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Correlation Beetwen Body Mass Index, Macro Nutrition Intake (Energy, Protein, Fat, Carb) with Vo2Max Value on Employees of Aisyah Pringsewu University in 2021

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A B S T R A C T

Fitness and health are important aspects that must be owned by a person. One of the things is cardiovascular fitness (cardiorespiratory) because it is known to affect individual fitness levels for a person, for fitness measurements it can be expressed by maximum oxygen volume (VO2max). One of the factors that cause heart disease is low cardiorespiratory fitness. The purpose of this study was to determine the relationship between body mass index, macronutrient intake and the VO2max value of Aisyah Pringsewu University Employees in 2021. The design of this study used a cross sectional. The number of research samples was 78 consisting of 30 men and 48 women with an average age of 30.81 ± 6.58 years. Fitness was measured using the 20-Meters Shuttle Run Test. The results of statistical analysis showed that there was a significant relationship between body mass index and VO2max value ($p<0.05$), and there was no relationship between macronutrient intake and VO2max value ($p<0.05$). In conclusion, body mass index has a significant relationship with the vo2max value in employees. However, there was no significant relationship between macronutrient intake.

Kata kunci:

VO_{2max}
IMT
Asupan Gizi

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A B S T R A K

Kebugaran dan kesehatan adalah aspek penting yang harus dimiliki oleh seseorang. Salah satu hal yaitu kebugaran jantung paru (kardiorespirasi) karena diketahui dapat mempengaruhi tingkat kebugaran individu bagi seseorang, untuk pengukuran kebugaran dapat dinyatakan dengan volume oksigen maksimal (VO_2max). Salah satu faktor penyebab terjadinya penyakit jantung yaitu rendahnya kebugaran kardiorespiratori. Tujuan penelitian ini adalah untuk mengetetahui hubungan indeks massa tubuh, asupan zat gizi makro dengan dengan nilai VO2max pada Karyawan Universitas Aisyah Pringsewu Tahun 2021. Desain penelitian ini menggunakan Cross Sectional. Jumlah sampel penelitian sebesar 78 yang terdiri dari 30 laki laki dan 48 perempuan dengan usia rata rata 30,81 ± 6,58 tahun. Kebugaran diukur menggunakan 20-Meters Shuttle Run Test. Hasil analisis statistik menunjukkan terdapat hubungan yang signifikan antara indeks massa tubuh dengan nilai VO_2max ($p<0,05$), serta tidak ada hubungan antara, asupan zat gizi makro dengan nilai VO_2max ($p<0,05$). Kesimpulannya indeks massa tubuh memiliki hubungan yang bermakna dengan nilai vo2max pada karyawan. Tetapi, asupan zat gizi makro tidak terdapat hubungan yang signifikan

INTRODUCTION

Fitness and health are important aspects that must be owned by a person. One of the most important things in the body is cardiovascular fitness (cardiorespiratory) because it is known to affect an individual's level of fitness (Ramadyani & Rahayu, 2016).

According to WHO data (2015) cardiovascular disease causes 17.7 million deaths and 31% of them represent all deaths as a whole. Some of the diseases that cause death include 7.4 million due to coronary heart disease and 6.7 million due to stroke. According to the 2018 Basic Health Research data, on the prevalence of heart disease with a doctor's diagnosis in the population of all ages by province, it was found that Indonesia was at 1.5% with the highest being North Kalimantan (2.2%) and the lowest being East Nusa Tenggara (0.7). %). Lampung Province is below the average percentage of Indonesian people, which is 1.3% (Kemenkes, 2018).

Cardiorespiratory endurance is one component of an assessment of fitness. Assessment of maximal oxygen volume (VO2max) is an assessment that can be made of the quality of cardiorespiratory endurance which is the ability of the heart and lung organs in humans to inhale as much oxygen as possible during physical activity and VO2max is expressed in milliliters/minute/kg body weight. (Sukadiyanto & Muluk, 2011).

One of the instruments used in the assessment of cardiovascular fitness is the Bleep Test in a study conducted with young adult male and female respondents showing that as many as 55% have poor cardiovascular fitness (Sukamti, et., al, 2016).

Factors that can affect a person's level of fitness is nutritional status. A person's nutritional status is expressed in body mass index which will determine the level of good and bad health. The nutritional status of obesity or overweight caused by poor nutritional status causes the body to be less than optimal in carrying out various physical activities so that it will also have an impact on low levels of physical fitness (Maharani, 2020). A study conducted on a group of young adults found that there was a significant relationship which meant that the nutritional status in the normal category had better cardiorespiratory endurance than the obese category (Bryantara, 2016). The results of another study conducted by Budiarto (2012) in the young adult age group showed that there was a significant relationship between nutritional status and Maximum Oxygen Volume (VO2max).

Food intake can affect fitness apart from nutritional status. Food intake in the form of energy and macronutrient intake. A study conducted by (Rahmah, 2020) showed that there was a relationship between macronutrient intake and VO2max value. A similar study conducted on adult men showed that there was a significant relationship between energy intake, protein intake, fat intake and carbohydrate intake with physical fitness (VO2max) (June, 2017). Excessive nutritional intake will cause obesity which has an impact on various risks of degenerative diseases such as hypertension, coronary heart disease, liver and others. Meanwhile, malnutrition will cause a lack of energy that is usually used for activities and a decrease in the immune system (Maharani, 2020).

METHOD

Participant characteristics and research design

This research is a type of quantitative research using the observation method with a cross sectional approach, namely a research design that aims to find the relationship between risk factors and the effect of observations or observations between variables carried out simultaneously.

Sampling procedures

The sampling technique used is simple random sampling. Sampling is taken randomly regardless of the level in the population and each element of the population has an equal and known chance of being selected as a subject.

The research was conducted in determining the sample size by using the cross sectional research formula (Masturoh and Temesvari, 2018). Based on the calculation results, the research sample was 78 consisting of 30 men and 48 women. The instrument in this study was a research questionnaire containing a research explanation text, informed consent, respondent identity, Omron brand digital weighing scale with an accuracy of 0.1 cm, GE brand microtoise, anthropometric measurement column, Form 2 x Recall 24 hours (weekdays & weekends).

Measures and covariates

Primary data collection in this study was carried out during the Covid-19 pandemic so it was mandatory to comply with health protocols by using masks, washing hands with soap, and maintaining a distance of 1 meter between one respondent and another. Researchers used latex medical gloves and adhered to health protocols. Before taking measurements, researchers and respondents washed their hands with soap and running water, wore masks and sat with a distance of 1 meter.

Primary data collection was carried out directly, through filling out questionnaires on respondent identity data, anthropometric measurements including measurements of the respondent's weight and height and determining BMI, macronutrient intake interviews, measuring VO2max estimation with the 20 - Meters Shuttle Run Test.

Data analysis

Conducted a test to determine the relationship between VO2max values based on body mass index, intake of macronutrients (energy, protein, fat, carbohydrates) on employees of Aisyah Pringsewu University in 2021. The statistical test used in this analysis was the Spearman correlation test.

RESULTS AND DISCUSSION

Characteristics of Research Subjects

Table 1
Distribution of Age, Weight and Height of Aisyah Pringsewu University Employees

Variable	Mean ± SD	Minimum – Maximum
Age (years)	30,81 ± 6,584	22 – 60
Weight (kg)	64,160 ± 12,575	41,1 – 94,4
Height (cm)	159,403 ± 8,301	145,0 – 182,2

The general description of the results of data collection related to age, weight and height of 78 respondents to Aisyah Pringsewu University employees is presented in table 1.

Table 2
Frequency Distribution of Gender and Position in Aisyah Pringsewu University Employees

Characteristics	Frequency (f)	Percentage (%)
Gender		
Male	30	38.5
Female	48	61.5
Total	**78**	**100**
Job title		
Lecturer	36	46.2
Driver	2	2.6
Office Boy	4	5.1
Security	8	10.3
Staff	26	33.3
The Cook	2	2.6
Total	**78**	**100**

The following is a description of the characteristics of respondents as a result of data collection on 78 respondents related to gender and respondent's position, which is presented in table 2.

Data Normality Test

The results obtained on each variable were tested for normality, from the results of the analysis which showed the normality of the numerical data on the value of VO2max, body mass index, intake of macronutrients (energy, protein, fat, carbohydrates) in table 3.

Based on table 3, it is known that the results of the normality test using the Kolmogorov-Smirnov test, the variable VO2max value has a p-value of 0.000 (p-value <0.05) so that it shows that the data is not normally distributed, the body mass index variable has a p-value of 0.200 (p-value > 0.05) so that it shows that the data are normally distributed, the variables of macronutrient intake including energy, protein, fat, carbohydrates have a p-value of 0.000, respectively; 0.0025; 0.000; 0.005 (p-value <0.05) so it shows that the data is not normally distributed.

Table 3
Test Of Normality VO2max Value, Body Mass Index and Macro Nutrient Intake

Variable	Kolmogorov-Smirnov			Saphiro-Wilk		
	Stat.	df	Sig.	Stat.	df	Sig.
Value of VO2max	,226	78	,000	,625	78	,000
Body mass index	,155	78	,000	,864	78	,000
Energy Intake	,210	78	0,000	,834	78	,000
Protein Intake	,108	78	0,025	,972	78	,084
Fat Intake	,202	78	0,000	,836	78	,000
Carbohydrate Intake	,124	78	0,005	,829	78	,000

Correlation between Body Mass Index and VO2max

The correlation between body mass index and VO2max was analyzed using the Spearman correlation test, the analysis was carried out because the body mass index data were normally distributed and did not meet the linearity requirements, so the analysis used was the Spearman correlation test. The following is a table of results of the analysis of the relationship between body mass index and VO2max value.

Table 4
Analysis of the Relationship between Body Mass Index and VO2max Value for Aisyah Pringsewu University Employees

	Value of VO2max
Body mass index	r = -0,467 p = 0,000 n = 78

The results of the statistical test analysis listed in table 4 obtained a p-value of 0.000 which indicates that there is a relationship between body mass index and VO2max values in Aisyah Pringsewu University employees. The correlation value (r) is -0.467 which means it shows a negative correlation with moderate correlation strength, this explains that the higher the body mass index value, the lower the VO2max value.

This study is in line with that conducted by Hung, et., al. (2014), in Taiwan, showed that adult respondents who are overweight and obese, their cardiorespiratory fitness is much lower than normal weight. In addition, the results of a similar study conducted on employees of the Muhammadiyah University Prof. DR. Hamka Limau Jakarta that there is a significant relationship between body mass index and fitness status (Soraya, 2014).

This is in accordance with Maharani's research (2020) that a person's nutritional status can describe a person's level of health or well-being. Someone who is overweight or obese is caused by the body being less than optimal in carrying out various physical activities so that it will also have an impact on the low level of physical fitness. Every increase in body mass index of 1 kg/m2 will be followed by a decrease in VO2max of 1.30 ml/kgBW/minute (Budiarto, 2012).

Correlation of Macro Nutrient Intake with VO2max

The relationship between macronutrient intake and VO2max was analyzed using the Spearman correlation test because the macronutrient intake data were not normally distributed and did not meet the linearity requirements, so the analysis used was the Spearman correlation test. The following is a table of the results of the analysis of the relationship between macronutrient intake and the VO2max value.

Based on table 5, the results of statistical test analysis obtained p-values of 0.323, respectively; 0.263; 0.469; and 0.730 which indicates that there is no relationship between intake of macronutrients such as energy, protein, fat, and carbohydrates with the VO2max value of Aisyah Pringsewu University employees. The correlation value (r) is <0.2 which means it shows a positive correlation with a very weak correlation strength, this explains that the higher the value of macronutrient intake, the higher the VO2max value.

Table 5
Analysis of the Relationship of Macro Nutrient Intake with VO2max Value in Aisyah Pringsewu University Employees

	Value of VO2max
Energy Intake	r = 0,113 p = 0,323 n = 78
Protein Intake	r = 0,128 p = 0,263 n = 78
Fat Intake	r = 0,083 p = 0,469 n = 78
Carbohydrate Intake	r = 0,040 p = 0,730 n = 78

In this study, the results of the bivariate analysis were obtained from the Spearman Ranks correlation test. The results showed that there was no relationship between the intake of macronutrients, both energy, protein, fat and carbohydrate intake with the VO2max value, and had a positive correlation with a very weak correlation strength, meaning that the higher the value of macronutrient intake, the higher the VO2max value. This study is not in line with that conducted by Rahmah (2020), which shows that there is a relationship between macronutrient intake and VO2max value. Research is also not in line with June (2017) conducted on adult men showing that there is a significant relationship between energy intake, protein intake, fat intake and carbohydrate intake with physical fitness (VO2max).

According to Maharani's research (2020) excessive nutritional intake will cause obesity which has an impact on various risks of degenerative diseases such as hypertension, coronary heart disease, liver and others. Meanwhile, malnutrition will cause a lack of energy that is usually used for activities and a decrease in the immune system (Maharani, 2020). The absence of a relationship in this study can be caused by several things, namely from the enumerator, at the time of conducting interviews, respondents, and also when inputting. This research is in line with Muthmainnah, et., al. (2019) it is known that there is no relationship between fat intake and fitness. Research in line with Dewi., et., al., it is known that there is no significant relationship between protein and fat intake and VO2max value.

CONCLUSIONS AND SUGGESTIONS

There is a relationship between body mass index and VO2max value with p value = 0.000. There is no relationship between intake of macronutrients (energy, protein, fat, carbohydrates) with the value of VO2max with p value = 0.323; 0.263; 0.469; 0.730. Suggestion, this research can be used as material for further research related to body mass index, intake of macronutrients with VO2max value. Further research that can be done can be in the form of intervention research, namely measuring fitness levels with other methods, with the benefits of intervention to improve nutritional status and improve nutritional intake.

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