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Smartphone addiction and sedentary lifestyle among university students: a correlation study

Lina Handayani [a*], Aditama Huzaifi Ahmad [a], Tria Nisa Novianti [a], Karimatul Khalidah [a], Beddu Hafidz [b]

[a] Department of Public Health, Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia
[b] Department of Community Medicine, Faculty of Medicine, Khon Kaen University, Thailand

* Corresponding author: linafkm@gmail.com

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ABSTRACT

Smartphone addiction is an increasing public health concern globally, especially in Indonesia. Smartphone use often begins in early adolescence and intensifies during the university years, driven by greater autonomy and dependence on smartphones for academic, social, and entertainment purposes. These variables contribute to prolonged screen time, which may increase the risk of smartphone addiction and a sedentary lifestyle, which has been widely reported among adolescents and university students. Therefore, this study aims to determine the relationship between smartphone addiction and sedentary lifestyle among university students. An analytical observational study with a cross-sectional design was conducted among students enrolled in the Public Health Study Program at Universitas Ahmad Dahlan (2021–2024 cohorts). Purposive sampling was used to recruit 95 active students who owned smartphones and agreed to participate. Data was collected through an online questionnaire. Smartphone addiction was assessed using the Indonesian Smartphone Addiction Scale – Short Version (SAS-SV), while sedentary lifestyle was measured using the Indonesian Adolescent Sedentary Activity Questionnaire. Both instruments had been translated, validated, and pilot-tested, with details provided in the Supplementary Materials. Data were analyzed using Spearman's Rho correlation test. The prevalence of moderate smartphone addiction was 64.21%, while 42.11% of students exhibited a sedentary lifestyle. Spearman's Rho correlation analysis showed a weak and non-significant association between smartphone addiction and sedentary lifestyle ($r = 0.090$; $p = 0.388$). Smartphone addiction and sedentary lifestyle were not significantly associated among university students in this study. However, the high prevalence of moderate smartphone addiction remains a concern, indicating that preventive strategies should address not only individual behaviors but also broader environmental, social, and economic factors.

1. Introduction

Mobile media, particularly smartphones, have transformed media consumption behavior worldwide. Smartphones have become essential devices for most individuals [1], and their use among children and adolescents has increased dramatically over the past decade [2]. Globally, smartphone usage continued to rise, with an estimated 7.21 billion users in 2024, representing more than 90% of the world's population [3]. In Germany, 93% of 12–19-year-olds own smartphones, and 92% use

them every day. Young people in this age bracket spend 205 minutes each day on digital media devices [4]. The latest study has shown that excessive internet use, such as online gaming or social media use, can cause behavioral addiction–like symptoms, including gambling problems [5]. Furthermore, the Centers for Disease Control and Prevention (CDC) reports a worrying association between mobile phone addiction and disruptive behavioral consequences, with significant increases in both conditions between 2010 and 2015. In the same five-year period, serious depression among heavy smartphone users surged 58%, and suicide rates rose 65%. The CDC noted that heavy smartphone use had different psychological consequences on women than men [5].

In Indonesia, statistical data on Information and Communication Technology over the past three years show that Internet use has increased significantly, from 15% in 2014 to 51% in 2017, placing Indonesia as a country with one of the highest growth rates of internet users, five times higher than the global average between 2016 and 2017. The number of smartphone users in Indonesia exceeded the total population in 2014, reaching approximately 112%. This figure is highly significant compared to the average ratio of smartphone users to the Indonesian population [6]. This is certainly harmful for the individual, as using a smartphone for more than four hours a day can lead to poor sleep, increased anxiety, stress, and depression levels, and more [7]. Furthermore, using a smartphone while studying affects focus, which lowers motivation to learn [8]. This certainly has an impact on academic achievement, as prior research indicated that students who use their smartphones excessively usually receive lower grades [9].

Due to several studies, students struggle to put their smartphones away. Based on a Yogyakarta survey, 69.8% of students were classified into the group of medium smartphone addicts [10]. Based on another study, 67.4% of Universitas Pendidikan Indonesia (UPI) Sumedang Campus undergraduate nursing students were classified into the high category of smartphone addiction, with the use of a smartphone for more than six hours a day being common [11]. Since smartphones provide students with access to information, communication, education, and entertainment nowadays, this should not be unreasonable [3]. However, there are several consequences of using a smartphone as well, such as addiction, disruption of social interactions, and interference with daily activities [12].

The phenomenon shows that smartphone use is often while seated. Similarly, research conducted by Zakiyatul Fuadah et al. (2021), showed that students frequently use their smartphones while sitting or lying down, which are sedentary positions [8]. Rather than walking to a restaurant or stall, students use the smartphones fiture to order meals online on their smartphones [14]. On the other hand, 90.9% of teenagers in a Chinese study who participated used smartphones when seated, which led to a sedentary lifestyle [15]. Then, an Indonesian study found that teenagers who were addicted to smartphones were 2.7 times more likely to have a sedentary lifestyle than those who were not addicted [16]. In addition to smartphone use, the sedentary lifestyle phenomenon can also be caused by several behaviors in front of the screen, such as watching television, playing on computers, and playing video games [17].

A sedentary lifestyle is highly harmful to both mental and physical health, such as obesity, heart disease, hypertension, and type 2 diabetes, which constitute some of the physical consequences of this sedentary lifestyle [18]. While on the mental aspect, some of the impacts are depression, anxiety, and decreased cognitive functions, such as reduced learning ability and productivity [19]. Furthermore, people who lead more active lifestyles are generally happier than those who lead sedentary lifestyles [20]. Ironically, despite the potential health consequences, students in public health studies programs continue to lead sedentary lives and get addicted to smartphones. In contrast, they need to have been taught the fundamentals of public health science, including how to lead a clean and healthy lifestyle, in class. According to a study conducted among students enrolled in the

Public Health Study Program at Muhammadiyah University Jakarta, 119 out of 237 (50.2%) students led a highly sedentary lifestyle [21].

A preliminary study conducted using questionnaires on smartphone addiction and sedentary lifestyle among 15 students from the Public Health and Nutrition Study Programs (cohorts 2021–2024) at the Faculty of Public Health, Universitas Ahmad Dahlan, indicated that students exhibited both smartphone addiction tendencies and sedentary lifestyle behaviors. Public Health students were found to spend more than 4 hours per day on a smartphone than Nutrition students. In addition, Public Health students engaged in physical activity for only 1–2 hours per week, contributing to sedentary lifestyle patterns, whereas Nutrition students reported more than 3 hours of weekly physical activity. These preliminary findings highlight that, within the researchers' own study setting, sedentary behavior and excessive smartphone use are already evident among Public Health students.

While a research study was done in Kupang City, 47 out of 66 students (71.2%) enrolled in Nusa Cendana University Kupang's Public Health Study Program had a smartphone addiction [22]. Preliminary UAD data show a similar concern about high smartphone use and low levels of physical activity. Based on the above description, along with the considerable number of public health students who exhibit sedentary lifestyles and the high prevalence of smartphone addiction among students in public health programs, researchers are interested in conducting a study to determine the relationship between smartphone addiction and sedentary lifestyle among students.

2. Method

This study is an analytic, observational, cross-sectional design. The population consisted of all active students from the 2021–2024 cohorts of the Public Health Study Program, Faculty of Public Health, Universitas Ahmad Dahlan, totaling 579 students. The sample size was calculated using the Slovin formula with a 10% margin of error, yielding a minimum sample size of 85 respondents. To anticipate non-response, an additional 10% was added, bringing the final target to 95 participants. Sampling was carried out based on inclusion criteria, namely being an active student in the 2021–2024 cohorts of the Public Health Study Program, being a smartphone user, and agreeing to participate by completing the online questionnaire. A total of 95 students who met these criteria were included in the study.

Data were collected using a demographic questionnaire and a sedentary lifestyle questionnaire. Sedentary lifestyle was measured using the Adolescent Sedentary Activity Questionnaire (ASAQ), developed by Hardy et al. (2007) and adapted into Indonesian by Pramita & Griadhi (2016) [23,24]. The Indonesian version consists of five domains—small-screen recreation, education, transportation, cultural activities, and social activities—and has demonstrated acceptable validity, with reliability coefficients ranging from 0.57 to 0.86. ASAQ identifies 11 categories of sedentary behavior, and respondents report the time spent in each category, in hours and minutes. The total time is then summed and divided by seven to obtain the average sedentary minutes per day. The level of sedentary behavior is categorized following Young et al. (2014) into three levels: low (< 2 hours/day), moderate (2–5 hours/day), and high (> 5 hours/day).

Smartphone addiction was measured using the Indonesian version of the Smartphone Addiction Scale–Short Version (SAS-SV), originally developed by Kwon et al. (2013) and later translated and adapted by Arthy et al. (2019). The instrument consists of 10 statements answered on a 1–6 Likert scale (1 = strongly disagree, 6 = strongly agree). The total score is obtained by summing all item scores for each respondent. Levels of smartphone addiction are categorized into low, moderate, and high using z-scores, with low corresponding to $z < -1.0$, moderate to z between -1.0 and +1.0, and high to $z > +1.0$. Concurrent validity testing showed a significant correlation ($r = 0.558$, $p < 0.001$), indicating medium validity. The Indonesian version also demonstrated strong internal consistency,

with a Cronbach's alpha coefficient of 0.931, confirming the instrument's reliability following cultural and linguistic adaptation [25].

The data collection process began on November 23, 2024, and was completed on November 30, 2024. Throughout this period, data were gathered in accordance with the approved protocol and ethical guidelines stipulated in the ethical clearance (KEPK/UMP/97/XII/2024). Before data collection commenced, respondents were informed about the study objectives, confidentiality, and their rights to withdraw at any time. Only participants who provided informed consent were included in the study. Data analysis was performed using Spearman's rho to examine the relationship between continuous scores of smartphone addiction and sedentary duration. For categorical data, only gender was analyzed as a category using the Chi-square test.

3. Results and Discussion

3.1. Results

The total sample in this study was 95 university students. Furthermore, the respondent's characteristics, including gender, age, smartphone addiction level, and sedentary lifestyle level, are shown in Table 1. This table shows that most respondents were female (84.21%) and primarily from the 2023 cohort (48.42%). More than half of the students had a moderate level of smartphone addiction (64.21%) and a moderate sedentary lifestyle (42.11%), indicating that both behaviors were generally present at moderate levels among the respondents.

Table 1. Frequency Distribution of Respondents' Characteristics Based on Gender and Year of Entry among Public Health Students at UAD

Characteristic		Total	Percentage (%)
Gender	Male	15	15.79
	Female	80	84.21
Year of Entry	2021	9	9.47
	2022	35	36.84
	2023	46	48.42
	2024	5	5.26
Addiction Level	Low	17	17.89
	Medium	61	64.21
	High	17	17.89
Sedentary Level	Low	23	24.21
	Medium	40	42.11
	High	32	33.68

The relationship between smartphone addiction and students' sedentary lifestyle at the Faculty of Public Health, Ahmad Dahlan University, is shown in Table 2. To determine the relationship between smartphones and sedentary lifestyles, a Spearman's Rho correlation analysis was conducted. The analysis showed a correlation coefficient (r) of 0.090, indicating a very weak relationship between the two variables. The positive coefficient indicates that the higher the level of smartphone addiction, the higher the level of sedentary behaviour, but this relationship is not significant ($p=0.388$, $p>0.05$). For categorical data, the relationship between gender and sedentary lifestyle was analyzed using the Chi-square test, which showed a significant association ($p = 0.042$).

Table 2. Relationship of Gender and Smartphone Addiction with Sedentary Lifestyle among Students

	Sedentary Lifestyle		
	Type of Test	*r-value*	*p-value*
Gender	Chi-Square	-	0.042
Smartphone Addiction	Spearman's Rho	0.090	0.388

3.2. Discussion

The use of smartphones among students is increasing as technological developments advance. Smartphones are the main tool for accessing information, communicating, and supporting academic activities. However, excessive use can lead to smartphone addiction, which has the potential to affect daily behavior patterns, including an increase in sedentary lifestyle. The results showed that the majority of students were at a moderate level of smartphone addiction and a moderate sedentary level. Nearly 80% of students have a sedentary lifestyle of 2 to more than 5 hours per day. The results showed that students in the faculty of public health at Ahmad Dahlan University had a medium level of smartphone addiction and a sedentary lifestyle. This shows that respondents are highly dependent on smartphones in their daily lives and lead sedentary lifestyles. The results of this study indicate that although there is a tendency for a positive relationship between smartphone addiction and sedentary lifestyle, the relationship is not strong enough and not statistically significant. This means that high smartphone use does not directly correlate with increased sedentary behaviour among students in this study. It may occur due to uncontrolled confounding variables. It may be the limitations of this current study.

Several factors that cause smartphone addiction in college students are the inability to control themselves in using smartphones, academic stress, study boredom, and high media exposure [26]. In addition, low self-esteem and fear of missing important moments, which is known as fear of missing out (FOMO), also contribute to the increase in excessive smartphone use [10]. The impact of smartphone addiction is not limited only to the academic aspect, such as difficulty completing tasks and a tendency to postpone work [27]. But also on physical health aspects, such as neck, shoulder, and back pain due to bad posture [28], as well as visual impairment due to prolonged screen exposure [29].

Gender is one of the determinants of a sedentary lifestyle among university students. Male students tend to have lower sedentary levels than female students because they are more physically active and engage in sports more frequently [30]. Evidence shows that gender and educational differences in sedentary activity vary across the life span. Among adolescents, evidence suggests that gender differences and parents' education influence sedentary behavior. Boys have been shown to spend more total sitting time as measured by devices, but findings are inconsistent regarding whether gender is associated with screen time [31].

A sedentary lifestyle among university students is influenced by various factors, including technological advancement, socioeconomic conditions, and the environment. Male students generally exhibit lower sedentary levels because they are more engaged in physical activity [32]. Students with higher incomes also tend to be more physically active because they have better access to sports facilities [33]. The impact of a sedentary lifestyle can lead to increased risk of cardiovascular disease, obesity, type 2 diabetes, and mental health disorders such as stress, anxiety, and depression [34].

The weak, insignificant correlation found in this study differs from that reported in previous research. One study involving 500 young adults reported that students with high levels of smartphone addiction also exhibited higher levels of sedentary behavior [35]. Likewise, a study on high school adolescents found a significant relationship between smartphone addiction and a high sedentary lifestyle. In the study, adolescents with smartphone addiction had a 2.7 times higher risk of experiencing sedentary behavior compared to adolescents who did not experience smartphone addiction [16].

The results of another study that does not match are research conducted in Ahmedabad, which found that the higher the level of smartphone addiction among college students, the lower the level of physical activity [36]. This is due to students' tendency to prefer watching movies or playing games

in their spare time rather than engaging in physical activities [14]. Therefore, students are expected to remain active in physical activity to reduce smartphone addiction [37].

From a theoretical perspective, the Theory of Planned Behavior (TPB) provides additional insight into the lack of statistical significance. TPB posits that positive attitudes toward a behavior increase the intention to engage in it [38]. However, in this study, attitude did not significantly influence behavior, likely because respondents did not hold strong preferences. Many described the activities as routine or habitual—for instance, "I engage in this behavior because it has become a habit, not due to a specific intention." Such neutral attitudes align with the insignificant findings. Moreover, previous studies have shown that when individuals perceive high behavioral control, the influence of attitude on intention tends to diminish [39]. Therefore, the combination of neutral attitudes and high perceived control may explain the weak influence of attitude observed in this study.

The absence of a relationship between smartphone addiction and a sedentary lifestyle in this study may be due to confounding factors, such as parents' socioeconomic status and the physical and social environments. One study showed that there is a relationship between parents' socioeconomic status and sedentary lifestyle [40]. Meanwhile, another study states that the physical and social environment affects low physical activity [41]. If a person lives in an environment that supports physical activity, they may remain active despite frequent smartphone use. Therefore, these factors may explain why the results of this study differ from those of previous studies.

4. Conclusion

The study found that most students have moderate levels of smartphone addiction and sedentary lifestyles, yet no significant relationship was identified between the two. This suggests that other factors, such as the physical and social environment and economic conditions, may influence students' sedentary behavior. Future studies should include additional variables and control for potential confounders to better understand these relationships. The findings imply that efforts to reduce sedentary behavior should not focus solely on smartphone addiction but also consider broader determinants. Practically, universities and policymakers can develop comprehensive health promotion strategies by expanding opportunities for physical activity, fostering supportive social environments, and increasing awareness of the health risks associated with sedentary lifestyles.

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Conflict of Interest

The authors report no conflicts of interest. No financial support or other relationships influenced the outcome or interpretation of the results in this study.

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