

## The Relationship of Macronutrient Intake with Physical Fitness in Sokowaten Baru Primary School Students

Ihsan Fahroji<sup>1\*</sup>, Sunarti<sup>2</sup>, Dyah Suryani<sup>3</sup>

<sup>1-2</sup>Public Health of Department, Ahmad Dahlan University  
Jl. Prof. Dr. Soepomo, S.H. Janturan, Yogyakarta, Indonesia

<sup>3</sup>Public Health Master's Study Program, Department of Public Health, Ahmad Dahlan University  
Jl. Prof. Dr. Soepomo, S.H. Janturan, Yogyakarta, Indonesia  
Telp./Fax. 0274-564604

<sup>1</sup>Email : [ihsanfahroji08@gmail.com](mailto:ihsanfahroji08@gmail.com)

---

### Article Info

#### Article history:

Received January 2<sup>th</sup>, 2024

Revised February 25<sup>th</sup>, 2024

Accepted March 28<sup>th</sup>, 2024

#### Keyword:

Carbohydrate Intake; Fat Intake; Physical Fitness Level; Protein Intake;

### ABSTRACT

**Background:** Physical fitness can be defined as the body's ability or capacity to perform all forms of physical activity in daily life without excessive fatigue. Everyone must be physically healthy to carry out activities effectively and efficiently. Based on the results of observations that were made in October 2023 on 15 students from randomly selected research locations, it is found that 13 out of 15 students need physical fitness of less than 60 VO<sub>2</sub>MAX. This is because these eight students rarely do physical activity and more often play games in their spare time; besides that, there are 9 out of 15 students who do not have breakfast before going to school. This is another factor causing students to lack physical fitness. Sokowaten Baru Primary School has adequate learning facilities. Still, there needs to be improvements for physical fitness education, such as sports equipment that has been damaged and cannot be used compared to other schools in Yogyakarta City.

**Research Purposes:** This study aimed to determine the relationship between macronutrient intake and physical fitness in students at Sokowaten Baru Primary School, Bantul Regency.

**Research Methods:** The research design used was cross-sectional. The population was 432 students, and the sample size was 59 respondents. The study was conducted by proportional random sampling with sampling criteria aged 10-11 years. Data were collected by completing a 24-hour food recall questionnaire and the Harvard test.

**Research Result:** The results showed a relationship between carbohydrate ( $p=0.003$ ), protein ( $p=0.001$ ), fat intake ( $p=0.924$ ), and physical fitness level.

**Conclusion:** It was concluded that carbohydrates and proteins are associated with a physical condition. However, there is no relationship between fat intake and physical fitness level.

---

### BACKGROUND

Physical fitness is the body's ability to perform x daily physical work without causing significant fatigue. This means that after someone does their activities, they still have enough energy and ability to enjoy their free time or other sudden business needs (Adi et al., 2019).

Everyone, including elementary school students, needs sufficient physical fitness; if the level of physical fitness in students is very high, then students can carry out their daily activities for a relatively long time and without any significant fatigue compared to students who have low physical fitness (Hadi & Prihanto, 2016). Besides that, low physical fitness will also negatively impact elementary school students,

affecting child growth and development, increasing the risk of developing diseases, inhibiting bone growth, and reducing brain performance. Based on Farid and Nasution's research, physical fitness positively correlates with academic achievement at school (Farid & Nasution, 2017).

A high and stable level of physical fitness also affects the learning process of elementary school students. Usually, students will be eager to learn and ready to follow it, and the material delivered by the teacher will be absorbed in the students' brains (Sitoayu et al., 2020). For this reason, it is necessary to have guidance and physical fitness training for elementary school students and teachers. This means that there is a need for physical education in elementary schools (Agus & Sepriadi, 2021). Physical fitness education in primary schools plays a significant role in improving the physical fitness status of primary school students. Achieving a good fitness status can have a good impact on elementary school students, such as conducive learning activities, student diets that are fulfilled, good nutritional status, adequate rest, good attitudes and skills, and activities that do not exceed the capacity of elementary school students. Every activity requires and consumes food from all foodstuffs, which contain all the essential nutrients utilized by the whole body to carry out all activities or activities properly (Agus & Sepriadi, 2021).

There are three roles of food consumed by the human body. These substances provide a source of energy or energy used by the body to provide stamina, build cells in the body, and regulate substances in the metabolism of living things. The food group of energy-giving substances consists of carbohydrates, fats, and proteins. To increase physical endurance in children, in addition to adequate nutritional intake, one should practice various directed activities that are carried out gradually and are manageable for children. The training can certainly be achieved and passed well by doing exercises on the child's physique, called physical fitness training (Adhianto & Arief, 2023).

The thing that must be understood and considered to train the physical fitness of elementary school students is their food intake because food functions as an energy-producing substance needed to support growth, development, muscle activity, metabolic functions (maintaining body temperature, storing body fat) and repairing tissue or bone damage that can be caused by illness or injury, so nutrient intakes need to be considered and diet needs to be maintained. The conclusion is that if the diet is good, the child's nutritional status is also good, and the child's physical fitness is also good (Alawiyah et al., 2015). In addition to student diet and nutrition, physical exercise also influences the physical fitness of elementary school students, so it is necessary to have sufficient and appropriate physical exercise for elementary school students. Based on the results of research on physical fitness, it is explained that nutritional status has a positive correlation with human physical quality. The better a person's nutritional status, the better their physical quality. In addition to nutritional status, children's physical fitness is influenced by various things, including food consumption, physical activity, exercise and hemoglobin levels, age, gender, genetics, and race (Agus & Sepriadi, 2021).

Based on physical fitness data from the Sports Development Index activities by the Indonesian Ministry of Youth and Sports in 2021, 81.2% of community members were nationally involved in sports / physical activities. 30.1% of participants exercise once a week, 34.7% twice a week, and even 35.2% three or more times a week. In terms of activity, the proportion of sports is 32.83%. By age, the highest participation rate was in the 10 to 19 age group, followed by 20 to 44 years and 45 to 60 years. This means that physical activity tends to decrease with age. Nationally, the average VO<sub>2</sub>MAX was 26.35 mL/kg/min, male VO<sub>2</sub>MAX was 28.68 mL/kg/min, and female VO<sub>2</sub>MAX was 23.98 mL/kg/min. Data analysis showed that the fitness level of 53.63% was in the inferior category, 22.68% in the poor category, and only 5.86% in the excellent and superior categories. Based on regional comparisons, non-Javanese participants generally had higher VO<sub>2</sub>MAX than Javanese participants in all age groups. This is strongly suspected to be because there are more sports facilities outside Java than in Java, which offers more flexibility in performing physical activities. In addition, physical activity is more prevalent in people's daily lives outside Java than in Java (Kemenpora R1, 2021).

In previous studies, physical fitness data collection uses the Indonesian physical fitness test (TKJI), while this study uses the Harvard test technique, which uses pulse frequency in its calculations; the Harvard test technique is usually used by going up and down the bench for a specified time so that students do not need much space to move like the Indonesian physical fitness test. Related to this, the researcher is very confident that elementary school students can apply the Harvard test method in measuring their physical fitness, and no research in the Bantul area examines macronutrient intake with physical fitness.

Based on the results of observations that were made in October 2023 on 15 students from randomly selected research locations, it is found that 13 out of 15 students need physical fitness of less than 60 VO2MAX. This is because these eight students rarely do physical activity and more often play games in their spare time; 9 out of 15 students only have breakfast after school. This is another factor causing students to lack physical fitness. Sokowaten Baru Primary School has adequate learning facilities. However, there needs to be improvements in physical fitness education, such as sports equipment that has been damaged and cannot be used compared to other schools in Yogyakarta City. The researcher chose grade III and IV students because these students could be used as respondents and could take a series of physical fitness tests. With these observations, the researcher focused on the physical fitness learning activities of classes III and IV of Sokowaten Baru Primary School. However, due to the COVID-19 pandemic, not all students of Sokowaten Baru Primary School achieved achievements in physical fitness activities at school because they were only given 1 hour a week. It can be concluded that Sokowaten Baru Primary School students do less physical activity.

It should be noted that attitudes also affect students' willingness to engage in activities. Therefore, guidance and leadership are needed so that these elementary school students are willing to participate in fitness training. Based on the results of these observations, the researcher is interested in conducting research titled "The Relationship Of Macronutrient Intake With Physical Fitness In Sokowaten Baru Primary School Students."

## MATERIAL AND METHODS

This research is a descriptive correlation study using a cross-sectional approach. The approach used in this research is quantitative, namely, the data and information obtained in the form of numbers, so the analysis is based on numbers using statistical analysis. This research was conducted at Sokowaten Baru Primary School. The research population in this study were all students of SD Sokowaten Baru, with a total of 432 students. The sample size is based on the cross-sectional sample formula from the Lemeshow Formula, namely:

$$n = \frac{Z^2 \cdot N \cdot p \cdot q}{d^2 (N - 1) + Z^2 \cdot p \cdot q}$$

The results obtained were 59 students; all samples met the inclusion criteria, namely good physical, grades 4 and 5, and got approval from the respondent's parents. In contrast, the exclusion criteria were sick or unable to attend the data collection (Agus & Sepriadi, 2021).

Data collection of this study used a 24-hour Food Recall Form for two days of interviews, then made the categories Excess ( $\geq 100\%$ ), Sufficient (80-100%), and Deficient ( $\leq 80\%$ ). Meanwhile, to determine the variable level of physical fitness collected using the Physical Fitness Test instrument, namely the Harvard Step Test, the tools used in the Harvard Step test are Bench, Stopwatch, and Metronome (Farid & Nasution, 2017). In summary, the Harvard step test is carried out by going up and down the bench for 5 minutes following the metronome rhythm with a beat of 120 bpm. When the respondent begins to feel fatigued, or the respondent's steps are not in rhythm, the test is stopped, and then the time is written down. The pulse on the radial artery is counted from 1-1.5 minutes, 2-2.5 minutes, and 3-3.5 minutes, then calculated based on the formula:

$$\text{HST} = \frac{\text{Duration of ups and downs (inseconds)} \times 100}{2 \times (\text{pulse 1} + \text{pulse 2} + \text{pulse 3})}$$

Furthermore, the results of these calculations are categorized into Very Good ( $> 90$ ), Good (80 - 89), Medium (67 - 79), Less (55 - 66), and Very Less ( $< 55$ ). Furthermore, a normality test was carried out with the criteria used in knowing whether the variables studied were standard, namely, if the p-value  $> 0.05$ , the distribution was declared normal, and if the p-value  $< 0.05$ , the distribution was said to be abnormal. Furthermore, the linearity test with the criteria used if the p-value  $> 0.05$  is declared linear. Conversely, if the p-value  $< 0.05$  is declared not linear (Agus & Sepriadi, 2021).

Data processing includes editing, coding, and entry of research data. The presentation of data from this study was obtained entirely from each respondent for each variable studied using data processing software, encompassing the following: 1) Editing. Editing matches and checks the data collected through questionnaire interviews; if there is incomplete data, improvements will be made; 2) Coding. Coding is the

provision of codes to facilitate researchers in processing and analyzing research data; 3) Data Entry. Data entry fills in the research data into the data processing program, which will then be analyzed.

Data analysis is carried out after all field data is collected. To determine whether or not there is a positive relationship between the independent variable and the dependent variable, it is necessary to use the multiple regression correlation formula with a significant level of 5%. Data analysis in this study used computer software, namely SPSS, encompassing the following: 1) Normality Test. This normality test uses SPSS version 25 for Windows and in this normality tests with the Kolmogorov-Smirnov test; 2) Linearity Test. The linearity test is used to see whether there is a linear relationship between the independent variable and the dependent variable and whether the dependent variable has a linear relationship.

In this study, the correlation hypothesis was used. The correlation hypothesis can be obtained from a variable by finding the relationship points between more than two variables that affect each other in this study. Multiple correlation analysis serves to find the magnitude of the relationship and contribution of two or more independent variables (X) simultaneously (together) with the dependent variable (Y). This is in contrast to simple linear analysis, which is only used to test the partial relationship between the independent and dependent variables. Decision-making in the multiple correlation test can be done by comparing the probability value of 0.05 with the Sig probability value with the basis for decision-making: 1) If the probability value of 0.05 is smaller or equal to the Sig probability value. F change or  $[0.05 < \text{sig. Fchange}]$ ,  $H_0$  is accepted, and  $H_a$  is rejected, meaning there is no significant relationship between variable X and Y; 2) If the probability value of 0.05 is greater than the probability value of sig. F change or  $[0.05 > \text{sig. Fchange}]$ ,  $H_0$  is rejected, and  $H_a$  is accepted, meaning a significant relationship exists between variables X and Y.

The research protocol has successfully been examined and granted an Ethics Review Certification by the Health Research Ethics Committee of the Faculty of Public Health, Ahmad Dahlan University, under Reference No: F10/113/D.66/V/2023.

## **RESULTS**

### **Frequency Distribution According to Variable Levels of Macronutrient Intake and Physical Fitness**

The frequency distribution of the data generated is derived from the values of Macronutrient Adequacy Level in % and Physical Fitness in VO2MAX, which have been categorized according to the applicable cutoff.

**Table 1. Presents the data categorized by Carbohydrate Intake, Protein Intake, Fat Intake, and Physical Fitness in Sokowaten Baru Primary School Students**

Category of Respondents	Frequency (n)	Percent (%)
<b>Carbohydrate Intake (%)</b>		
excess	17	28,9
Sufficient	4	6,7
deficient	38	64,4
<b>Total</b>	<b>59</b>	<b>100</b>
<b>Protein Intake (%)</b>		
excess	6	10,17
Sufficient	4	6,78
deficient	49	83,05
<b>Total</b>	<b>59</b>	<b>100</b>
<b>Fat Intake (%)</b>		
excess	16	27,11
Sufficient	10	16,95
deficient	33	55,94
<b>Total</b>	<b>59</b>	<b>100</b>
<b>Physical Fitness (VO2MAX)</b>		
Excellent	5	8,48
Good	11	18,64
Medium	10	16,95
Less	12	20,33
Very Less	21	35,6
<b>Total</b>	<b>59</b>	<b>100</b>

Based on Table 1, it can be seen that the most results in the Carbohydrate Intake variable are in the deficient category, with as many as 38 respondents in the Protein Intake variable, namely the deficient category, as many as 49 respondents in the Fat Intake variable, namely the deficient category as many as 33 respondents and the physical Fitness variable, namely the significantly less category as many as 21 respondents.

**Table 2. Relationship between Macronutrient Intake and Physical Fitness of Students in Sokowaten Baru Primary School Students**

Variable	Category	Physical Fitness										r	P
		Excellent		Good		Medium		Less		Very Less			
		n	%	n	%	n	%	n	%	n	%		
Carbohydrate Intake	Deficient	2	3,4	8	13,5	6	10,2	9	15,3	12	20,3	0,465**	0,003
	Sufficient	2	3,4	0	0	0	0	1	1,7	2	3,4		
	Excess	1	1,7	3	5,1	4	6,7	2	3,4	7	11,9		
Protein Intake	Deficient	1	1,7	10	16,9	9	15,3	10	16,9	17	28,9	0,438**	0,001
	Sufficient	1	1,7	1	1,7	1	1,7	1	1,7	0	0		
	Excess	3	5,1	0	0	0	0	1	1,7	4	6,7		
Fat Intake	Deficient	5	8,5	9	15,3	4	6,7	5	8,5	12	20,3	0,013	0,924
	Sufficient	5	8,5	1	1,7	1	1,7	1	1,7	4	6,7		
	Excess	2	3,4	1	1,7	1	1,7	3	5,1	5	8,5		

## DISCUSSION

From the results of the relationship test calculation, the correlation relationship value is obtained as follows. In the relationship value of Carbohydrate Intake with Physical Fitness, the sig value is  $0.003 < 0.05$ . Thus, it can be said that there is a significant relationship between the Carbohydrate Intake and the Physical Fitness Level of Sokowaten Baru Primary School; in the relationship value of Protein Intake with Physical Fitness, the sig value is  $0.001 < 0.05$ . Thus, there is a significant relationship between the Protein Adequacy Level and Physical Fitness Level of Sokowaten Baru Primary School students. In the relationship value of

Fat Intake with Physical Fitness, the sig value is  $0.924 > 0.05$ . Thus, there is no significant relationship between the Fat Adequacy Level and the Physical Fitness Level of Sokowaten Baru Primary School students.

The researcher wishes to review the results he has found in this conversation. With a sig value of  $0.003 < 0.05$ , it can be deduced that there is a significant relationship between carbohydrate Intake and the physical fitness of students at Sokowaten Baru Primary School. The first concern is the relationship between carbohydrate adequacy and the student's level of physical fitness. This study differs from that of Fahroji in 2023 states, which found no correlation between students at MI AL-Khairiyah Lebak Kelapa's Kelapa's level of carbohydrate consumption and their degree of physical fitness (p-value = 0.439) (Fahroji et al., 2023). However, research conducted by Rahmah in 2020 states that there is a relationship (p-value = 0.003) between carbohydrate intake and physical fitness in athletes (Rahmah et al., 2020). This is because respondents do not have breakfast before leaving for school, so the intake of student carbohydrate intake based on 24-hour food recall is not sufficient according to the needs required by the body; another factor that distinguishes the results of researchers from previous researchers is the measurement of physical fitness in previous researchers using TKJI so that the results obtained that even though respondents lack carbohydrate intake but if the body is often trained and has a habit of physical activity, then the body remains fit despite lack of carbohydrate intake.

Table 2 demonstrates that more respondents with lower carbohydrate intake have abysmal fitness levels, likely due to respondents skipping breakfast before heading to school and frequently grabbing a snack at the school canteen to stave off hunger. Because it can increase learning concentration and make it simpler for students to absorb material at school, breakfast plays a crucial function in helping schoolchildren satisfy their energy demands. As a result, learning achievement improves. Generally, breakfast provides 25% of the energy needed for the day. Breakfast is crucial for kids of school age since they engage in several activities that demand much energy. Since breakfast can help students better retain classroom material, it plays a crucial role in meeting their energy requirements. Breakfast provides youngsters still in school with the energy they need for class activities and academics. Lunch will replenish energy stores that were depleted during learning activities between 8 and 10 hours after breakfast. Breakfast should be had to help with learning concentration and to provide significant contributions of several nutrients required by the body in physiological activities (Pibriyanti et al., 2021).

Carbohydrates are nutrients that are needed by the human body, especially school-age children, because they serve as the primary source of energy and are divided into complex carbohydrates and simple carbohydrates. Every 1 gram of carbohydrate contains 4.1 calories, creating organic compounds such as fats and proteins that maintain acid and alkaline balance in the body. The need for carbohydrates in each respondent is not the same because the carbohydrates we need are adjusted to the daily activities that respondents do, age, gender, and certain medical conditions in respondents. The more physical activity the respondent does, the more carbohydrates their body needs. An average person ideally only needs 1 gram per 1 kg of body weight (Abihail et al., 2023).

Some carbohydrates can be digested by the body to produce glucose and energy, and some carbohydrates cannot be digested, which are helpful as dietary fiber. The primary function of digestible carbohydrates for humans is to provide energy for cells, including brain cells, whose work depends on the supply of carbohydrates in the form of glucose. Apart from being the primary energy source, carbohydrates also have other benefits, namely fulfilling calorie needs healthily. The calories derived from certain carbohydrates are less than fat with the same weight. Conversely, carbohydrate deficiency is also not good for the body. When there is a lack of carbohydrates, the body will weaken and take protein and fat for energy (Sa'adahSa'adah et al., 2023).

Given that most carbs are converted to glucose in the blood, glucose is the most significant monosaccharide for schoolchildren (Sa'adahSa'adah et al., 2023). When there is an overabundance of energy, glucose can also be turned into body fat or stored as glycogen in the liver and muscles. Because carbohydrates are the most effective at being converted into energy, they are the best energy source. The amount of glycogen in your muscles and liver will decrease if you do not consume enough carbohydrates daily. Reduced glycogen stores will influence physical endurance and performance. If excessive carbohydrate intake contributes to weight gain, it will impact a person's nutritional status and limit their ability to engage in specific activities (Triandari et al., 2021).

The second is about the relationship between the protein intake and the physical fitness of students of Sokowaten Baru Primary School, which obtained a sig value of  $0.001 < 0.05$ , so it can be said that there is a significant relationship between the level of protein nutrient adequacy and the level of physical fitness of students of Sokowaten Baru Primary School. This study is not in line with the research of Fahroji in 2023 states, which states that there is no significant relationship ( $p\text{-value} = 0.611$ ) between the level of protein consumption and the level of physical fitness in MI AL-Khairiyah Lebak Kelapa students (Fahroji et al., 2023). However, in line with research conducted by Rahmah in 2020 it states a relationship ( $p\text{-value} = 0.005$ ) between protein intake and physical fitness in athletes (Rahmah et al., 2020). This is because respondents do not have breakfast before leaving for school, so the intake of student protein intake based on 24-hour food recall is not sufficient according to the needs required by the body; another factor that distinguishes the results of researchers different from previous researchers is the measurement of physical fitness in previous researchers using TKJI so that the results obtained that even though respondents lack protein intake but if the body is often trained and has a habit of physical activity, then the body remains fit despite lack of protein intake.

All cells in our bodies are mostly made of protein, which also serves as a vital building block for compounds such as hormones and enzymes. Protein is recognized as a particular food because it offers both a source of energy and the amino acids needed to construct bodily cells. Protein is described as a building block since it offers the "raw materials" needed to develop the body. According to the research findings, schoolchildren require protein for growth. Unlike lipids and carbs, protein is not the primary energy source during physical activity. However, athletes need more protein than non-athletes or schoolchildren do. Athletes require protein to support the training-induced adaptation, repair damaged muscle fibers, and create enzymes. Protein that functions as a material for forming new tissues and repairing damaged muscle fibers is needed by an athlete who trains intensively and for a long time so that physical fitness can be adequately maintained (Del'ArcoDel'Arco et al., 2021). Protein, as one of the nutrients needed by the body, plays a vital role in the growth process, replacing damaged body cells and as a catalyst. The unique function of a protein cannot be replaced by other nutrients, namely, building and maintaining body cells and tissues (Pibriyanti et al., 2021).

Protein also has physiological benefits that improve exercise performance. A study found that amino acids play a role in forming molecules like hormones, enzymes, and the walls of muscles. Proteins are used to make hemoglobin, and fibrinogen and albumin are used to store energy. The production of enzyme proteins for aerobic exercise and contractile proteins for energy will occur due to fitness training (Salamah, 2019). As a result, it is clear from this explanation that protein and fitness are directly related. Protein is one of the main components of food. Protein is essential for the growth and development of school-age children. Protein provides the body's energy to perform various functions, such as forming tissues and muscles, carrying oxygen throughout the body, producing enzymes, building immunity, helping calcium absorption, and more. Eating protein is also essential to help children thrive (Agus & Sepriadi, 2021).

Protein provides the amino acids needed to build and repair the body's cells and tissues. If school-age children do not get enough protein, they can experience growth problems and low body weight (Triandari et al., 2021). Protein also provides essential nutrients for children's growth, such as vitamins, minerals, and fatty acids. In addition, protein can also help school-age children maintain a healthy heart. Protein contains omega-3 fatty acids, essential for reducing the risk of heart disease and stroke. Protein also provides the energy needed for physical activity. Regular physical activity is essential for heart health and helps children maintain a healthy weight. Protein also helps children maintain a sound immune system. Protein contains antibodies that the body needs to fight infections. Protein also helps keep children's brains healthy by providing essential nutrients for brain growth and development (Cornia & Adriani, 2018).

Since protein has several significant benefits for children's growth and development, parents must ensure they receive adequate protein intake. Some foods that contain protein that is good for school-age children are fish, eggs, dairy products, meat, nuts, and seeds. The recommended dose of protein for children varies depending on their age and needs. In conclusion, protein is essential for the growth and development of school-age children. It provides the nutrients needed to build and repair tissues and cells. Protein also helps children maintain a healthy weight, maintain a healthy heart, and improve immunity (Agus & Sepriadi, 2021).

The third is about the relationship between the fat intake and the physical fitness of students at Sokowaten Baru Primary School, which obtained a sig value of  $0.924 > 0.05$ , so it can be said that there is no significant relationship between the level of fat nutrient adequacy and the level of physical fitness of students at Sokowaten Baru Primary School. This study is in line with the research of Fahroji in 2023 states, which states that there is no significant relationship ( $p$ -value = 0.223) between the level of fat consumption and the level of physical fitness in MI AL-Khairiyah Lebak Kelapa students (Fahroji et al., 2023). However, research conducted by Rahmah in 2020 states a relationship ( $p$ -value = 0.000) between fat intake and physical fitness in athletes (Rahmah et al., 2020). This is because respondents do not have breakfast before leaving for school, so the intake of student fat intake based on 24-hour food recall is not sufficient according to the needs required by the body; another factor that distinguishes the results of researchers different from previous researchers is the measurement of physical fitness in previous researchers using TKJI so that the results obtained that even though respondents lack fat intake but if the body is often trained and has a habit of physical activity, then the body remains fit despite lack of fat intake.

Due to the likelihood of other factors affecting fitness that were not studied in this study, such as heredity, age, physical activity, physical health, and micronutrient intake (calcium, potassium, sodium, chlorine, and iron), Table 2 reveals insufficient fat intake among people who have good physical fitness. Cardiopulmonary capacity, posture, obesity, hemoglobin/blood cells, and muscle fiber are all impacted by heredity. Furthermore, consuming too much fat does not necessarily indicate that a person is overweight. This is because when data on fat consumption is collected, respondents frequently consume high-fat snacks like fried foods, french fries, ice cream, and other snacks. There are other factors that can cause a person to consume much fat without becoming overweight, such as heredity from his parents (Grygiel-Górniak et al., 2016).

As a food with a high energy density (9 kcal per gram), fat is crucial for regulating both body weight and energy levels. Vitamins A, D, E, and K, which are fat-soluble, can be absorbed through fat(16). These findings, taken together with the study's findings, show that additional (non-nutritional) elements (such as energy and nutrients) can alter students' fitness levels in addition to those related to diet. The body uses fat primarily as an energy source, and fat is where the body stores the most energy. Maintaining the body's health takes a significant amount of fat, as fat serves different purposes. The relationship test results can be used to explain why fat becomes the primary fuel source when activity intensity decreases and duration rises. More fat is consumed to provide energy for the muscles to work during more strenuous activities that rely on muscle performance (Rachma & Zulaekah, 2017).

From the relationship test obtained, it can be explained that fat becomes the primary fuel source if the intensity of activity decreases and the duration increases. During more physical activities that use muscle performance, fat is used more to supply energy for the muscles to work. Therefore, fat intake does not have a direct relationship with physical fitness. Fat is only a supporting factor as a second source of energy supply after carbohydrates when individuals exercise so that they can exercise for a long duration. To get good physical fitness, it is necessary to have a good diet so that nutritional intake is fulfilled according to the needs of the body to increase stability in student activities. Fat is a valuable nutrient as an energy material and stores the most energy in the body. Fat has other functions in the body, and it takes a sufficient amount of fat in the diet to maintain the body's health properly. This is because glycogen is stored in limited amounts in the body, so this causes the use of fat to delay the feeling of fatigue in students (Sa'adahSa'adah et al., 2023).

To enable people to exercise for an extended period, fat only serves as a supporting element as a secondary source of energy after carbs. In order to maintain consistency in student activities while achieving good physical fitness, it is essential to eat a healthy diet that meets the body's needs for nutrients. Fat serves as a nutrient for the body that may be used as an energy source and reserves the most energy. It takes a significant amount of fat in the diet to maintain the body's health, as fat serves different purposes in the body. Because the body can only retain a finite amount of glycogen, pupils' feelings of exhaustion are delayed by using fat (UNICEF Indonesia, 2019).

The limitations of this study include collecting data with a research instrument in the form of a form or questionnaire so that the resulting data is highly dependent on the ability and honesty of respondents when answering the research questionnaire submitted; there are students as a category of respondents who do not take part in a series of data collection due to absence from school when measuring physical fitness using the



Harvard Step Test method, the calculation of the pulse rate needs to be calculated by the researcher himself to be accurate because some respondents said they did not feel the pulse so they could not calculate the number of pulse beats per minute (Suciani et al., 2018).

## CONCLUSIONS

The study's results conclude that there is a significant relationship between carbohydrate and protein intake and the physical fitness of students at Sokowaten Baru Primary School. Meanwhile, there is no significant relationship between fat intake and the physical fitness of students at Sokowaten Baru Primary School.

## RECOMMENDATION

Seeing that the nutritional adequacy of students in general needs to meet the dietary requirements of school children, it is recommended that students improve their daily food intake by consuming food sources that are sufficient protein, high in carbohydrates, and sufficient fat. The presentation of the daily menu given to students is 3x main meals and 3x snacks; this needs to be considered for schools and parents to support the improvement of learning performance and student achievement and to prevent stunting. It is necessary to control other factors that can cause bias during the study, such as the subject's understanding of the test procedure and the strong motivation of each subject to obtain maximum measurement results. It is hoped that the physical education teacher will master and understand the learning of the Harvard step test well. This can measure the fitness of school children, especially in determining the VO<sub>2</sub>MAX value of children needed during school and daily activities. In future studies, it is better to know the energy and nutrient needs of school children specifically to consider indicators of physical activity calculated based on a basal metabolic rate per individual. In addition, to be able to see the comparison of food intake and fitness values in real terms, further research is needed using two different samples from athlete and non-athlete students.

## REFERENCES

- Abihail, C. T., Simanoah, K. H., & Muniroh, L. (2023). Association between Energy and Macronutrient Intake and Sleep Duration with Nutritional Status of New Students of the Faculty of Public Health, Universitas Airlangga during Online Courses. *Amerta Nutrition*, 7(1), 1–6. <https://doi.org/10.20473/amnt.v7i1.2023.1-6>
- Adhianto, K. G., & Arief, N. A. (2023). Hubungan Aktivitas Fisik Terhadap Kebugaran Jasmani Peserta Didik Sekolah Menengah Pertama. *Jambura Journal of Sports Coaching*, 5(2), 134–141. <https://doi.org/10.37311/jjsc.v5i2.20978>
- Adi, M., Universitas, P., & Malang, N. (2019). Hubungan Status Gizi Dan Aktivitas Fisik Dengan Tingkat Kebugaran Jasmani Pada Siswa SMP. 1(3), 138–142.
- Agus, A., & Sepriadi. (2021). *Manajemen Kebugaran*. In S. Jumiaty (Ed.), Sukabina Press (Cetakan 3), SUKABINA Press.
- Alawiyah, Tuti., Wiyono Sugeng., Kuswari, M. (2015). Aktivitas Fisik Dengan Kebugaran Anak Sekolah Dasar. *Nutrire Diaita*, 7(April), 48–53.
- Cornia, I. G., & Adriani, M. (2018). Hubungan Antara Asupan Zat Gizi Makro dan Status Gizi dengan Kebugaran Jasmani Mahasiswa UKM Taekwondo. *Amerta Nutrition*, 2(1), 90. <https://doi.org/10.20473/amnt.v2i1.2018.90-96>
- Del'Arco, A. P. W. T., Previdelli, A. N., Ferrari, G., & Fisberg, M. (2021). Food intake, physical activity and body composition of adolescents and young adults: data from Brazilian Study of Nutrition and Health. *BMC Public Health*, 21(1), 1–10. <https://doi.org/10.1186/s12889-021-11171-3>
- Fahroji, I., Suyatno, Nugraheni, S. A., & Kartini, A. (2023). Hubungan Tingkat Kecukupan Zat Gizi Makro dan Status Gizi (IMT/U Dan Hb) Dengan Tingkat Kebugaran Jasmani Siswa MI Al-Khairiyah Lebak Kelapa Kota Cilegon. *Jurnal Kesehatan Masyarakat*, 11(1), 62–71. <http://ejournal3.undip.ac.id/index.php/jkm>
- Farid, M., & Nasution, J. D. H. (2017). Hubungan Antara Status Gizi Dengan Tingkat Kebugaran Jasmani Siswa Kelas V Sdn Kedondong I Kecamatan Tulangan Kabupaten Sidoarjo. *Jurnal Pendidikan Olahraga Dan Kesehatan*, 05(03), 762–765. <http://ejournal.unesa.ac.id/index.php/jurnal-pendidikan-jasmani/issue/archive>
- Grygiel-Górniak, B., Tomczak, A., Krulikowska, N., Przystański, J., Seraszek-Jaros, A., & Kaczmarek, E. (2016). Physical activity, nutritional status, and dietary habits of students of a medical university. *Sport Sciences for Health*, 12(2), 261–267. <https://doi.org/10.1007/s11332-016-0285-x>

- Hadi, N. M., & Prihanto, J. B. (2016). HUBUNGAN ANTARA AKTIVITAS SEHARI-HARI DENGAN TINGKAT KEBUGARAN JASMANI SISWA (Studi Pada Siswa Kelas 5 SDN Lidah Wetan II/462, Kota Surabaya). *Jurnal Pendidikan Olahraga Dan Kesehatan*, 04(02), 396–400. <http://ejournal.unesa.ac.id/index.php/jurnal-pendidikan-jasmani/issue/archive>
- Kemenpora RI. (2021). Laporan Nasional Sport Development Index Tahun 2021 Olahraga Untuk Investasi (P. A. Maksum (ed.); 2021st ed., Issue March). Kementerian Pemuda dan Olahraga RI. <https://deputi3.kemenpora.go.id/dokumen/30/laporan-nasional-sport-development-index-tahun-2021>
- Pibriyanti, K., Zahro, L., Ummah, S. K., Luthfiya, L., & Sari, F. K. (2021). Macronutrient, nutritional status, and anemia incidence in adolescents at Islamic boarding school. *Jurnal Gizi Klinik Indonesia*, 18(2), 97. <https://doi.org/10.22146/ijcn.63122>
- Rachma, F., & Zulaekah, S. (2017). Status Gizi, Asupan Cairan Dan Kebugaran Jasmani Atlet Di Persatuan Bulutangkis Kabupaten Kudus. *Nutri-Sains: Jurnal Gizi, Pangan Dan Aplikasinya*, 1(1), 50–56. <https://doi.org/10.21580/ns.2017.1.1.1525>
- 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>
- Sa'adah, U., Hardiansyah, A., & Darmuin, D. (2023). Hubungan Pengetahuan Gizi dan Asupan Zat Gizi Makro dengan Tingkat Kebugaran Jasmani Atlet Sepak Bola di SSB Ganesha Putra FC Purwodadi. *Jurnal Ilmu Gizi Indonesia (JIGZI)*, 4(1), 5–14. <https://doi.org/10.57084/jigzi.v4i1.1026>
- Salamah, R. (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>
- Sitoayu, L., Yuslaili, N., & Kuswari, M. (2020). Hubungan Asupan Zat Besi, Kadar Hb dan Kebugaran Jasmani Remaja Vegetarian di Pusdiklat Buddhis Maitreyawira. *Physical Activity Journal*, 2(1), 11. <https://doi.org/10.20884/1.paju.2020.2.1.2619>
- Suciani, I., Maryanto, S., & Mulyasari, I. (2018). the Correlation Between Percent Body Fat and Iron Intake With Physical Fitness of the Adolescents in Vocational School Widya Praja Ungaran. *Jurnal Gizi Dan Kesehatan*, 10(23), 96–106.
- Triandari, S. T., Fatmawati, I., Maryusman, T., & Puspita, I. D. (2021). Hubungan Pengetahuan Terkait Gizi, Asupan Karbohidrat, dan Aktivitas Fisik Dengan Kebugaran Jasmani Pada Atlet Cabang Olahraga Permainan. *JURNAL ILMIAH KESEHATAN MASYARAKAT: Media Komunikasi Komunitas Kesehatan Masyarakat*, 13(4), 160–166. <https://doi.org/10.52022/jikm.v13i4.219>
- UNICEF Indonesia. (2019). *Hidup Sehat Sejak Sekarang Untuk Remaja Kekinian* (M. Reza (ed.); edisi 2019). Kementerian Kesehatan RI.