TURNITIN ANALYSIS OF FATIGUE LEVELS IN SEMARANG STATE UNIVERSITY

by Deny Pradana Saputro

ANALISIS TINGKAT KELELAHAN PADA ATLET KAMPUS UNIVERSITAS NEGERI SEMARANG CABANG OLAHRAGA BEREGU TAHUN 2023

ANALYSIS OF FATIGUE LEVELS IN SEMARANG STATE UNIVERSITY CAMPUS ATHLETES IN TEAM SPORTS BRANCH IN 2023

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Abstrak

Penelitian ini bertujuan untuk mengetahui tingkat kelelahan pada atlet kampus Universitas Negeri Semarang cabang olahraga berregu khususnya futsal dan basket tahun 2023 dengan menggunakan analisa tes anaerobik. Metode penelitian menggunakan desain penelitian kuantitatif. Metode yang digunakan dalam penelitian adalah menggunakan metode survei dengan teknik tes dan pengukuran. Instrument penelitian menggunakan RAST (Running-based Anaerobic Sprint Test). Proses pengumpulan dan pengorganisasian data secara metodis dari catatan lapangan, wawancara, dan dokumentasi dikenal sebagai analisis data. Hasil penelitian menunjukkan bahwa tingkat kelelahan atlet kampus Universitas Negeri Semarang cabang olahrag futsal dan bola basket tahun 2023 yaitu atlet UKM futsal Universitas Negeri Semarang, diperoleh mahasiswa dengan kategori Good dengan persentase 15,2 % dari total responden, mahasiswa dalam kategori Enough dengan persentase 36,4%, mahasiswa dalam kategori Less dengan persentase 36,4%, dan dalam kategori Very less dengan persentase 12,1%. Dari hasil statistik deskriptif dapat dilihat nilai rata-rata indeks kelelahan atlet UKM Futsal sebesar 6,46 menunjukkan dari rata-rata atlet UKM Futsal dalam kategori rendah dalam pengukuran indeks kelelahan. Sedangkan untuk atlet UKM basket Universitas Negeri Semarang, diperoleh mahasiswa yang termasuk dalam kategori Good dengan persentase 53,8 % dari total responden, mahasiswa dalam kategori dengan persentase 38,5%, mahasiswa dalam kategori Less dengan persentase 7,7%. Dari hasil statistik deskriptif dapat dilihat nilai rata-rata indeks kelelahan atlet UKM Basket sebesar 3,77 menunjukkan dari rata-rata atlet UKM Basket dalam kategori Enough dalam pengukuran indeks kelelahan.

Kata Kunci: tingkat kelelahan, atlet, anaerobik

Abstract

This research aims to determine the level of fatigue in Semarang State University campus athletes in team sports, especially futsal and basketball in 2023 using anaerobic test analysis. The research method uses a quantitative research design. The method used in the research is a survey method with test and measurement techniques. The research instrument used RAST (Running-based Anaerobic Sprint Test). The process of methodically collecting and organizing data from field notes, interviews, and documentation is known as data analysis. The results of the research show that the level of fatigue of Semarang State University campus athletes in futsal and basketball in 2023, namely Semarang State University futsal UKM athletes, was obtained by students in the good category with a percentage of 15.2% of the total respondents, students in the fair category with a percentage of 36, 4%, students in the poor category with a percentage of 36.4%, and in the very poor category with a percentage of 12.1%. From the descriptive statistics results, it can be seen that the average fatigue index value for UKM Futsal athletes is 6.46, indicating that the average UKM Futsal athlete is in the low category in measuring the fatigue index. Meanwhile, for Semarang State University basketball UKM athletes, students were found to be in the good category with a percentage of 53.8% of the total respondents, students in the category with a percentage of 38.5%, students in the poor category with a percentage of 7.7%. From the descriptive statistics results,
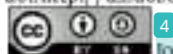
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it can be seen that the average fatigue index value for UKM Basketball athletes is 3.77, indicating that the average UKM Basketball athlete is in the adequate category in measuring the fatigue index.

Keywords: fatigue level, athletes, anaerobic

INTRODUCTION

The human body is always moving to carry out daily activities (Wirasasmita, 2013). To be able to move the body requires energy (Wiarto, 2013). The energy required for physical performance is obtained from the metabolism of food consumed daily. By using enzyme catalysts that are in the way of metabolism, this energy source will be converted into ATP molecules (adenosine triphosphate), a high energy component that is responsible for muscle contraction and other cell functions (Rismayanthi, 2015; Lesmana, 2018). The use of ATP depends on the type of sports activity, namely sports activities without using oxygen (anaerobic) and using oxygen (aerobic) (Irawan, 2007). Aerobic activity is a systematic exercise activity that uses oxygen burning energy and increases the load gradually and continuously, requiring oxygen without causing fatigue (Palar et al., 2015).

There are various aerobic exercises, for example aerobics, brisk walking, swimming, running, cycling, Zumba and jumping rope (Palar et al., 2015). Anaerobic exercise is exercise without oxygen supply, making you easily run out of breath and creating a quick burst of energy at one time. This exercise is carried out for a short duration but with high intensity (Saptono et al., 2021). This type of exercise can stimulate muscle activity at high intensity which can increase muscle strength and endurance. Examples of anaerobic exercise are weight lifting, sprinting (fast running) (Saptono et al., 2021). A sport may use both energy systems but differ in the percentage of use, which is why the term dominant energy system is used. Predominant energy is a description of the dominant energy system in a sport (Fox, 1993).

Sports, especially team events, require athletes to always be in good shape, fit and always have improved performance (Parwata, 2015) The physical demands of competitive games can cause athletes to suffer from fatigue. According to Kellis, fatigue is a condition caused by several things, especially associated with acute metabolic changes (Yustika, 2018). The rapid activity of carbohydrate metabolism and the increase in hydrogen ion concentration cause the acidity state in the muscles to change (intramuscular acidosis) and lead to a decrease in athlete performance. Fatigue can be divided into two types, namely mental fatigue and physical fatigue. Mental fatigue is usually caused by mental work while physical fatigue is caused by muscle work. Fatigue recovery is an important aspect to any physical conditioning program (Rifan, 2016). By recovering well, athletes will be able to maintain their fitness level after training and competing. There are many ways you can do when you experience fatigue and to speed up recovery after energy-draining activities, namely recovery and massage methods (Purnomo, 2015).

Team sports are a favorite among both the general public and students in Indonesia. As is the case on the Semarang State University (UNNES) campus. Currently, UNNES has a Student Activity Unit (UKM) which operates in the field of sports, especially team sports such as football, basketball, volleyball, futsal, sepak takraw and soft ball There are many types of Student activity units (UKM) with many athletes joining them. The research only focuses on futsal and basketball Student activity units (UKM). This is because only futsal and basketball UKM still carry out routine training every week.

Based on the results of interviews with athletes at UKM Basketball, 16 out of 26 athletes

had a high level of fatigue while 10 out of 26 athletes said they had a low level of fatigue. The answers given by the athletes are not based on accurate data because they are the result of their own opinions without valid test result data. As a result of an interview with the basketball coach (Wahyu Rafli Wardhana), information was obtained that the poor performance of UKM athletes was caused by a decrease in athletes' stamina when competing in the 3rd and 4th quarters. It was seen that some of the athletes in the match experienced slow movements when defending, were less agile and lots of turnovers when in attacking position, and there are still some when shooting the ball doesn't go in. It was also conveyed that there had been no evaluation of the training program provided through measurements using standard instruments to measure fatigue levels.

This kind of research has been carried out by several researchers regarding fatigue indices, including the fatigue index value of futsal players at the Indonesian Institute of Semarang High School, where a sample of sixteen people was obtained from twelve players in the fatigue index category (75%) while for the non-fatigue category there were four players (25%) (Wibisana, 2020). The novelty of this research is focused on the sample number of athletes studied and the athletes are students at Semarang State University. The problems seen from students at Semarang State University are likely to experience fatigue, including 1) Training programs that are too heavy, 2) over-training, 3) Recovery between lecture hours and training hours that is too short. If they do not receive special attention, athletes will not be able to show maximum performance in sporting events. Problems can also be seen from coaches who do not regularly test athletes' physical condition. A good exercise program should involve monitoring physical condition evaluations carried out every one or three months. This is done so that aerobic endurance and anaerobic endurance can be seen. Trainers in routine training tend to provide training programs on aerobic endurance and do not pay attention to anaerobic endurance, while aerobic endurance cannot identify the level of fatigue.

Based on this view, researchers wanted to test whether athletes really have high levels of fatigue or not. This research needs to be carried out because it is useful for the development of athletes to be able to determine the level of fatigue so that it can increase the athlete's maximum performance and improve performance in inter-campus championships.

METHOD

This research is quantitative research, so the condition of the object will be described according to the data obtained (Panjaitan, 2017). Quantitative research is a type of research that must be systematic, planned and structured from the beginning of the research to the research design (Panjaitan, 2017). Quantitative descriptive research aims to investigate conditions and then create a report containing the results of the investigation. Descriptive research is an approach used to accurately test facts and phenomena regarding the characteristics of a certain population using numbers (Ahyar et al., 2020). The variable in this study is the level of fatigue in athletes. Fatigue is a reduction in the state of the body's functional units, which will affect the performance of their duties (Parwata, 2015).

Furthermore, the sampling technique used to determine the sample in this study used purposive sampling. Purposive sampling is a sampling technique from data sources with certain considerations (Sugiyono, 2015). Sampling in this study was based on inclusion criteria and exclusion criteria (Arikunto, 2014). Inclusion criteria include: 1) Athletes have been members of UKM futsal and basketball for at least 6 months, 2) UKM futsal and basketball athletes actively train every week, 3) Are listed on the list of players in inter-campus championships, 4) Athletes are not currently or in injury recovery period, 5) Physically and Spiritually Healthy. Meanwhile, the exclusion criteria include: 1) Having a history of congenital disease, 2) Athletes who are not or are recovering from an injury, 3) Athletes who are in unhealthy condition, 4) Athletes who are not willing to be research samples. So, the sample taken was 59 athletes who met the

criteria, consisting of 33 UKM futsal athletes and 26 UKM basketball athletes.

This research was conducted at Semarang State University, in the Kamiso Field Building, Faculty of Sports Sciences. Data collection techniques use survey methods. The research instrument used the Running based Anaerobic Test (RAST). This series of tests must be carried out according to applicable procedures. Before carrying out RAST, the sample underwent a brief history and physical examination, and body weight, height was measured. Subjects were then measured using RAST (Mubarrok, 2018). The data analysis technique used is quantitative descriptive statistical analysis with percentages (Sudijono, 2010).

RESULT

The basic characteristics of the research subjects are shown in the table below based on several variables, namely body weight, height, body mass index (BMI), fatigue index and time to perform RAST of the research subjects. Data descriptions are presented in table form containing statistics including number of subjects (N), minimum, maximum, average (mean), standard deviation (SD), median, mode and range.

Characteristics of respondents from futsal and basketball's UKM

Tabel 1. Descriptive statistics of respondents from futsal and basketball student activity units (UKM)

	N	Minimum	Maximum	Mean	Std. Deviation	Median	Modus	Range
Weight	59	47.3	110	61.516	11.12	58,3	55,6	53,1
Height (cm)	59	148.5	192	166.537	8.05	173	175	160
IMT	59	17.480	30.141	22.106	2.94	23,93	24,35	21,4
Fatigue Index	59	0.361	13.572	5.283	2.68	5,29	5,63	4,74
Time	59	31.86	50.7	38.04	5.08	36,19	34,98	33,63

Source: Research data, 2023

Based on the results of descriptive statistical tests from data obtained from 59 student UKM Futsal and UKM Basketball athlete respondents, the processed Body Weight figures showed the lowest value of 47.3 and the highest value of 110 with an average of 61.516 and a standard deviation value of 11.117, as well as the mean value is 58.3 and the value that appears most often is 55.6 and the range is 53.1. Body height (cm) shows the lowest value of 148.5, the highest value is 192 with an average of 166.537 and a standard deviation of 8.05, and the middle value is 173 and the value that appears most frequently is 175 and the range is 160. From the results of the weight calculation for body and height, the BMI value in the table shows the lowest value is 17.480, the highest is 30.141 and the average is 22.106 with a standard deviation of 2.935, and the middle value is 23.93 and the value that appears most frequently is 24.35 and the range is 21.4.

Results of measuring the fatigue level of futsal's UKM

Table 2. Results of measuring the level of failure of futsal UKM

Sample	Weight	Fatigue index	Total running time	Category
1	59,2	5,70	34,98	Enough
2	66,1	5,80	37,7	Enough
3	58,2	4,71	36,61	Enough

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Sample	Weight	Fatigue index	Total running time	Category
4	58,9	6,77	31,86	Less
5	55,9	6,49	35,89	Less
6	52,5	3,25	33,98	Good
7	57	9,10	33,24	Less
8	62,8	8,32	34,98	Less
9	78,3	8,88	36,99	Less
10	55,2	3,65	35,98	Enough
11	47,3	2,98	36,19	Good
12	75,2	10,37	32,92	Very less
13	55,6	7,71	37,45	Less
14	59,7	9,62	33,41	Very less
15	75,1	9,93	33,36	Very less
16	59,9	6,03	34,68	Enough
17	59,6	8,11	35,77	Less
18	85,1	4,20	40,85	Enough
19	78,9	13,57	34,24	Very less
20	56,4	5,40	36,19	Enough
21	65,4	6,06	35,98	Enough
22	61,6	5,42	33,48	Enough
23	68,3	2,60	35,2	Good
24	52,1	9,19	35,63	Less
25	53,1	3,08	38,11	Good
26	50,75	7,13	34,32	Less
27	47,3	6,46	36,67	Less
28	59,5	8,70	32,92	Less
29	63,2	0,36	34,91	Good
30	65,7	8,54	37,33	Less
31	58	4,12	32,96	Enough
32	56,3	5,76	32,96	Enough
33	62	5,29	36,6	Enough

Source: Research data, 2023

The processed fatigue index (table 2) shows the lowest value is 0.36 and the highest is 13.57 with an average value of 5.28 and a standard deviation value of 2.6784, as well as a middle value of 5.29 and a value of the most frequently appearing is 5.63 and the range is 4.74. Finally, the travel time for UKM Futsal and UKM Basketball athletes with the lowest value was 31.86 and the highest was 50.7 with an average travel time of 38.04 and a standard deviation of 5,081, and the average value was 36.19 and the value that appeared most often was 34.98 and a range of 33.63.

Based on the results of data analysis from measuring the fatigue level of athletes at UKM Futsal Semarang State University (figure 1), it was found that there were no students with a very good fatigue index category, 5 students who were included in the good category with a percentage of 15.2% of the total respondents, students in the sufficient category there were 12 students with a percentage of 36.4%, in the insufficient category there were 12 students with a percentage of 36.4%, and in the very poor category there were 4 students with a percentage of 12.1%. From the descriptive statistics results, it can be seen that the average fatigue index value

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for UKM Futsal athletes is 6.46, indicating that the average UKM Futsal athlete is in the low category in measuring the fatigue index.

Based on the results of data analysis from measuring the fatigue level of athletes at UKM Basketball, Semarang State University (figure 2), it was found that there were no students with a very good fatigue index category, 14 students who were included in the good category with a percentage of 53.8% of the total respondents, students in the sufficient category there were 10 students with a percentage of 38.5%, in the insufficient category there were 2 students with a percentage of 7.7%. From the descriptive statistics results, it can be seen that the average fatigue index value for UKM Basketball athletes is 3.77, indicating that the average UKM Basketball athlete is in the adequate category in measuring the fatigue index.

Table 3. Distribution of results measuring the level of fatigue of futsal's UKM

Weight (kg)	Frequency	Percentage
Good	5	15.2%
Enough	12	36.4%
Less	12	36.4%
Very less	4	12.1%

Source: Research data, 2023

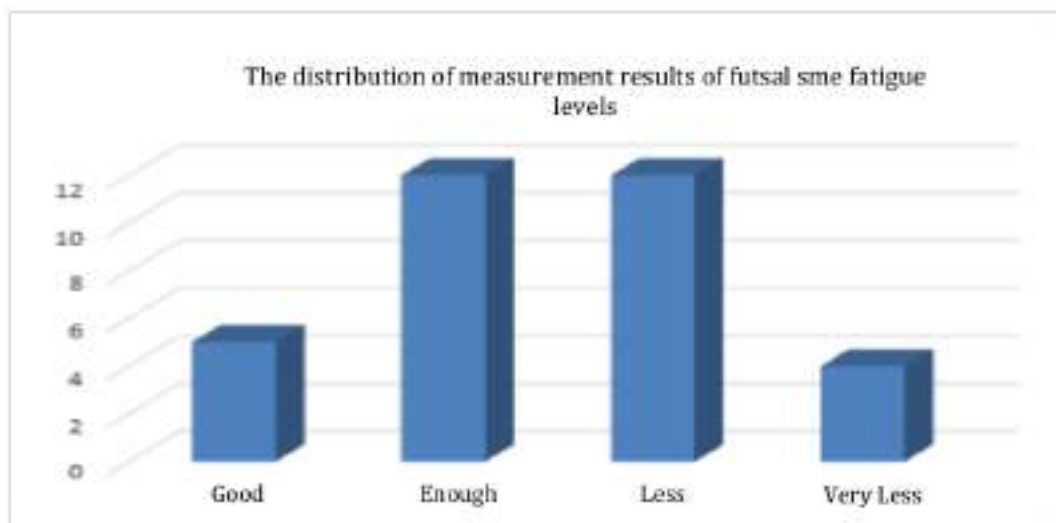The distribution of measurement results of futsal sme fatigue levels

Figure 1. Distribution diagram of measurement results of futsal UKM fatigue levels

Results of measuring the level of fatigue of basketball UKM

Table 4. Results of measuring the level of fatigue of basketball UKM

Sample	Weight	Fatigue index	Total running time	Category
1	56,7	6,39	32,07	Enough
2	58,8	3,01	36,9	Good
3	65,9	3,65	34,3	Enough
4	55,6	7,23	34,85	Less
5	110	4,94	41,91	Enough
6	68,1	4,18	38,71	Enough

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Sample	Weight	Fatigue index	Total running time	Category
7	95,5	5,24	40,84	Enough
8	69	5,98	35,8	Enough
9	55,6	8,44	33,74	Less
10	60	5,93	33,5	Enough
11	52,3	2,52	35,6	Good
12	60,3	2,99	39,59	Good
13	51	3,43	40,34	Enough
14	60,1	2,33	46,42	Good
15	52,9	2,21	48,99	Good
16	54,2	2,69	42,59	Good
17	55	3,73	41,5	Enough
18	58,9	3,30	48,48	Good
19	50,8	2,20	43,3	Good
20	66,8	2,35	47,35	Good
21	48,9	1,33	50,7	Good
22	63	3,07	46,08	Good
23	65,7	2,37	47,3	Good
24	70,1	2,54	49,8	Good
25	54	2,28	48,5	Good
26	50,1	3,79	40,8	Enough

Source: Research data, 2023

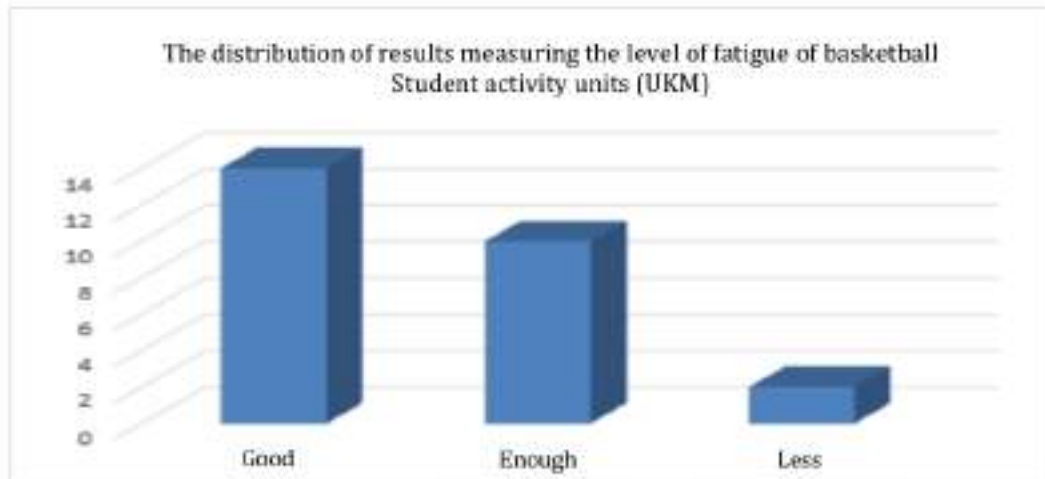The distribution of results measuring the level of fatigue of basketball Student activity units (UKM)

Figure 2. Distribution diagram of the results of measuring the level of fatigue in basketball UKM

Table 5. Distribution of results measuring the level of fatigue in basketball UKM

Weight (kg)	Frequency	Percentage
Good	14	53,8%
Enough	10	38,5%
Less	2	7,7%

Source: Research data, 2023

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DISCUSSION

Based on the results of the analysis that has been carried out, it was found that anaerobic endurance ability was categorized as Enough in UKM Basketball and Low in UKM Futsal. Respondents looked strong when they entered 1 to 4 repetitions, but students looked very tired when they entered 5 to 6 repetitions. The level of anaerobic endurance for each participant is different, this is influenced by various internal and external factors. Internal factors are something that is already present in a person's body and is permanent, for example: age, gender, muscle type and so on. Meanwhile, external factors include physical activity, environment, diet and patterns (Altavilla et al., 2020). To increase anaerobic endurance, extracurricular participants must exercise regularly and regularly and avoid external factors that can affect fitness levels and anaerobic endurance levels.

According to (Charlim, 2011) In the game of futsal, good endurance is required, especially anaerobic endurance. Because the predominant energy used in futsal games uses more anaerobic energy. Futsal games use 60% alactic anaerobic, 20% lactic anaerobic, and 20% oxygen. Then (Borrie & Knowles, 2003) also revealed that when pushing, dribbling and close dribling predominantly require alactic anaerobic energy, while energy requirements during one round predominantly require lactic anaerobic energy, and when futsal players jog or jog waiting for the ball, the energy used is aerobic.

Based on the results of data analysis from measuring the RAST of Semarang State University Futsal UKM athletes, it was found that there were no students with a very Good fatigue index category, 5 students in the Good category with a percentage of 15.2% of the total respondents, 12 students in the Enough category students with a percentage of 36.4%, students in the Less category were 12 students with a percentage of 36.4%, and in the Very less category there were 4 students with a percentage of 12.1%. From the descriptive statistics results, it can be seen that the average fatigue index value for UKM Futsal athletes is 6.46, indicating that the average UKM Futsal athlete is in the low category in measuring the fatigue index. The results show that futsal athletes have a high level of fatigue. The results of this study are in line with (Wibisana, 2020) which stated that the test results showed that the sample had a fatigue index of 12 (75%) while the sample that was said to be not tired was 4 (25%).

According to (Zulfiyani & Indra, 2015) The intensity used in the Enough basketball game is high, because this game requires basic techniques of passing, dribbling, jumping and shooting in a short time so that the ball cannot be controlled by the opposing team. The physical fitness component, namely speed, has also increased due to work demands which require every basic technique to be carried out quickly. Then, (Indra, 2015) also revealed that this has been regulated in the official basketball regulations which require athletes to move quickly within 24 seconds while in the attack area or 3 seconds in the opponent's defense and also require athletes to go home and leave within a short time. The use of the anaerobic energy system in basketball plays almost throughout the game when athletes make fast and explosive movements such as shooting, passing, lay-ups, jumping, rebounding, fast dribbles and sprints.

Based on the results of data analysis from measuring the RAST of Semarang State University Basketball UKM athletes, it was found that there were no students in the very Good fatigue index category, 14 students in the Good category with a percentage of 53.8% of the total respondents, 10 students in the Enough category students with a percentage of 38.5%, students in the Less category were 2 students with a percentage of 7.7%. From the descriptive statistics results, it can be seen that the average fatigue index value for UKM Basketball athletes is 3.77, indicating that the average UKM Basketball athlete is in the Enough category in measuring the fatigue index. The results show that basketball athletes have an Enough level of fatigue. The results of this research are in line with Satwiko & Kumaat (2020) who stated that the test results showed that research on anaerobic endurance from 12 athletes found that 9 people

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were in the good category, and 3 people were in the Less category. The conclusion is that the aerobic endurance profile is average.

Based on opinion (Taufik, 2019) the fatigue index is the level of an athlete's physical condition. By knowing the level of fatigue from eating implicitly, the athlete's physical condition can be predicted. Exhausting physical activity can cause a decrease in body performance. a marker of body fatigue is an increase in lactic acid levels in the blood. Besides that, (Wibisana, 2020) also revealed that the accumulation of lactic acid in the blood is a fundamental problem in physical performance. This causes chronic fatigue and can reduce athlete performance. Fatigue will cause a decrease in a person's performance.

Judging from oxidative stress, one of the negative impacts of physical activity is an increase in the formation of oxidant compounds followed by oxidative stress (Bloxham & Porter, 2010; Susanto, 2011). Plasma malondialdehyde (MDA) is an indicator that has high reaction sensitivity to the formation of free radicals in tissue (Temmasonge, 2020). MDA is a toxic compound which is the final result of the release of fatty acid carbon chains in lipid peroxidation. If MDA levels increase it will also increase membrane permeability. This results in damage to cell and organelle function (Sulaiman, 2014). The body has the ability to fight free radicals by forming endogenous antioxidants such as GPx, catalase, and SOD. If antioxidant capabilities are inferior to the production of free radicals, this will result in oxidative stress.

A fast recovery phase is needed to restore body condition for the next match. The recovery phase is seen from two factors, namely lactic acid levels and oxidative stress (Wibisana, 2020). So, there will be a perfect recovery phase. Predicting an athlete's physical condition can use fatigue levels. This can be used to determine the right training program to improve and create a good recovery asset to maintain performance or improve performance. futsal is different from football physiologically (Blackwell, 2015). So, by correctly determining the physical condition using the correct tests taking into account the energy system used will be able to see the athlete's condition and make appropriate performance plans.

The impact of this research for coaches and athletes is used as an input reference for reviewing future training programs and for evaluating training programs, as well as for preparing training programs according to athlete needs so that goals in sports performance, especially in -campus championships, can achieve maximum performance. And for future researchers, this research can be used as information material, future researchers can research with a larger number of populations and samples and other physical condition instruments can be ad d, not just about anaerobic ability.

Based on the research that has been carried out and obtained results and validation, the author feels that there are still several limitations, weaknesses and shortcomings in this research which can be complemented by further research, including: 1) the sample used by researchers is only limited to UKM futsal and basketball athletes who are in accordance with research criteria, 2) researchers cannot control if there are some athletes who are less than optimal in carrying out tests, 3) the small number of respondents used for research means that research results still need to be improved widely.

CONCLUSION

Based on the analysis of descriptive data, it can be concluded that the fatigue level of Semarang State University campus athletes for team sports in 2023, namely Semarang State University futsal UKM athletes, obtained an average fatigue index value for Futsal UKM athletes of 6.46, indicating that Futsal UKM athletes have a high level of fatigue. Meanwhile, for UKM Basketball athletes at Semarang State University, the average fatigue index value for UKM Basketball athletes is 3.77, indicating that UKM Basketball athletes have sufficient or moderate levels of fatigue.

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