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Correlation between the physical activities and the percentage of body fat of the members of fitness center

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Abstract
Today, a change in lifestyle from active to inactive has begun to occur, especially in the lifestyle of modern society. This research was a correlational study with survey research methods or self-reported questionnaires. The research population was for about 60 members of HSC Fitness Center, Yogyakarta State University taken by a random sampling technique. Meanwhile, the research instrument used to measure the level of physical activity was the Global Physical Activity Questionnaire (GPAQ) developed by the World Health Organization and the percentage of body fat was measured by using the Body Impedance Analysis (BIA) tool. Furthermore, the data analysis was performed by using the Pearson Product Correlation test. The results show that there is a correlation with a significant negative direction on the level of physical activity and body fat percentage of the members of HSC Fitness Center, Yogyakarta State University with a Pearson Product Correlation coefficient of -0.760, and with a significance value of 0.00 < 0.05. Through this research, the research results obtained can be used as information for the wider community, especially those with the excessive body fat percentages so that they pay more attention to their daily physical activities and so they can achieve a healthy body fat percentage.
Keywords: physical activity; body fat percentage; fitness members.

INTRODUCTION

By 2022, obesity rates in the world have tripled since 1975 (Di Cesare et al., 2016). There are currently more than 650 million adults, 340 million adolescents, and 39 million children who are obese. (*World Health Organization*, 2021). This number will continue to increase every year. The WHO projects that as many as 167 adult, adolescent, and child individuals will experience health problems (health decline) due to overweight or obesity. In Indonesia, as many as 1 in 5 adults, 1 in 5 children aged 5-12 years, and 1 in 7 adolescents aged 13-18 years are known to be overweight or obese. Obesity in Indonesia is mainly caused by unhealthy dietary malnutrition such as foods with high levels of fat, sugar and salt. This is further reinforced by the COVID-19 pandemic, which has limited people's access to healthy food and opportunities to participate in physical activity. (UNICEF, 2022).

Compared to previous generations, the level of physical activity in today's society is approaching a sedentary lifestyle. An inactive or sedentary lifestyle is recognized as one of the major problems in global health followed by obesity (Adhianto & Arief, 2023; Satriawan et al., 2024). According to modern society, health is not the first priority but the second priority after work for professionals and education for students (Jakovljevic & Milovanovic, 2015). Meanwhile, based on the results of

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observations and interviews, the characteristics of modern society are also reflected in fitness members who are members of the Health and Sport Center at Universitas Negeri Yogyakarta. On average, fitness members before joining the Health and Sport Center at Universitas Negeri Yogyakarta prioritized their education or work career compared to their health. Meanwhile, the average fitness member works as a student and private worker who has the characteristics of doing little moderate-heavy physical activity and more physical activity in a sitting state. Work with these characteristics causes the emergence of limitations or obstacles for fitness members in physical activity. In the end, the level of physical activity of fitness members is low.

In 2016, worldwide, the prevalence of inactive lifestyles was estimated at 27.5%, among the adult population. Low levels of physical activity will drastically lead to underdevelopment of public health. In today's modern era and supported by technological advancements, the decline in the frequency of physical activity in the society can be said to be the result of the erosion of fission activity levels (Hall et al., 2021). Moreover, the decline in physical activity levels was even more significant after the COVID-19 pandemic (UNICEF, 2022). According to the interview results of one of the Health and sport center fitness members Universitas Negeri Yogyakarta, the factors of progress, social restrictions, and the new normal order have an impact that can be felt by fitness members directly, namely a decrease in physical activity and further changes in habits or lifestyles. Low levels of physical activity, if not addressed, can lead to a transition in fitness members' lifestyles towards an inactive lifestyle.

Physical activity levels are known to be associated with physical fitness levels in today's society (Aldenaini et al., 2020). In addition, physical activity levels along with other factors such as dietary intake, sleep, stress control and so on are known to have an influence on the body's weight homeostat (Wadden et al., 2020). Individuals who have certain levels of physical activity may have specific anthropometric profile characteristics and physical fitness levels (Guzmán-Muñoz et al., 2023). This is the same as the results of researchers' observations of the anthropometric profile of fitness members of the health and sports center Universitas Negeri Yogyakarta. Fitness members appear to have diverse differences in their anthropometric profiles. It was noted in the initial anthropometric measurement data on new fitness members that the anthropometric profile of fitness members had a range of BMI and fat percentage in all categories (underweight-obese and underweight respectively). In addition, many fitness members complained about changes in body composition, namely the increase in body fat percentage in recent times. The diversity of anthropometric profiles suggests that there is also potential diversity in physical activity levels. However, an explanation of the relationship between physical activity levels independent of other factors on body fat percentage has not been explained with certainty.

Body fat percentage is influenced by many things or many factors simultaneously, one of which is physical activity. Fitness members of the Health and Sport Center of Universitas Negeri Yogyakarta have various differences in body fat percentage and physical activity levels. However, the activity level of each member is unknown and furthermore, the relationship between body fat percentage and physical activity level is not clearly known. Considering the various problems that have occurred, the researcher wants to prove the truth of the above problems through a study entitled "Relationship between Physical Activity Level and Body Fat Percentage in HSC fitness members". Meanwhile, the research site chosen was the Health and Sport Center of Universitas Negeri Yogyakarta, Fitness Center division.

METHOD

The study "Relationship between Physical Activity and Fat Percentage in Fitness Members" is a correlational study. Correlational research is research conducted to determine whether or not there is a contribution between two or more variables (Sugiyono, 2015). In other words, correlational research is conducted to determine whether or not there is a relationship between two or more research variables (Arikunto, 2013: 247-248). This study aims to determine the relationship or relationship between the level of physical activity and body fat percentage. The method used in this study is the survey method.

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Survey research is defined as the collection of information from a sample (individuals) through their responses to questions or questionnaires given (Check & Schutt, 2011).

This research was conducted at the Health and Sport Center Universitas Negeri Yogyakarta (HSC), which is located at Jl. Karangmalang, Karang Malang, Caturtunggal, Depok District, Sleman Regency, Yogyakarta Special Region 55281.

This study uses a 5% error rate. Meanwhile, sampling in this study was carried out using the random sampling method. The random sampling method is one of the probability sampling methods in which each individual has an equal and independent probability of being selected in the sample (Setia, 2016). The sample taken in this study amounted to 60 people consisting of men (n = 38) and women (n = 22). The instruments used in this study will be explained as follows:

1. Global Physical Activity Questionnaire (GPAQ)

   In this study, the instrument used to measure physical activity was the GPAQ. The GPAQ has a moderate level of validity (r = 0.52, p = 0.12), if used to estimate MVPA (Moderate-vigorousPhysical Activity), while the reliability of the GPAQ shows good and very good results (good-to-very-good test-retest reliability) for physical activity time intervals that range from three days to two weeks (Keating et al., 2019). Test-retest reliability results for the 10-day GPAQ showed results of 0.83 to 0.96. Meanwhile, the results shown for three months were 0.53 to 0.83 (Herrmann et al., 2013). The GPAQ questions fall into three domains, namely workplace activities, commuting, and leisure activities. Respondents were asked to fill in statements regarding the activities performed daily and also the intensity of time required to perform them. The data was then converted into MET minutes per week. Activity duration data in the heavy category was multiplied by the MET coefficient = 8, for activity duration data in the moderate category was multiplied by the MET coefficient = 4. The converted data were then grouped based on high, medium, and low criteria.

   Using the GPAQ, measurement results are expressed in MET-minutes/week. At the population level, MET-minutes/week is the more commonly used measure to avoid measurement data results with an abnormal distribution of energy expenditure. METs is a multiple of resting metabolic rate (RMR) where 1 MET is the energy expended per minute/kg of adult BW (1 MET = 1.2 kcal/min) Physical activity is expressed as a score of METs-min as the amount of activity per minute.

When the total physical activity in MET-minutes/week has been obtained, the respondents will then be categorized into 3 different levels of physical activity according to the intensity or level of high, medium, and low physical activity. The division of categories can be seen through the following table.

Table 1. Physical Activity Level Category

MET	KATEGORI
MET ≥ 3000	High
3000 > MET ≥ 600	Medium
600 < MET	Low

Source: (WHO, 2012)

2. Body Fat Percentage

   In this study, the measurement of body fat percentage was carried out through two stages, namely 1) measuring height and 2) measuring body weight as well as fat percentage using BIA. The height measurement instrument was carried out using a microtoise stature meter with an accuracy of 0.1 cm. This tool is a standard tool for measuring height that has been standardized by the Yogyakarta Metrology Center. The results of the fat percentage measurement are then compared with the fat percentage measurement norm table to determine the category of respondents whether they have excess body fat percent or not.

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Table 2. Body Percentage Rate Norms for Adolescents to Seniors

JENIS KELAMIN	AGE	BODY FAT RANGES FOR STANDARD ADULTS			
		UNDERFAT	HEALTHY	OVERFAT	OBESE
Female	18	<=16	17-30	31-35	>=36
	19	<=18	19-31	32-36	>=37
	20-39	<=20	21-32	33-38	>=39
	40-59	<=22	23-33	34-39	>=40
	>60	<=23	23-35	36-41	>=42
Male	18	<=9	10--19	20-23	>=24
	19	<=8	9--19	20-23	>=24
	20-39	<=7	8--21	20-24	>=25
	40-59	<=10	11--21	22-27	>=28
	>60	<=12	13--24	25-29	>=30

Source: (Gallagher et al., 2000)

The data analysis techniques used in this study are (1) Prerequisite Test, namely the normality test using the Kolmogorov Smirnov formula and the linearity test using the Anova test (F test), both using a significance value> 0.05. (2) Hypothesis Test using the Person Product Correlation formula, with a significance value <0.05. In analyzing the data in this study, it was assisted by the SPSS version 27 application.

RESULTS AND DISCUSSION

Results

This section will show the results of research based on descriptive tests, prerequisite tests, and correlation tests. The research data regarding the level of physical activity and fat percentage of fitness members of Health and Sport Center UNY can be displayed through statistical descriptions in table 3 below.

Table 3. Descriptive Physical Activity Level of Fitness Members of Health and Sport Center UNY

N	Mean	Median	Mode	Std. Dev	Min	Max
Physical Activity						
60	3877.00	3600	720	2472.95	480	11040
Body Fat Percentage						
60	23.96	26.05	17.50	8.57	9.30	43.20

Meanwhile, the frequency distribution data for physical activity level and body fat percentage of UNY Health and Sport Center fitness members can be seen in tables 4 and 5 as follows.

Table 4. Frequency Distribution, Physical Activity Level of Fitness Members of Health and Sport Center UNY

Category	Frekuensi	Persentase	Valid Percent	Cumulative Percent
Low	2	3.3	3.3	3.3
Medium	21	35.0	35.0	38.3
High	37	61.7	61.7	100.0
Total	60	100.0	100.0	

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Table 5. Frequency Distribution of Body Fat Percentage of Fitness Members of Health and Sport Center UNY

Category	Frekuensi	Percent	Valid percent	Cumulative percent
Underfat	0	0	0	0
Healthy	38	63.3	63.3	63.3
Overfat	10	16.7	16.7	80.0
Obese	12	20.0	20.0	100.0
Total	60	100.0	100.0	

In the process of testing data hypotheses, research data analysis must first pass several requirements tests so that the results can be accounted for. The analysis requirements test includes normality test and linearity test. Meanwhile, the results of the data analysis requirements test can be explained as follows.

Table 6. Normality Test Results

N	P	Description
60	0.552	Normal

From the table above, the normality test results show that the significance value (p) of the residual is 0.200> 0.05, so the data is normally distributed. The full results can be seen in the attachment.

Through table 7 it can be seen that Sig. Deviation from Linearity 0.971 > 0.05 so there is a linear relationship between physical activity level and body fat percentage. Meanwhile, the linearity test using the F value shows the value of Fcount < Ftable, so it can be concluded that there is a linear relationship between the level of physical activity (independent variable) and the percentage of body fat (dependent variable). Thus, data analysis can proceed to correlation or linear regression analysis.

Table 7. Linearity Test Results

Functional Relationship	F_{count}	F_{table}	Sig. Deviation from Linearity	Description
Physical Activity Fat Percentage	0.483	2.41	0.971	Linier

Table 8. Hypothesis Test Results

Variable	N	P	r
Fat Percentage	60	.000	-.760
Physical Activity Level	60	.000	-.760

Based on the results of the analysis using the Pearson Product Correlation test, it is known that there is a significance value of 0.00 <0.05 so that there is a correlation in the level of physical activity and body fat percentage. The Pearson Correlation coefficient value shows a value of -0.760 (negative direction / value), which means that there is a negative correlation between the level of physical activity and body fat percentage. In this case, the coefficient value of 0.760 (regardless of direction) is in the range of 0.61-0.80 so that the correlation between variables has a strong degree of relationship. In brief, it can be concluded that there is a strong negative correlation between physical activity level and body

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fat percentage. If there is an increase in the level of physical activity, there will be a decrease in body fat percentage and vice versa. Thus, the hypothesis with the sound "there is a significant negative relationship between physical activity and body fat percentage of fitness members of Health and Sport Center Universitas Negeri Yogyakarta " can be accepted.

Discussion

Through this study, in the population of fitness members of the Health and Sport Center of Universitas Negeri Yogyakarta, it is known that the independent variable of physical activity level is related to the dependent variable of body fat percentage. The relationship that occurs between the two variables is linear and has a negative direction. In this case, the relationship that occurs between the two variables is an opposite relationship. If there is an increase in the level of physical activity, it will be followed by a decrease in body fat percentage. Meanwhile, if there is a decrease in the level of physical activity, it will be followed by an increase in body fat percentage. Thus, the level of physical activity according to the results of this study can be used as a control or regulator of the balance of body fat percentage levels.

These results are reinforced by research conducted by Bradbury et al. (2017) which states that physical activity level is inversely related to BMI and body fat percentage. Data from 119,230 men and 140,578 women aged 40-69 years showed that a lower percentage of body fat was found in individuals who were physically active than those who were not. This result did not change even when the study samples were grouped into the same BMI category. According to Zou et al. (2020) the inverse relationship was more significant in the subpopulation of normal weight obese individuals.

Exercise and physical activity are things that need to be considered in maintaining health and preventing various diseases (Anggunadi & Sutarina, 2017). According to Primasoni, (2021), physical activity is efficient for weight loss. Physical activity itself is one of the factors that influence weight control and simultaneously body fat percentage (Wiklund, 2016). Changes that occur in the level of body fat percentage due to the influence of physical activity can be explained from a physiological point of view. Changes in the percentage of fat in the body result from the difference or imbalance between energy intake and energy requirements used or expended. In a resting state, the body has a total energy expenditure requirement. The total energy expenditure requirement can be referred to as Basal Metabolic Rate (BMR) (Popson et al., 2019). Each individual's BMR level varies and is influenced by their level of physical activity. Meanwhile, energy intake is influenced by eating. Excess energy in the body will cause energy to be stored in the form of fat, while lack of energy in the body will cause the body to use energy reserves in the form of fat (Fazzino et al., 2023; Horgan et al., 2022).

Fat tissue is an essential tissue that plays a role in regulating the energy balance in the body (Hames et al., 2015). As the level of physical activity increases, the basal energy expenditure requirement increases and the body further requires more energy intake (Bosy-Westphal et al., 2021). If these energy needs are not met, the body will use fat reserves. On the other hand, if the level of physical activity decreases, the need for energy expenditure will decrease to near basal levels and energy intake may not be needed. In this condition, if the individual overeats, resulting in excess energy intake in the body, the energy will be stored in the form of fat (Hill et al., 2013). This excess energy is stored in fat depots. In the male population, energy is generally more easily stored in the abdominal organs or visceral abdominal fat tissue compared to subcutaneous fat tissue. Whereas in the female population, body fat is more commonly found stored in the gynoid or lower body more precisely in the circumference of the pelvis and thighs (Zou et al., 2020).

According to the average data regarding physical activity in the sedentary time category, it was found that individuals with obese fat percentage had a longer sedentary time than all categories with an average time of 10 hours per day (Savikangas et al., 2020). Since the data was taken from a small group in the research sample, the results can be said to be less reliable. Nonetheless, the relationship between the level of sedentary time and body fat percentage is consistent with theory. Liao et al. (2021) which

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states that the level of fat percentage is influenced by the duration of sedentary activity. Individuals who engage in sedentary activities more often have more fat percentage accumulation than individuals who are physically active or mobile.

Furthermore, when averaged in total, the entire sample has an average of 7 hours per day in doing sedentary physical activity. Looking at this figure, there is a potential or tendency for a sedentary lifestyle in fitness members of the Health and Sport Center of Universitas Yogyakarta. The researcher argues that promoting physical activity may be able to reduce sedentary activity in the wider community, especially members of the fitness center of Health and Sport Center of Universitas Negeri Yogyakarta, and thus may offer more positive health effects. Higher intensity physical activity may be required to reap the benefits of greater health.

CONCLUSION

Based on the description, testing, data analysis, and discussion of the research results, it can be concluded that there is a significant negative relationship between the level of physical activity and body fat percentage of fitness members of the Health and Sport Center of Universitas Negeri Yogyakarta with a Pearson Product Correlation significance value of r = -0.760, which means that the higher the level of physical activity, the lower the percentage of body fat a person has and vice versa.

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