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Aktivitas fisik dan vo2max: tim nasional Indonesia, apakah ada perbedaan sebelum dan sesudah covid-19?

Physical activities and vo2 max: Indonesian national team, is there a difference before and after covid-19?

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Abstrak

Atlet harus memiliki aktivitas fisik yang tinggi dan vo2max yang optimal tanpa mengalami kelelahan, baik untuk performa pertandingan ataupun aktivitas sehari-hari. Penelitian ini bertujuan untuk mengetahui tingkat aktivitas fisik dan vo2max atlet Timnas Indonesia sebelum dan pada saat pandemi covid-19. Metode penelitian ini menggunakan metode observasional dengan menggunakan rancangan *cross sectional* yang dianalisis menggunakan teknik deskriptif kuantitatif. Sampel pada penelitian ini menggunakan *sampling purposive* sebanyak 30 atlet yang terdiri dari atlet cricket, sepakbola, dan bolavoli. Instrumen penelitian ini menggunakan kuisioner *Global Physical Activity Questionnaire* (GPAQ) untuk mengetahui aktivitas fisik, dan metode *Bleep Test* untuk mengukur vo2max. Hasil penelitian menunjukkan bahwa atlet Timnas Indonesia memiliki aktivitas fisik dengan kategori tinggi sebesar 80% dan kategori sedang sebesar 20%. Pada vo2max sebelum covid-19 menunjukkan kategori *superior* sebesar 50%, dan pada saat covid-19, vo2max atlet mengalamin penurunan yang tidak jauh dengan kategori *good* sebesar 40%. Penelitian ini menyimpulkan bahwa wabah covid-19 menjadi satu-satunya pandemi terbesar yang dampaknya terhadap dunia. Sehingga pada aktivitas fisik atlet yang tinggi terdapat perbedaan vo2max atlet tim nasional Indonesia sebelum dan pada saat pandemi covid-19.

Kata kunci: aktivitas fisik, vo2max, tim nasional Indonesia, covid-19.

Abstract

Athletes must have high physical activity and optimal vo2max without experiencing fatigue, both for match performance or daily activities. This study aims to determine the level of physical activity and vo2max of Indonesian National Team athletes before and during the covid-19 pandemic. This research method using observational method using cross sectional design and analyzed using quantitative descriptive techniques. The sample in this study used purposive sampling of 30 athletes consisting of cricket, football, and volleyball athletes. The research instrument used the Global Physical Activity Questionnaire (GPAQ) questionnaire to determine physical activity, and the Bleep Test method to measure vo2max. The results showed that the athletes of the Indonesian National Team had physical activity with a high category of 80% and a moderate category of 20%. In the vo2max before covid -19, it showed a superior category of 50%, and at the time of covid-19, vo2max athletes experienced a similar decrease with the good category by 40%. This study concludes that the covid-19 outbreak is the single largest pandemic impacting

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the world. So that in the high physical activity of athletes, there is a difference in the vo2max of Indonesian national team athletes before and during the covid-19 pandemic.

Keywords: physical activity, vo2max, Indonesian national team, covid-19.

INTRODUCTION

Endurance is very important for the fitness of sports athletes in achieving optimal performance so that athletes are able to excel (Eynon et al., 2011). To obtain optimal performance requires good training. For this reason, the training process must be carried out intensively so that athletes always maintain body fitness with energy that comes from the aerobic training process (Carlsson et al., 2015). If the intensity of the exercise is increased, an increase in pulse frequency will be followed and vice versa if the intensity of the exercise is lowered, until there is a decrease in the pulse frequency (Teramoto & Golding, 2006). In addition to the training process, this has an impact on the speed of oxygen consumption in maximum aerobic metabolism (VO2Max), which basically means that every sporting match is usually carried out in a long time (Debbian & Rismayanthi, 2016).

In accordance with the condition of the Indonesian national team athletes, at the time of the covid-19 pandemic all athletes from various sports were affected, so that the physical activity of the athletes could not be carried out optimally to maintain the stabilization of the body's condition and the dominant level of fitness would decrease if the intensity of the training decreased. In general, humans are social creatures who will certainly carry out physical activities every day, from doing work, sports, and using vehicles to travel to a place (Laeremans et al., 2017).

Talking about the physical activity of athletes has a direct impact on the cardiovascular system. Regular physical exercise has several benefits for the cardiovascular system, namely; normalizes blood pressure, reduces resting pulse frequency, increases the ability of the cardiovascular system to measure oxygen, and improves heart muscle (Kuntaraf & Kuntaraf, 2009). This is in line with previous research that tried aerobic

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endurance exercise with a duration of 2x30 minutes which can increase pulse frequency, body temperature, blood pressure training, and blood lactic acid (Sandi, Pangkahila, & Adiatmika, 2016).

Physical activity expressed in multiples of resting metabolic rate (MET) is contained in the guidelines and norms which have been based on agreement according to Kemper (2008), namely, all adolescent children must be physically healthy and active every day for 1 hour with moderate intensity (5 -8 MET). For example: walking, running, cycling (6-7 MET) and team games such as basketball, soccer, cricket and volleyball (8 MET). Then, at least twice a week doing physical activities that are directed at improving physical fitness (endurance, flexibility, muscle strength, and coordination) (McKenna, Kelly, & Kennedy, 2019). The Ministry of Health has data on the behavior of physical activities according to research conducted on a national scale.

According to the results of the Basic Health Research (Riskesdas) in 2013 using the Global Physical Activity Questionnaire (GPAQ) instrument, the criteria for active physical activity are someone doing heavy, moderate, or both physical activity. Conversely, the criterion for being less active is someone who does not perform moderate or strenuous physical activity. Strenuous physical activity is an activity that continuously carries out physical activity for at least 10 minutes until the pulse rate increases and breathing is faster in general, for example, hoeing, digging the ground, climbing mountains, etc., for three days a week and the total time on when activity ≥ 1500 MET. Whereas physical activity is doing activities such as sweeping, mopping, and others with a minimum of five days or more and the total duration of activity is 150 minutes a week. Apart from these two conditions, including light physical activity (WHO, 2012).

Based on the explanation above, physical activity is carried out for daily activities with a healthy lifestyle. In addition, physical activity has been a concern since the covid-19 pandemic. Until now, the impact of the covid-19 virus in Indonesia has proven that there are difficult times when making fast large-scale decisions, the main focus in the limited response

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of the national government is also very important to give local governments the mandate. Thus, Indonesia needs valid and fast information to get a description of the major conditions in the spread of covid-19. In the future, information regarding covid-19 has the aim of deciding the actual policy, and munoreaction-based detection tools (RDT) can determine the extent of covid-19 virus infection in Indonesia (Djalante et al., 2020). So that the Indonesian people, especially sports athletes, can still focus on doing training activities during the covid-19 pandemic. Because, VO2Max and physical activity are closely related to maintaining athlete performance. Therefore, researchers are interested in measuring the level of physical activity using the GPAQ and VO2Max instruments before the covid-19 pandemic until the covid-19 pandemic in Indonesian National Team athletes in Cricket, Soccer, Volleyball.

There is research that shows that inadequate physical activity and doing a lot of self-activity will cause functional disabilities and reduced quality of life, compared to people who do sports by maintaining endurance at least 150 minutes in one week (Owen, 2018). In addition, research by (Black et al., 2016) states that using vo2max training data and physical activity questionnaire data can accurately predict the endurance conditions of athletes. Thus, research by (Nevill, Duncan, & Sandercock, 2020) states that vo2max increases with greater physical activity, and vice versa with low physical activity, an athlete has less physical activity. This is influenced by weight status, age, and gender.

Based on the explanation above, there is a gap that since the outbreak of covid-19, the majority of athletes in Indonesia have not done intensive training. This will be risky during the performance of the match if the immune system is not maintained and is actually dangerous during the covid-19 pandemic. This problem is limited, especially the results of the research literature showing physical activity and vo2max of athletes before and during covid-19. Therefore this research is important to do to determine the description analysis of these differences. Thus, the novelty in this study lies in the characteristic aspects of the research subject,

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namely Indonesian national team athletes by measuring physical activity and vo2max before and during the covid-19 pandemic which is the subject of further discussion.

METHOD

Types of research

This type of research is an observational study using a cross sectional design. This study uses a design or observation design from research variables that are measured at the same time and in a momentary nature within a certain period of time.

Research Samples

There were 30 male athletes in this study who were only taken from 3 sports, namely cricket, volleyball, football, each of which was 10 Indonesian national team athletes using purposive sampling. States that purposive sampling is a sampling technique with certain considerations. The criteria used in determining the sample were athletes who had intensive training before covid-19, team sports, male athletes, athletes who had taken the vo2max measurement using the bleep test method before covid-19, the trainer allowed to provide secondary vo2max data for athletes before covid-19. The characteristics of the athlete's anthropometric data can be seen in table 1. The researcher only describes the data quantitatively without comparing the variables.

Tabel 1. Anthropometric Characteristics of Athletes

Variabel (n=30)	Average	Minimum	Maximum
Age	23,70 ± 2,29	19,00	29,00
Weigh (kg)	72,37 ± 9,43	57,00	89,00
Heigh (cm)	178,87 ± 6,20	168,00	192,00
BMI (kg/m^{-2})	22,57 ± 2,14	19,00	29,00

Research Instrument

In this study, there were 2 variables measured by standard research instruments. The level of physical activity was measured using the Global Physical Activity Questionnaire (GPAQ) questionnaire research instrument (WHO, 2012), while the endurance (endurance) vo2max was measured using the Bleep Test method. The data analysis technique used

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is descriptive quantitative in the form of mean (mean), standard deviation. Retrieval of research data for physical activity using the GPAQ questionnaire instrument that has been filled in by the research sample.

Data analysis

At the initial stage, descriptive analysis of the data was carried out using SPSS version 22 to determine the MET value consisting of the minimum, maximum, mean, and standard deviation values. Then the results of physical activity were analyzed to determine the percentage of respondents with the classification of the total physical activity assessment (MET minute / weeks) which are categorized into 3 levels as follows:

Table 2. Physical Activity Category (MET minutes/week)

MET minutes/week	Kategori
≥ 3000	High
≥ 600-3000	Moderate
< 600	Low

Source: (WHO, 2012)

Furthermore, vo2max data collection before covid-19 uses secondary data obtained from cricket, football and volleyball national team coaches who have taken measurement tests using the Bleep Test method and during the covid-19 pandemic vo2max data were obtained from measurement test results using the same method and conducted one test by the athlete. Then, the data were analyzed descriptively in the form of mean, standard deviation, minimum and maximum values. The data that has been obtained are processed to be classified according to the category to determine the athlete's vo2max score and the number of percentages below:

Table 3. VO2Max Classification of Athletes Aged 20-29 Years

VO2Max score	Classification
>52.6	*Superior*
49.3 – 52.5	*Excellent*
43.9 – 48.7	*Good*
39.9 – 43.3	*Fair*
33.0 – 39.2	*Poor*
< 31.5	*Very Poor*

Source: Agus & Apri (2012)

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RESULT AND DISCUSSION

Result

The data obtained from the study were processed and analyzed using SPSS version 22 to test descriptive statistics. From the results of this study the researcher also used the Microsoft Excel program to determine the category and classification of physical activity levels, vo2max and percentage. Below is a summary of the overall data description in accordance with the measured variables and is presented as follows:

Table 4. Description of Results Data

	N	Minimum	Maximum	Mean	Std. Deviation
Physical Activity	30	1080	10800	6017.33	2945.124
VO2Max Before Pandemi	30	34.7	68.0	51.973	8.3069
VO2Max After Pandemi	30	36.8	484.0	123.300	155.6651

From table 1 in the description of the research data, it can be seen that there are two variables measured with standard instruments. Collecting research data was assisted by 3 representative students from one of the sports cricket, volleyball, and football. To maintain the quality of the data taken, the three students took vo2max data using the Bleep Test method. Then, the data is sent via email online to find out the vo2max results during the covid-19 pandemic. VO2Max data collection before the covid-19 pandemic was carried out by online interviews and also using secondary data. The physical activity variable uses the Global Physical Activity Questionnaire (GPAQ) questionnaire which is distributed online which is then filled in by cricket, volleyball and football national team athletes. In table 1 above, there are N or the number of research subjects, namely 30 national team athletes, each representing 10 athletes in cricket, volleyball, and football with an average score of the respondents' physical activity of 6017.33 with a standard deviation value of 2945,124 , while the mean score on the vo2max variable before the covid-19 pandemic was 51.973 with a standard deviation of 8.3069, then the mean vo2max score

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during the covid-19 pandemic was 123.3 with a standard deviation value of 155.66. There is table 2 below, which describes the level of physical activity based on Metabolic Equivalent (MET).

Table 5. Total Physical Activity Levels based on Metabolic Equivalent (MET)

MET menit/minggu	Physical Activity	Mean MET	STDEV MET	Frequency Responden	Presentase (100%)
≥ 3000	High	6994,167	2441,762	24	80
≥ 600-3000	Moderate	2110	585,9351	6	20
< 600	Low	-	-	-	0
	Amount			30	100

Based on table 2, it shows the number of physical activity levels based on Metabolic Equivalent (MET). At the level of physical activity with MET ≥3000 minutes / week is included in the high category, then the mean score of MET is 6994.167 with a standard deviation value of 2441.762, from these results there are 24 (80%) high category respondents. Moderate level of physical activity with a MET value of ≥600-3000 minutes / week has a mean score of 2110 MET with a standard deviation value of 585.9351, from this value the number of respondents in the moderate category is 6 (20%). From the results of the physical activity level above, there is no low category with MET values <600 minutes / week. In Figure 1 below, you can see the percentage classification describing the physical activity level of the Indonesian national team athletes.

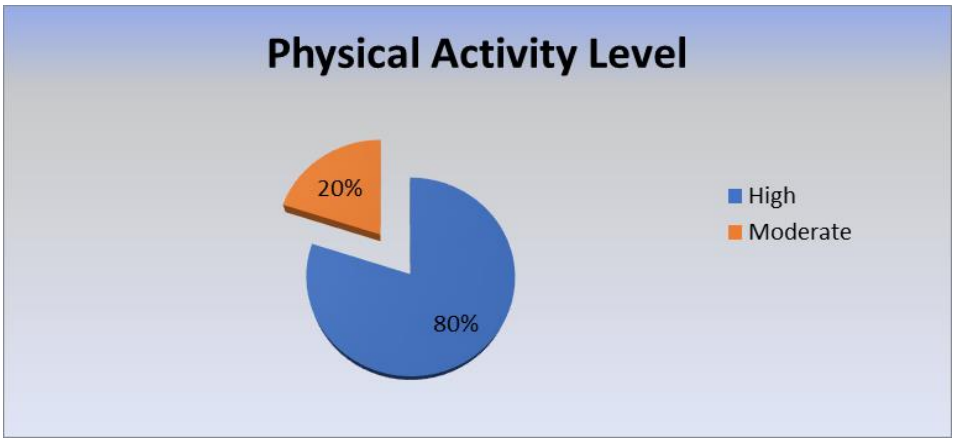

Figure 1. Physical Activity Indonesian National Team

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In figure 1 above, the level of physical activity that has been classified according to the results of the analysis has been described into two categories, namely high and medium. Based on the results of the analysis, the research subjects had a high level of physical activity (80%), while a small proportion had a moderate level of physical activity (20%). Below are the results of the analysis of tables and figures on the vo2max of Indonesian national team athletes before the covid-19 pandemic and during the covid-19 pandemic.

Table 6. VO2Max Frequency Distribution of Indonesian National Team Athletes Before the Covid-19 Pandemic

No	Classification	Skor VO2Max	Frequency	Presentase (100%)
1	*Superior*	>52.6	15	50
2	*Excellent*	49.3 – 52.5	4	13,33
3	*Good*	43.9 – 48.7	8	26,67
4	*Fair*	39.9 – 43.3	1	3,33
5	*Poor*	33.0 – 39.2	2	6,67
6	*Very Poor*	< 31.5	0	0

Based on table 4 above, it shows that there is the highest classification, namely the superior category of 15 (50%) athletes, then in the category exposed with the excellent classification 4 (13.33%) athletes are obtained, then there are categories with the good classification obtained 8 (26.67%) athletes, in the category with the fair classification there are 1 (3.33%) athletes, after that with the poor classification, 2 (6.67%) athletes are obtained, and the last one is no number of subjects and the percentage is very poor. with a vo2max score of <31.5. In table 5 below is the vo2max frequency distribution of Indonesian national team athletes during the covid-19 pandemic which can be seen as follows:

Table 7. Distribution of VO2Max Frequency of Indonesian National Team Athletes during the Covid-19 Pandemic

No	classification	Skor VO2Max	Frequency	Presentase (100%)
1	*Superior*	>52.6	7	23,33
2	*Excellent*	49.3 – 52.5	3	10
3	*Good*	43.9 – 48.7	12	40
4	*Fair*	39.9 – 43.3	5	16,67
5	*Poor*	33.0 – 39.2	2	6,67
6	*Very Poor*	< 31.5	1	3,33

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Based on table 5 above shows the results of the analysis which have been classified from the highest to the lowest. In the category with the superior classification obtained 7 (23.33%) athletes, then in the excellent classification obtained 3 (10%) athletes, then in the category with the good classification 12 (40%) athletes, on the fair 5 classification (16.67%) athletes, in the classification of poor 2 (6.67%) athletes, and in the classification of very poor 1 (3.33%) athlete. When viewed from the level of the vo2max category before the covid-19 pandemic and during the covid-19 pandemic the subjects can be classified, namely:

Figure 3. Histogram of VO2Max Percentage of Indonesian National Team Athletes

Figure 3 above, it can be concluded that the vo2max of Indonesian National Team Athletes before the covid-19 pandemic was included in the superior category by 50%, while during the covid-19 pandemic the vo2max level of Indonesian National Team athletes could be concluded that it was included in the good category by 40%.

Discussion

According to Wollaston et al. (2015) if physical activity is a drug, then the benefits range in mental well-being, mental illness, heart disease, obesity, diabetes, and osteoporosis. Thus, the physical condition of the sports athlete can also change depending on the action and collection of body components. This means that absolute physical conditions can be

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trained and improved according to their respective physical abilities by means of structured, orderly, and progressive training methods, so that each component wants to complement each other (Zawawi & Burstiando, 2020). There are four main dimensions that become the focus of physical activity, namely the type, frequency, duration and intensity of physical activity. Type is a type of physical activity such as walking, sports, and cycling; frequency is the number of physical activity sessions per certain unit of time; duration is the amount of time spent doing physical activity; and the intensity of physical activity associated with the terms light, moderate, and heavy (Gademan et al., 2014).

Based on the results of data analysis, it shows that most of the respondents in this study have physical activity in the work domain and do sports activities in the heavy activity category. A small proportion of the activities are being carried out by respondents with the time not used for doing work. However, recreational activities and sports such as volleyball, relaxing cycling, and brisk walking result in an increase in breath and pulse to the maximum. The results of this study also revealed that there was no physical activity in the light category, according to the physical condition of the respondents that high physical activity was in line with relatively good endurance. The results of this study contradict the results of research by (Adhitya, 2016) which showed that 1 respondent (2.70%) had a high level of physical activity, 25 (67.57%) had a moderate level of physical activity, and 11 respondents (29.73%)) have a low level of physical activity.

This information shows if most of the State University of Yogyakarta student internet service operators have a moderate physical activity level. This proves that not all research subjects and results can be generalized. In general, physical activity carried out by sports athletes who are accustomed to training will have a much better level of physical activity than non-athletes. All physical components in sports activities are a process of fulfilling energy needs that take advantage of energy sources derived from glucose.

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Endurance is the ability to do work or exercise for a long duration of time without experiencing fatigue. With good endurance, the athlete's performance will be optimal for a long duration with a long fatigue time (Prakoso & Sugiyanto, 2017). Endurance to measure vo2max is something that describes the ability of the heart, lungs and blood to use oxygen with standard measurements of cardiorespiratory fitness (Ando, Piaggi, Bogardus, & Krakoff, 2019). There are several aspects that affect endurance ranging from lifestyle to human anatomical aspects, so that good endurance without being supported by the ability to play methods, good tactics accompanied by good mentality, so that the achievement to be achieved cannot run with balance, and On the other hand, having a physical condition with poor endurance but supported by good methods, tactics, and mentality, it is less supportive for optimal achievement (Satrio & Winarno, 2019). The dominant physical and psychological aspects that support the ability can be good if given proper training with the game position. Specialized exercises are performed by athletes to adapt to the principles of their specialization.

Training each component certainly requires efficient, effective training; and quality such as exercise volume, exercise intensity, training breaks (training intervals), and training frequency (Guntoro, Muhammad, & Qomarrullah, 2020). The factors that affect vo2max include gender, age, physical exercise, temperature, cardiovascular function, pulmonary, hemoglobin in red blood cells, body composition and elevation. In theory, vo2max value is also a limitation of aerobic ability, therefore it is like the best parameter to measure an athlete's aerobic capacity. There is previous research that reports that the peak vo2max value for men is reached at the age of 17-25 years. The results of this study showed that the average age of athletes in martial arts was closer to the peak age with an average age of 15.83 years compared to athletes in sports with an average age of 15.00 years. However, the vo2max value of game sports athletes is greater than that of martial sports athletes. Thus, the type of

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exercise, movement intensity, and duration of physical activity have a greater influence on the vo2max value (Sagiv, 2012).

Before the covid-19 pandemic, Indonesian National Team athletes participated in an intensive training program, one of which was endurance physical training which included a certain intensity, duration and frequency that could increase cardiorespiratory endurance because there was a physiological adaptation of the body's circulatory system (Gielen, Schuler, & Adams, 2010). Most of the Indonesian national team athletes before the covid-19 pandemic had a very good vo2max (superior), did not experience fatigue when carrying out strenuous physical activities because it was related to cardiorespiratory endurance, which is one of the factors of physical fitness that describes the ability of the respiratory system and inner rotation. providing oxygen for muscle performance during intense physical activity (Weatherwax-Fall & D, 2011), while vo2max during the covid-19 pandemic tended to decrease but was still relatively good. This happens because athletes do not do intense training together with teammates and only maintain endurance that can be done while at home, so that the intensity of the exercise decreases. Exercises that are done 1-2 times a week do not have a significant change, because there is more rest time than training time (Irianto, 2000).

CONCLUSION

The Covid-19 pandemic is the single biggest pandemic that has an impact on the world. In this study, describes the level of physical activity which is classified as high category. Meanwhile, vo2max before the covid-19 pandemic could be categorized as very high (superiror), and there was a decrease in vo2max during the Covid-19 pandemic which was obtained in the good category (good). So that in the high physical activity of athletes, there is a difference in the vo2max of Indonesian national team athletes before and during the covid-19 pandemic.

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