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Analysis of the Relationship between Macronutrients and Components of Physical Conditions in Amateur Aerobic Gymnastics

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Abstract

This study aimed to determine the relationship between macronutrients and the main physical conditions of amateur aerobic gymnasts. This is quantitative descriptive research with data analysis using a bivariate correlation test. This study sample comprised 15 people who met the inclusion criteria. This research was conducted in the Cempaka Obic Lovers gymnastics community, Cempaka Village, Cirebon Regency. This research instrument uses a food record form survey method for 7x24 hours and a physical condition test which includes a cardiorespiratory endurance test, a coordination test and a reaction speed test. The results of this study stated that the average age of the respondents was 25±3.80 years, carbohydrates 564.41±139.96 kcal, fat 418.45±108.93 kcal, protein 182.80±42.55 kcal, cardiorespiratory energy resistance 22.53±1.30 mL/Kg/min, coordination 18.80±1.97 points and reaction rate 15.08±4.10 cm. Carbohydrate, fat, and protein intake on the physical condition of cardiorespiratory endurance, coordination, and reaction speed did not have a significant relationship ($p>0.05$). The conclusion of this study states that there is no important relationship between macronutrients consisting of carbohydrates, fats and proteins with the components of the physical condition of cardiorespiratory endurance, coordination and reaction speed of amateur aerobic gymnasts.

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INTRODUCTION

The Indonesian government always strives to improve national and international sports achievements, one of these efforts is to create a national sports design which is now contained in Presidential Regulation (Perpres) No. 86 of 2021 concerning the Great Design of National Sports (DBON) (Kemenpora, 2021). As stated in the Perpes DBON, the scope of sports is educational, achievement, recreational, and the sports industry. Recreational sports are carried out in a free time where the perpetrators are not required to excel and can be done by all groups and can also be referred to as community sports (Arief & Andun, 2020). Based on observations in the Cirebon Regency area, many community sports have developed, one of which is aerobic exercise. Cempaka Village is one of the many villages in Cirebon Regency, which is still holding and developing aerobic exercise as a fitness sport. Aerobic gymnastics that has developed in the community so far is also known as fitness gymnastics, which is popular with the community to improve fitness and health and to obtain pleasure and happiness. Fitness gymnastics can be done by all people with simple equipment (Sahudi, 2015; Dwijayanti et al., 2021). As a community sport, fitness gymnastics is shaded by a committee which is a government partner who is responsible for community recreational sports, namely the Indonesian Community Recreational Sports Committee (KORMI) (Buana, 2020).

Excellent and optimal physical conditions are essential for each individual to carry out various activities (Subekti, 2018). However, each individual's fitness level varies depending on the type of physical activity carried out (Sari & Nurrochmah, 2019). Physical fitness is the ability of an individual to carry out daily activities without significant fatigue and still have energy reserves to rest or do other activities (Julianto, 2016); (Kuswary et al., 2021). A fit body is influenced by several things, one of which is nutritional intake. Nutritional intake optimises body performance and prevents fatigue (Leonarda et al., 2018).

Good Nutrition is influenced by the intake of good food, drink or supplements with the correct dose. Nutritional supplements balanced with regular physical activity will result in a healthy, fit and ideal body (Kuswary et al., 2021). Athletes need Nutrition in sports to improve performance during training and competition (Zahra & Muhlisin, 2020). One way to improve a person's physical condition can be done by doubling physical activity in a week by exercising, such as aerobic exercise and balancing with healthy and appropriate nutritional intake (Ardoy et al., 2011).

The intake of food and nutrients that enter the body must be adjusted in quality and quantity. Every physical activity or sports activity requires the intake of macronutrients that are consumed in large quantities, such as carbohydrates, fats, and proteins, to be processed directly by the body to produce energy for activities (Sandi, 2019). Based on

the Regulation of the Minister of Health of the Republic of Indonesia concerning the recommended nutritional adequacy rate for the Indonesian people, the average energy adequacy rate for the Indonesian people is 2100 kcal/person/day (Permenkes, 2019).

Sports coaching refers to 3 sports buildings, namely achievement sports, educational sports and recreational sports (Setiawan, 2018). Therefore, community recreational sports have a role and contribute to sports achievements through massing and breeding sports. However, in reality, few studies still examine community sports, especially regarding their nutritional intake. This is the background of research on the relationship of macronutrient intake with cardiorespiratory endurance, coordination and reaction speed of aerobic gymnasts to know how the relationship between macronutrients and components of physical condition (cardiorespiratory endurance, coordination and reaction speed) in aerobic gymnasts.

METHODS

This research is a type of correlational research with a quantitative approach. The population in this study were members of the Cempaka Obic Lovers gymnastics community in Cempaka Village, Cirebon Regency. The sample in this study is a sample that has met inclusion. The sampling technique used was purposive sampling technique with the following inclusion criteria: 1.) willing to be the research sample; 2.) members of the Cempaka Obic Lovers community; 3.) aged 25-35 years; 4.) healthy; 5.) willing to fill out a food record form for seven days; 8.) willing to do a physical condition test on the eighth day of the study. The sample consisted of 15 amateur aerobic gymnasts. Data analysis with bivariate correlation test using SPSS 25 for windows application. Presentation of data using tables.

The independent variable in this study was macronutrient intake, and the dependent variable in this study was the physical condition of the gymnast. The instrument used in this study was a 7×24 hour food record form and the main physical condition tests for gymnasts, namely a heart and lung endurance test (cardiorespiratory endurance), a coordination test, and a reaction speed test. The sample fills out a food record form for 7x24 hours by recording all food and drinks consumed for 7x24 hours and will be calculated using the 2007 nutrition survey application (Ministry of Health, 2018).

Measurement of physical condition was carried out in 3 tests, the first to measure cardiorespiratory endurance was carried out with a multistage fitness test (MFT), and the second test was a test of the eye, hand and foot coordination, which was carried out by throwing and kicking a ball at a distance of 4 meters for 30 seconds. to the targets that have been provided (Sridadi, 2014). The third test is the reaction speed test using the Ruller Drop Test, where the test requires a 30 cm ruler, table/chair and writing utensils. This research was ethically approved by the Health Research

Ethics Commission (KEPK) of Semarang State University with an ethics certificate no 110/KEPK/EC/2022.

FINDINGS AND DISCUSSION

Findings

Based on the data obtained, macronutrient intake, physical condition, and the relationship between macronutrient intake and the physical condition of amateur aerobic gymnasts can be seen in the following tables. From Table 1 above, it can be interpreted that of the 15 samples above, the average age of the sample is 25 years, with the lowest age being 15 years and the highest sample age being 30 years. The average height of the sample is 154 cm, with the lowest height at 150 cm and the highest at 158 cm.

Table 1. Characteristics of Amateur Aerobic Gymnastics

No.	n=15	*Mean*±SD	*Min*	*Max*
1	Age (years)	25 ± 3,8	15	30
2	TB (cm)	154 ± 2,35	150	158
3	BB (kg)	54,5 ± 7,41	43	67
4	IMT (kg/m^2)	22,79 ± 2,91	19,1	27,5

The average body weight of the sample is 54.5 kg with the lowest weight being 43 kg and the highest being 67 kg. The average body mass index (BMI) of the sample is 22.79 (kg/m2) with the lowest BMI value of 19.10 (kg/m2) and the highest at 27.50 (kg/m2).

Table 2. Average Macro Nutrient Consumption of Amateur Aerobic Gymnasts

No.	Macronutrients	*Mean*±SD (kcal)	%*Mean*
1	Carbohydrate	564,41±139,96	48,42
2	Fat	418,45±108,93	35,90
3	Protein	182,80± 42,55	15,68
	Total macronutrients	**1.165,66 kcal**	

In Table 2 the average amount of carbohydrate consumption is 564.41 kcal or 48.42% of the total macronutrients consumed. The average amount of fat consumption is 418.45 kcal or 35.90% of the total macronutrients consumed. The average amount of protein consumption is 488.70 (kcal) or about 15.68% of the total macronutrients consumed.

Table 3. Category of Physical Condition Amateur Aerobic Gymnastics

No.	Physical Fitness Level	Frekuensi (n)	Percentage %
1	Cardiorespiratory Endurance Test (ml/kg/min)		
	Very Good (> 52.1)	0	0
	Good (42.1-52)	0	0

	Enough (34,1-42)	0	0
	Less (28.1-34)	0	0
	Less Once (< 28)	15	100
2	Coordination Test (points)		
	Very Good (>43)	0	0
	Good (37-42)	0	0
	Enough (31-36)	0	0
	Less (25-30)	0	0
	Less Once (<24)	15	100
3	Reaction Speed Test (cm)		
	Very Good (7.5)	0	0
		10	66,67
	Good (7.5-15.9)	3	20
	Enough (16-20.4)	2	13,33
	Less (20.5-28)	0	0

Based on the data in Table 3, the physical condition of the gymnast's cardiorespiratory endurance is in the very poor category (100%), the physical condition of the coordination of the entire sample is in the very poor category (100%) and the physical condition of the gymnast's reaction speed is in the good category as many as 10 people with a percentage of 66.67%, the sample included in the sufficient category was 3 people with a percentage of 20%, the sample included in the less category was 2 people with a percentage of 13.33%.

Table 4. Analysis of the Macro Nutrient Correlation Test on the Physical Condition of Aerobic Gymnasts

Physical condition	**Macro Nutrients**	**r**	**r^2 (%)**	**P**
Cardiorespiratory Endurance	Carbohydrate	0,019	0,036	0,946
	Fat	-0,217	4,709	0,437
	Protein	0,165	2,723	0,558
Coordination	Carbohydrate	-0,438	19,184	0.103
	Fat	-0,427	18,233	0,112
	Protein	-0,356	12,677	0,193
Reaction Speed	Carbohydrate	-0,015	0,023	0,958
	Fat	0,342	11,696	0,212
	Protein	0,277	7,672	0,318

Table 4 states that all data have a significance value of p> 0.05, which means that between macronutrients consisting of carbohydrates, fats and proteins, there is no significant relationship to the physical condition of cardiorespiratory endurance, coordination and reaction speed of amateur aerobic gymnasts.

The relationship of carbohydrates to cardiorespiratory endurance has a correlation value of 0.019, with the contribution of carbohydrates to cardiorespiratory endurance of 0.036%. The relationship between fat and cardiorespiratory endurance has a correlation value of -0.217, with fat contributing 4.709% to cardiorespiratory endurance.

The relationship between protein and cardiorespiratory endurance has a correlation value of 0.165 with a protein contribution of 2.723% on cardiorespiratory endurance. The relationship of carbohydrates to coordination has a correlation value of -0.438 with a carbohydrate contribution of 19.184% to the coordination of aerobic gymnasts. The relationship between fat and the physical condition of coordination has a correlation value of -0.427 with a fat contribution of 18.233% to coordination. The relationship between protein and coordination has a correlation value of -0.356 with a protein contribution of 12.677% to coordination.

The relationship between carbohydrates and reaction speed has a correlation value of -0.015 with carbohydrate intake having a contribution of 0.023% to the reaction speed. The relationship between fat and reaction speed has a correlation value of 0.342 with a fat contribution of 11.696% to the reaction speed. The relationship between protein and reaction speed has a correlation value of 0.277 with a protein contribution of 7.672% to the reaction speed.

Discussion

The Acceptable Macronutrient Distribution Range (AMDR) or the recommended proportion of macronutrient consumption for carbohydrates is 45-65%, fat 20-35%, and protein 10-35% (Mega Anggita et al., 2021). Based on this, the average carbohydrate consumption of aerobic gymnasts is in the normal category. The average consumption of fat for aerobic gymnasts exceeds the recommendation (high). The average protein consumption of aerobic gymnasts is in the normal category.

Aerobic gymnastics is an endurance physical activity, which requires efforts to maintain physical condition in order to stay fit. One of the efforts is to pay attention to Nutrition. Nutrition plays a role in supporting athlete performance during training or in competition (Kuswari et al., 2019). Macronutrients are nutrients needed by the body in large amounts consisting of carbohydrates, fats and proteins (Abeywickrama et al., 2018). Carbohydrates as the main energy producer, regulator of fat metabolism and protein saver (Ruslan et al., 2019). The appropriate intake of carbohydrates will meet the energy needed by the body in carrying out activities. Fat is the main source of energy in endurance sports with long durations such as aerobic exercise (Thomas et al., 2016). This is because fat is digested longer and has a longer residence time in the stomach (Handayani, 2019). The percentage of body fat for each individual from the age of 18 to 34 years should range between 13%-28% for men and 8%-20% for women (Ali et al., 2020). Protein is a macronutrient that is no less important. Protein is needed for muscle formation, growth, development, formation of red blood cells, the body's defence against disease, enzymes and hormones, and the synthesis of other body tissues.

Recommendations for a good macronutrient intake are a balanced intake

with the right quality and quantity. Consumption of excess or deficient macronutrients can adversely affect physical and health conditions. Excess carbohydrate and protein intake will be converted into body fat, where the accumulation of saturated fat will increase the risk of obesity, but a lack of macronutrients will result in nutritional deficiencies or malnutrition (Wulandari et al., 2016).

The level of the physical condition of cardiorespiratory endurance and coordination of aerobic gymnasts is included in the very poor category. The lack of a physical condition of cardiorespiratory endurance and coordination is caused by a lack of exercise and physical activity. Based on Nugroho's research in 2017 stated that the lack of a physical condition of cardiorespiratory endurance is influenced by the frequency and quality of exercise which is very low (Nugroho, 2017). To increase the cardiorespiratory endurance of the gymnast by increasing the exercise and the frequency of exercise. Cardiorespiratory endurance is influenced by haemoglobin levels, nutritional status and physical activity (Kusuma et al., 2019). Gymnasts who have a poor level of coordination usually tend to be stiff and tense in performing movements, which ultimately expend a lot of energy (Muisma, 2020). To improve the physical condition of coordination, you can do regular and structured exercises by doing various variations of motion and skills (Subarjah, 2013). Reaction speed is very important and needed in various sports, therefore aerobic gymnasts are required to have a good reaction speed in order to follow the movements of the aerobic trainer/instructor. A person's physical condition can be improved by doing regular physical exercise (Garber et al., 2011).

Between intake of macronutrients consisting of carbohydrates, fats and proteins on cardiorespiratory endurance, coordination and reaction speed of amateur aerobic gymnasts did not have a significant relationship. These results are in line with research conducted by Cornia and Adriani in 2018 which showed that there was no significant relationship between energy intake and consumption of macronutrients (carbohydrates, fats and proteins) in the physical condition of Taekwondo students at Airlangga University (Cornia & Adriani, 2018). . The results of other studies also stated that there was no significant relationship between protein and carbohydrates with the physical condition of male and female badminton athletes in the Ragunan athlete dormitory (Kuswary, 2013). However, the results in this study are in contrast to research conducted by Muthmainnah in 2019 which stated that there was a significant relationship between protein intake and carbohydrate intake with the level of the physical condition of adolescent athletes at SSB Harbi (Muthmainnah et al., 2019). Research conducted by Mega Anggita et al in 2021 also showed different research results from this study, which stated that there was a significant relationship between macronutrient intake and

physical condition with a correlation value of 0.419 and ($p<0.05$) (Mega Anggita et al. ., 2021).

The insignificant relationship between macronutrients and the physical condition of COL amateur aerobic gymnasts is because the contribution given by each macronutrient to cardiorespiratory endurance, coordination and reaction speed is very small. Because, other factors can affect a person's physical condition, namely internal and external factors. Internal factors include genetics, age, and gender. While external factors are nutritional status, physical activity, exercise habits and others (Ramadhana & Prihanto, 2016).

CONCLUSION

This study concluded that the gymnast's macronutrient intake included the categories of normal carbohydrates, high fat and normal protein. The physical condition of the gymnast is in the category of very poor cardiorespiratory endurance and coordination and is in the moderate category of reaction speed. There is no significant relationship between carbohydrates, fats and proteins on the components of the physical condition of cardiorespiratory endurance, coordination and reaction speed of amateur aerobic gymnasts.

As for suggestions that can be given for further research, it can link the physical condition of aerobic gymnasts with other independent variables such as physical activity or other variables that may make a significant contribution to the physical condition of aerobic gymnasts.

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