



Aerobic Endurance Level (VO₂Max) of Physical Education students of Faculty of Sport and Health Sciences of Universitas Negeri Makassar

Hasbunallah AS^{1*}, Ramli² and Akbar Sudirman³

Fakultas Ilmu Keolahragaan dan Kesehatan, Universitas Negeri Makassar¹²³

Correspondence E-mail: hasbunallah.as@unm.ac.id

Abstract. The study aimed to determine the aerobic endurance (Vo₂Max) of PJKR Department students at SD FIKK UNM, with a sample size of 25 male students. The survey method was employed, and the "Bleep Test" over a 20-meter distance was used as the instrument. The results showed a total Vo₂Max value of 879.60 ml/kg/min, with an average of 35.18 ml/kg/min and a standard deviation of 5.85. The range was 20.40, ranging from 23.20 to 43.60 ml/kg/min. For students aged 19 and under, 6 students were in the very poor category (50%), 2 in the poor category (33.33%), and 1 in the fair category (16.67%). No students fell into the Good, Excellent, or Superior categories, indicating a very poor Vo₂Max capacity for this age group. Among students aged 20-29, 6 were in the very poor category (31.58%), 3 in the poor category (15.79%), 7 in the fair category (36.84%), and 3 in the good category (15.79%). Again, no students reached the Excellent or Superior categories, suggesting a fair Vo₂Max capacity for this age group. In conclusion, the Vo₂Max capacity of male PJKR SD FIKK UNM students, both aged 19 and under and 20-29, was found to be in the very poor and fair categories, respectively.

Keywords: *Endurance, VO₂Max, Student.*

1. Introduction

Makassar State University (UNM) is a leading university in Indonesia especially the Eastern Indonesia part of Sulawesi with the Faculty of Sports and Health Sciences which is the largest sports faculty in Eastern Indonesia. The Faculty of Sports and Health Sciences (FIKK) houses several departments and undergraduate level study programs including OR Training Education, PJKR, Elementary School PJKR, Sports Science, Health Administration, Nutrition and Physiotherapy Physical fitness is a measure of a person's individual quality. Physical fitness is needed to carry out various daily activities, both at low, medium and high intensity. Someone who has good physical fitness will not experience significant fatigue in carrying out daily physical activities. Physical fitness can be measured by aerobic and anaerobic endurance capacity. Students at the Faculty of

Sports Science have relatively heavy physical activity during their lecture period because there will be theoretical lectures as well as practical lectures. Sports students are expected to have a good level of physical fitness so that they are able to undertake physical activities while following the lecture program. Sports students' aerobic endurance

capacity must be above the average endurance capacity other student aerobics. In particular, Sports students in the early semesters (semesters 1-4) will receive a larger portion of practical lectures so that their aerobic endurance capacity must be in the good category, so the selection of Sports Science students from the class of 2021 is suitable for this research. Aerobic endurance capacity is better known as maximal oxygen volume capacity (VO2Max). VO2Max is the volume of oxygen that muscles can use in the process of synthesizing aerobic energy reserves in units of milliliters of oxygen per kilogram of body weight in one minute. VO2Max can also be used as an indicator of the size of a person's aerobic energy reserve synthesis capacity [1]. The same opinion was also explained that VO2Max is the ability of the heart and lungs to supply oxygen throughout the body over a long period of time, so VO2Max is very important for everyone to have. VO2Max is important in sports because it can help in choosing the right training program for athletes so that it is useful in supporting athlete performance. So someone who has a high VO2Max value can be concluded to have good aerobic endurance. VO2Max capacity can also be interpreted as the fastest pace at which a person can use oxygen during exercise. The greater the VO2Max capacity, the greater the ability to carry heavy work loads and the faster physical fitness will recover after the hard work is finished. The importance of VO2Max is a barometer of fitness, and body composition, which consists of body mass index and body fat percentage, is a benchmark for whether a person's body is ideal or not. VO2Max can also be called maximum oxygen consumption or maximum oxygen uptake or Aerobic capacity, which is meant by maximum capacity, is the maximum capacity of the body to obtain and use oxygen during increased exercise, thereby indicating a person's physical fitness. The cells in a person's body will convert food into Adenosine Triphosphate (ATP) with the help of oxygen which is used for the work of each cell which consumes minimal oxygen when the muscles are at rest. Aerobic exercise requires more oxygen and is generally done for more than 15 minutes. Training to increase aerobic endurance (VO2Max) must last for a long time, for example long distance running, long distance swimming, cross country, fartlek, interval training, balke or any form of exercise that forces our bodies to work for a long time. A person's aerobic endurance capacity (VO2Max) can be measured using several tests. The Bleep test is a test to measure a person's VO2Max which can be done in the field or using a treadmill. The Bleep test is a good field test and is suitable for fitness testing for sports students who have activities above the average for other students. Subjects in the beep test are asked to run back and forth along a 20 meter track following the beeping rhythm which will later be played using sound or a speaker.

It is hoped that this research can enrich references at the Faculty of Sports Science, Makassar State University regarding VO2Max capacity using the bleep test. This research can be used as a reference for each student to increase or maintain the VO2Max capacity they already have. To have a high aerobic endurance capacity, a high level of VO2Max capacity is also needed. The level of VO2Max capacity is influenced by several supporting components such as: heart capacity, lungs, blood quality, blood vessels and skeletal muscle capacity that will consume oxygen. If one of these components has a low capacity, it will affect the VO2Max capacity level [2] Physical condition is a person's inner state or potential and image. Some people consider the condition or image of someone to think quickly and precisely by improving every activity they do, so it really determines someone's ability to carry out daily activities, especially FIKK UNM students, where 70% of their courses require physical activity for semesters 1-4. Physical conditioning training in order to improve and develop Vo2max capacity is the right answer to deal with emergencies and pressures that come suddenly when exercising. The physical condition training process is well programmed so that these factors can be mastered. Training is a systematic sporting activity over a long period of time that is increased progressively and individually, which leads to human physiological and psychological characteristics to achieve predetermined targets. To train VO2max capacity, there are several things that must be considered, training must use the large muscles of the body intensively (continuously) for a relatively long duration. Exercise must last for a relatively long duration but with moderate intensity. A number of studies show that increasing VO2max capacity can be achieved by training at a heart rate intensity of 65% to 85% of maximum heart rate, for 20-60 minutes, a frequency of at least 3 times a week (Janssen & LeBlanc 2010; Nieman 2011 in [3]). Based on the description above, the importance of physical condition in this case is aerobic endurance as a support in carrying out daily sports activities, especially for students at the Faculty of Sports and Health Sciences, Makassar State University. So Therefore, the researcher proposed the title for this research, "Aerobic Endurance Level (Vo2Max) of Students from the PJKR Department of Elementary School FIKK UNM". The aim to be achieved in this research is to determine the level of aerobic endurance (Vo2Max) of students majoring in PJKR at SD FIKK UNM. To be used as data base material for majors, especially the PJKR Elementary School major. As well as if the results This research can be proven, then the results can be used as follows: Provides descriptive information regarding Aerobic Endurance Level (Vo2Max) Students from the PJKR Department at FIKK UNM Elementary School. Students can find out the extent of their respective aerobic endurance levels. Indirectly, students can apply the bleep test which is used as an instrument in this research.

2. Research and Methodes

The location of this aerobic endurance level (Vo2Max) research was carried out on the FIKK UNM campus. Research on VO2Max levels is descriptive research. The data collection method is by using the survey method. The instrument used in this research is the "Bleep Test". The variable in this research is a single variable, namely "Level of Aerobic Endurance (Vo2Max) of Students from the PJKR Department of Elementary School FIKK UNM". These research variables need to clearly know the boundaries and scope of the study, so as not to give rise to different interpretations, so operationally the research variables are defined as follows. The level of aerobic endurance (VO2Max) in question is the maximum volume capacity or capacity to consume oxygen optimally as an indicator of work cardiovascular and respiratory. To determine the level of aerobic endurance VO2Max *The bleep test* is used, which is a test that gets faster and faster according to the number of passes taken. The number of returns and levels determine the capacity of the *VO2Max capacity*.



Figure 1. Running Back and forth Bleep Test

The reference for making the path length is by calculating the time between two "bleep" sound on the cassette (which is used as a benchmark). If the sound between two "bleep" for 55 seconds, the length of the field that becomes the track is 18,333 meters. Meanwhile, if the sound between two "bleeps" lasts 60 seconds then the length of the field that becomes the track is 20 meters. Count the sound between two "bleeps" and create the appropriate field [4].

3. Result and Discussion

Descriptive Analysis

Descriptive data analysis regarding the Vo2max capacity of male students at PJKR SD FIKK UNM can be seen in the following table.

Table 1. Vo2max capacity data for male students at PJKR SD FIKK UNM

Number	Name	Years	Level	Vo2max (ml/kg/min)
1	Muh. Syamsul	19	7/9	39.6
2	Syafaruddin	20	6/9	36.0
3	Arfandi	19	4/5	27.6
4	Nursalfiansyah	20	3/1	23.2
5	Iqbal	20	9/1	43.6
6	Ahmad Fajar	20	8/1	40.2
7	Khotibul	20	3/3	24.0
8	Imam Haerul	21	5/3	30.6
9	Anugrah	19	4/5	27.6
10	Muhammad Is Raihan	20	5/7	32.4
11	Muh. Fathur	20	8/1	40.2
12	Al Arqam	21	5/8	32.6
13	Adrian Maulana	22	4/8	29.1
14	Tasyrif HB	20	7/1	36.8
15	Muh. Abdal	19	5/2	30.2
16	Feri Irwanto	20	6/7	35.4
17	Muh. Maulana Akbar	20	8/5	41.5
18	Rachmat Hermawan	20	7/7	38.9
19	Muhammad Aslan	19	6/8	35.7
20	Yusril Syam	20	7/5	38.2
21	Riswandi	19	6/7	35.4
22	Tanwir Sukri	20	7/9	39.6
23	Miftahul Ichwan	20	6/8	35.7
24	Rifqih Fadillah Syafri	20	8/10	42.9
25	Akbar Saleh	20	8/9	42.6

Displayed equations are centered and set on a separate line. Based on the table above, data on the VO2Max capacity of male students at PJKR SD FIKK UNM was obtained after the bleep test was carried out from 25 samples. Obtained with a total value of 879.60 ml/ kg/min, the average value was 35.18 ml/kg/min with a standard deviation of 5.85 while the range of 20.40 was obtained from the difference in data between the minimum value of 23.20 ml/kg/min and a maximum value of 43.60 ml/kg/min.

Table 2. Frequency distribution of male students' Vo2max capacity levels PJKR SD FIKK UNM.

No	Classification	Frequenci	Percentage (%)
1	Very Poor	9	36%
2	Poor	5	20%
3	Fair	8	32%
4	Good	3	12%
5	Excellent	-	-
6	<i>Superior</i>	-	-
	Amount	25	100%

Based on the table above, it appears that the percentage of bleep test results for the frequency distribution of Vo2max capacity levels for male students at PJKR Elementary School FIKK UNM is 25 students. In the *very poor* category there are 9 people with a percentage value of 36%, in the *poor* category there are 5 people with a percentage value of 20%, in the *fair* category there are 8 people with the percentage value is 32%, and there are 3 people in the *good* category with a percentage value of 12%. Meanwhile, there are no students in the *Excellent and Superior categories*. Thus it can be concluded that the Vo2max capacity level of male students at PJKR SD FIKK UNM is in the *very poor* category (very poor).

4. Discussion

Based on the results of the analysis, data was obtained on the VO2Max capacity of male students at PJKR SD FIKK UNM after a bleep test was carried out from 25 samples. The average VO2Max prediction value was 35.18 ml/kg/min. From this average value, guided by the VO2Max prediction table, it can be concluded that the average FIKK UNM PJKR Elementary School student is only able to follow the bleep rhythm at level 6 with a return of 6 to 7. The higher the VO2Max, the more oxygen the body can consume and the more effective the body is in using that oxygen to produce the maximum amount of ATP energy. This means that the body can work better in carrying out aerobic fitness activities that require a lot of oxygen

intake, such as running, swimming and various other types of cardio sports. VO2Max can also be an indicator to predict athletic performance, especially if a swimmer or runner [5] The maximum number of VO2Max can be used as a benchmark to monitor progress during exercise, or if you want to keep the VO2Max value at a certain level. certain to maintain performance. In line with this research, a student Vo2max capacity survey was conducted at Bhayangkara University, Jakarta Raya, Department of Sports Coaching Education. Based on the results of the data analysis carried out, it is known that from the 45 sample people there were 3 people (6.67%) with high abilities, 8 people (17.78%) with good abilities, 12 people (26.67%) with sufficient abilities, 13 people (28.88%) with medium ability, and 9 people (20%) with low ability [6].

5. Conclusion

In general, the data from research with the age group 19 years and under and 20 – 29 years old male students with an average predicted VO2Max value of 35.18 ml/kg/min, illustrates that the Vo2max capacity level of male students at PJKR Elementary School FIKK UNM is in the *very poor* category (very poor).

References

- [1] DK Untoro, Fajar Setyo, "The Relationship Between Body Mass Index and Agility and Maximum Oxygen Volume in Mufc Karanganyar Futsal Players - UMS ETD-db," 2017. <http://eprints.ums.ac.id/51823/> (accessed Feb. 26, 2023).
- [2] EL Fox, RW Bowers, and ML Foss, "The physiological basis of physical education and athletics," p. 734, 1988.
- [3] R. Komala, H. Riyadi, and DB Setiawan, "Moderate and Heavy Intensity Exercise Improves Vo2max, Body Mass Index, and Percent Body Fat in Obese Adolescents," *J. Nutrition and Food*, vol. 11, no. 3, pp. 211–218, Nov. 2016, doi: 10.25182/JGP.2016.11.3.
- [4] J. Hairy, *Basics of Sports Medicine*. Jakarta: Open University, Department of National Education., 2009.
- [5] A. Rachman, "Understanding what VO2 Max is and how to increase it," 2021. <https://www.sehatq.com/article/segala-hal-tangan-vo2-max-that-you-need-to-know> (accessed Aug. 02, 2023).
- [6] R. Kurniawan and F. Ala, "Vo2max Ability of Sports Coaching Education Students at Bhayangkara University, Jakarta Raya,"

JOSEPHA J. Sport Sci. Phys. Educ., vol. 2, no. 1, pp. 15–20,
Apr. 2021, doi: 10.38114/JOSEPHA.V2I1.109.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

