

Cardiorespiratory Fitness Profile of Sixth-Semester University Students: Evidence from the Bleep Test

Noviola Sari Kusuma Sagala, Rida Wahyuni, Claudia Caroline Zefanya Hasibuan, Aisyah Harahap, Mesnan, Mawardinur

¹ Sports Science Study Program, Faculty of Sports Science and Health, State University of Medan, Email, novisagala99@gmail.com

* Corresponding author: Noviola Sari Kusuma Sagala

ARTICLE INFO

Received: 06-01-2026
Accepted: 06-25-2026
Published Online: 07-08-2026

Correspondent:
novisagala99@gmail.com

Available online at:
<https://ejournal.yayasanumamahaminahalibdhamaal.org/index.php/>

Keywords

1. VO₂ Max,
2. Cardiorespiratory fitness,
3. Bleep Test,
4. Multistage Fitness Test,
5. University students.

ABSTRACT

Overview: Cardiorespiratory fitness is an important component of physical fitness that supports students' academic performance, productivity, and overall health. One of the most widely used indicators of cardiorespiratory fitness is maximal oxygen uptake (VO₂ Max). However, modern sedentary lifestyles and increasing academic demands may negatively affect students' aerobic capacity.

Method: This study aimed to analyze the VO₂ Max levels of sixth-semester students using the Bleep Test (Multistage Fitness Test). A quantitative descriptive research design was employed. The sample consisted of 20 sixth-semester students selected through purposive sampling. Data were collected using the Bleep Test and analyzed through descriptive statistics, including mean, minimum value, maximum value, standard deviation, and percentage distribution of VO₂ Max categories using SPSS version 25.

Result: The results showed that the average VO₂ Max value of the students was 38.01 ml/kg/min, with a minimum value of 31.2 ml/kg/min and a maximum value of 43.1 ml/kg/min. The standard deviation was 3.07, indicating relatively homogeneous data distribution. Based on the VO₂ Max classification, 50% of students were categorized as very poor, 40% as poor, and only 10% as moderate. No students were classified in the good or very good categories.

Conclusion: The findings indicate that the cardiorespiratory fitness level of sixth-semester students remains generally low. Most students demonstrated poor to very poor aerobic capacity, suggesting the need for regular physical activity and structured fitness programs to improve VO₂ Max and overall physical fitness among university students.

Pendahuluan

Physical fitness is one of the important elements that supports an individual's quality of life. Good physical condition enables individuals to perform various daily activities effectively without experiencing excessive fatigue while still having sufficient energy reserves for other activities. The level of physical fitness is not only related to physical abilities but is also associated with health, productivity, thinking skills, learning concentration, and overall quality of life. In the field of education, particularly at the higher education level, physical fitness is an aspect that requires attention because university students belong to a productive age group that is expected to possess optimal physical and mental abilities.

According to the World Health Organization (WHO), insufficient physical activity remains one of the leading risk factors for global mortality and contributes significantly to various non-communicable diseases. Among university students, increasing sedentary behavior, prolonged screen time, and reduced participation in physical activity have become major concerns affecting physical fitness and overall health.

Students face various complex academic and non-academic demands. Academic activities, assignment preparation, organizational involvement, field practice, and various other activities require good physical conditions to ensure that all activities can be carried out optimally. However, technological development has gradually changed people's lifestyles, including those of students. Activities that previously involved substantial physical movement have shifted toward greater reliance on digital devices, resulting in reduced physical activity levels. Prolonged sitting habits, excessive gadget use, lack of exercise, and unhealthy lifestyles have the

potential to decrease students' physical fitness levels. This condition creates new challenges because students, as individuals in a productive age period, require optimal physical conditions.

One indicator that can be used to measure an individual's physical fitness level is aerobic capacity or Maximum Oxygen Volume (VO₂ Max). VO₂ Max refers to the body's maximum ability to take in, transport, and utilize oxygen during high-intensity physical activity. It can also be defined as the maximum capability of the respiratory system, circulatory system, and body muscles to meet oxygen demands during physical activities. The higher an individual's VO₂ Max value, the better their cardiorespiratory endurance capacity. Conversely, lower VO₂ Max values indicate reduced physical performance capacity, resulting in quicker fatigue (Herawati et al., 2023).

VO₂ Max plays a crucial role in supporting individual activities, particularly among university students. Individuals with good VO₂ Max levels tend to have better endurance capacity, enabling them to perform daily activities more effectively. In addition, higher VO₂ Max levels are associated with improved cardiovascular health, reduced risk of chronic diseases, and enhanced physical performance. On the other hand, low VO₂ Max levels may lead to reduced physical performance, decreased activity capacity, and increased health risks in the future. Research has shown that physical activity has a significant relationship with cardiorespiratory fitness and students' VO₂ Max levels (Arfanda, 2025).

Theoretically, university students belong to the early adulthood age group and should generally have relatively good physical conditions. At this stage of life, individuals are in a productive phase where physical abilities are expected to be at their

peak, meaning students should ideally possess optimal cardiorespiratory fitness levels. However, this ideal condition does not always align with actual findings in the field. Various studies have indicated that many students still exhibit low to moderate fitness levels.

Research conducted by Herawati et al. (2023) on the VO₂ Max profile of students from the Public Health Study Program, Faculty of Health Sciences, Universitas Pembangunan Nasional Veteran Jakarta, revealed that most students had VO₂ Max levels categorized as poor. Male students were found to predominantly fall into the very poor category, while female students were mostly categorized as poor. These findings indicate that students' aerobic capacity had not yet reached optimal levels.

Another study conducted by Afrizal (2024) on students of the Sports Coaching Education Study Program at Universitas Gunung Leuser Aceh found that most students' VO₂ Max levels fell within the moderate, poor, and very poor categories. Only a small proportion of students demonstrated very good VO₂ Max levels. These findings suggest that even students from sports-related disciplines do not necessarily possess optimal cardiorespiratory fitness levels.

Furthermore, a study on the VO₂ Max ability of first-year students in the Sports Science Study Program at Universitas PGRI Madiun in 2024 showed that approximately 75% of students were categorized as "poor" and "very poor." These findings indicate that low fitness levels are not only present among general university students but also among students within sports-related disciplines. Other studies have also shown that daily physical activity levels have a positive relationship with students' VO₂ Max capacity. Students with higher levels of physical activity tend to demonstrate better VO₂ Max levels than those with lower physical activity levels (Arfanda, 2025). Based on these studies, a

gap exists between ideal conditions and actual field conditions. Theoretically, university students, as a productive age group, should possess good cardiorespiratory fitness levels. However, practical findings indicate that most students still have low to moderate VO₂ Max levels. This gap highlights the need for greater attention to student fitness conditions.

To determine students' cardiorespiratory fitness levels, an appropriate, practical, and valid measurement method is required. One widely used method for measuring VO₂ Max is the Bleep Test, also known as the Multistage Fitness Test. The Bleep Test is a fitness assessment involving repeated 20-meter shuttle runs following a series of beep sounds that gradually increase in speed. This test is commonly used because it is easy to administer, cost-effective, efficient, and capable of objectively measuring an individual's aerobic endurance capacity. Additionally, the Bleep Test has strong validity in estimating an individual's VO₂ Max capacity.

Sixth-semester students were selected as research subjects because, at this academic stage, students generally face relatively high academic workloads. Various demands such as lectures, assignments, practical activities, research, and thesis preparation may reduce physical activity levels and consequently affect fitness conditions. Therefore, a specific analysis of the VO₂ Max condition among sixth-semester students is necessary to provide a realistic overview of their fitness levels. Based on this rationale, the study entitled "Analysis of VO₂ Max Among Sixth-Semester Students Using the Bleep Test" is important to determine the aerobic capacity levels of sixth-semester students. The results of this study are expected to provide information regarding students' fitness conditions and serve as evaluation material for educational institutions in

designing programs aimed at improving students' physical activity and fitness levels.

METHOD

This study employed a descriptive research method using a quantitative approach. The quantitative descriptive method was used to describe and analyze the condition of a variable based on data obtained objectively from the field. According to Sugiyono (2022), quantitative research is a research method used to investigate a particular population or sample through data collection using research instruments, followed by statistical analysis to test or describe a phenomenon. This method was selected because the study aimed to identify and describe the aerobic capacity or VO₂ Max level of sixth-semester students through measurements using the Bleep Test without providing any specific treatment to the research subjects.

This study used a descriptive survey research design, which involved direct measurements of the subjects to obtain data relevant to the research objectives. Data collection was conducted using the Bleep Test, also known as the Multistage Fitness Test, which is one of the methods used to measure aerobic capacity in estimating an individual's VO₂ Max value. The test was conducted by requiring participants to run back and forth over a distance of 20 meters while following beep sounds that gradually increased in speed at each level. The test was terminated when participants failed to

reach the designated line in accordance with the beep rhythm for two consecutive times. The last level successfully achieved by the participants was then recorded and used as the basis for determining the students' VO₂ Max values.

The collected data were subsequently analyzed using descriptive statistical techniques with the assistance of SPSS version 25 software. The analysis aimed to obtain an overview of the VO₂ Max level of sixth-semester students through calculations of the mean, maximum value, minimum value, standard deviation, and percentage distribution of VO₂ Max categories. The results of this analysis were used to provide a clearer description of the cardiorespiratory fitness condition of sixth-semester students and to serve as evaluation material for improving the quality of students' physical fitness.

RESEARCH RESULT

1. Description of Research Results

This study aimed to determine the VO₂ Max level of sixth-semester students using the Bleep Test. The study was conducted on 20 sixth-semester students who were selected as research samples. The test implementation used the Multistage Fitness Test (Bleep Test), and the test results were subsequently converted into VO₂ Max values.

The results of the VO₂ Max measurements of sixth-semester students are presented in the following table:

Table 1. VO₂ Max Measurement Results of Sixth-Semester Students

No	Kode Sampel	VO ₂ Max
1	M1	31,2
2	M2	33,5
3	M3	35,1
4	M4	36,8
5	M5	37,2
6	M6	38,4
7	M7	39,1
8	M8	40,3
9	M9	41,5
10	M10	42,0
11	M11	34,7
12	M12	36,1
13	M13	37,8
14	M14	38,9
15	M15	39,6
16	M16	40,8
17	M17	41,2
18	M18	35,9
19	M19	37,0
20	M20	43,1

Based on the table above, it can be observed that the VO₂ Max measurement results of sixth-semester students indicate variations in cardiorespiratory endurance capacity among the students. The highest VO₂ Max value was obtained by student M20 with a score of 43.1, while the lowest

value was obtained by student M1 with a score of 31.2. These variations suggest that students' physical fitness levels differ and are influenced by various factors such as physical activity levels, exercise habits, lifestyle patterns, and individual physical conditions.

2. Research Data Analysis

a. Mean Calculation (Average)

Mean Formula:

$$\bar{X} = \frac{\sum X}{N}$$

Description:

$$\bar{X}$$

= Mean (average)

$$\sum X$$

= Total data values

N = Number of samples

Total data values:

$$31.2 + 33.5 + 35.1 + 36.8 + 37.2 + 38.4 + 39.1 + 40.3 + 41.5 + 42.0 + 34.7 + 36.1 + 37.8 + 38.9 + 39.6 + 40.8 + 41.2 + 35.9 + 37.0 + 43.1 = 760.2$$

Therefore:

$$\begin{aligned}\bar{X} &= \frac{760.2}{20} \\ &= 38.01\end{aligned}$$

Based on the calculation results, the average VO₂ Max value of sixth-semester students was 38.01 ml/kg/min. This average value indicates that, in general, the VO₂ Max capacity of sixth-semester students falls within the poor category.

b. Maximum and Minimum Value Calculation

Based on the research data, the following values were obtained:

Maximum value: 43.1

Minimum value: 31.2

Data range:

$$\begin{aligned}R &= X_{max} - X_{min} \\ &= 43.1 - 31.2 \\ &= 11.9\end{aligned}$$

The data range value of 11.9 indicates differences in cardiorespiratory endurance capacity among the students.

c. Standard Deviation Calculation

Standard deviation is used to determine the level of data dispersion in the research results.

Formula:

$$SD = \sqrt{\frac{\Sigma(X - \bar{X})^2}{n - 1}}$$

Table 2. Standard Deviation Calculation

Nilai X	(X- $\bar{X}$)	(X- $\bar{X}$) ²
31,2	-6,81	46,37
33,5	-4,51	20,34
35,1	-2,91	8,46
36,8	-1,21	1,46
37,2	-0,81	0,65
38,4	0,39	0,15
39,1	1,09	1,19
40,3	2,29	5,24
41,5	3,49	12,18
42,0	3,99	15,92

Amount:

$$\begin{aligned}\Sigma(X - \bar{X})^2 \\ &= 179,31\end{aligned}$$

So:

$$\begin{aligned}SD &= \sqrt{\frac{179,31}{19}} \\ &= 3,07\end{aligned}$$

The standard deviation of 3.07 indicates that the spread of research data is not too large so that the data is relatively homogeneous.

d. Frequency Distribution of VO₂ Max Levels

Table 3. Vo₂ Max Categories:

Category	Range
Very Good	>51
Good	46–51
Moderate	42–45
Poor	38–41
Very Poor	<38

VO₂ Max Frequency Distribution

Category	Frequency	Percentage
Very Good	0	0%
Good	0	0%
Moderate	2	10%
Poor	8	40%
Very Poor	10	50%
Total	20	100%

Formula:

$$P = \frac{F}{N} \times 100\%$$

example:

$$\begin{aligned} P &= \frac{10}{20} \times 100 \\ &= 50\% \end{aligned}$$

Based on the table, it is known that there are 10 students (50%) in the very poor category, 8 students (40%) in the poor category, and 2 students (10%) in the moderate category.

e. Analysis Results Using SPSS

Table 4 Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
VO ₂ Max	20	31.2	43.1	38.01	3.07

Based on the results of the SPSS analysis, the average value was 38.01, the minimum value was 31.2, the maximum value was 43.1, and the standard deviation was 3.07.

3. Interpretation of Research Results

The research results revealed that the average VO_2 Max for sixth-semester students was 38.01 ml/kg/minute. These results indicate that students' cardiorespiratory endurance is generally still in the poor category. The largest percentage falls in the very poor category, at 50%, while there are no good or very good categories. This indicates that most students do not yet have optimal aerobic capacity. This condition indicates that students tend to have low levels of physical activity, resulting in the heart and lungs not functioning optimally to supply oxygen.

DISCUSSION

The results of this study indicate that the VO_2 Max level of sixth-semester students generally falls within the poor category, with an average value of 38.01 ml/kg/min. These findings suggest that the cardiorespiratory endurance capacity of students is still not optimal. Low VO_2 Max capacity can be influenced by various factors such as insufficient physical activity, sedentary lifestyles, irregular exercise habits, dietary patterns, rest duration, and students' academic workload.

Sixth-semester students generally experience more intensive academic demands compared to previous semesters. Coursework, organizational activities, research proposal preparation, and various other responsibilities often cause students to spend more time sitting and using digital devices for extended periods. Such conditions may lead to a reduction in daily physical activity, which consequently affects physical fitness levels.

The findings of this study are consistent with the research conducted by Herawati et al. (2023), which reported that the majority of students had VO_2 Max levels within the low to moderate categories. The study explained that low

physical activity levels are among the primary factors contributing to decreased aerobic capacity among students. Similarly, this study is also in line with the findings of Afrizal (2024), which indicated that most students had VO_2 Max levels categorized as moderate and poor. These findings suggest that students' physical fitness levels still require greater attention.

From a physiological perspective, individuals who engage in regular physical exercise generally experience improvements in the functioning of the heart, lungs, and circulatory system, resulting in better oxygen uptake and utilization. Conversely, individuals with low levels of physical activity tend to have lower VO_2 Max capacity. Therefore, students need to increase their physical activity through regular exercise such as jogging, running, cycling, aerobic training, and other physical activities to improve VO_2 Max capacity and achieve better physical fitness conditions.

CONCLUSION

The overall cardiorespiratory fitness level of students was found to remain within the poor category. The measurement results indicated that the majority of students had VO_2 Max values ranging from poor to very poor categories, while only a small proportion fell within the moderate category. This condition suggests that the body's ability to absorb and utilize oxygen efficiently during physical activity has not yet reached an optimal level. Low VO_2 Max levels may be influenced by several factors, including insufficient physical activity, sedentary lifestyle habits, rest patterns, dietary habits, and high academic demands among students. These findings highlight the need for regular and structured physical activity programs to improve students' physical fitness and

cardiorespiratory endurance more effectively.

REFERENCES

- Afrizal. (2024). *Volume Oksigen Maksimal (VO₂ Max) Mahasiswa Program Studi Pendidikan Kepelatihan Olahraga Universitas Gunung Leuser Aceh. Gelanggang Olahraga: Jurnal Pendidikan Jasmani dan Olahraga*, 7(1).
- Afrizal. (2024). Volume oksigen maksimal (VO₂ Max) mahasiswa Program Studi Pendidikan Kepelatihan Olahraga Universitas Gunung Leuser Aceh. *Gelanggang Olahraga: Jurnal Pendidikan Jasmani dan Olahraga (JPJO)*, 7(1). <https://doi.org/10.31539/jpjo.v7i1.8370>
- Arfanda, P. E. (2025). *Pengaruh Tingkat Aktivitas Fisik Harian terhadap Profil Kebugaran Kardiorespirasi dan Kekuatan Otot pada Mahasiswa*. Global Journal Sport Science.
- Fiana, D. N., Putri, M. S., Berawi, K., Wintoko, R., & Rahmayani, F. (2023). Hubungan massa otot dengan VO₂ Max pada mahasiswa Fakultas Kedokteran Universitas Lampung dengan metode Balke Test. *Jurnal Kedokteran Universitas Lampung*, 7(2), 125–127.
- Herawati, J. N., Nazhira, F., Agustiyawan, A., & Sirada, A. (2023). *Gambaran Tingkat Volume Oxygen Maximal (VO₂Max) dan Aktivitas Fisik pada Mahasiswa Program Studi Kesehatan Masyarakat FIKES UPNVJ. Jurnal Ilmiah Fisioterapi Muhammadiyah*.
- Herawati, J. N., Nazhira, F., Agustiyawan, A., & Sirada, A. (2023). Gambaran tingkat volume oxygen maximal (VO₂ Max) dan aktivitas fisik pada mahasiswa Program Studi Kesehatan Masyarakat FIKES UPNVJ. *Jurnal Ilmiah Fisioterapi Muhammadiyah*, 2(2).
- Ikhsan, D. F., & Henjilito, R. (2024). Tingkat VO₂ Max Unit Kegiatan Mahasiswa Bola Tangan Universitas Islam Riau. *Jurnal Review Pendidikan dan Pengajaran*, 7(3). <https://doi.org/10.31004/jrpp.v7i3.28920>
- Maksum, A. (2020). *Metodologi penelitian dalam olahraga*. Surabaya: Unesa University Press.
- Pramana Putra, S., Damanik, S. A., & Kesumawati, S. (2024). *Analisis Kemampuan VO₂Max pada Mahasiswa Baru Ilmu Keolahragaan Universitas PGRI Madiun*. *Jurnal Ilmu Keolahragaan*, 23(2), 250–257.
- Ramadhani, A., Tarigan, B. S., Lestri, E. A., Septian, M. D., & Iwandana, D. T. (2025). Kapasitas VO₂ Max mahasiswa TPB olahraga semester genap Institut Teknologi Sumatera tahun 2025. *Jurnal Pengabdian Masyarakat dan Riset Pendidikan*, 4(1). <https://doi.org/10.31004/jerkin.v4i1.1716>
- Sudjana. (2002). *Metode statistika*. Bandung: Tarsito.
- Sugiyono. (2022). *Metode penelitian kuantitatif, kualitatif, dan R&D* (Edisi ke-2). Bandung: Alfabeta.
- Triandini, S., Rahmawati, N. A., & Prastowo, B. (2024). Aerobic exercise affects VO₂ Max in college students. *Jurnal Keperawatan dan Fisioterapi*, 7(2). <https://doi.org/10.35451/jkf.v7i2.2607>
- Widiastuti. (2020). *Tes dan pengukuran olahraga*. Jakarta: Rajawali Pers.