Association Between Smartphone Addiction, Physical Activity Levels, and Physical Fitness Among University Students in Papua

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Article Info	Abstract
	The use of smartphones, if not properly controlled, will also hurt the population of Papua, especially students who are more prone to smartphone addiction. This study aims to determine the level of smartphone addiction and the relationship between physical activity and physical fitness among students in Papua. The method used is a quantitative correlation analysis design. The sample consisted of 91 university students (73 males and 18 females) selected using a stratified proportional random sampling method. Data collection techniques included the Smartphone Addiction Scale (SAS), which is a valid and reliable instrument with a Cronbach's Alpha value of 0.848, the International Physical Activity Questionnaire (IPAQ), and the Rockport Test to assess students' physical fitness. The results showed that the level of smartphone addiction was moderate (57.1%), the respondents' level of physical activity was mostly high (61.5%), and their level of physical fitness was mostly good (47.9%). The conclusion showed a significant correlation between the variables with a P value < 0.05. Based on the research findings, it is recommended that students increase their physical activity levels to reduce smartphone use and improve their physical fitness.

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INTRODUCTION

Based on data from the Central Statistics Agency in 2021, 65.87% of Indonesians aged 5 years and older owned a smartphone, and this number is expected to increase in 2022 to 67.88% of Indonesians aged 5 years and older owning a smartphone (Badan Pusat Statistik, 2023). Smartphone users in Indonesia accounted for two-thirds of the total Indonesian population in 2022 (Maarif, 2023). Meanwhile, in Papua, the proportion of individuals who owned smartphones in 2021 was 38.94%, and in 2022, it tended to decline to 35.33% (Badan Pusat Statistik, 2023). Although lower than other provinces in Indonesia, smartphone use, if not properly controlled, will also hurt the people of Papua, especially students who are more prone to smartphone addiction.

Previous research has revealed that smartphone addiction among Papuan students is considered abnormal in terms of usage duration, which exceeds the limit of 15–24 hours. TikTok is the most frequently accessed application, followed by YouTube, Instagram, and Facebook (Alua, 2023). Excessive smartphone use can lead to social dysfunction and a decline in physical activity among students.

Children aged 8-18 years old spend an average of 7.5 hours per day using electronic devices, including smartphones (Karismakristi, 2018). Smartphone addiction has emerged as a critical global issue affecting people at all levels, including students and university students. In the Kingdom of Saudi Arabia, there has been a sharp increase in the prevalence of smartphone addiction among students from 19.1% to 60.3% as reported in 2016 and 2019 (Alkhateeb et al., 2020). Similar research reveals that high smartphone use is associated with low levels of physical activity (Dwi Suryana et al., 2023).

Smartphone addiction is the inability of individuals to control the time they spend using smartphones, which often results in excessive use, thereby reducing the time available for physical activity and leading to hypokinetic diseases. Previous studies have revealed that individuals with inactive lifestyles are prone to diseases known as hypokinetic diseases (Nuryana et al., 2022).

The growth of smartphones in Indonesia has elicited different reactions from users. Some of the positive impacts of these devices include flexible access to information and knowledge, video call features that facilitate communication, and the expansion of friendships across the globe through social media sites (Nafisa, 2017). In addition, excessive use of smartphones also has negative effects on adolescents. The high amount of time spent staring at screens and low levels of physical activity lead to eating patterns that are not in line with ideal portions, which, if done over the long term, can affect the nutritional status of adolescents (Kumala et al., 2019). The amount of time spent staring at screens has an impact on weight gain and unhealthy eating patterns. Smartphones have now become

devices owned by people of all ages, especially teenagers (Efendi, 2021).

The negative impacts include addiction, sleep disturbances, decreased physical activity, decreased concentration in learning, developmental disorders, health risks to the eyes and brain, and reduced direct social interaction. In addition, students also tend to become wasteful and experience changes in attitude and behaviour as a result of uncontrolled smartphone use (Susanti & Yusri, 2023). However, smartphones also have a positive impact, especially on social interaction patterns. Associative patterns, such as collaboration through applications such as WhatsApp, LINE, and Instagram, allow students to exchange information and complete assignments online.

Physical fitness levels are one aspect influenced by human activities. Some physical activities, such as morning runs, gymnastics, and playing sports, are examples of physical activities that support an individual's physical fitness, and these are easily accessible. Human activities that are constantly evolving are the result of advancements in science and technology. During periods of rapid technological change, humans are spoiled by the constant advancements in technology. The development of technology has undoubtedly had a significant impact on human life. Activities that once required a lot of energy can now be completed quickly and easily.

The level of advancement in science and technology has also had an impact on sports activities. Treadmills, rowing machines, and stationary bicycles are some examples of technological advancements in the field of sports. However, on the other hand, this technological development has also led to people becoming less active in performing physical activities. Laziness is one of the negative effects of technology and is detrimental to a person's lifestyle. This is completely contrary to a healthy lifestyle. Facilities that influence activities have been created thanks to the rapid development of technology, such as airplanes, motor vehicles, ships, and electric trains. Unbeknownst to us, sedentary activities come in various forms, whether someone is at home, in an educational environment, at work, or while travelling, such as watching television, driving, or playing with gadgets—all of which are considered sedentary activities (Efendi, 2021).

Physical fitness is closely related to physical activity. Everyone's physical activity is different, and indirectly, physical fitness also varies. When someone engages in more physical activity, their level of physical fitness automatically increases. Physical fitness is a core element of the national sports system. Good training and development can produce quality human resources, which are also related to physical fitness (Rama Sandi Firdaus et al., 2025).

Physical fitness is the ability to perform activities or work, increasing work capacity without feeling excessive fatigue (Rustiadi & Rahayu, 2021).

Physical fitness components are divided into two categories: physical fitness related to health and physical fitness related to skills.

Based on facts from various countries, it is clear that identifying and treating smartphone addiction and recommending regular physical activity are important measures for preventing the negative effects of smartphone use, such as the onset of hypokinetic diseases. Based on observations of students at the Faculty of Sports Science, Cenderawasih University, there has been no in-depth study on the relationship between smartphone addiction levels, physical activity levels, and the occurrence of hypokinetic diseases. Therefore, the research team is interested in conducting a thorough investigation into the relationship between smartphone addiction levels, physical activity levels, and the occurrence of hypokinetic diseases among students in Papua.

Based on field observations and previous research findings, this study aims to determine: 1) The relationship between smartphone addiction levels and the physical fitness of students in Papua; 2) The relationship between physical activity levels and the physical fitness of students in Papua; and 3) The relationship between smartphone addiction levels and physical activity levels and the physical fitness of students in Papua.

METHODS

This study uses quantitative research with a correlational analysis design. The researcher uses this research design because the researcher collects data once (Point Time Approach).

Participants

The population in this study consisted of 775 students. This population comprised all students who met the criteria to be research subjects, namely students of the Faculty of Sports Science at Cenderawasih University, which consists of two departments: the Department of Sports Science (IKOR) and the Department of Sports Coaching Education (PKO).

The sampling technique used was Stratified Proportional Random Sampling. This technique was chosen to ensure that every member of the population had an equal chance of being selected as a sample, thereby allowing the research results to be generalised to a broader population. From the population of 775 students, 91 students were selected as the research sample. This number represents approximately 11.7% of the total population. All selected samples agreed to participate in the study. This consent indicates that the study adhered to research ethics principles, particularly the principles of autonomy and informed consent, where participants voluntarily and consciously agreed to participate in the study.

Data collection techniques used the Smartphone Addiction Scale (SAS) instrument, which has been validated and is reliable with a Cronbach's Alpha value of 0.848 (Alsalameh et al., 2019). International Physical Activity

Questionnaire (IPAQ) (Ita et al., 2022). and physical fitness tests for students using the Rockport Test (1600 m run/walk test) (Budiman et al., 2017).

Procedures

The research procedure began with gathering respondents to fill out the research questionnaire, namely the Smartphone Addiction Scale (SAS) and International Physical Activity Questionnaire (IPAQ) instruments. In this study, the questionnaire was filled out using Google Forms.

Physical fitness was measured using the Rockport test (a 1600m run/walk test). Before the Rockport test, participants warmed up, particularly their leg muscles, for 10–15 minutes.

Participants ran or walked briskly for 1600m or four laps around a standard track at a pace appropriate to their ability. The research team recorded the time taken by participants to complete the 1600-metre distance. After finishing the fast run/walk, participants' heart rates were immediately measured by the research team. The results of the time taken and heart rate were used to calculate the VO2max value using a valid and reliable formula as follows:

METS = 2,5043 + (0,84 x km/h)

1 METS (metabolic equivalent) = oxygen used by the body at rest = 3,5 ml O2 /kgBB/menit.

VO2max = METS x 3,5.

The Rockport test criteria are as shown in Tables 1 and 2 below:

Table 1. Rockport test categories (Male)

Category / Age	Duration (Minutes, Seconds)					
	13-19	20-29	30-39	40-49	50-59	>60
Very good	<09'40''	<10'45''	<11'0''	<11'30''	<12'30''	<13'59''
Good	09'41''-10'46''	10'46''-12'00''	11'01''-1230''	11'31''-13'00''	12'31''-14'30''	14'00''-16'15''
Fair	10'49''-12'10''	12'01''-14'00''	12'31''-14'45''	13'01''-15'35''	14'31''-17'00''	16'16''-19'00''
Poor	12'11''-15'30''	14'01''-16'00''	14'44''-16'30''	15'36''-17'30''	17'01''-19'00''	19'01''-20'00''
Very Poor	>15'31''	>16'01''	>16'31''	>17'31''	19'01''	>20'01''

Table 2. Rockport test categories (Female)

Category / Age	Duration (Minutes, Seconds)					
	13-19	20-29	30-39	40-49	50-59	>60
Very good	<12'29''	<13'30''	<14'30''	<15'55''	<16'30''	<17'30''
Good	12'30''-14'30''	13'31''-15'54''	14'31''-16'30''	15'56''-17'30''	16'31''-19'00''	17'31''-19'30''
Fair	14'31''-16'54''	15'55''-18'00''	16'30''-19'00''	17'31''-19'30''	19'01''-20'00''	19'31''-20'00''
Poor	16'55''-18'30''	18'31''-19'00''	19'01''-19'30''	19'31''-20'00''	21'01''-20'30''	21'31''-21'00''
Very Poor	>18'31''	>19'01''	>19'31''	>20'01''	>20'31''	>21'01''

Design or Data Analysis

Data analysis techniques in research are carried out in several stages, including: 1) Data preparation: The first stage is to prepare the data by ensuring that it is formatted, organised, and cleaned correctly of errors or outliers. 2) Descriptive statistics: Describe the results obtained based on the respondents' department, gender, age, and BMI. 3)

Correlation test statistics: The collected data is then analysed using inferential statistics with correlation test techniques (SPSS version 29.0).

RESULT

Based on the results of data collection and analysis, the results are as shown in Table 3.

Table 3. Respondent Characteristics

Respondents	F	%
Department		
IKOR	53	58.2
PKO	38	41.8
Total	**91**	**100.0**
Gender		
Male	73	80.2
Female	18	19.8
Total	**91**	**100.0**
Age (year)		
27 - 29	9	9.9
24 - 26	30	33.0
21 - 23	36	39.6
18 - 20	16	17.6
Total	**91**	**100.0**
BMI		
Underweight	4	4.4
Normal	49	53.8
Overweight	29	31.9
Obesity	9	9.9
Total	**91**	**100**

Based on the descriptive analysis of the data, it was found that the majority of respondents were from the IKOR department compared to the PKO department, with 58.2% of IKOR students versus 41.8% of PKO students. Male students were more dominant than female students, with 80.2% male students versus 19.8% female students. The dominant age group of respondents was between 21-23 years old (39.6%), followed by 24-27 years old (33%), 18-20 years old (17.6%), and 27-29 years old (9.9%). Additionally, the respondents' BMI was predominantly in the normal category at 53.8%, overweight at 31.9%, obese at 9.9%, and underweight at 4.4%.
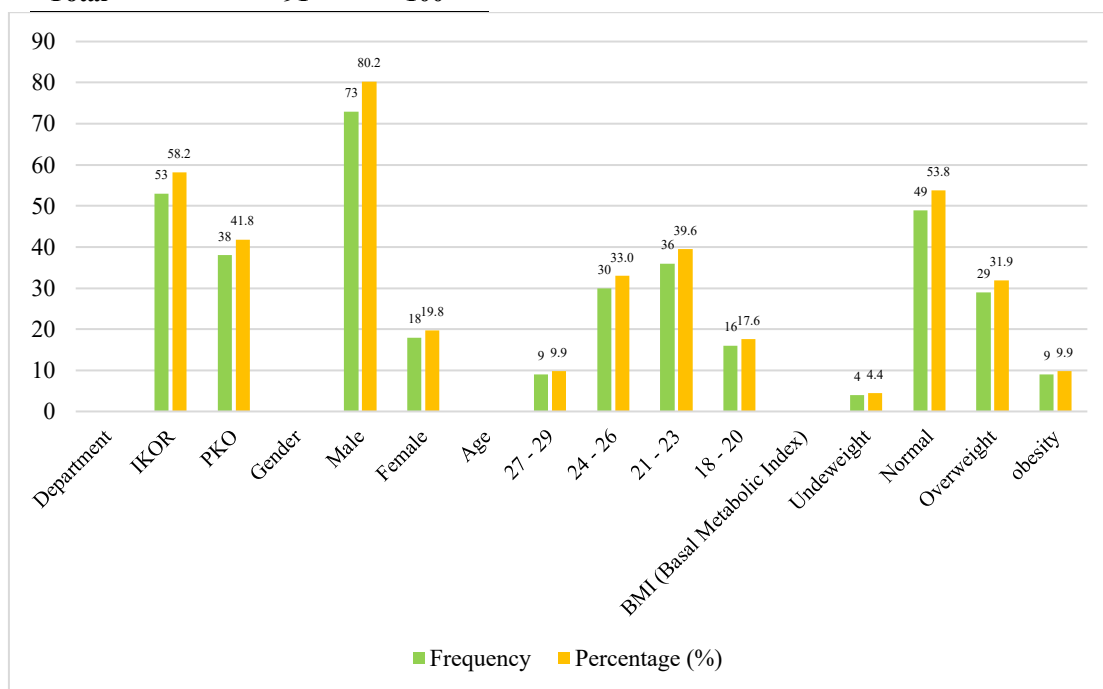

Fig 1. Respondent Characteristics Diagram

Smartphone Addiction Level

Based on data collected using the Smartphone Addiction Scale (SAS) instrument, the results are as shown in Table 4.

Table 4. Smartphone Addiction Level

Level of Smartphone Addiction	F	%
High	39	42.9
Moderate	52	57.1
Low	0	0
Total	91	100

Based on the results of data analysis, it was found that the majority of respondents experienced moderate smartphone addiction (57.1%), severe smartphone addiction (42.9%), and none experienced mild smartphone addiction. In addition, the results also showed the duration of smartphone use by respondents during the academic week, Monday to Friday, as shown in Figure 2.
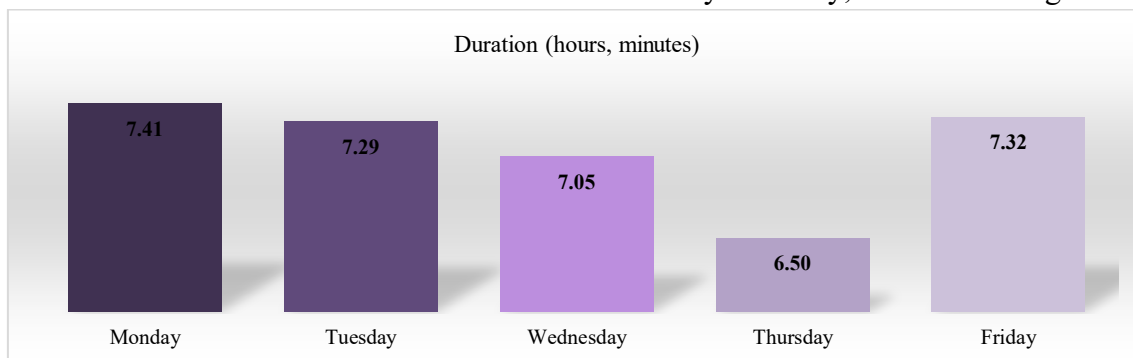

Fig 2. Smartphone Usage Duration

Based on the results obtained, the dominant duration of smartphone use by respondents was on Monday with an average duration of 7 hours and 41 minutes, Friday with an average duration of 7 hours and 32 minutes, Tuesday with an average duration of 7 hours and 29 minutes, Thursday with an average duration of 7 hours and 5 minutes, and Friday with an average duration of 6 hours and 50 minutes, resulting in an average smartphone usage of 7 hours and 11 minutes during lecture days. Additionally, data was obtained regarding the dominant applications used by respondents, as shown in Figure 3.
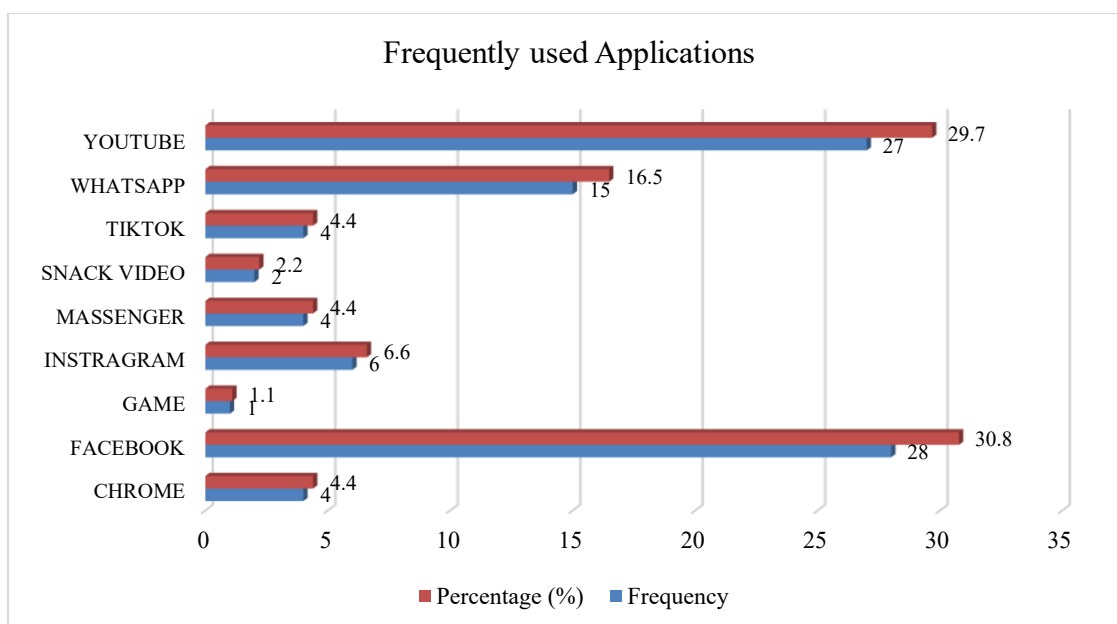

Fig 3. Applications frequently used by respondents

Based on the data, it was found that respondents predominantly used Facebook (30.8%), YouTube (29.7%), WhatsApp (16.55%), Instagram (6.6%), TikTok (4.4%), Messenger (4.4%), Chrome (4.4%), Snack Video (2.2%), and Games (1.1%).

Physical Activity Level

Based on data obtained using the International Physical Activity Questionnaire (IPAQ) instrument, the results are as shown in Table 5.

Table 5. Level of Physical Activity among FIK UNCEN Students

Level of Physical Activity	Frequency	Percentage (%)
High activity level	56	61.5
Moderate activity level	24	26.4
Low activity level	11	12.1
Total	91	100.0

Based on the results of data analysis, it was found that the respondents' physical activity levels were predominantly in the high category (61.5%), moderate physical activity level (26.4%), and low physical activity level (12.1%). Additionally, the average MET-minutes/week for men was 2,397 MET-minutes/week and for women was 2,179 MET-minutes/week, as shown in Table 6.

Table 6. Level of Physical Activity (MET-minutes/week)

Male			Female			Average MET-min/week		
Category	Frequency	%	Category	Frequency	%	Male	Female	Male & Female
High	43	58.9	High	13	72.2			
Moderate	20	27.4	Moderate	4	22.2	2397	2179	2354
Low	10	13.7	Low	1	5.6			
Total	73	100.0	Total	18	100.0	High	High	High

Physical Fitness

Based on the collection of physical fitness data using the Rockport test (1600-metre run), the results are shown in Table 7.

Table 7. Fitness Levels of FIK Uncen Students

Male			Female		
Category	Frequency	Percentage	Category	Frequency	Percentage
Very good	20	27.4	Very good	3	16.7
Good	35	47.9	Good	4	22.2
Fair	15	20.5	Fair	6	33.3
Poor	3	4.1	Poor	3	16.7
Very Poor	0	0.0	Very Poor	2	11.1
Total	73	100.0	Total	18	100.0

Based on the data analysis results, male respondents were predominantly in the good category (47.9%), followed by the very good category (27.4%), fair category (20.5%), and poor category (4.1%). Meanwhile, female respondents predominantly had a physical fitness level in the adequate category (33.3%), good category (22.2%), very good category (16.7%), poor category (16.7%), and very poor category (11.1%). Additionally, based on data analysis using correlation tests, a significant relationship was found between variables, as shown in Table 8.

Table 8. Correlation between smartphone addiction level and physical activity level with physical fitness of FIK Uncen students

Correlation (Variable)		P-Value	r (Pearson Correlations)	Clarification
Smartphone Addiction Level	Physical Fitness	0.014	-0.573	Moderate Correlation
Physical Activity Level	Physical Fitness	0.001	0.933	Very Strong Correlation
Smartphone Addiction Level And Physical Activity Level	Physical Fitness	0.003	0.751	Strong Correlation

Based on the correlation test, it was found that the level of smartphone addiction has a significant relationship with physical fitness, with a P-value = 0.014 < 0.05. Additionally, the level of physical activity also has a significant relationship with physical fitness, with a P-value of 0.001 < 0.05, and there is a significant relationship between the level of smartphone addiction and the level of physical activity with physical fitness, with a P-value of 0.003 < 0.05.

DISCUSSION

In today's digital age, smartphone use has become an integral part of daily life, especially among students. However, excessive smartphone use can hurt physical activity and physical fitness. In this study, it was found that the average student has a moderate level of smartphone addiction, with an average daily usage duration of 7 hours and 11 minutes on school days. Additionally, a significant correlation was found between the level of smartphone addiction and the physical fitness of students at the Faculty of Physical Education (FIK) of the University of Cenderawasih (UNCEN). The results indicate that the longer the smartphone usage, the lower the physical fitness of the students.

Similar studies have revealed that the higher the smartphone usage, the lower the physical fitness level, and vice versa (Cahyono et al., 2022). It was further explained that there is a significant relationship between the length of smartphone use and cardiorespiratory fitness (Zahrani et al., 2024). Another case shows that the influence of smartphones affects interest in exercise, thereby impacting physical fitness levels (Aldiansyah & Kristiyandaru, 2023). In today's digital age, smartphone use has become an integral part of everyday life. However, excessive use can cause health problems, including impacts on physical fitness (Kumar & Sherkhane, 2018). Several

studies have revealed a significant correlation between smartphone addiction and a decline in physical activity and overall fitness. Smartphone addiction hurts health, especially among teenagers (Zhang et al., 2024).

A study conducted on sports science students showed that smartphone addiction has a significant effect on physical activity levels. The results of the study indicate that physically inactive students tend to experience problematic smartphone use (Kumban et al., 2025). In addition, experimental studies show that lifestyle interventions focused on increasing physical activity can prevent excessive smartphone use and improve mental health (Precht et al., 2024). This shows that physical activity is not only affected by gadget addiction, but can also be a solution to overcome it.

Based on the results of this study, it was found that the majority of students have moderate levels of physical activity. Moderate physical activity is defined as activities requiring 3-6 METs (Metabolic Equivalent of Task) or equivalent to brisk walking at 4-6 km/h. According to the WHO, moderate physical activity is recommended for a minimum of 150 minutes per week or 30 minutes per day for 5 days a week (WHO, 2024). Incorporating physical activity into a healthy lifestyle can help individuals better control themselves and reduce excessive smartphone use, as their bodies become more active and engaged in real-life activities (Ye et al., 2025). Similar research reveals that physical activity plays an important role in improving fitness levels (Supriyanto et al., 2021). Regular physical activity improves heart and lung capacity, thereby increasing the body's ability to deliver oxygen throughout the body. It is further explained that physical fitness affects enthusiasm for learning, so physical activity is necessary to improve fitness to achieve academic achievement (Hariyanto et al., 2022).

CONCLUSION

Based on the research results, it was concluded that there is a significant relationship between the level of smartphone addiction and the level of physical activity with the physical fitness of students at the Faculty of Sports Science, Cenderawasih University. The level of smartphone addiction shows a negative relationship with physical fitness, indicating that the higher the level of smartphone addiction, the lower the level of physical fitness of students. Physical activity levels are positively correlated with physical fitness, suggesting that increased physical activity can improve students' physical fitness.

It is recommended that future researchers conduct similar studies on a broader population, including students from various faculties and universities. Additionally, more comprehensive measurements of physical fitness biomarkers should be added, and real-time smartphone usage data should be integrated to reduce recall bias.

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