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Application of Short Interval Training Method Based on Low Maximum Aerobic Speed Capacity on Anaerobic Lactate Capacity Improvement

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ABSTRACT

This study aims to determine the effect of the Short Interval Training (SIT) method based on low Maximum Aerobic Speed (MAS) capacity on increasing anaerobic lactase capacity. This study used an Experimental method with a one-group pretest-posttest design. The population in this study was 24 athletes with a sample of 3 athletes. The instrument used was a 150-meter sprint test. The training program was carried out for 8 weeks with a total of 16 meetings. The results of the analysis showed a decrease in travel time from an average of 24.433 seconds to 23.527 seconds. This indicates that there is an effect between Short Interval Training (SIT) based on low Maximum Aerobic Speed on increasing Anaerobic Lactase with a significant value of 0.025, the value is smaller than 0.05. So it can be concluded that Short Interval Training (SIT) can increase Anaerobic Lactase capacity in Athletes who have low Maximum Aerobic Speed Effectively.

Keywords: Short Interval Training; Anaerobic Lactacyd; Low Maximum Aerobic Speed

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INTRODUCTION

Competitive sports are currently developing rapidly, with increasingly fierce competition. Achieving sporting success is determined not only by talent and technical skill, but also by optimal physical preparation (Rosdiana et al., 2019). One important aspect of physical capacity is anaerobic lactate capacity, which is the body's ability to produce energy without using oxygen during short periods of high-intensity activity.

One factor contributing to increased anaerobic lactase capacity is the training method used. Anaerobic endurance, often referred to as stamina, has a higher level of resistance than aerobic endurance (Giriwijoyo & Sidik, 2010). There are several training methods used to improve anaerobic lactate capacity, including circuit training, fartlek training, and high-intensity training. One effective method for improving anaerobic

capacity is Short Interval Training (SIT) (Dhanireksa et al., 2023). Short interval training is essential to improve anaerobic endurance.

Short Interval Training (SIT) is a type of exercise that is short in duration and performed at high intensity (Hita, 2020). The aim of this method is to increase the working capacity of muscles as well as the anaerobic energy system (Adi, S. 2024). According to (Sepriadi et al., 2018) interval training provides changes to increase anaerobic endurance capacity. The application of the Short Interval Training (SIT) method based on low Maximum Aerobic Speed (MAS) capacity has been proven effective in increasing anaerobic lactase capacity in female futsal athletes. This is demonstrated by a decrease in the 150-meter sprint test time after the training program. Short Interval Training (SIT) encourages optimal anaerobic energy system function, increases tolerance to lactic acid accumulation, and is suitable

for athletes with suboptimal aerobic conditions. With its high intensity and short duration, Short Interval Training (SIT) is an efficient method for improving physical performance in explosive power-based sports. From research (Yunisal, Papat, Rismayanti, Rismayanti, 2016). There is an effect of active rest interval training on increasing aerobic endurance.

By enhancing the anaerobic energy system of lactacyd, an athlete can maintain high performance for a longer period of time before experiencing fatigue (Utoro & Dieny, 2016). Short Interval Training (SIT) is a type of exercise that is short in duration and performed at high intensity. One of the main advantages of Short Interval Training (SIT) is its time efficiency (Rønnestad et al., 2020). The duration of the exercise is 5–30 seconds, the intensity of the exercise is above 95% of the best performance standard, and the duration of the rest period is 15–150 seconds. Then Research (Ar Rasyid et al., 2023)shows that in a short time,Short Interval Training(SIT) can improve athlete performance more quickly than other conventional training methods, such as standard aerobic training.

Other benefits of Short Interval Training (SIT) include exercise variations that can be tailored to the athlete's needs and can increase motivation in training (Arfanda & others, 2022). Not only does this exercise provide physical benefits, it also contributes to mental health by reducing stress levels, anxiety, and increasing the release of endorphins (Sagita, 2024). Maximum Aerobic Speed (MAS) is one of the factors that influence anaerobic lactate capacity.

Maximum Aerobic Speed (MAS) is the maximum running speed that an athlete can maintain using the aerobic energy system (Putri, 2023) Maximum Aerobic Speed (MAS) is an important indicator in determining training intensity and is correlated with an athlete's aerobic capacity. However, a common phenomenon in the coaching world is the large number of athletes with Maximum Aerobic Speed (MAS) low who have difficulty improving performance in activities that predominantly use the anaerobic lactase energy system.Low Maximum Aerobic Speed (MAS) capacity indicates that an athlete has limitations in the efficiency of his aerobic system, so there are researchers who study that high intensity in games will result in fatigue when not equipped with a good VO2max level (Buanasita, 2022).

As for the strengthening of the research, when an athlete has good VO2max endurance, it will be very easy to maintain his performance in playing, in contrast when a player does not have good endurance, it will affect his game, fatigue causes a decrease in performance in the match (Budiansyah, 2024). Short Interval Training (SIT) is its ability to improve cardiovascular fitness and anaerobic capacity in a relatively short time.

Research in national journals such as (Candra, 2023) shows that Short Interval Training (SIT) is effective in improving athletic performance in a more efficient time frame compared to other methods. However, its drawback is the higher risk of injury due to extremely high intensity and the need for adequate recovery, as highlighted in the study (Indrayana & Yuliawan, 2019). Short interval training is a type of anaerobic exercise that students and coaches can use to improve cardiovascular endurance or an athlete's maximum oxygen volume (Insani et al., 2025).

However, the main drawback of Maximum Aerobic Speed (MAS) requires a longer time to see significant results in improving aerobic performance. Anaerobic training at maximal speed can also cause fatigue. This research aims to provide deeper insight into the effect of the Short Interval Training (SIT) method on increasing anaerobic lactase, especially in individuals with low Maximum Aerobic Speed (MAS) capacity. By understanding the relationship between training methods and increasing anaerobic capacity, coaches and athletes can design more effective and efficient training programs, which can ultimately improve overall athlete performance.

By understanding how the application of the Short Interval Training method based on Low Speed Maximum Aerobic Capacity to Increase Lactacid Anaerobic Capacity, coaches, athletes and sports practitioners can design training programs more effectively and efficiently that suit the needs of athletes. This approach is expected to improve the overall quality of athletes' performance, both in terms of anaerobic endurance and energy efficiency during competition. The results of this study are also expected to serve as a reference for the development of evidence-based sports training that considers individual physiological conditions as the basis for training decisions.

METHOD

This study involved 24 female futsal athletes from Universitas Pendidikan Indonesia who were divided based on the type of interval training (Short Interval Training, Intermediate Interval Training, Long Interval Training) and Maximum Aerobic Speed (MAS) capacity, namely high and low. At high Maximum Aerobic Speed (MAS), each group of Short Interval Training (SIT), Intermediate Interval Training (IIT) and Long Interval Training (LIT) consisted of 4 athletes with different dependent variables: a combination of Aerobic, Anaerobic, Lactacid, and Alactacid. At low Maximum Aerobic Speed (MAS), the Short Interval Training (SIT) group consisted of 3 athletes, Intermediate Interval Training (IIT) 4 athletes, and Long Interval Training (LIT) 5 athletes, also with varying dependent variables. This study used an experimental method with a one-group pretest-posttest design, which focused on 3 athletes from the Short Interval Training (SIT) group with low Maximum Aerobic Speed (MAS) capacity based on the initial test results.

The instrument used to measure anaerobic lactate capacity is the Speed Endurance (150-meter sprint). The 150-meter sprint test measures an athlete's ability to maintain high speed over a short distance, reflecting the activity of the anaerobic energy system. This instrument was chosen because it is relevant to the type of training provided and can effectively measure anaerobic capacity indicators.

The research procedure was conducted in three stages: pretest, treatment, and posttest. The pretest was conducted to measure the initial condition of anaerobic capacity using two test items. The treatment, a Short Interval Training (SIT) program, was carried out for 8 weeks, twice per week, for a total of 16 sessions. Each training session consisted of a warm-up, a core exercise in the form of high-intensity sprints according to each

athlete's Maximum Aerobic Speed (MAS) capacity, and concluded with a cool-down. After the program was completed, a posttest was conducted using the same instrument to assess changes in lactid anaerobic capacity.

This research was conducted at the Running Track of the Faculty of Sports and Health Education (FPOK) of the Indonesian University of Education, Padasuka Campus, from May to June 2025. Data from the pretest and posttest results were analyzed using a quantitative approach through descriptive statistical tests. Descriptive tests were used to determine the average, minimum, maximum, and standard deviation values. Normality tests were conducted using the Shapiro-Wilk test, while hypothesis testing was conducted using the paired-sample t-test using SPSS software (Fadluloh et al., 2024), to determine whether or not there is a significant difference between the results before and after treatment.

RESULTS AND DISCUSSION

Findings

Table 1 shows the descriptive statistical results of the speed endurance test (150-meter sprint) before and after being given the Short Interval Training (SIT) method treatment based on low Maximum Aerobic Speed (MAS) capacity. The average value of the pretest run time was 24.433 seconds with a standard deviation of 1.3650, while the average value of the posttest decreased to 23.527 seconds with a standard deviation of 1.6088. This decrease in run time indicates an increase in the performance of the participants' lactase anaerobic capacity after participating in the training program for 8 weeks. The range of minimum and maximum values also shows a consistent increase in results between individuals.

Table 1. Descriptive Analysis Test

	N	Minimum	Maximum	Mean	Standard Deviation
Pretest 150m	3	23.5	26.0	24,433	1.3650
Post Test 150m	3	22.5	25.4	23,527	1.6088
Valid N (listwise)	3				

Table 2 shows the results of the Shapiro-Wilk normality test for the 150-meter sprint pretest and posttest data. The significance value for the pretest was 0.210 and for the posttest was 0.131. Both values are greater than 0.05, indicating a normal distribution. Therefore, the data meet the normality assumption required for hypothesis testing using a paired sample t-test.

Table 2. Tests of Normality

	Shapiro-Wilk		
	Statistics	df	Sig.
Pretest 150m	.839	3	.210
Post Test 150m	.807	3	.131

Table 3 presents the results of the paired sample t-test used to determine the significance of the difference between the pretest and posttest results of the 150-meter sprint. The analysis results show a significance value (2-tailed) of 0.025, which means there is a statistically significant difference ($p < 0.05$) between before and after treatment. Thus,

it can be concluded that the Short Interval Training (SIT) method based on low Maximum Aerobic Speed (MAS) has a significant effect on increasing lactid anaerobic capacity in female futsal athletes.

Table 3. Paired Samples Test

		Paired Differences		t	df	Sig. (2-tailed)
		95% Confidence Interval of the Difference				
		Lower	Upper			
Pair 1	Pretest 150m - Posttest 150m	-1.24049	.53549	-1.263	3	.296

This diagram shows a comparison of 150-meter sprint times between pretest and posttest results after a Short Interval Training (SIT) program based on low Maximum Aerobic Speed (MAS) capacity. There were three research subjects: Aura Putri Aleyda, Fasyha Aurelya Febrian, and Risty Dewi Utami. The results show a decrease in sprint times in all three subjects after treatment. Aura Putri Aleyda experienced a decrease from approximately 24 seconds to 23 seconds, Fasyha Aurelya Febrian from approximately 26 seconds to 25 seconds, and Risty Dewi Utami from approximately 24 seconds to 23 seconds. This decrease illustrates an increase in lactid anaerobic capacity after participating in the Short Interval Training (SIT) program for 8 weeks.

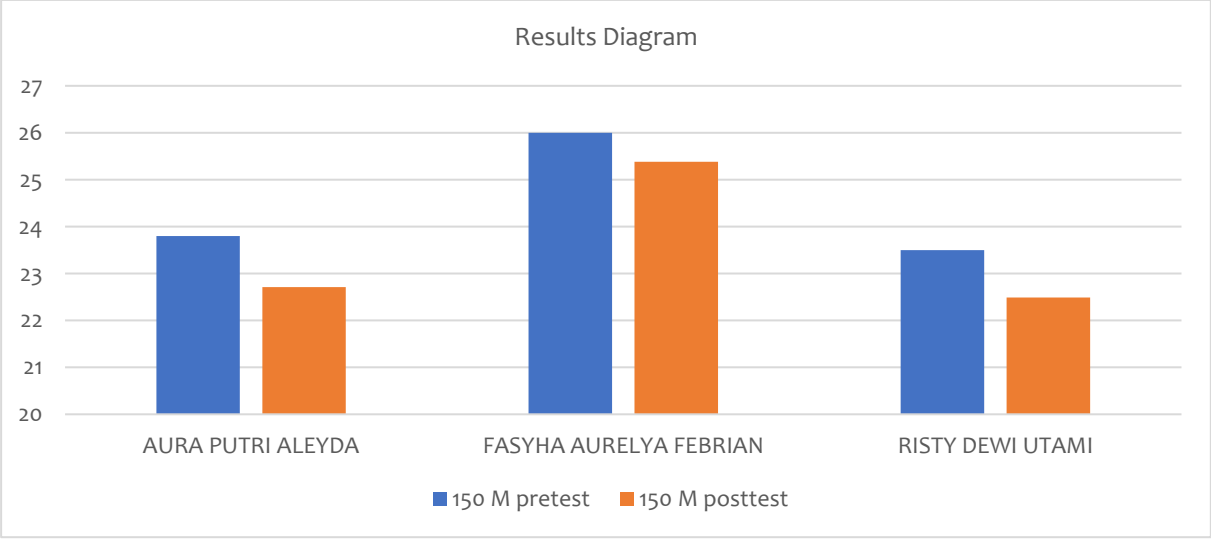

Figure 1. Results Diagram

Discussion

Based on the data processing results, it was found that there was an increase in 150-meter sprint performance from an average pretest value of 24.433 seconds to 23.527 seconds in the posttest. This decrease in time indicates an increase in the anaerobic lactase capacity of female futsal athletes after participating in the Short Interval Training (SIT) training program for 8 weeks. This increase was achieved through high-intensity training in a short time, which targets the anaerobic energy system, especially the anaerobic lactase glycolysis pathway.

This increase in performance is in line with the concept that Lactacyd Anaerobic Capacity is a very important component in athlete performance, especially in sports that require short bursts of energy (Anggraini & Widodo, 2021)The anaerobic lactase system, which produces energy without the use of oxygen, is ideal for sports like futsal that require intense, fast-paced activity.

The training program used in this study was the Short Interval Training (SIT) method, which was conducted based on the low Maximum Aerobic Speed (MAS) capacity of the study subjects. Short Interval Training (SIT) has been proven to be a highly effective method for improving anaerobic capacity because it prioritizes short duration and high intensity. Short Interval Training (SIT) is a short-duration, high-intensity training method. These results are consistent with systematic reviews and meta-analyses that have found that HIIT, including SIT protocols, consistently improves aerobic and anaerobic performance in various competitive sports (Smith et al., 2025).

(Hita, 2020), which is able to increase muscle work capacity and maximize the anaerobic energy system. In this context, Short Interval Training (SIT) provides a physiological stimulus that can increase the body's tolerance to lactic acid accumulation, which is often a limiting factor in high-intensity physical activity. By enhancing the lactid anaerobic energy system, an athlete can maintain high performance for longer periods before experiencing fatigue (Utoro & Dieny, 2016).This is reflected in the increase in athletes' ability to maintain speed in the 150 meter sprint test after the intervention.

Physiologically, the anaerobic lactacyd system works by anaerobically breaking down glucose through glycolysis, which produces ATP and lactic acid. During activity, glucose is broken down through anaerobic glycolysis, producing ATP as the cell's primary energy source (Lesmana & Broto, 2019). Although its ATP production is limited, this system is capable of providing energy quickly, which is essential in match situations that demand explosive and instant responses (Sidik & Rosdiana, 2022).

However, the advantages of the Short Interval Training (SIT) method lie not only in its efficiency in improving performance, but also in its efficiency in training time. One of the main advantages of Short Interval Training (SIT) is its time efficiency, where with a training session of just 15–30 minutes, athletes can achieve significant performance improvements (Rønnestad et al., 2020). This is especially beneficial for athletes who have limited training time or a busy training schedule. These findings are consistent with studies on middle-distance runners, which show that six weeks of sprint interval training results in greater improvements in running performance than traditional endurance training (Johnson et al., 2025).

Another important factor that underpinned this research design was the subjects' low Maximum Aerobic Speed (MAS) capacity. Maximum Aerobic Speed (MAS) is the highest speed an athlete can achieve using energy from the aerobic system. Maximum Aerobic Speed (MAS) is an important indicator in determining training intensity and is correlated with an athlete's aerobic capacity (Putri, 2023) Athletes with a low Maximum Aerobic Speed (MAS) tend to fatigue more quickly during anaerobic activities due to the low efficiency of their aerobic system. Therefore, using Short Interval Training (SIT) based on a low Maximum Aerobic Speed (MAS) is an appropriate strategy, as this method does not directly demand the aerobic system but rather optimizes energy from the anaerobic pathway.

The application of Short Interval Training (SIT) based on low Maximum Aerobic Speed (MAS) demonstrates that training can still be performed at high intensity by adapting to

the athlete's physiological condition. By understanding the relationship between training methods and increased anaerobic capacity, coaches and athletes can design more effective and efficient training programs (Dwitama & Wibowo, 2022). This research reinforces the idea that by integrating the principle of individualized training based on physiological measurements such as Maximum Aerobic Speed (MAS), training can be more targeted and effective in improving specific performance, such as anaerobic lactacy.

This performance improvement is also supported by the physiological principles of the anaerobic system. Anaerobic glycolysis produces ATP rapidly, but also causes a buildup of lactic acid, which can inhibit muscle contraction (Samantha & Almalik, 2019). With consistent Short Interval Training (SIT) training, the body can adapt to the accumulation of lactic acid, allowing athletes to delay fatigue and maintain performance longer.

The effectiveness of Short Interval Training (SIT) in this study also stems from its implementation principles, which prioritize high intensity, measured repetitions, and adequate rest. Measured repetitions and structured rest are key to Short Interval Training (SIT) because they influence energy recovery and the body's adaptation to exercise (Santosa, 2015). Thus, the success of this training is also greatly influenced by how the program is designed and implemented consistently.

Beyond the physiological aspects, the results of this study also illustrate the importance of an evidence-based training approach in modern coaching. By understanding the interaction between Short Interval Training (SIT) and low Maximum Aerobic Speed (MAS) capacity, coaches and sports practitioners can design more effective, efficient, and personalized training programs (Candra, 2023)Personalization in training allows each athlete to receive treatment tailored to their body's needs, rather than based solely on generalizations.

Additionally, this research aligns with previous studies showing that Short Interval Training (SIT), or high-intensity interval training, can improve anaerobic performance and endurance in athletes. Short interval training is essential for improving anaerobic endurance (Dhanireksa et al., 2023), and is effective in accelerating adaptation to muscle fatigue due to lactate accumulation.

Further research Insani et al, (2025) this study aims to analyze the effect of Small Sided Game (SSG) with mixed method training on increasing anaerobic lactase capacity in soccer athletes. The research design used a pre-experimental study with 50 Persib Academy U-17–18 athletes as subjects. Based on pre-observation through anaerobic lactase tests, 10 athletes were found to have low levels, so they were selected as samples using purposive sampling. The SSG training program was given with varying intensity and duration, combined with mixed methods involving anaerobic and aerobic loads. Anaerobic lactase capacity was measured before and after the intervention to see the changes that occurred (Hamzah, 2024).

Thus, it can be concluded that the application of Short Interval Training (SIT) based on low Maximum Aerobic Speed (MAS) in this study significantly increased lactase anaerobic capacity. These results are not only useful in the context of improving the performance of 24 female futsal athletes from Universitas Pendidikan Indonesia (UI), but can also be adopted by coaches and other sports practitioners in designing training programs that suit the physiological conditions of the athletes.

CONCLUSION

The application of the Short Interval Training (SIT) method based on low Maximum Aerobic Speed (MAS) capacity has been proven effective in increasing anaerobic lactase capacity in female futsal athletes. This is demonstrated by a decrease in the 150-meter sprint test time after the training program. Short Interval Training (SIT) encourages optimal anaerobic energy system function, increases tolerance to lactic acid accumulation, and is suitable for athletes with suboptimal aerobic conditions. With its high intensity and short duration, Short Interval Training (SIT) is an efficient method for improving physical performance in explosive power-based sports.

CONFLICT OF INTEREST

There were no conflicts that occurred in this study.

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