

# Early sedentary behavior symptoms investigation on nutrition, physical fitness, and behavioral setting for novice sports science students

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# Early sedentary behavior symptoms investigation on nutrition, physical fitness, and behavioral setting for novice sports science students

*Wczesne badania objawów siedzącego trybu życia w kontekście żywienia, sprawności fizycznej i zachowań środowiskowych u początkujących studentów nauk o sporcie*

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## Abstract

This study investigates the condition of (1) nutritional status, (2) physical fitness, (3) physical activity patterns of sports science study program students after the pandemic. The research method uses quantitative methods with analytical observational design. The research subjects were sports students from the Sports Science study program, FIKK UNY. The subjects were active students totaling around 50 participants determined using purposive sampling techniques. Physical fitness data collection techniques use the BMI formula, bleep test and GPAQ questionnaire. Techniques for analyzing data with homogeneity and normality. The results obtained from nutritional status and cardiovascular fitness can be said to be still unsatisfactory, nutritional status is in the normal or ideal category, but the range of cardiovascular abilities is still in the adequate category for men and inadequate for women. Meanwhile, the measurement results from filling out the GPAQ questionnaire show that there is still a need to increase awareness of the importance of physical activity, indicated by transportation and recreational activities of moderate intensity which are still in the category of not meeting the recommendations, even though heavy, moderate physical activity and vigorous recreational activities meet the recommendations. Nutritional status is still in the normal category, but the range of cardiovascular abilities is still in the adequate category for men and inadequate for women. This is positively correlated with moderate intensity physical activity patterns, transportation and recreation, which are still in the category of not meeting recommendations. The sedentary habits usually carried out by sports students must be able to be transferred as soon as possible to more useful and productive movement activities. Amount of leisure time for physical activity is still relatively low, whereas other moderate to vigorous physical activity habits are beginning to resurface. There must be an intentional strategy to provide suggestions on how to spend free time performing activities outdoors or indoors.

## Keywords

nutritional status, physical fitness, physical activity

## Streszczenie

Niniejsze badanie analizuje (1) stan odżywienia, (2) sprawność fizyczną, (3) wzorce aktywności fizycznej studentów programu nauk o sporcie po pandemii. Metodologia badawcza opiera się na metodach ilościowych z analitycznym projektem obserwacyjnym. Przedmiotem badania byli studenci nauk o sporcie z programu nauk o sporcie FIKK UNY. Badanie obejmowało aktywnych studentów, których liczba wynosiła około 50 uczestników wybranych metodą celowego doboru próby. Techniki zbierania danych dotyczących sprawności fizycznej obejmowały wykorzystanie formuły BMI, testu biegu na 20 metrów (bleep test) oraz kwestionariusza GPAQ. Techniki analizy danych uwzględniały testy jednorodności i normalności. Wyniki dotyczące stanu odżywienia i sprawności układu sercowo-naczyniowego można uznać za niezadowalające; stan odżywienia mieści się w kategorii normalnej lub idealnej, jednak zakres zdolności sercowo-naczyniowych pozostaje na poziomie wystarczającym dla mężczyzn i niewystarczającym dla kobiet. Wyniki pomiarów na podstawie wypełnionych kwestionariuszy GPAQ wskazują na potrzebę zwiększenia świadomości znaczenia aktywności fizycznej, na co wskazują transport i rekreacja o umiarkowanej intensywności, które wciąż nie spełniają zaleceń, mimo że intensywna i umiarkowana aktywność fizyczna oraz energiczne zajęcia rekreacyjne spełniają zalecenia. Stan odżywienia pozostaje w kategorii normalnej, ale zakres zdolności sercowo-naczyniowych pozostaje na poziomie wystarczającym dla mężczyzn i niewystarczającym dla kobiet. Jest to pozytywnie skorelowane z wzorcami aktywności fizycznej o umiarkowanej intensywności, transportem i rekreacją, które wciąż nie spełniają zaleceń. Siedzące nawyki zazwyczaj wykonywane przez studentów sportu muszą zostać jak najszybciej zamienione na bardziej pożyteczne i produktywnie formy ruchu. Ilość wolnego czasu na aktywność fizyczną jest nadal stosunkowo niska, podczas gdy inne umiarkowane do intensywnych nawyki aktywności fizycznej zaczynają się odradzać. Niezbędna jest celowa strategia, która ma na celu dostarczenie sugestii dotyczących spędzania wolnego czasu na aktywności na świeżym powietrzu lub w pomieszczeniach.

## Słowa kluczowe

stan odżywienia, sprawność fizyczna, aktywność fizyczna

## Introduction

Physical fitness is a crucial requirement for students, particularly those pursuing sports-related disciplines. These students are confronted with a demanding academic program that includes lectures, practical sessions, and the acquisition of diverse movement technique abilities, along with a huge load of homework. Engaging in several academic commitments might lead to infrequent physical exercise among students, resulting in a decline in their overall physical fitness level. The previously mentioned trend has the potential to impact various health-related aspects of physical fitness, including cardiovascular capacity and adipose tissue percentage [1, 2]. Individuals exhibiting inadequate nutritional status as well as those displaying excessive nutritional status tend to have diminished muscle strength in comparison to individuals with optimal nutritional condition. The assessment of an individual's nutritional health can be conducted through the utilization of body mass index (BMI). The body mass index (BMI) is a widely used measure for determining whether an individual falls into the categories of overweight, obese, or underweight [3–5]. It is essential to maintain students' nutritional and fitness status to encourage a lifestyle of good health and physical activity. According to a previous study, the adoption of these positive habits might facilitate the integration of healthy and active behaviors among students [6], which can persist into their later years. A strong correlation has been shown between optimal nutritional status and a well-proportioned body shape characterized by a low percentage of body fat and a healthy level of lean body mass. Regrettably, due to the recent global pandemic, a significant proportion of students exhibited a higher body mass index compared to the preceding generation. This assertion is substantiated by the notable increase in the obesity rate subsequent to the pandemic, which has experienced a significant surge in terms of percentage.

On the contrary, it is evident that societal limitations have an enormous effect on several dimensions of human existence. The range of outdoor sporting activities is likewise restricted. Similarly, in the context of educational activities, students traditionally attended campus-based institutions for the purpose of acquiring knowledge. During the pandemic, students engaged in daily learning activities remotely, utilizing laptop or smartphone displays [7–10]. There has been an observed rise in the amount of time that students spend in front of screens compared to the period before the epidemic [5, 11]. One potential consequence of online learning is its potential to decrease the level of physical activity among individuals or students [12]. The pandemic has led to both beneficial and detrimental outcomes. Online learning activities allow students to participate in remote lectures from the comfort of their own residences. An imbalance between home-based learning and other activities may lead to an increased risk of an inactive lifestyle or sedentary behavior among students [13, 14]. The risk of health issues, such as high blood pressure, is notably affected by sedentary behavior or a sedentary lifestyle [15].

While it was expected that students would be more active after the pandemic ended, the opposite happened. This trend contradicts recent observations on campus, where students' active ha-

bits were influenced by their behavior during the 2–3 year pandemic. The effect has a substantial influence on habit change, as it turns out [16]. For instance, the levels of high-intensity physical activity may not have improved compared to those before the pandemic. [17]. This might be due to the fact that according to large-scale studies, which used tracking applications to record physical activity, indicating lower activity levels in Indonesia's population. We need additional incentives or triggers to enhance the popularity of physical activity; the current situation is no better than it was in the post-pandemic era. Nutritional status, levels of physical activity, and eating behaviour, are all correlated, according to research [16]. Incorporating healthy behaviours into daily life, such as consuming less fried food and increasing physical exercise, can lead to improved nutritional status in the long run. Consistency in maintaining these habits is crucial. Research has shown that certain nutritional statuses are associated with an increased risk of illness, depending on the category [18, 19]. A higher risk of health issues is associated with lower weight, classifying it as underweight. According to several studies [2, 20–23], a higher body mass index is associated with a higher risk of developing disorders associated with overweight and obesity. Overweight and obese students may need to exert more effort to complete various activities without significant fatigue, unlike physically fit students who can easily manage these tasks [24–26]. This disparity in fitness levels will significantly affect cardiovascular capacity, fat percentage, and motor competence, especially in terms of movement ability and flexibility [25].

The findings of the previously mentioned study contrasts with conflicting realities observed in practice. Insufficient data collection about post-pandemic fitness conditions continues to be considered as a prevailing issue, compounded by observable shifts in adolescent behaviors deviating from the norm. For instance, it was anticipated that there would be a shift in screen-related behaviors during the pandemic. However, contrary to expectations, no substantial changes were observed, with some individuals even increasing their screen time. Therefore, it is crucial to reassess the fitness levels that affect nutritional status, especially among students in Sports Science programs. Moreover, students in sports disciplines should have extensive training experience, strong technical skills, and a thorough understanding of the practical skills required for each activity. Regular monitoring is essential to help maintain optimal nutritional status, promote physical fitness, track physical activity patterns, and reduce excessive screen time. The objective of this study is to examine the current state of factors such as nutritional status, physical fitness, and physical activity patterns among students enrolled in a sports science study program following the occurrence of the pandemic. Prompt implementation of these three factors is necessary to determine essential indicators for each sports student, who should maintain good health and a well-proportioned physique.

## Methods

### Design

This study employs a quantitative descriptive research design with an observational approach. Descriptive statistics are used for data examination and interpretation.

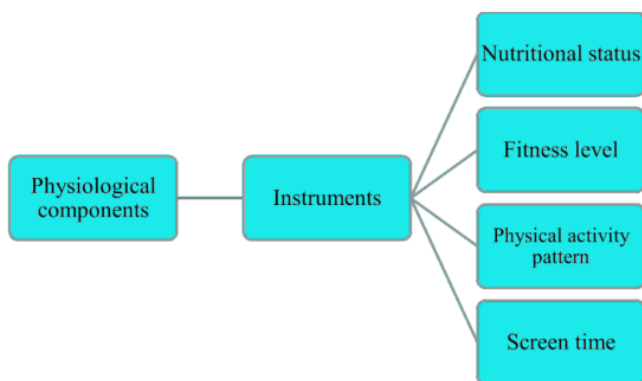


Figure 1. Research design

### Subjects

The inclusion criteria for the subjects encompassed individuals between the ages of 18 and 22 years, who willingly participated in the research, with total 40 subjects, and had no prior record of illness or injury. Data gathering strategies commonly involve the

use of questionnaires and the acquisition of fitness-related data. Descriptive statistical analysis is the methodology employed for the examination and interpretation of data. The data revealed that 65% of male participants and 35% of female participants were engaged in completing the aforementioned questionnaire.

Table 1. Subject characteristics

| Variables   | Females (N = 14) | Males (N = 26) | All (N = 40)  |
|-------------|------------------|----------------|---------------|
| Age [years] | 18.21 ± 0.80     | 18.19 ± 0.92   | 18.2 ± 0.66   |
| Height [cm] | 157.92 ± 4.51    | 171.86 ± 6.13  | 166.85 ± 8.56 |
| Weight [kg] | 51.07 ± 2.25     | 62.46 ± 11.05  | 56.47 ± 10.74 |

### Instruments

The fitness assessment tool, the Bleep test, is used to assess maximal lung capacity, emphasizing cardiovascular health. In addition to this, the study examined physical activity behaviour and sedentary habits by utilising data obtained through the completion of the Global Physical Activity Questionnaire (GPAQ). Additionally, the body mass index (BMI) formula is used to assess nutritional status.

### Analysis

Data analysis will use descriptive methods to clarify the outcomes by examining each measured variable. The GPAQ analysis uses an independent calculation method to categorize outcomes based on the level of physical activity fulfillment.

Cardiovascular capacity is assessed using the Bleep test procedure.

### Results

The results indicate that cardiovascular fitness and nutritional status are not yet at or above the desired level. As shown in Table 2, while men's cardiovascular abilities fall within the adequate category, women's are poor. Table 3 indicates that heavy, moderate, and vigorous physical activities meet the recommendations. However, moderate-intensity transportation and recreational activities consistently fall into the 'not meeting the recommendations' category (Table 4), highlighting the ongoing need to raise awareness about the importance of physical activity, as it can highlight on moderate sedentary behavior (Table 5).

Table 2. Nutritional status and VO<sub>2</sub>Max

| Variables                       | Females (N = 14) | Males (N = 26) | All (N = 40) |
|---------------------------------|------------------|----------------|--------------|
| Nutritional Status (BMI)        | 20.51 ± 2.25     | 21.17 ± 3.38   | 20.93 ± 3.01 |
| VO <sub>2</sub> Max (ml/kg/min) | 30.52 ± 3.30     | 41.28 ± 4.91   | 37.59 ± 6.66 |

**Table 3. Activity per day**

| Variables                           | Males   |      | Females |      | Total   |      |
|-------------------------------------|---------|------|---------|------|---------|------|
|                                     | minutes | %    | minutes | %    | minutes | %    |
| Work related activity (IND)         | 57.9    | 53.3 | 32.3    | 53.9 | 44.0    | 53.6 |
| Transport related activity (IND)    | 20.7    | 19.1 | 11.4    | 19.1 | 15.7    | 19.1 |
| Recreational related activity (IND) | 29.9    | 27.6 | 16.2    | 27.0 | 22.4    | 27.3 |

**Table 4. Fulfillment physical activity recommendation**

|                                    | METs   | Category                      |
|------------------------------------|--------|-------------------------------|
| Heavy physical activity per day    | 844.21 | Meet recommendations          |
| Moderate physical activity per day | 809.35 | Meet recommendations          |
| Transportation activity            | 438.36 | Does not meet recommendations |
| Vigorous recreational activity     | 666.90 | Meet recommendations          |
| Moderate recreational activity     | 589.94 | Does not meet recommendations |

**Table 5. Sedentary activity**

|                              | Females (N = 14) | Males (N = 26) | All (N = 40) |
|------------------------------|------------------|----------------|--------------|
| Sedentary behavior [minutes] | 7235             | 4605           | 11840        |

**Discussions**

A research carried out on medical students revealed a positive correlation between body mass index and muscular strength. There is a positive correlation between body mass index and muscular strength, indicating that as the body mass index increases, so does the muscle strength [27]. However, it is important to note that the correlation between an increase in body mass index and strength does not remain constant when comparing individuals with the same body mass index but different in speed and agility. In such cases, the outcomes would certainly vary. Having a low body weight increases the likelihood of malnutrition. Malnutrition is caused by inadequate consumption of energy and nutrients [28]. The most evident indication of malnutrition is the reduction in body weight caused by the depletion of both fat and muscle mass. This issue begins with a decline in muscular functionality, indicating inadequate daily consumption to meet nutritional requirements [27]. Gender differences arise from elevated levels of testosterone, IGF-1 hormone (insulin-like growth factors), and growth hormone in males during puberty. These hormonal changes lead to a substantial increase in muscle mass and the development of a wider shoulder structure [29]. The percentage of macronutrient intake directly influences adolescents' physical fitness levels. The nutritional intake may be evaluated and modified in accordance with the desired targets, particularly for athletes [30]. Prior studies indicate that the timing of nutrient consumption plays a crucial role in maximising the body's response to exercise. For instance, consuming a diet heavy in carbohydrates in the morning seems to have an adverse effect on evening aerobic activity [31]. Adolescents, in contrast to adults, have a significant risk of

reducing their nutritional intake due to higher energy requirements and the tendency to ignore meals, particularly breakfast [32, 33]. Adolescents and workers often struggle to achieve a balanced calorie intake due to their lifestyles, which often overlook the nutritious value of their food choices. Adolescents and workers frequently struggle to achieve a balanced calorie intake due to lifestyles that overlook the nutritious value of their food choices. Furthermore, the majority of adolescents live in households where both parents are employed [33]. As a result, they often live alone and must prepare their own meals, impacting their dietary choices [32], leading to limited access to nutritious food and beverage options [33]. Hence, the endeavour to achieve the requirements for both macro and micronutrient intake necessitates cooperation with many individuals who can enhance knowledge regarding the need of maintaining a well-rounded nutritious diet [34]. Prolonged commitment to an imbalanced diet combined with a sedentary lifestyle poses a significant risk of developing metabolic syndrome, highlighted by obesity [23, 35–37]. Obesity can be specifically attributed to a significant enlargement of the abdominal tissue [38]. In order to decrease the likelihood of developing metabolic syndrome, it is necessary to reduce sedentary behaviours, since prolonged durations of screen time have a detrimental effect on physical fitness [39]. Previous literature reviews have demonstrated that a decline in physical fitness has a more significant effect on motor competence, specifically movement ability. This is followed by disruptions or alterations in flexibility, body fat percentage, and cardiovascular capacity [25]. Ensuring adequate nutrition, physical fitness, and minimising

sedentary behaviour is a multidimensional approach that is consistently influenced by scientific breakthroughs [24], in order to attain a high standard of living. Metabolic syndrome has a higher likelihood of occurring in late adolescence, particularly among those of student age [40]. Furthermore, the literature review highlights the fascinating relationship between nutrition, physical activity, and metabolic syndrome, which warrants further investigation [24, 40, 41]. This relationship can potentially create a cycle of issues involving these three factors. Despite the fact that the participants in this study were sports students, it has been demonstrated that education is still necessary to standardise the understanding of a proper, healthy, and physically active lifestyle. In addition, sports students are required to use their acquired knowledge and comprehension in their daily lives, demonstrating not just theoretical mastery but also practical understanding.

## Conclusions

Cardiovascular capacities remain at an adequate level for males, but are still poor for females. The nutritional status is still in the normal category. This is positively connected with patterns of physical activity of moderate intensity, transportation, and recreation, all of which continue to fall into the category of not meeting guidelines. The sedentary behaviors common among students enrolled in sports should be quickly replaced with more beneficial and productive physical activities.

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