



## Analysis of Macro and Micro Nutrient Intake on Athletes' Physical Fitness at The Student of Sports Atlet

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### ABSTRACT

An athlete's physical fitness is closely related to his nutritional intake. In 2019, it was found that as many as 27% of athletes in the West Sumatra DISPORA Sports Talent UPTD were in the unfit category. This study aims to analyze the intake of macro and micronutrients on the physical fitness of athletes at the UPTD Sport Talent DISPORA West Sumatra in 2022. The study design was cross-sectional. The population is 140 athletes with a sample of 58 athletes. Sampling using Proportional Random Sampling. Intake data was collected through interviews with the food recall and physical fitness using the bleep test. Data analysis used the chi-square test and logistic regression test. The results of this study indicate that 37.9% of athletes are in the unfit category. Athlete's intake of nutrients that are less than their needs, namely energy (15.5%), protein (8.6%), fat (10.3%), carbohydrates (17.2%), iron (55.2%) vitamins B12 (12.2%), and vitamin C (10.3%). There is no significant relationship between intake of energy, protein, vitamin B12 and vitamin C with physical fitness, but there is a significant relationship between intake of fat, carbohydrates and iron with physical fitness. The variable that most affects physical fitness is iron intake. Suggested to increase intake so that athletes' achievements can increase.

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### Kata kunci:

Asupan gizi makro  
Asupan gizi mikro  
Kebugaran Jasmani

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### ABSTRAK

Kebugaran jasmani seorang atlet berkaitan erat dengan asupan gizinya. Pada tahun 2019, diketahui bahwa sebanyak 27 % atlet di UPTD Kebakatan Olahraga DISPORA Sumatera Barat berada pada kategori tidak bugar. Penelitian ini bertujuan untuk menganalisis asupan zat gizi makro dan mikro terhadap kebugaran jasmani atlet di UPTD Kebakatan Olahraga DISPORA Sumatera Barat tahun 2022. Desain penelitian adalah *cross sectional*. Populasi berjumlah 140 atlet dengan jumlah sampel 58 atlet. Pengambilan sampel menggunakan teknik *Proportional Random Sampling*. Pengambilan data asupan melalui wawancara dengan metode *food recall 2x24 jam* dan kebugaran jasmani menggunakan *bleep test*. Analisis data menggunakan uji *chi-square* dan uji regresi logistik. Hasil penelitian ini menunjukkan bahwa terdapat 37,9 % atlet berada dalam kategori tidak bugar. Asupan zat gizi atlet yang kurang dari kebutuhannya yaitu energi (15,5 %), protein (8,6 %), lemak (10,3 %), karbohidrat (17,2 %), zat besi(55,2 %) vitamin B12 (12,2 %), dan vitamin C (10,3 %). Tidak ada hubungan yang bermakna antara asupan energi, protein, vitamin B12 dan vitamin C dengan kebugaran jasmani, namun ada hubungan bermakna antara asupan lemak, karbohidrat dan zat besi dengan kebugaran jasmani. Variabel yang paling mempengaruhi kebugaran jasmani adalah asupan zat besi. Diharapkan agar atlet lebih memperhatikan asupan agar prestasi atlet dapat meningkat.

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## INTRODUCTION

Sports are one of the important elements in improving the quality of Human Resources, because sports are directed at improving the physical, mental and spiritual fitness of the community in the hope of forming a specific character of Indonesian people (Guntur, 2018). Types of exercise are divided into three, namely aerobic, anaerobic and aerobic-anaerobic exercise. Aerobic sports include swimming, rowing, running, and cycling. Anaerobic sports include weightlifting, 100-meter running, tool gymnastics, long jump, discus throw, javelin throw, and boxing. Aerobic-anaerobic sports such as football, futsal, sepak takraw, basketball, volleyball, court tennis, beach volleyball and badminton (Ministry of Health R I, 2014). All these types of sports always compete in various national and international sports festivals.

Indonesia has not achieved brilliant achievements in all these sports, only in a few sports but these achievements are still experiencing ups and downs. An athlete can get maximum achievements if he has excellent physical fitness. The higher the level of physical fitness of an athlete, the better the level of physical health, so that the greater the physical ability and productivity that can produce brilliant achievements (Kurnia et al., 2020).

Data from the Sport Development Index (SDI) in 2006 showed that the fitness level of the Indonesian people was 1.08% in the category of very good, 4.07% good, 13.55% medium, 43.90% less and 37.40% less once (Muizzah, 2013). Research conducted by Putri (2018) on athletes in the Regional Technical Implementation Unit (UPTD) of the Sports Service of the Youth and Sports Service (DISPORA) of West Sumatra showed that 30.6% of athletes had a lack of fitness level (Putri, 2018). The results of research by Rahmah, et al (2019), namely the results of physical fitness tests for football and sepak takraw athletes at the UPTD Sports Service dispora West Sumatra showed that 27% of athletes were in the unfit category as measured using the bleep test (Rahmah et al., 2020).

Physical fitness is influenced by age, gender, genetics, intake, nutritional status, body composition, physical activity and smoking habits (Fakhiroh & et al, 2017)(Dwiyana et al., 2017). The intake of macronutrients and micronutrients plays a very important role in physical fitness, especially for muscle strength. The intake of macronutrients acts as a source of energy that functions as muscle growth. The intake of micronutrients such as iron plays a role in the formation of red blood cells that function to deliver nutrients into the muscles (Dwiyana et al., 2017). In addition, iron acts as a cofactor and activator of energy metabolism as well as oxygen transport of muscle tissue, where the oxygen demand in athletes is more than in someone who is not an athlete (Department of Health R I, 2014). This plays a role in the combustion of carbohydrates so that it produces energy, especially during the game. Micronutrients that play a role in meeting oxygen needs are iron, vitamin B12 and vitamin C. Iron plays a role in the formation of red blood cells and in the formation of red blood cells is assisted by vitamin B12. Any transport of oxygen to the muscles requires hemoglobin supported by sufficient iron (K. I. Dewi & Wirjatmadi, 2018). Iron absorption is assisted by vitamin C (Almatrsier, 2009).

Research by Rahmah, et al (2019) shows that there is a relationship between macronutrient intake and VO2 max (Rahmah et al., 2020). Vitamin B12 helps the formation of hemoglobin. The results of Astuti's research (2019) showed a meaningful relationship between hemoglobin levels and the physical fitness of adolescent athletes (Astuti, 2019).

Research conducted by Widiastuti, et al. stated that vitamin C and iron strongly correlate with physical fitness as measured by VO2 max. This shows a significant relationship between vitamin C and iron and physical fitness (Widiastuti et al., 2009).

Athletes who are fostered at the UPTD Kebakatan Olahraga DISPORA West Sumatra are teenagers who need adequate nutritional and food intake in accordance with the activities they do because they are in their growing age (KEMENPORA, 2014). Adolescence is where individuals experience rapid physical and reproductive organs changes that have an impact on increasing nutritional needs in adolescents (Fikawati & et al, 2017).

Data on the achievements of athletes at the UPTD Sports Service DISPORA West Sumatra is known that out of 12 sports, there are still 5 branches that have not met the achievement target in 2019. The comparison between the number of athletes who received achievements between 2018 and 2019 experienced a decrease where in the National Championships Between PPLP /D and SKO (School of Sports Diversity) in Indonesia in 2018 there were 60 outstanding athletes while in 2019 there were only 36 outstanding athletes. In 2020 there was no championship due to the corona virus disease pandemic conditions found in 2019 (COVID 19). In 2021, UPTD is preparing athletes to take part in the National Championships. This study aims to analyze the intake of macro and micronutrients on the physical fitness of athletes at the UPTD Sports Service DISPORA West Sumatra in 2022.

## METHOD

The design of this study is cross sectional. This research was carried out at the UPTD Sports Service DISPORA West Sumatra. The population is all athletes in the UPTD Kebakatan Olahraga DISPORA West Sumatra in 2022 totaling 140 people with an age range of 14-18 years. The sample was 58 people with proportional random sampling. The method of taking data on the intake of macro and micronutrients uses food recall 2 x 24 hours and physical fitness using the bleep test.

The data obtained were presented in the form of a frequency distribution table and analyzed using a chi-square test with a confidence level of 95% and a logistic regression test. This research has passed the ethics test of the Research Ethics Committee of Padang State University with number 15.01 / KEPK-UNP / III /2022

## RESULTS AND DISCUSSION

The analysis carried out on the characteristics of respondents in this study is based on gender, age, and sport, the results of the analysis can be seen in table 1.

Table 1 shows that respondents with the out-of-shape category were mostly on female sex characteristics, 14-year-old age characteristics, judo sports characteristics and fat category nutritional status characteristics.

Athletes who are not fit are 37.9%, generally found in the female sex. This is in line with research conducted by Triana on basketball athletes that the majority of athletes who are not in shape are found in the female sex (60 %) (Triana, 2006). Athletes who are trained at the UPTD Sports Service DISPORA West Sumatra are in puberty. Cardiovascular

endurance at the age of puberty for females is 15-25 % lower than that of men. The difference is due to the difference in maximal muscular power related to body surface area, body composition, muscle strength, hemoglobin amount, lung capacity and so on (E. K. Dewi & Kuswary, 2013).

The category of not being fit is at the age of 14 years, this is in accordance with the theory that age is a factor in determining physical fitness, since cardiovascular and neuromuscular function will increase from childhood to adolescence, then achieve maximum improvement in young adulthood and decrease with age (Triana, 2006).

**Table 1.**  
**Frequency Distribution of Respondents Based on Gender, Age, Sports Branch and Nutritional Status at UPTD Sports Services DISPORA West Sumatra in 2022**

Characteristics of Respondents	Sum	Fit			Not Fit		
		N	%		n	%	
<b>Gender</b>							
Male	36	30	83,3	%	6	16,7	%
Female	22	6	27,3	%	16	72,7	%
<b>Age</b>							
14 Years	7	3	42,8	%	4	57,1	%
15 Years	11	7	63,6	%	4	36,4	%
16 Years	18	11	61,1	%	7	38,9	%
17 Years	20	14	70	%	6	30	%
18 Years	2	1	50	%	1	50	%
<b>Nutritional Status</b>							
Underweight	3	1	33,3	%	2	66,7	%
Normal	53	35	66,1	%	18	33,9	%
Overweight	2	0	0	%	2	100	%
<b>Sports</b>							
Soccer	7	7	100	%	0	0	%
Takraw	10	4	40	%	6	60	%
Athletics	7	3	42,9	%	4	57,1	%
Archery	2	2	100	%	0	0	%
Gymnastics	4	1	25	%	3	75	%
Bicycle Racing	2	2	100	%	0	0	%
Wrestling	7	4	57,1	%	3	42,9	%
Karate	3	2	66,6	%	1	33,4	%
Pencak silat	7	5	71,4	%	2	28,6	%
Taekwondo	4	3	100	%	0	0	%
Judo	2	0	0	%	2	100	%
Boxing	4	3	75	%	1	25	%

The category of not being fit is found in the sport of judo. This is related to the nutritional status of athletes because it belongs to the thin category. An athlete should have a normal weight to get good physical fitness, because one of the indicators of measuring nutritional status is weight. For this reason, regular weight monitoring is needed so that athletes can have a normal nutritional status and can achieve optimal health (Yusuf et al., 2020).

The results of the frequency distribution analysis are divided into less, enough and more on energy intake and macronutrients and less and enough on micronutrient intake. Here is the distribution for macronutrients based on the table 2.

Table 2 shows the percentage of macronutrients that are lacking in energy (15.5 %), proteins (8.6 %), fats (10.3 %), and carbohydrates (17.2 %).

The energy expended to exercise must be balanced with the energy that enters from food, so that food intake must correspond to the type and duration of exercise (Mahardika et al., 2010). Energy is needed to support growth and physical activity.

Protein for athletes is very important for growth and body shaping in order to achieve optimal height. Athletes need a higher protein intake to repair damaged muscle fibers, and the formation of enzymes so that physical fitness can be maintained properly (Rahmah et al., 2020).

**Table 2.**  
**Frequency Distribution of Respondents Based on Energy Intake and Macronutrients at UPTD Sports Services DISPORA West Sumatra**

Macronutrients Intake	Frequency (n)	Percentage (%)	
<b>Energi</b>			
Less	9	15,5	%
Enough	47	81	%
Over	2	3,4	%
<b>Protein</b>			
Less	5	8,6	%
Enough	51	87,9	%
Over	2	3,4	%
<b>Lemak</b>			
Less	6	10,3	%
Enough	49	84,5	%
Over	3	5,2	%
<b>Karbohidrat</b>			
Less	10	17,2	%
Enough	44	75,9	%
Over	4	6,9	%
<b>Total</b>	<b>58</b>	<b>100</b>	<b>%</b>

Similar to energy and protein intake, fat intake in athletes must also be balanced (Salamah & et al, 2019).

Athletes need fat as much as 20-30% of the total energy needs. Athletes should also pay attention to the types of fats consumed, namely polyunsaturated fats and monounsaturated fats (Mirza & et al, 2019). During physical activity, to meet the energy needs of skeletal muscles relies on the oxidation of fats. Fat oxidation will contribute more to the provision of energy at resting conditions (Mirza & et al, 2019).

Carbohydrates act as the main source of energy generation for the needs of cells and body tissues. There are some tissues that can only use carbohydrates as a source of energy such as the nervous system and erythrocytes (Kurniasih et al., 2019).

During exercise, carbohydrates play a role in maintaining blood sugar levels by replacing glycogen stores during exercise. So that the amount of glycogen deposits has an effect in determining the performance of athletes. Athletes with insufficient carbohydrate intake will have an impact on decreasing muscle and liver glycogen stores and have an impact on reducing endurance and athlete performance (Rahmah et al., 2020). The distribution for the intake of micronutrients can be seen in table 3.

Table 3 shows the percentage of micronutrients that are lacking in iron (55.2 %), vitamin B12 (12.1 %) and vitamin C (10.3 %). Meanwhile, iron plays a role in physical fitness as an enzyme cofactor in energy metabolism. Iron can accelerate energy metabolism so that energy deficiencies can be replaced immediately (K. I. Dewi & Wirjatmadi, 2018). Therefore iron is indispensable in hematopoiesis (blood formation) in the synthesis of hemoglobin (Hb).

In addition to iron, vitamin B12 also has an important role in physical fitness, namely in fatty acid catabolism, erythrocyte regeneration, and taking part in the synthesis of hemoglobin and DNA as well as the synthesis of choline and methionine (Yuska, 2016). The results of the vitamin B12 intake analysis are in line with the research of Cendani, et al (2011) that vitamin 12 intake in young women of SMAN 2 Semarang is in the less category of 10% (Cendani & Murbawani, 2011).

Vitamin B 12 and vitamin C also play a role in physical fitness, helping iron absorption (Halimah et al., 2014). The results of this vitamin C intake analysis are in line with the

research of Halimah, et al (2014) that athletes with less vitamin C intake are 6.2% (Halimah et al., 2014).

Bivariate analysis explains the relationship between energy and macro substances as found in the table 4. Table 4 shows that there is a relationship between fat and carbohydrate intake and athletes' physical fitness, but there is no relationship between energy and protein intake and athletes' physical fitness. Athletes with sufficient energy and macronutrient intake have physical fitness in the fit category.

The results of the analysis showed no relationship between energy intake and the physical fitness of athletes. This research is in line with the research conducted by Evi, et al (2013) on badminton athlete Jaya Baya in the dormitory of ragunan athletes (E. K. Dewi & Kuswary, 2013). Research conducted by Pertiwi (2012) also showed similar results that there was no significant relationship between energy intake and the physical fitness of athletes (Pertiwi & Murbawani, 2012).

This research contradicts the theory that explains that energy consumption can improve physical fitness (Rahmah et al., 2020). However, based on the frequency distribution, it is known that athletes with sufficient energy intake are in the fit category more than athletes who have less or more energy intake.

**Table 3.**  
**Frequency Distribution of Respondents Based on Micronutrient Intake at UPTD Sports Services DISPORA West Sumatra**

Micronutrient Intake	Frequency (n)	Percentage (%)
<b>Iron</b>		
Less	32	55,2 %
Enough	26	44,8 %
<b>Vitamin B12</b>		
Less	7	12,1 %
Enough	51	87,9 %
<b>Vitamin C</b>		
Less	6	10,3 %
Enough	52	89,7 %
<b>Total</b>	<b>58</b>	<b>100 %</b>

**Table 1.**  
 Relationship of Energy Intake and Macronutrients with Athletes Physical Fitness

Energy and Macronutrients Intake	Physical Fitness				Total		p Value
	Unfit		Fit		n	%	
	n	%	N	%			
<b>Energy</b>							
Less	4	6,9	5	8,6	9	15,5	0,114
Enough	16	27,6	31	53,5	47	81,1	
Over	2	3,4	0	0	2	3,4	
<b>Protein</b>							
Less	2	3,4	3	5,2	5	8,6	0,133
Enough	18	31,1	33	56,9	51	88	
Over	2	3,4	0	0	2	3,4	
<b>Fat</b>							
Less	3	5,2	3	5,2	6	10,4	0,034
Enough	16	27,5	33	56,9	49	84,4	
Over	3	5,2	0	0	3	5,2	
<b>Carbohydrates</b>							
Less	5	8,6	5	8,6	10	17,2	0,008
Enough	13	22,4	31	53,5	44	75,9	
Over	4	6,9	0	0	4	6,9	
<b>Total</b>	<b>22</b>	<b>37,9</b>	<b>36</b>	<b>62,1</b>	<b>58</b>	<b>100</b>	

The results of the protein analysis also showed that there was no meaningful relationship between protein consumption and physical fitness in athletes. This study is in line with research conducted by Evi, et al (2013) there is no significant relationship between athletes' protein intake and athletes' physical fitness (E. K. Dewi & Kuswary, 2013).

The results of the fat analysis showed that there was a meaningful relationship between fat consumption and physical fitness in athletes. This study is in line with research conducted by Evi, et al (2013), there is a significant relationship between athletes' fat intake and athletes' physical fitness (E. K. Dewi & Kuswary, 2013). Research conducted by Rahmah, et al (2019) also showed similar results that there is a significant relationship between fat intake and physical fitness (Rahmah et al., 2020).

The results of the carbohydrate analysis showed that there was a meaningful relationship between carbohydrate consumption and physical fitness in athletes. Research conducted by Rahmah, et al (2019) showed similar results

that there was a significant relationship between carbohydrate intake and athlete physical fitness (Rahmah et al., 2020). This research is also relevant to the research of Rizqi, et al (2019) namely that there is a significant relationship between carbohydrate intake and the physical fitness of adolescent basketball athletes of junior high school students (Rizqi & Udin, 2018).

Carbohydrates are related to an increase in  $VO_2 max$  because carbohydrates are the main source of energy that has an important role in sports. Carbohydrates in the body are in the form of glucose and glycogen which are stored in the muscles and liver. Then, muscle glycogen is used directly by muscles for energy formation (E. K. Dewi & Kuswary, 2013). Therefore, athletes need to pay attention to carbohydrate intake because with insufficient carbohydrate intake, it will have an impact on muscle and liver glycogen stores, so it will affect the decline in endurance and performance of athletes (Rizqi & Udin, 2018).

There is a relationship between micronutrient intake and athletes' physical fitness, as shown in the following table:

**Table 2.**  
 Relationship of Micronutrient Intake with Athlete Physical Fitness

Macronutrients Intake	Physical Fitness				Total		p Value
	Unfit		Fit		n	%	
	n	%	N	%			
<b>Iron</b>							
Less	18	31,0	14	24,1	32	55,1	0,004
Enough	4	6,9	22	38	26	44,9	
<b>Vitamin B12</b>							
Less	4	6,9	3	5,2	7	12,1	0,409
Enough	18	31,0	33	56,9	51	87,9	
<b>Vitamin C</b>							
Less	3	5,2	3	5,2	6	10,4	0,664
Enough	19	32,7	33	56,9	52	89,6	
<b>Total</b>	<b>22</b>	<b>37,9</b>	<b>36</b>	<b>62,1</b>	<b>58</b>	<b>100</b>	

Table 5 shows that there is a relationship between iron intake and athletes' physical fitness, but there is no relationship between vitamin B12 and vitamin C and athletes' physical fitness. Athletes with sufficient intake of iron, vitamin B12 and vitamin C have physical fitness in the fit category.

The results of the analysis showed that there was a meaningful relationship between iron consumption and physical fitness in athletes. This research is in line with Sukmajati's research (2015) showing the same results that there is a significant relationship between iron intake and  $VO_2 max$  in students at UNY Football UKM (Sukmajati, 2015). The higher the iron intake, the higher the  $VO_2 max$  value, which means the more fitness increases.

Iron has an important role in the physical fitness of an athlete, because iron serves as a cofactor of enzymes in energy metabolism. Iron is able to accelerate energy metabolism so that it can quickly replace energy deficiencies which greatly affect athletes' fitness.

Most of the respondents in this study had less iron intake. This is because in adolescents there are no iron stores so it is very necessary to consume enough iron every day, to prevent iron deficiency so that athletes' fitness is maintained (Mirza & Et al, 2019).

Respondents with less iron intake had an out-of-shape fitness category. If it is associated with the characteristics of respondents, respondents who are not fit are more in the female sex, this is due to the fact that the amount of

hemoglobin and lung capacity of women is less than that of men (E. K. Dewi & Kuswary, 2013).

The results of the analysis showed that there was no meaningful relationship between vitamin B12 consumption and physical fitness in athletes. Vitamin B12 does not play a direct role in physical fitness.

The role of vitamin B12 only helps the formation of red blood cells (Antoni, 2021). Red blood cells, namely hemoglobin, have a role for every transport of oxygen to the muscles (K. I. Dewi & Wirjatmadi, 2018). Hemoglobin deficiency will affect the amount of oxygen that is carried so that it will affect  $VO_2 max$  (Astuti, 2019).

The research conducted by Endah Kurniasih, et al (2019) obtained the results of a correlation analysis between vitamin B12 intake and hemoglobin levels, namely with a value of  $r = 0.186$  with a positive direction with statistical test results obtained a value of  $p = 0.419$  ( $p > 0.05$ ) which means that there is no significant relationship between vitamin B12 intake and hemoglobin levels and the higher the level of vitamin B12, then hemoglobin levels are getting higher (Kurniasih et al., 2019).

The results of the analysis explained that there was no meaningful relationship between vitamin C consumption and physical fitness in athletes. This study is the same as the research of Kartika, et al (2017) that there is no relationship between the level of vitamin C adequacy and the physical fitness of IPSI martial arts athletes in Lamongan Regency (K. I. Dewi & Wirjatmadi, 2018).

This research is also relevant to Sukmajati's research (2015) that there is no significant relationship between vitamin C consumption and student physical fitness in the Student Activity Unit (UKM) of Football, Yogyakarta State University (UNY) (Sukmajati, 2015). This research is also the same as the study conducted by Nur Halimah (2014) on Central Java PPLP football athletes that there was no significant relationship between vitamin C consumption and

athletes' physical fitness level (Halimah et al., 2014). This shows that athletes' good physical fitness level is not determined from the adequacy of vitamin C (K. I. Dewi & Wirjatmadi, 2018). The variables that are most influential with physical fitness can be seen by logistic regression analysis in the table below:

**Table 3**  
 Variables That Most Affect Physical Fitness

Macronutrients and Mikronutrients Intake	B	P wald	OR	95 % CI	
				Lower	Lower
<b>Step 1</b>					
Fat	-0,910	0,307	0,403	0,070	2,305
Carbohydrate	-0,571	0,420	0,565	0,141	2,262
Iron	2,306	0,001	10,032	2,494	40,361
<b>Step 2</b>					
Fat	-1,243	0,124	0,289	0,059	1,409
Iron	2,223	0,001	9,238	2,373	35,963
<b>Step 3</b>					
Iron	1,956	0,003	7,071	1,978	25,278

The results of the analysis of table 6 showed that the iron intake variable was the most significant variable against physical development. The iron intake variable has a positive coefficient of B which is 1,956 which means that athletes with iron intake who are less at risk of having physical fitness in the unfit category will be 7,071 times higher than athletes with sufficient iron intake.

Iron has an important role in physical fitness, namely as an enzyme cofactor in energy metabolism and also plays a role in the formation of hemoglobin. Fe is reduced from ferrous to ferrous in the GI tract, so it is easily absorbed, subsequently merging with globin proteins to form hemoglobin. Hemoglobin is useful in the transport of oxygen to the muscles. Hemoglobin takes oxygen in the lungs and releases it into active tissues, such as contracting muscles.

The speed and volume of maximum oxygen consumption is known as VO2 max capacity (Sukmajati, 2015). VO2 max is an indicator that describes the capacity to carry out activities continuously for a long time without experiencing significant fatigue. Thus, athletes can follow a regular and well-directed training program to achieve improved achievements (Listianasari et al., 2022).

### CONCLUSIONS AND SUGGESTIONS

The results of the chi square test showed that there was a relationship between fat intake, carbohydrate intake and iron intake to physical fitness, on the contrary, there was no relationship between energy intake, protein, carbohydrates, vitamin B12 and vitamin C with physical fitness. The variable most related to physical fitness is the iron intake variable. The intake of nutrients, especially athletes' iron, is important to pay attention to because it affects the physical fitness of athletes so that it is recommended to the UPTD Sports Service dispora West Sumatra so that they can better regulate the nutritional intake of athletes according to their needs so that the athlete's physical fitness can be in shape.

### CONFLICT OF INTEREST STATE-MENT

The author states that there is no potential conflict of interest with respect to the authorship and publication of this article.

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### REFERENCES

- Almatrsier, S. (2009). *Prinsip Dasar Ilmu Gizi*. PT. Gramedia Pustaka Utama.
- Antoni, P. (2021). *Hubungan Status Gizi dengan Tingkat Kesegaran Jasmani Pada Mahasiswa Program Studi Pendidikan Jasmani Kesehatan & Rekreasi Universitas Islam Indragiri*. Jurnal Olahraga Indragiri (JOI), 8(2), 368–382.
- Astuti, R. W. (2019). *Hematokrit Dan Kadar Hemoglobin Dengan Konsumsi Oksigen Maksimal (Vo2Maks) Pada Atlet Remaja*. Medika Respati: Jurnal Ilmiah Kesehatan, 14(2), 151. <https://doi.org/10.35842/mr.v14i2.250>
- Cendani, C., & Murbawani, E. A. (2011). *Asupan Mikronutrien, Kadar Hemoglobin dan Kesegaran Jasmani Remaja Putri*. Media Medika Indonesiana, 45(1), 26–33. <http://www.ejournal.undip.ac.id/index.php/mmi/article/view/3119>
- Departemen Kesehatan R I. (2014). *Pedoman Gizi Olahraga Prestasi*.
- Dewi, E. K., & Kuswary, M. (2013). *Hubungan Asupan Zat Gizi Makro dan Status Gizi Terhadap Kebugaran Atlet Bulutangkis Jaya Raya pada Atlet Laki-Laki dan Perempuan di Asrama Atlet Raygunan Tahun 2013*. Nutrire Diaita, 5.
- Dewi, K. I., & Wirjatmadi, R. B. (2018). *Hubungan Kecukupan Vitamin C Dan Zat Besi Dengan Kebugaran Jasmani Atlet*

- Pencak IPSI Lamongan*. Media Gizi Indonesia, 12(2), 134. <https://doi.org/10.20473/mgi.v12i2.134-140>
- Dwiyana, P., Prasetio, A., & Ramayulis, R. (2017). *Gambaran Tingkat Kecukupan Asupan Energi, Zat Gizi Makro, Dan Zat Gizi Mikro Berdasarkan Tingkat Kekuatan Otot Pada Atlet Taekwondo Di Sekolah Atlet Ragunan*. Jurnal Ilmiah Kesehatan, 9(1), 31–38.
- Fakhiroh, M. M. P., & Dkk. (2017). *Hubungan Indeks Glikemik Makanan yang Dikonsumsi dengan VO<sub>2</sub>max Pada Pemain Futsal*. Universitas Muhammadiyah.
- Fikawati, S., & Dkk. (2017). *Gizi Anak dan Remaja*. Rajawali Perss.
- Guntur. (2018). *Olahraga Membangun Karakter Sumber Daya Manusia*. 1–13.
- Halimah, N., Rosidi, A., & Noor, Y. (2014). *Hubungan Konsumsi Vitamin C dengan Kesegaran Jasmani pada Atlet Sepak Bola di Pusat Pendidikan dan Latihan Olahraga Pelajar Jawa Tengah*. Jurnal Gizi Universitas Muhammadiyah Semarang, 3(2), 17–24.
- KEMENPORA. (2014). *Prestasi dan Cabang Olahraga Unggulan PPLP*.
- Kurnia, D. I., Kasmiyetti, K., & Dwiyanti, D. (2020). *Pengetahuan Pengaturan Makan Atlet dan Persen Lemak Tubuh terhadap Kebugaran Jasmani Atlet*. Sport and Nutrition Journal, 2(2), 56–64. <https://doi.org/10.15294/spnj.v2i2.39001>
- Kurniasih, E., Kuswari, M., & Nuzrina, R. (2019). *Hubungan Asupan Zat Gizi Makro (Protein, Lemak, Karbohidrat) dan Zat Gizi Mikro (Zat Besi, Asam Folat, Vitamin B12) dengan Kadar Hemoglobin Atlet Futsal Putri Universitas Pendidikan Indonesia Bandung*.
- Listianasari, Y., Hidayat, N., & Waluyo. (2022). *Asupan Protein, Kadar Hb Dan Vo 2 maks Pada Atlet Sepakbola Di Kabupaten Sleman Yogyakarta*. 5, 135–140.
- Mahardika, R., Kuswari, M., & Angkasa, D. (2010). *Asupan Energi dan Zat Gizi Makro, Kebiasaan Merokok, Konsumsi Alkohol dan Kuantitas Tidur Terhadap Kebugaran dan Keterampilan Shooting Atlet Basket ASPAC Jakarta*. Gizi.
- Mirza, H., & Dkk. (2019). *Sistem Energi, Antropometri dan Asupan Makan Atlet*. Gajah Mada University Press.
- Muizzah, L. (2013). *Hubungan Antara Kebugaran dengan Status Gizi dan Aktivitas Fisik pada Mahasiswi Program Studi Kesehatan Masyarakat UIN Syarif Hidayatullah Jakarta Tahun 2013*. UIN Syarif Hidayatullah Jakarta.
- Pertiwi, A. B., & Murbawani, E. A. (2012). *Pengaruh Asupan Makan (Energi, KH, Protein, Lemak) terhadap Daya Tahan Jantung Paru (VO<sub>2</sub> max) Atlet Sepak Bola*. Journal of Nutrition Collenge, Vol 1 No 1, 199–208.
- Putri, N. (2018). *Hubungan Asupan Zat Gizi Makro dan Persen Lemak Tubuh dengan Nilai Kebugaran Jasmani Atlet di UPTD Keberbakatan Olahraga Sumatera Barat tahun 2018*. Universitas Andalas.
- Rahmah, Z., Dwiyanti, D., Mourbas, I., Yuniritha, E., & Kasmiyetti, -. (2020). *Hubungan Somatotype dan Asupan Gizi Makro dengan Kebugaran Jasmani Atlet*. Jurnal Gizi, 9(2), 189. <https://doi.org/10.26714/jg.9.2.2020.189-200>
- Rizqi, H., & Udin, I. (2018). *Hubungan Asupan Karbohidrat Dan Status Gizi Dengan Tingkat Kebugaran Jasmani Pada Atlet Basket Remaja Siswa Sekolah Menengah Pertama*. Media Gizi Indonesia, 11(2), 182. <https://doi.org/10.20473/mgi.v11i2.182-188>
- Salamah, R., & dkk. (2019). *Hubungan Asupan Zat Gizi, Aktivitas Fisik, dan Persentase Lemak Tubuh dengan Kebugaran Jasmani*. Media Kesehatan Masyarakat Indonesia, 18(2), 14–18. <https://doi.org/10.14710/mkmi.18.2.14-18>
- Sukmajati, R. P. (2015). *Hubungan Asupan Zat Gizi Mikro dan Komposisi Lemak Tubuh dengan Tingkat Kebugaran Mahasiswa di UKM Sepakbola UNY*. Universitas Muhammadiyah Surakarta.
- Triana, M. S. (2006). *Faktor-Faktor yang Berhubungan dengan Kesegaran Jasmani pada Atlet Bola Basket*. Universitas Airlangga.
- Widiastuti, P. A., Kushartanti, B. M. W., & Kandarina. (2009). *Pola Makan dan Kebugaran Jasmani Atlet Pencak Silat Selama Pelatihan Daerah Pekan Olahraga Nasional XVII Provinsi Bali*. Jurnal Gizi Klinik.
- Yuska, D. (2016). *Hubungan Kadar Vitamin B12 dalam Darah, Asupan Energi, dan Aktivitas Fisik dengan Ketahanan Kardiorespirasi pada Mahasiswa Diploma IV Jurusan Gizi Poltekkes Kemenkes Padang Tahun 2015*. Universitas Andalas.
- Yusuf, K. A. M., Nurcahyo, P. J., & Festiawan, R. (2020). *Hubungan Status Gizi dan Asupan Energi dengan Tingkat Kebugaran Jasmani*. Jurnal Ilmu Keolahragaan, 19(1), 76–83. <https://jurnal.unimed.ac.id/2012/index.php/JIK/article/view/18458>

