



## Association between physical activity and body mass index with physical fitness in first-year sport students

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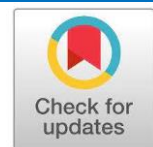
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**Abstract:** This study aims to determine the association between physical activity, Body Mass Index (BMI), and physical fitness in first-year sports students. This study is descriptive quantitative research with a cross-sectional study approach. 66 students (age 18,30 dan 0,70) (male =43, female = 23) of the sport were involved. Instruments to measure physical activity level adopted the Baecke Questionnaire; physical fitness used the sit and reach test, 60-second sit up, 60-second squat thrust, and PACER test. BMI was measured by dividing body weight (kg) by the multiplication of height (meters). Spearman's Rank test was used to determine whether there was a relationship. The results showed that the level of physical activity was mostly in the high category (37.88%), BMI was mostly in the normal category (81.7%), and physical fitness was mostly in the poor category (51.5%). Statistical test results showed that physical activity was related to physical fitness, while BMI was not. In conclusion, a person's level of physical activity can affect physical fitness. Longitudinal studies are needed to ascertain whether physical fitness and physical activity are factors in the success of sports students in following all practice-based courses.

**Keywords:** physical activity; physical fitness; baecke questionnaire; sport students.

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### INTRODUCTION

Sedentary behaviors include activities that imply energy expenditure  $\leq 1.5$  METs, while physical inactivity is defined as insufficient physical activity (PA) levels that do not meet current recommendations (Carson et al., 2017). Both behaviors have increased in recent years due to changes in the physical, social, and economic environments of our current society (Owen et al., 2014).

There are substantial physiological and psychological benefits of PA that have also been linked to health benefits (Janssen & LeBlanc, 2010; Warburton et al., 2006). Nevertheless, despite the World Health Organization's (WHO) recommendation to engage in moderate to vigorous PA, levels of sedentary living and physical activity are alarming (Organization, 2019).

Scientific evidence has shown that high levels of sedentary living and physical inactivity are associated with an increased risk of obesity (Lätt et al., 2015; Liu et al., 2023; Owen et al., 2014) various cancers (Cannioto et al., 2018; Cong et al, 2014; Lee et al., 2012; Schmid & Leitzmann, 2014), cardiovascular disease (Lee et al., 2012; Sattelmair et al., 2011), diabetes (Lee et al., 2012; Liu et al., 2023; Van der Berg et al., 2016), and mortality (Löllgen et al., 2009; Wilmot et al., 2012).



Students in universities have a variety of activities that are spent in class, studying in front of a computer, and the lifestyle of current students is more likely to choose to spend their free time enjoying coffee in a shop. The diversity of physical activities also allows the level of physical fitness each student possesses. Sports students are required to have an adequate level of physical fitness because the sports department lecture activities are mostly practical courses, so it is assumed that to be able to follow the dense practical lectures, students are required to be fit. For information, the number of credits that undergraduate students in Indonesia must take on average is 146 semester credit systems (SKS), with a distribution of about 60% of SKS being practical courses. Not a few students experience problems when they want to complete 146 credits. A recent study conducted by [Munthe & Lase \(2022\)](#) reported that fatigue is one of the factors that cause students' learning activities to experience problems.

In the 2023-2024 academic year, the Faculty of Sports Science, State University of Malang, accepted 727 new students into four departments. One department that does not involve practical lectures is the Department of Health Sciences. However, faculty leaders need to know how ready new students are to take part in undergraduate programs at the Faculty of Sport Science from the aspect of physical activity and physical fitness. An investigation of the level of physical activity, Body Mass Index, and Physical Fitness needs to be carried out so that faculty leaders can provide the right policies for new students to complete their studies without any fitness problems. Malang State University also encourages all academicians through the Car Free Day (CFD) policy, carried out every Friday, so that all academicians are more active by walking around the campus area.

Scientific evidence reporting associations between physical activity, body mass index, and physical fitness is abundant. [Kasyifa et al. \(2018\)](#) in their study reported that there was no strong association between BMI and physical fitness in students of Semarang State Vocational High School. The study also reported a relationship between physical activity and physical fitness. The same thing was also done by [Erwinanto \(2017\)](#), who reported a weak relationship between physical activity level and physical fitness, with a correlation coefficient value of 0.336 and a significance value = 0.003. Another study also reported that physical activity and BMI have a close relationship with physical fitness in high school students.

The scientific evidence that has been presented is limited to the relationship between physical activity, BMI, and Physical Fitness at the Senior High School level, and no studies have attempted to determine the relationship between physical activity, BMI, and Physical Fitness at the level of sports students in higher education. As described in the previous paragraph, the duties of sports students tend to be heavier than students from other departments, let alone students at the high school level. The results of this study are important as a basis for consideration for faculty leaders to design activities that encourage students to be fit and ready to complete 146 credits without experiencing illness due to fatigue. These results are also important for students to know their initial fitness condition so that they also have time to prepare for their fitness condition.

Based on this, this study sought to investigate the relationship between physical activity, BMI, and Physical Fitness in new sports students. This study involved students from 4 departments to measure physical activity, BMI, and physical fitness.

## METHOD

### Design

This study is descriptive quantitative research with a cross sectional study approach.

### Participants

The population in this study were all FIK UM Class 2023 students consisting of 727 students from 4 departments. The sampling technique used was purposive random sampling, with inclusion criteria: 1) willing to become a participant; 2) willing to fill out informed consent. The exclusion criteria: 1) Not willing to be involved; 2) Students who are sick when doing research; and 3) Students who have infectious diseases. Based on these criteria, 66 students were found willing to be involved in this study.

### Instrument

To determine the level of physical activity using a questionnaire adapted from the Baecke Questionnaire. The results of physical activity are shown in the categories of very low, low, medium, high, and very high. Body Mass Index (BMI) is measured by dividing body weight (kg) by the multiplication of body height by height (meters) (Kemenkes, 2014). The instrument to determine physical fitness uses the Student Fitness Test of the Archipelago (TPKN) from the Kementerian Pemuda dan Olahraga (2022), which includes sit and reach test, sit up 60 seconds, squat thrust 60 seconds, and PACER test.

### Data analysis

Data were analyzed using the SPSS Statistics @23 program. Spearman Rank Correlation Test ( $>0.05$ ) was conducted to determine if there was a statistically significant correlation between physical activity scores, BMI, and physical fitness.

## RESULTS AND DISCUSSION

Before taking the test, 66 students signed informed consent. The data of 66 students can be seen in Table 1. Furthermore, all participants took a series of tests that were carried out in 2 days. The tests carried out were filling out questionnaires about physical activity and physical fitness tests using the Nusantara Student Fitness Test. Furthermore, the data were recapitulated in Microsoft Excel and then analyzed with the Spearman Rank correlation test to determine whether there was a relationship.

Table 1. Participant Characteristics

Gender	n	%	Mean	SD	Minimum	Maximum
Male	43	65,15				
Female	23	34,85				
Age (year)	66	100%	18,3	0,7	17	21
Height (cm)	66	100%	165,67	7,94	145	179
Weight (kg)	66	100%	58,73	10,48	42	96

Most of the participants were male (65.15%), the average age was 18.3 years, the average height was 165.67 cm, and the average weight was 58.73 kg. Data on physical activity level, BMI, and physical fitness can be seen in [Table 2](#).

Table 2. Frequency distribution of physical activity level, BMI, and physical fitness

Component	n	Percentage (%)
Physical activity	5	7,58
High	18	27,27
Vigorous	25	37,88
Moderate	12	18,18
Light	6	9,09
Sedentary	0	0
BMI		
Obesity	3	4,6
Overweight	2	3
Ideal	54	81,7
Underweight	4	6,1
Severely Underweight	3	4,6
Physical fitness		
Very good	0	0
Good	2	3
Enough	30	45,5
Poor	34	51,5
Very poor	0	0

The level of physical activity was mostly in the vigorous category (37.88%), BMI was mostly in the ideal category (81.7%), while physical fitness was mostly in the poor category (51.5%). To determine whether or not there is a relationship, the Spearman's Rank test is shown in [Table 3](#) below.

Table 3. Relationship between Physical Activity Level, BMI, and Physical Fitness

Variable	r	p value
Physical activity with Physical fitness	0,706	0,000
BMI with Physical fitness	0,013	0,915

Referring to [Table 3](#), it is known that there is a relationship between physical activity and physical fitness ( $p$  value =  $0.000 < 0.05$ ), while between BMI and physical fitness has no relationship ( $p$  value =  $0.915 > 0.05$ ).

The findings of this study indicate that there is a relationship between physical activity and physical fitness and BMI is not closely related to physical fitness. Most of the new students from the Faculty of Sport Science, State University of Malang have high vigorous levels (37.88%), have ideal BMI (81.7%), and have poor physical fitness (51.5%). These findings conclude that even though having high activity does not necessarily have good physical fitness. [Kasyifa et al. \(2018\)](#) in their study reported the same thing, namely there was no relationship between BMI and physical fitness, but physical activity had a relationship with physical fitness in vocational high school students.

Physical activity and fitness are closely linked as fitness is mainly influenced by recent physical activity habits. The connection between BMI and fitness tends to highlight the negative impact of weight status, possibly due to higher rates of overweight and obesity in young people globally. Current research suggests a linear relationship between BMI and fitness, particularly for individuals who are overweight or obese.

This limitation arises from the variability in height and weight growth spurts, which can impact BMI and its association with fitness measures during adolescence. Moreover, body weight, fat mass, and muscle strength experience growth spurts that typically occur after the peak speed of height growth (Malina et al., 2004, 2017). However, the data were analyzed across a relatively small age group, which may reduce the potential influence of interindividual differences in biological maturation.

One of the limitations of our study is that it was not analyzed by gender, leading to differences in physical activity between men and women. A more comprehensive study investigating what factors are associated with physical fitness should be conducted.

### CONCLUSION

The findings can be concluded that physical activity has a close relationship with physical fitness, while BMI does not. Studies on whether physical activity and physical fitness factors influence the continuity of study in higher education need to be conducted in a longitudinal study design.

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