness of training at these two times in increasing VO2 max (Sabri, 2019).

SMA Negeri 4 Makassar has a futsal team that regularly carries out training to improve their performance in competitions. However, it is not yet known for certain whether morning or evening training is more effective in increasing athletes' VO2 max. Therefore, this study aims to compare the effectiveness of morning training and evening training on VO2Max of futsal athletes at SMA Negeri 4 Makassar.

METHODS

This study employs a quasi-experimental method with a pre-test and post-test control group design. The research subjects were divided into two groups: the morning training group and the evening training group, each consisting of 10 futsal athletes from SMA Negeri 4 Makassar. The population in this study includes all futsal athletes from SMA Negeri 4 Makassar. The sample was selected using purposive sampling based on the following criteria (Pasaribu, 2020):

1. Actively training futsal athletes for at least the last six months.
2. Not experiencing injuries or health issues that could affect fitness.
3. Willing to participate in all research stages.

Research Procedure

1. Pre-test: Initial VO2 Max measurement using the Multistage Fitness Test (Beep Test).
2. Intervention:
   a. Group 1 (Morning Training): Training sessions from 06:00 to 07:30 for four weeks.
   b. Group 2 (Evening Training): Training sessions from 18:00 to 19:30 for four weeks.
   c. The training program includes warm-up exercises, aerobic training, futsal-specific training, and cooldown sessions.
3. Post-test: Re-measurement of VO2Max after four weeks of intervention.

Data was collected through testing and measurement using the Beep Test before and after the intervention (Ilyas, 2019).

Subject Preparation: Ensure that the futsal players are in good health and ready for physical testing. Ensure they are not fatigued or experiencing health problems that may interfere with the test.

Environmental Conditions: Prepare a field or area with a minimum length of 20 meters for the test.

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RESULTS AND DISCUSSION

The description test is a data test aimed at being able to interpret and give meaning to the research data.

Table 1.
Summary of the results of the descriptive analysis of comparative data of morning and evening sports on VO2Max futsal athletes of SMA Negeri 4 Makassar

Variable	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
VO2MAX Morning Workout	10	8.30	33.20	41.50	378.70	37.8700	3.12980	9.796
VO2MAX Night Workout	10	10.30	29.90	40.20	362.10	36.2100	3.41905	11.690

Table 1 above is explained as follows:

1. Data from morning sports data on VO2Max futsal athletes of SMA Negeri 4 Makassar obtained a value of N 10, a range of 8.30, a minimum value of 33.20, a maximum of 41.50, a sum value of 378.70, a mean value (average) of 37.8700, a standard deviation of 3.12980 and a variance of 9.796.
2. Data from night sports data on VO2Max futsal athletes of SMA Negeri 4 Makassar obtained a value of N 10, a range of 10.30, a minimum value of 29.90, a maximum of 40.20, a sum value of 362.10, a mean value (average) of 36.2100, a standard deviation of 3.41905 and a variance of 11.690.

One of the assumptions that must be met for parametric statistics to be used is that the data follows a normal distribution. If the test turns out that the data is normally distributed, it means that the parametric statistical analysis has been fulfilled. To find out the data of the two groups of comparison of morning exercise and evening exercise to VO2 max futsal athletes of SMA Negeri 4 Makassar with normal distribution, a test was carried out using the Kolmogorov Smirnov Test.

Table 2.
Summary of the results of the normality test of comparative data of morning exercise and evening exercise on VO2Max futsal athletes of SMA Negeri 4 Makassar

Variable	Absolute	Positive	Negative	KS-Z	Asymp	Information
VO2MAX Night Workout	0.247	0.150	-0.247	0.781	0.575	Normal
VO2MAX Morning Workout	0. 178	0.132	-0.178	0.564	0.908	Normal

Table 2 above shows that from the results of the data normality test using the Kolmogorov-Smirnov shows the following results:

1. Data from nighttime sports data on VO2Max futsal athletes of SMA Negeri 4 Makassar obtained absolute values of 0.247, positive 0.150, negative -0.247, Kolmogorov-Smirnov 0.781, Asymptot. Sig 0.575 (P>0.05), then it can be said that the data follows a normal distribution or is normally distributed.
2. Data from morning sports data on VO2Max futsal athletes of SMA Negeri 4 Makassar obtained absolute values of 0.178, positive 0.132, negative -0.178, Kolmogorov-Smirnov 0.564, *Asymptot. Sig* 0.908 (P>0.05), then it can be said that the data follows a normal distribution or is normally distributed.

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The hypothesis carried out in this study needs to be tested and proven through empirical data obtained in the field through tests and measurements of the variables studied. Furthermore, the comparative data of morning sports and night sports against VO2Max futsal athletes of SMA Negeri 4 Makassar will be processed statistically. The hypothesis test of this research used is the T-test.

Table 3.

Results of the influence analysis test data Comparison of morning sports and evening sports to VO2Max futsal athletes of SMA Negeri 4 Makassar

Variable	N	Mean	Sig
VO2MAX Morning Workout	10	37.8700	0.00
VO2MAX Night Workout	10	36.2100	
Difference		1.6600	

Based on the table above, it can be stated as follows:

1. From the morning sports data on VO2Max, futsal athletes of SMA Negeri 4 Makassar obtained a value of N 10, a mean or average of 37.8700 and a P value of 0.00 (P<0.05).
2. From the night sports data on VO2Max, futsal athletes of SMA Negeri 4 Makassar obtained a value of N 10, an average mean of 36.2100 and obtained a P value of 0.00 (P<0.05).

From the morning sports data on VO2Max futsal athletes of SMA Negeri 4 Makassar, a value of N 10, a mean or an average of 37.8700 and obtained a P value of 0.00 (P<0.05) and night sports data on VO2Max futsal athletes of SMA Negeri 4 Makassar obtained a value of N 10, an average mean of 36.2100 and obtained a P value of 0.00 (P<0.05). It can also be seen that there is a comparison of morning and evening sports reviewed from VO2Max futsal athletes of SMA Negeri 4 Makassar with a difference of 1.6600.

Discussion

Exercise can be done in the morning, afternoon, afternoon and evening. Most people prefer to exercise in the morning to pump up their spirits and they believe that exercise is better done in the morning because the air is still fresh and pollution-free. But some do sports during the day, afternoon and even at night, because they only have that time. A good exercise time according to the circadian rhythm for health is not known for sure, as well as the time to exercise to burn body fat (Safitri et al., 2024).

Sport is a tool to stimulate physical, spiritual and social functional development. Eating, and movement (exercise) are a continuous necessity of life, meaning exercise is a tool to maintain and foster health, which cannot be abandoned (Wiarto, 2021). Generally, exercise can be done in various places and times, such as in the morning, and at night. Regular exercise activities in the morning will give positive energy for a whole day. Morning is the right time to do sports because, in addition to the capacity of fresh air, morning exercise also helps increase human concentration when doing various activities (Suryana et al., 2022)

Research conducted by Dr. Sheehan said that those who go to the gym or jog after work, tend to achieve higher fitness levels than those who exercise in the morning. This

statement is supported by the finding that the body's metabolism can adapt better by continuing to exercise regularly every afternoon or night (Maulana & Irawan, 2020)

The researchers (Atty et al., 2024) also found that their glucose levels decreased, this was due to a well-adapted metabolism, through regular exercise after work. Exercise that is done in the morning regularly when returning from work will get better results. Based on the results of the data analysis that has been presented previously, the following is a description of the discussion of the research which is also the answer to the formulation of the problems in the research.

The results of data analysis through statistics require theoretical discussion based on the theories and frameworks underlying this research. From the results of the analysis, a comparison of morning sports and night sports was revealed to VO2Max futsal athletes of SMA Negeri 4 Makassar. If you look at the results of the tests that are carried out, there is likely a comparison of the level of sports in the morning and at night, but these results can be used as a benchmark for the seriousness of students participating in these activities and various other things.

There is a comparison of morning sports and night sports against VO2Max futsal athletes of SMA Negeri 4 Makassar. This can be seen from the data Morning Exercise against VO2Max futsal athletes of SMA Negeri 4 Makassar obtained a value of N 10, mean or average 37.8700 and obtained a P value of 0.00 (P<0.05) and data Nighttime Sports against VO2Max futsal athletes of SMA Negeri 4 Makassar obtained a value of N 10, mean 36.2100 and obtained a P value of 0.00 (P<0.05). It can also be seen that there are Comparison of morning and evening sports reviewed from VO2Max Futsal athletes of SMA Negeri 4 Makassar with a difference of 1.6600.

This result follows the theory that states that the comparison of morning sports and evening sports to VO2Max futsal athletes of SMA Negeri 4 has more influence on night sports. The morning is the right time to do sports because, in addition to the capacity of fresh air, morning exercise also helps increase human concentration when doing various activities (Barbosa et al., 2024)

The study, conducted at the Clinical Research Center of the University of Chicago, involved 40 healthy men aged 20 to 30 years and divided into five groups. Four groups did regular exercise for one hour using a treadmill in the morning, afternoon, and night, while the remaining 4 groups did not exercise at all. Blood samples from participants were then tested. As a result, glucose levels decreased in those who exercised at night. The researchers (Pribadi, 2015) also found that their glucose levels decreased, this was due to a well-adapted metabolism, through regular exercise after work. Exercise that is done in the morning regularly when returning from work will get better results.

CONCLUSION

The research results showed that the average VO2Max value of athletes who exercised in the morning was 37.8700, while athletes who exercised in the evening had an average VO2Max of 36.2100. The statistical test results showed a P value of 0.00

(P<0.05), which indicated a significant difference between the two groups. The difference in VO2 Max between morning and evening exercise is 1.6600, which shows that morning exercise tends to provide better VO2 Max results than evening exercise. From the results of this research, it can be concluded that the timing of sports has an influence on the VO2 Max of futsal athletes at SMA Negeri 4 Makassar. Exercise done in the morning is more effective in increasing VO2 max capacity compared to exercise in the evening

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