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## Intervaltraining Training Methods On The VO2MAX Results Of Lubuk Linggau City Athletics Athletes

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**ABSTRACT.** Sport is a medium for people to gather and has become a new necessity in life. One of the most popular sports that many compete in is athletics. VO2Max is one of the supporting achievements of athletes, especially branch athletes who require good physical condition. Based on information from the management of the Indonesian Athletics Association in the city of Lubuklinggau, athlete performance tends to decline from the 2019 Provincial Sports Week in Prabumulih City where athletes running the 1,500m middle distance did not achieve good results. , athletes were only able to finish in 10th and 13th place. In the research used, this was experimental research using a one group pretest posttest design, where this research method was used to look for cause and effect or the influence of one variable on another variable. The population of this study were all 10 athletic athletes from the city of Lubuklinggau. The sampling technique was random sampling. This research involved 10 athletic athletes from the city of Lubuklinggau with 16 treatments in the form of interval training exercises, giving results where the average VO2Max before was 42.15 which changed to 44.12 after being given interval training treatment. Meanwhile, the results of scientific tests through the paired sample t test show that there is an influence of interval training on the VO2Max results of Lubuk Linggau City athletic athletes because the tcount is (5.625 - 1.833). Based on the findings of the research results above, this research can be concluded that the average VO2Max before was 42.15 which changed to 44.12 after being given interval training treatment. The results of statistical tests using the paired sample t test show that there is an influence of interval training on the VO2Max results of Lubuk Linggau City athletic athletes.

**Keywords:** Training, Sports, Athletics, VO2Max. Lubuk Linggau City.

### BACKGROUND

Sport is a medium for people to gather and has become a new necessity in life. Therefore, sport is no longer just a pastime but has become a necessary activity. Sport also improves physical and spiritual freshness, sports activities can also improve a person's physical condition, sport is not just recreation but also aims to improve an achievement carried out individually or in a group.

One of the most popular sports that is widely competed in is athletics, according to Ahmad Yanuar Syauki, (2021) Athletics is a very old sport in the world compared to other sports. Judging from the movement aspect, the movements contained in the Athletics branch are one of the subject matter in physical education, sports and health which consists of

running, throwing, jumping and repulsion events. Athletics has two competitions: track and field. Apart from the short, middle, long distance and race walking events, the field events also have throwing and jumping events. The pole vault, high jump, triple jump and long jump are contested. Middle distance running is a branch of athletics running with numbers 800 meters and 1500 meters. Because middle distance running is clearly different in terms of distance compared to short and long distances, the preparation and strategies that runners must prepare are also different.

Along with the advancement of technology and the development of athletics, it is necessary to develop and improve sports performance in a well-planned and programmed manner carried out by the government and society to achieve high performance, so it is necessary to carry out effective and efficient training, especially in training methods, both basic techniques and conditions. physical and good nutrition. Among the factors that determine achievement is strong physical condition, among the components of athletic physical condition that are very important to master is VO2Max (maximum oxygen volume) ability.

The level of VO2Max can be influenced by the lungs as an organ that provides oxygen, the quality of blood (hemoglobin) which will bind oxygen and carry it throughout the body and the heart as an organ that pumps blood throughout the body, blood vessels which will distribute blood throughout the body and muscles. As a result, the muscles used in exercise require more oxygen and produce CO<sub>2</sub>. In the training program there are many training methods used to increase VO2Max. There are several training methods to increase endurance by providing interval training, fartlek and so on because all these training methods must be in accordance with the training goals we achieve.

Intervals themselves are a very good training method for increasing VO2Max results. Interval training is a training method that is alternated by intervals consisting of rest periods. All sports that require endurance and stamina, such as athletics, swimming, basketball, volleyball, football, hockey, tennis, wrestling, boxing, fencing, etc. can use the interval training training method. Therefore, VO2Max is very necessary, especially in athletics, so the VO2Max level of an athlete must be known by a coach. To find out the VO2Max level by taking a measurement, VO2Max measurements can be done in ways such as doing a running test, walking for 15 minutes (balke), running test with a distance of 2.4 kilometers, running 12 minutes, bleep test and many others.

## **THEORETICAL STUDY**

### **Understanding Exercise**

"Training is the realization or implementation of material or forms of training that have been previously planned. The realization of this material or forms of training is carried out repeatedly and the demands are increasingly difficult in order to improve physical performance abilities" (Syafurudin, 2013: 17). In short, training can be formulated, namely an effort to improve the overall physical condition of the body with a systematic and repetitive process with the intensity volume of the day increasing in number of training loads, time or intensity. Someone doing exercise is a form of effort to achieve a goal they want to achieve (Romdani, S., & Prianto, DA , 2018).

According to Suharjana (2013: 40) training should refer to the principles of the training, so that the training is effective and efficient. Every exercise will definitely have a goal that will be achieved by both the athlete and the coach. The main purpose of exercise or training is to help an athlete improve his skills, abilities and achievements as much as possible. In this way, the athlete's achievement is truly a totality of the accumulated results of prayer practice (NA, Ali, M & Yanto, AH, 2020).

### **The essence of VO2Max**

According to Suharjana (2013: 51) maximum aerobic capacity or VO2Max is the process of maximum oxygen uptake and is often called oxygen consumption which is carried out continuously every minute. According to Sugiharto (2014: 82) reveals that VO2Max is the maximum oxygen uptake and VO2Max is expressed in liters /minute/kilogram body weight. VO2Max level performance can only be maintained for a short period of time, so training is also influenced by the training process.

Apart from that, the level of VO2Max can also be influenced by the lungs as an organ that provides oxygen, the quality of blood (hemoglobin) which can bind oxygen and carry it throughout the body, the heart as an organ that pumps blood to all parts of the body, blood vessels or (circulation) which will distributes blood throughout the body and the muscles of the body's organs which use oxygen which will be processed by the oxidation of food so that the process will produce energy.

**Normal VO2Max**

Age					
Lazy	13 to 19	20 to 29	30 to 39	40 to 49	50 to 59
Superior	55.9 or high	52.4 or high	49.4 or high	48.0 or high	45.3 or higher
Excellent	51.0 to 55.9.	46.5 to 52.4	45.0 to 49.4	43.8 to 48.0	41.0 to 45.3
Good	45.2 to 50.9	42.5 to 46.4	41.0 to 44.9	39.0 to 43.7	35.8 to 40.9
Reasonable	38.4 to 45.1	36.5 to 42.4	35.5 to 40.9	33.6 to 38.9	31.0 to 37.7
Bad	35.0 to 38.3	33.0 to 35.4	31.5 to 35.4	30.2 to 33.5	26.1 to 30.9
Age					
Females	13 to 19	20 to 29	30 to 39	40 to 49	50 to 59
Superior	42.0 or higher	41.0 or high	40.0 or higher	36.9 or high	35.7 or high
Excellent	39.0 to 41.9	37.0 to 41.0	35.7 to 40.0	32.9 to 36.9	31.5to 35.7
Good	35.0 to 38.9	33.0 to 36.9	31.5 to 35.6	29.0 to 32.8	27.0. to 31.4
Reasonable	31.0 to 34.9	29.0 to 32.9	27.0 to 31.4	24.5 to 28.9	22.8 to 26.9
Bad	25.0 to 30.9	23.6 to 28.9	22.8 to 26.9	21.0 to 24.4	20.2 to 22.7

**Table 1. Normal VO2Max**

Age		Very Good	Good	Avarage	Reasonable	Bad
13 - 14	m	2700+ m	2400 – 2700 m	2200 – 2399 m	2100 – 2199 m	2100- m
	F	2000+ m	1900 – 2000 m	1600 – 1899 m	1500 – 1599 m	1500- m
15 - 16	m	2800+m	2500 – 2800 m	2300 – 2499 m	2200 – 2299 m	2200- m
	F	2100+ m	2000 – 2100 m	1700 – 1999 m	1600 – 1699 m	1600- m
17 - 20	m	3000+m	2700 – 3000 m	2500 – 2699 m	2300 – 2499 m	2300- m
	F	2300+m	2100 – 2300 m	1800 – 2099 m	1700 – 1799 m	1700- m
20 - 29	m	2800+m	2400 – 2800 m	2200 – 2299 m	1600 – 2199 m	1600- m
	F	2700+ m	2200 – 2700 m	1800 – 2199 m	1500 – 1799 m	1500- m
30 -39	m	2700+ m	2300 – 2700 m	1900 – 2299 m	1500 – 1899 m	1500- m
	F	2500+m	2000 – 2500 m	1700 – 1999 m	1400 – 1699 m	1400- m
40 - 49	m	2500+m	2100 – 2500 m	1700 – 2099 m	1200 – 1499 m	1400- m
	F	2300+m	1900 – 2300 m	1500 – 1899 m	1300 – 1599 m	1200- m
50+	m	2400+m	2000 – 2400 m	1600 – 1999 m	1100 – 1399 m	1300- m
	F	2200+m	1700 – 2200 m	1400 – 1699 m	1100 – 1399 m	1100- m

**Table 2. Cooper Test****The Nature of Athletics.**

The word athletics comes from several sources, including Greek, from the word " *athlon* ", which means to race or compete. *Pentathlon* and *decathlon* are terms used. Athletics is also referred to as *athletics* (in English), *athletiek* (in Dutch), *athletique* (in French), or *athletik* (in German). Even though the terms are almost the same, the meaning is different from the meaning of athletics in Indonesia (Petrus, Y., 2023).

Many people only know the name athletics, but not many people know what athletics actually is. In fact, actions such as walking, running, jumping, and throwing, which are the

basis of athletics, are carried out by humans every day without realizing it. As stated by Muhtardalam (Gunawan et al., 2016), every dexterity demonstrated in athletic sports, such as running, throwing and jumping, is actually part of basic human movements or actions that have existed since the beginning of time.

Walking and running athletics, which are the oldest types of sports, are considered the "mother or parent" of all types of sports and are often referred to as the "*Mother of Sports*" (Dimiyati, 2017). This is because athletic movements have existed since ancient times. They remember the walking, running, jumping, and throwing they did subconsciously to maintain and expand their lives.

## RESEARCH METHODS

The research used is experimental research using a *one group pretest posttest design*. This research method is used to look for cause and effect or the influence of one variable on another variable (Sugiyono 2017). The research design can be seen as follows:

O1-----X-----O2

Figure 3.1. Research design

Source: (Sugiyono, 2016)

Information :

- O1 : Initial test
- X : Treatment ( *Interval Training* )
- O2 : Final test

Instrument validity is an important thing that must be considered when preparing or selecting the instrument used. Validity is related to the instrument used to measure something that can accurately measure the thing that will be measured. Measuring instruments that will be used in research must go through validity and reliability tests before being used in data collection. The measuring tool in this research uses a 12 minute running test to measure VO2Max results

An instrument is a tool used to measure, collect data or information Nugroho, U. (2018) Based on the description above in this research, the instrument that will be used is a test instrument. The instrument used was a *12 minute running test*.

a. *12 Minute Run Test*

One of the tests used to measure VO2Max is the *12 Minute Run test* , which carries out the test as follows:

- a. After the athlete is given an explanation, the athlete performs a running test for the specified time, namely 12 minutes.
- b. Before running, athletes will warm up first.
- c. In preparation, the athlete will run on a signal, the athlete will start running for 12 minutes.
- d. Athletes will run on the athletic field from a time determined by how far the athlete gets in running for 12 minutes.
- e. For example, in 12 minutes, male athletes aged 20 years and over can run 2,400 m, in the table of Cooper Test norms the athlete has a good category, whereas if the athlete is only able to run 1,500 m in 12 minutes the athlete has a poor category, as in the table above. already stated.
- f. To find out the calculation of an athlete's VO2Max value, it can be converted in the formula below:

$$VO2Max = (\text{Mileage (meters)} - 504.9) / 44.73$$

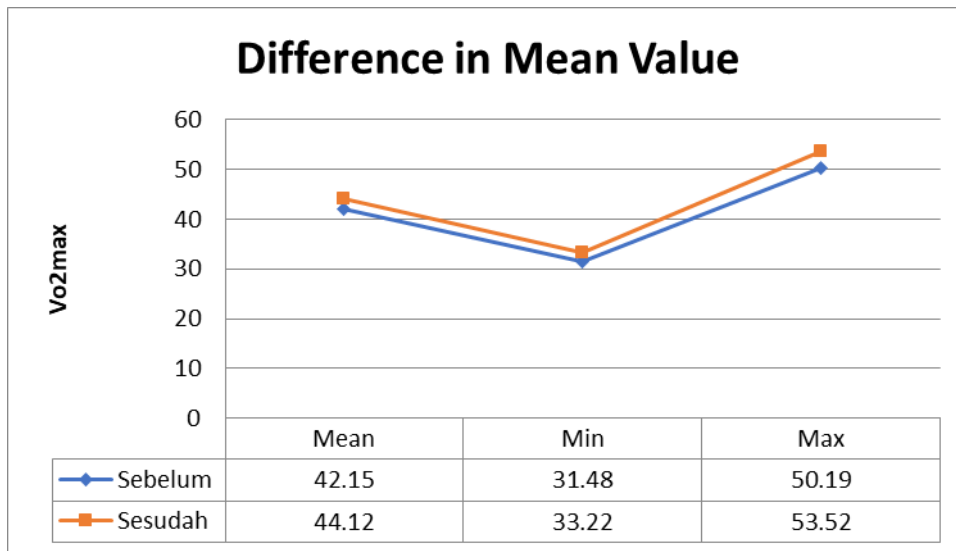
Data analysis is the process of arranging the sequence of data, organizing it into patterns, categories and basic units of description. Data analysis is a series of activities of reviewing, grouping, systematizing, interpreting and verifying data so that a phenomenon has social, academic and scientific value. The data analysis technique used in this research is the t-test to determine the comparison of interval training exercises in increasing VO2Max results. By comparing pairs of treatment means, a test is used.

**RESULTS AND DISCUSSION**

**Research result**

The data produced in the research process is data sourced from testees of 10 Lubuk Linggau City athletic athletes. This data is in the form of VO2Max data taken from carrying out a 12 minute running test. The results of this data can be presented with descriptive statistics in the table below:

Table 4.1 Descriptive Statistics						
	N	Min	Max	Sum	Mean	S. Dev
VO2Max before	10	31.48	50.19	421.55	42.1552	6.39287
VO2Max after	10	33.22	53.52	441.20	44.1203	6.67533
Valid N (listwise)	10					



**Image of Difference in Mean Values**

Based on the table and histogram above, it can be seen that there was a change in VO2 Max before and after being given treatment where the average before was 42.15 and changed to 44.12 after being given interval training treatment to Lubuk Linggau City athletic athletes.

**Initial Data Frequency**

Condition	Frequency	Percentage
Bad	0	0
Reasonable	2	20
Average	4	40
Good	4	40
Excellent	0	0

**Initial Data Frequency Table**

Based on the table and graph above, there are no athletes who have VO2Max with bad criteria, 2 (20%) athletes have VO2Max with reasonable criteria, 4 (40%) athletes have VO2Max with fairly good criteria, 4 (40%) athletes have VO2Max with good criteria, and there are no athletes who have VO2Max with very good criteria

**Final Data Frequency**

Condition	Frequency	Percentage
Bad	0	0
Reasonable	2	20
Average	3	30
Good	4	40
Excellent	1	10

**Final Data Frequency Table**

Based on the table and graph above, there are no athletes who have VO2Max with bad criteria, 2 (20%) athletes have VO2Max with reasonable criteria, 3 (30%) athletes have VO2Max with fairly good criteria, 4 (40%) athletes have VO2Max with good criteria, and 1 (10%) athlete has VO2Max with very good criteria.

## **Discussion**

This research, which involved 10 Lubuk Linggau City athletic athletes with 16 treatments in the form of interval training, gave results where the average VO2Max before was 42.15 which changed to 44.12 after being given interval training treatment. Meanwhile, the results of scientific tests using the paired sample t test show that there is an influence of interval training on the VO2Max results of Lubuk Linggau City athletic athletes because  $t_{count} > t_{table}$  ( $5.625 > 1.833$ ).

Most athletic sports are physiologically aerobic and anaerobic and require good stamina, endurance and mental strength. Therefore, a trainer must train aerobic and anaerobic endurance. Aerobic endurance is activity that lasts a long time and uses oxygen as an energy source, which is associated with VO2Max. VO2Max is a person's ability to consume O2 when tired, in other words VO2Max is defined as the maximum volume of O2 that the body processes when carrying out intensive activities. Sugiharto (2014: 82) stated that VO2Max is the maximum oxygen uptake and VO2Max is expressed in liters/minute/kilogram of body weight. VO2Max level performance can only be maintained for a short period of time, so training is also influenced by the training process. VO2Max is the maximum aerobic capacity that describes the maximum amount of oxygen consumed per time by a person during exercise or testing, with increasingly difficult exercise until fatigue, the measurement is called VO2Max. VO2Max is one of the supporting achievements of athletes, especially athletes in branches that require good physical condition. The level of an athlete's physical condition is greatly influenced by the level of his or her VO2Max ability. The level of VO2Max can be influenced by the lungs as an organ that provides oxygen, the quality of blood (hemoglobin) which will bind oxygen and carry it throughout the body and the heart as an organ that pumps blood throughout the body, blood vessels which will distribute blood throughout the body and muscles. As a result, the muscles used in exercise require more oxygen and produce CO2. In the training program there are many training methods used to increase VO2Max. There are several training methods to increase endurance by providing



interval training, fartlek and so on because all these training methods must be in accordance with the training goals we achieve.

Intervals themselves are a very good training method for increasing VO2Max results. Interval training is a training method that is alternated by intervals consisting of rest periods. All sports that require endurance and stamina, such as athletics, swimming, basketball, volleyball, football, hockey, tennis, wrestling, boxing, fencing, etc. can use the interval training training method. Therefore, VO2Max is very necessary, especially in athletics, so the VO2Max level of an athlete must be known by a coach.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **Conclusion**

Based on the findings of the research results above, this research can be concluded that the average VO2Max before was 42.15 which changed to 44.12 after being given interval training treatment. The results of statistical tests using the paired sample t test show that there is an influence of interval training on the VO2Max results of Lubuk Linggau City athletic athletes because  $t_{\text{count}} > t_{\text{table}}$  ( $5.625 > 1.833$ ).

### **Suggestion**

Based on the research data concluded above, what can be recommended is:

- a. So that trainers can provide an interval training menu that refers to the training program tailored by researchers, thereby helping to increase the athlete's VO2Max.
- b. So that students can follow the exercises given by the trainer correctly and well.
- c. So that clubs complete athlete training facilities, so that the need for equipment in training does not become an obstacle for coaches and athletes in training.

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