

## The effect of interval training on the 1500-meter freestyle swimming ability of UNP swimming specialization students

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### ABSTRACT

**Problems:** In swimming courses at Padang State University, specifically for specialized swimming, students tend to have difficulty completing the 1500-meter distance event which demands aerobic endurance, technical efficiency, and the ability to regulate swimming rhythm. The difficulties experienced by students are due to limited endurance and ineffective training methods. Therefore, this study examines how interval training can affect long-distance swimming abilities for swimming specialty students.

**Purpose:** This study aims to determine the effect of interval training on the 1500-meter freestyle swimming ability of swimming specialty students at Padang State University. **Methods:** This study uses a quantitative method with a quasi-experimental design (one group pretest–posttest design). The research sample consisted of 7 students taken using a saturated sampling technique. The research instrument was a 1500-meter freestyle swimming test with travel time measurements. Data were analyzed using the Shapiro–Wilk normality test and a paired sample t-test hypothesis test. **Results:** The results showed a significance value of 0.003 ( $p < 0.05$ ), which means there is a significant effect of interval training on the 1500-meter freestyle swimming ability. **Conclusion:** Interval training has been proven to have a significant effect on improving 1500-meter freestyle swimming ability in students specializing in swimming. Therefore, interval training is recommended to be integrated into the training periodization program for swimming specialists.

**Keywords:** 1500 meters, freestyle swimming, interval training, swimming students.

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### Introduction

Basically, swimming is a water sport that requires not only good technique, but also strength and endurance. In swimming, there are several styles, the most commonly used being freestyle swimming. According to (Syaleh Muhammad et al., 2019) freestyle swimming is the most efficient swimming movement compared to other movements because its technique is similar to our daily movements, and the body can maximize its strength continuously. This style also has less resistance compared to other swimming styles. In lectures, swimming is often chosen as the basis for learning because the technique is easier, so students are required to master it well, especially with a distance of 1500 meters as one of the requirements for graduating from the swimming department.

Based on preliminary observation data from swimming majors in the January-June 2025 semester, it was found that more than 60% of students had difficulty reaching the 1500-meter swimming distance without stopping and experienced a decline in performance at the 800-1500-meter distance. This is due to several factors, such as inefficient techniques, lack of leg and arm muscle strength, difficulty in regulating swimming rhythm, and many other obstacles in the field. These problems are caused by inefficient and suboptimal training or training methods. In the field, lecturers often face obstacles in determining training, especially interval training that suits the needs of students, both in terms of intensity and duration. Furthermore, previous research on the effectiveness of interval training on students' swimming abilities is still limited, especially at the university level.

Freestyle swimming requires dynamic and repetitive muscle movements, as well as the body's ability to maintain a constant speed. Swimming is an activity that provides great benefits because when a person swims, almost all parts of the body move effectively (Denay et al., 2022). According (Mardesia, 2023), the parts of the body that play a very important role in swimming are the arm and leg muscles. This can easily cause fatigue and difficulty in coordinating the body (arms, legs, and breathing), which can reduce the performance of swimming students. To support improved swimming performance, especially freestyle swimming, structured training is needed to improve freestyle swimming skills. This is supported by research (Junior et al., 2024) which consistently shows that the intensity level of training has a significant effect on changes or regulation of beta-endorphin levels in the body.

Optimal physical condition plays an important role in supporting athletes' abilities during training and competition. Physical condition includes various components, such as strength, endurance, agility, speed, and flexibility (Sari et al., 2024). One training method widely recommended to improve endurance and long-distance swimming performance is interval training. Interval training is not only used in running but is also widely used in other sports such as cycling, swimming, etc. (Rohman, 2019). Interval training is clearly a strong stimulus for physiological remodeling in humans and can increase or produce an increase in mitochondrial content and VO<sub>2</sub>MAX (MacInnis & Gibala, 2017)

From the above opinion, interval training is a training method that combines periods of work (high or moderate intensity) with planned rest or recovery periods. This method is designed to provide greater physiological stimulation compared to continuous training, thereby improving aerobic capacity, lactate threshold, and energy use efficiency. In the context of swimming, interval training allows swimmers to train at intensities close to competition conditions without experiencing excessive fatigue. According to Harsono (2001) in (Dwisetyo et al., 2019), the purpose of interval training is to maintain physical fitness and improve endurance. Thus, swimmers who have this ability will experience increased endurance, energy efficiency, and the ability to maintain speed over long distances.

Physiologically, interval training provides significant adaptations to the cardiovascular system and energy metabolism. This exercise can increase heart stroke volume, lung capacity, and the ability of muscles to utilize oxygen more efficiently. Additionally, interval training plays a role in increasing the body's tolerance to lactic acid buildup, allowing swimmers to maintain their swimming speed longer before experiencing fatigue. Therefore, this method is highly relevant for long-distance swimming training, including the 1500-meter freestyle event.

Although interval training has been widely applied in endurance sports such as athletics and cycling, its application in swimming training in a university setting still requires more in-depth scientific study. Each sport has different movement characteristics and physiological demands, so the effectiveness of a training method needs to be tested specifically. In the context of swimming majors at Padang State University, the application of interval training is expected to not only improve physical abilities but also provide direct experience in applying exercise methods based on sports science. A number of previous studies have shown that interval training has a positive effect on improving aerobic endurance and swimming performance over medium to long distances. However, differences in subject characteristics, training duration and intensity, and training program design mean that the results of these studies cannot be directly generalized. Therefore, research is needed that specifically examines the effect of interval training on 1500-meter freestyle swimming ability in swimming majors, so that it can be used as a reference in the development of swimming training and learning programs in higher education.

The ability to swim 1500 meters freestyle is an important competency that swimming majors must have. The problems of low endurance and decreased performance at long distances are the basis for the need to apply more effective, structured, and scientifically-based training methods. Interval training is considered one of the training methods that has the potential to improve long-distance swimming ability through increased aerobic endurance, movement efficiency, and optimal physiological adaptation. This is in line with the theory proposed by (MacInnis & Gibala, 2017) in the *Journal of Physiology*, which states that interval training is effective in improving physiological adaptation and performance in long-term endurance sports. These findings are reinforced by research by (Nugroho et al., 2021), which proves that interval training can increase the speed of 100-meter freestyle swimming, as well as research by (Mubarak & Kharisma, 2022), which shows a significant effect of interval training on increasing VO<sub>2</sub>Max capacity.

Based on this description, this study aims to determine the extent of the effect of interval training on the 1500-meter freestyle swimming ability of students majoring in swimming at the Faculty of Sports Science, Padang State University. The results of this study are expected to contribute theoretically to the development of scientific studies on swimming coaching and practically as a basis for developing effective, systematic, and evidence-based swimming training programs.

**Method**

The research method used in this study is quantitative research. According to (Irfan Syahroni, 2022), quantitative research is research that requires the use of numbers, from data collection and interpretation to the presentation of results. Quantitative methods in management science involve objective measurement and statistical analysis of numerical data collected through opinion polls, questionnaires, and surveys. This method aims to generalize findings across groups and explain certain phenomena, thereby improving understanding for researchers and policymakers (Geroulanos & Sapiro, 2024).

This type of research is quantitative with a quasi-experiment using a One Group Pretest-Posttest Design. According to (William & Hita, 2019) One-Group Pretest-Posttest Design. In this study, before the treatment was given, a pretest was conducted, which involved swimming 25 meters 60 times for a total of 1500 meters. Then, the treatment was given in the form of 16 sessions of interval training. After the training was given, a retest was conducted, similar to the first or previous test, to determine the results of the training. The results obtained from the group were then compared between the pretest and posttest, which were subsequently analyzed using a t-test. The research instrument measured the ability to swim 1500 meters freestyle using a stopwatch. The population used for the study was all students enrolled in the Specialized Swimming course from June to December 2025, with a total sample size of 8 people. The sampling technique used was saturated sampling, which is a technique for determining samples by making all members of the population the research sample, so that no individuals from the population are excluded.

**Results**

Swimming ability data were obtained through a 1500-meter freestyle swimming time trial conducted before (pretest) and after (posttest) the interval training treatment. The time trial data were converted into seconds so that they could be statistically processed using the SPSS program. Before testing the hypothesis, a prerequisite analysis test in the form of a data normality test was conducted. The normality test was performed using the Shapiro–Wilk test because the sample size of the study was relatively small, namely seven students.

Tabel 1 Tests of Normality

	Tests of Normality						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk			
	Statistic	df	Sig.	Statistic	df	Sig.	
Before Being Treated	.226	7	.200*	.905	7	.365	
After Being Treated	.171	7	.200*	.962	7	.833	

\*. This is a lower bound of the true significance.  
Lilliefors Significance Correction

The normality test results show that the swimming ability data before treatment had a significance value of 0.365 and the data after treatment had a significance value of 0.833. Both significance values are greater than the significance level of 0.05, so can be concluded that the pretest and posttest data are normally distributed.

With the assumption of normality fulfilled, data analysis can be continued using parametric statistical tests.

Tabel 2 Paired Samples Test

		Paired Samples Test							
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Before Treatment - After Treatment	572.429	308.316	116.533	287.284	857.574	4.912	6	.003

Hypothesis testing was conducted using the Paired Sample t-Test to determine the difference in 1500-meter freestyle swimming ability before and after interval training. The results of the Paired Sample t-Test showed that the average difference in swimming time between before and after treatment was 572.429 seconds, indicating a decrease in swimming time after interval training. The calculated t-value was 4.912 with a degree of freedom (df) of 6. The significance value (Sig. 2-tailed) was 0.003, which was smaller than the significance level of 0.05. Based on these results, can be concluded that there is a significant difference between the 1500-meter freestyle swimming ability before and after interval training, so that interval training has a significant effect on improving the 1500-meter freestyle swimming ability of swimming majors at Padang State University.

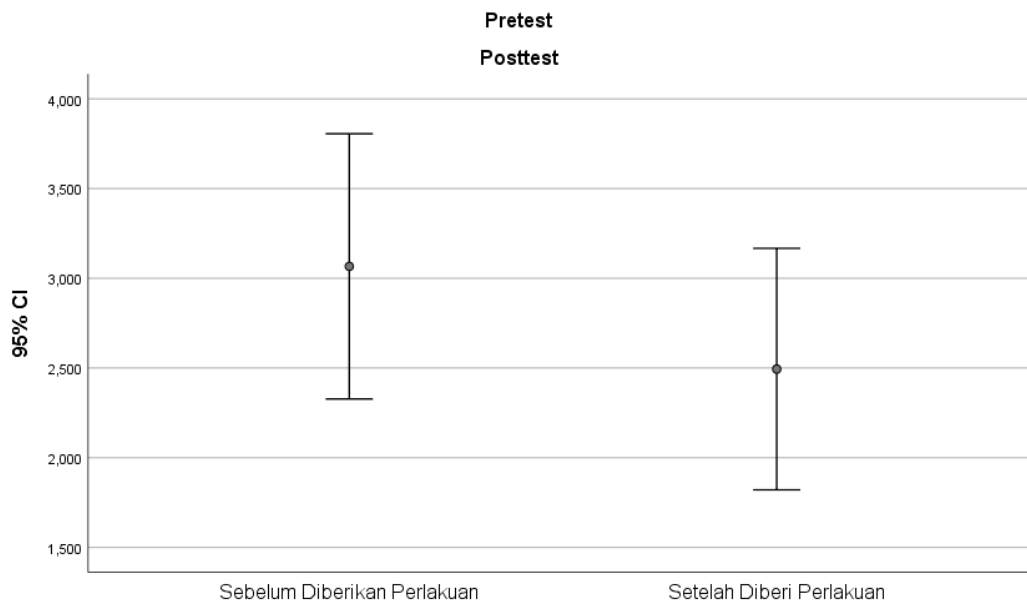


Figure 1. Error bar pretest and posttests

The figure shows a comparison of the average 1500-meter freestyle swimming times before and after interval training with a 95% confidence interval. There was a decrease in the average swimming time in the posttest compared to the pretest, indicating an improvement in long-distance swimming ability after the treatment. The confidence interval in the posttest was in a lower range than in the pretest, thus visually supporting the results of the Paired Samples t-Test, which showed that interval training had a significant effect on 1500-meter freestyle swimming ability.

### Discussion

The results of the study indicate that interval training has a significant effect on the 1500-meter freestyle swimming ability of swimming majors at Padang State University. This is demonstrated by the decrease in the 1500-meter swimming time in the posttest compared to the pretest. In the context of measuring swimming ability, a shorter swimming time reflects an improvement in performance, so these results indicate an improvement in long-distance swimming ability. This finding is in line with modern training theory, which states that interval training can increase aerobic capacity (VO<sub>2</sub>Max), cardiovascular system efficiency, and the body's ability to tolerate fatigue (Bompa & Buzzichelli, 2019); (Gabriel & Zierath, 2017). These physiological adaptations enable swimmers to maintain swimming intensity for longer durations without significant performance decline. Interval training also plays a role in improving rhythm and consistency in swimming, which according to studies on pacing strategies in long-distance freestyle swimming is an important factor in maintaining optimal performance throughout the race. Consistent pacing helps swimmers manage their effort and speed efficiently, thereby increasing their chances of achieving their best race time (Hołub et al., 2023).

The results of this study also support the findings of (MacInnis & Gibala, 2017) reinforced by Gibala et al. (2021), which state that high-intensity interval training effectively improves mitochondrial function, oxygen use efficiency, and endurance sports performance. Research by Pyne et al. (2020) shows that the application of interval training in swimming can significantly improve middle- and long-distance swimming performance when tailored to the characteristics of the athlete. (Nugroho et al., 2021) proved

that interval training affects the improvement of freestyle swimming speed, while (Mubarok & Kharisma, 2022) stated that intensive interval training provides a greater increase in  $VO_2\text{Max}$  compared to the extensive interval method. The research by (Dalamitros et al., 2016) also confirms that interval training is an effective and efficient training method for improving long-distance swimming performance in athletes and sports students. Thus, interval training can be recommended as an effective, systematic, and evidence-based training method to improve 1500-meter freestyle swimming ability.

### Conclusion

Based on the results of research and data analysis regarding the effect of interval training on the 1500-meter freestyle swimming ability of swimming majors at Padang State University, can be concluded that interval training has a significant effect on improving 1500-meter freestyle swimming ability. This is demonstrated by a reduction in the mean swimming time from the pretest to the posttest following the implementation of interval training.

The Paired Sample t-Test results showed a significance value of 0.003, which is smaller than the significance level of 0.05, so can be concluded that there is a significant difference between swimming ability before and after interval training. In addition, the results of the effect size analysis using Cohen's  $d$  produced a value of 1.86, which is classified as a large effect. These findings indicate that interval training not only has a statistical effect but also provides a strong and meaningful practical impact on improving 1500-meter freestyle swimming performance. Thus, interval training can be declared an effective training method for improving the 1500-meter freestyle swimming ability of swimming majors at Padang State University.

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