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INCREASING SMARTPHONE USAGE CORRELATES WITH WORSENING SLEEP QUALITY AMONG MEDICAL STUDENTS

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ABSTRACT

High intensity of gadget usage affects the population. Gadget addiction especially smartphones became more common. Previous studies have shown its negative effects, such as bad sleep quality. This study aims to find the relationship between smartphone usage and sleep quality among medical students. The questionnaires used in this study were AKPP (Asesmen Komunitas terhadap Pengalaman Psikotik), SAS- SV (Smartphone Addiction Scale - Short Version), and PSQI (Pittsburgh Sleep Quality Index). The statistical analysis used in this study were Pearson's Chi-square and Pearson's r. This study was an observational cross-sectional study. Among 201 respondents, 126 (62.7%) were at high risk of getting addicted to smartphones and 95 (47%) were having bad sleep quality. This study found that there was a moderate positive correlation between increasing smartphone usage and worsening sleep quality (p = 0.006, r = 0.320). In conclusion, there was a correlation between smartphone usage and sleep quality.

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INTRODUCTION

In 2020, the number of smartphone users in Indonesia was estimated to reach 81.87 million. Indonesia was the largest smartphone market in the world after China, India, and America[1]. In Indonesia, the average smartphone user spends 69 minutes a day using mobile apps and 66 minutes a day accessing the internet[2]. Gadgets, especially smartphones, have become a big part of people's daily lives.

In the 2019 South Korean government survey, around 88.5% of respondents stated that they had a smartphone. Another survey in the same year showed that the level of smartphone overdependence in South Korea reached 20%. This figure includes residents aged three years[3].

Excessive use of gadgets can lead to addiction that will make the user neglect important professional and personal life tasks[4]. Excessive smartphone use can also

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impact poor sleep quality, especially in latency and sleep duration[5]. In a study in Iran, poor sleep quality was found in medical students who used their mobile phones excessively[6].

Medical students are among the groups who regularly use a smartphone. For this reason, a study is needed to determine the relationship between smartphone use and sleep quality among medical students.

MATERIALS AND METHODS

This study was an observational study. The variables were smartphone usage and sleep quality. This research had been carried out with the approval of an ethical license number 114/EC/KEPK/FKUA/2021 from the Health Research Ethics Committee of the Faculty of Medicine Universitas Airlangga Surabaya.

The research subject of this study were medical students of the Universitas Airlangga class of 2018 and 2019. They were selected through random sampling with Microsoft Excel 2016 Data Analysis Tools. They were contacted via Whatsapp and LINE. Those who did not want to participate were excluded and another subject was selected through random sampling.

Psychotic disorders were the exclusion criteria and were screened with the *Asesmen Komunitas terhadap Pengalaman Psikotik* (AKPP), the Indonesian version of Community Assessment of Psychotic Experience-42 (CAPE-42)[7]. CAPE-42 is a questionnaire developed by Jim van Os, Hélène Verdoux, and Manon Hanssen in 2002. This questionnaire consists of 42 questions with 2 subscales, the frequency and distress subscales. These 42 questions are divided

into positive symptoms (no. 2, 5, 6, 7, 10, 11, 13, 15, 17, 20, 22, 24, 26, 28, 30, 31, 33, 34, 41, 42), negative symptoms (no. 3, 4, 8, 16, 1, 21, 23, 25, 27, 29, 32, 35,36, 37), and depressive symptoms (no. 1, 9, 12, 14, 19, 38, 39, 40) dimension. On the frequency subscales, "never" is worth 1 point, "sometimes" is worth 2 points, "often" is worth 3 points, and "almost always" is worth 4 points. On the stress subscale, "not distressed" scores 1 point, "a bit distressed" is worth 2 points, "quite distressed" is worth 3 points, and "very distressed" is worth 4 points. The cut-off score of 50 on the frequency or distress subscale of positive symptom dimensions is used to determine the presence of psychotic disorder. This cut-off has a sensitivity of 77% and a specificity of 70.5% [8].

Smartphone usage was screened with the Indonesian version of the Smartphone Addiction Scale–Short Version (SAS-SV). SAS-SV consists of 10 self-rated questions. Each question has 1-6 points. A score of "1" indicates no risk and a score of 6 indicates "high risk"[7]. On the Indonesian version, a total score >32 for males and a total score >34 for females indicates a high risk of smartphone addiction. The concurrent validity of the questionnaire shows a correlation with the Indonesian version of the Nomophobia Questionnaire (NMP-Q) (r =0.558, p <0.001). The reliability of this questionnaire is sufficient with Cronbach's value of 0.740. Sensitivity and specificity for males were 97.4% and 97.3%, respectively. Sensitivity and specificities for females were 91% and 97.4%, respectively[9].

Sleep quality was measured with the Indonesian version of The Pittsburgh Sleep Quality Index (PSQI). PSQI is a questionnaire developed by PSQI and

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consists of 19 self-rated questions and 5 questions answered by sleeping partners or roommates (if any). Only self-rated questions are included in the assessment. Nineteen questions are combined to form 7 "component" scores, each of which has 0-3 points. A score "0" indicates no difficulty while a score of "3" indicates severe difficulty. The 7 "component" scores are then combined to form a "global" score, with a range of 0-21 points, "0" indicates no difficulty, and "21" shows severe difficulty in all areas[10]. On PSQI-I total score <6.5 indicates good sleep quality and a total score >6.5 indicates bad sleep quality. The construct validity of this questionnaire shows a significant correlation with the total score of Beck's Depression Inventory II Indonesian version (Indo BDI-II), (r =0.22, P <0.05). The reliability of this questionnaire is sufficient with Cronbach's value of 0.72[11].

The questionnaires were made in Google Forms and were shared through links via Whatsapp and LINE. The researcher also sent Informed Consent in the same Google Forms. To maintain the confidentiality of the student's identity, their names and address was not included in the data processing page. The data were collected from November 2021 to January 2022.

The statistical analysis used was Pearson's Chi-Square test and Pearson's r test. In the Chi-square test, the level of significance was α =0.05, which means that if the statistical test results are p <0.05, then there is a significant relationship between variables. In Pearson's r critical value test at the 1% level, the level of significance was R =0.199, which means if the statistical test had results r >0.199 then there was a significant relationship between variables. The software used was the IBM Statistical Package for the Social Sciences (SPSS) version 26.

RESULTS

There was a total of 204 respondents collected. Among them, three were identified with psychotic disorders and were excluded from the research. The final sample consisted of 201 subjects. There were 66 male students and 135 female students. The average age of the subjects was 20.5 years old.

There were 75 respondents (37,3%) who were not at risk of smartphone addiction and there were 126 respondents (62,7%) who were at risk of smartphone addiction.

Table 1. Demographics of Respondents

No.	Characteristics		n	%
		18	1	0.4
		19	11	5.4
		20	60	29.8
		21	105	52.2
1.	Age	22	18	8.9
		23	3	1.4
		24	1	0.4
		Total	**201**	**100**
		Average	20,5	
		Male	66	32.8
2.	Sex	Female	135	67.1
		Total	**201**	**100**

Table 2. Smartphone Usage among Medical Students

Smartphone Addiction	Frequency	Percentage (%)
Not at risk	75	37.3
High risk	126	62.7
Total	**201**	**100**

There were 106 respondents (52,7%) who had good sleep quality and there were 95 respondents (47,3%) who had bad sleep quality.

Table 3. Sleep Quality of Medical Students

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Sleep Quality	Frequency	Percentage (%)
Good	106	52.7
Bad	95	47.3
Total	**201**	**100**

The results of the Chi-square analysis (p =0.006) was smaller than the level of significance (=0.05) indicating a significant relationship. The result of Pearson's correlation analysis was r =0.320, which was greater than the critical value level of 1% (r =0.199). This means that smartphone use and poor sleep quality had a moderately positive relationship.

Table 4. Relationship between Smartphone Usage and Sleep Quality

Smartphone Addiction	Sleep Quality			
	Good	%	Bad	%
Not at risk	49	24.3	26	12.9
Highrisk	57	28.3	69	13.3
p = 0.006				
r = 0.320				

DISCUSSION

The use of smartphones by medical students was mostly high. As much as 62.7% of the medical students were at a high risk of getting smartphone addiction. This number was greater than that found in a research by Rini et. al (2020), where the prevalence of gadget addiction was around 22.6% in developed countries and around 32.3% in developing countries[12]. It was also higher than the number found in research by Meng et. al (2022), which found that the prevalence of gadget addiction was 26.9% globally and 41.63% in Southeast Asia[13].

The results of this study might be influenced by the pandemic. A study by Carroll et. al in 2020 found an increase in screen time caused by switching to online learning tools[14]. In addition, stress due to the learning load also causes an increase in screen time as a coping mechanism for medical students[15]. Jahja et. al (2021) found an increase in screen time and a decrease in physical activity in medical students during the COVID-19 pandemic, especially in the first three months of the lockdown[16]. The prevalence of gadget addiction increased globally from 26.9% to 34.5% during the 2020-2021 COVID-19 Pandemic[13].

In this study, the sleep quality of most medical students (53%) was good. However, the number of students with poor sleep quality was also quite big, as much as 47%. This result was not much different from the prevalence of poor sleep quality in medical students in Asia in Rao's et. al study (2020) with data from 1996-2018, which was 47.4%. In that study, the prevalence of poor sleep quality among medical students globally was 52.7%[17]. The prevalence in this study was lower than that in Jahrami et. al (2019) with data from 2001-2018 which found that the prevalence of poor sleep quality in medical students was 55%[18]. Meanwhile, for college students in general, the prevalence of poor sleep quality was 23.9%[19].

In this study, the use of gadgets and poor sleep quality had a moderate positive relationship, where the higher the use of the device, the worse the quality of sleep and vice versa. The components of sleep quality that had a significant positive relationship were subjective sleep quality, latency, sleep duration, sleep disturbances, and daytime dysfunction. This was in line with Krisnana's et. al study which found that smartphone use was positively related to poor sleep quality, especially in latency and sleep duration[5]. This was caused by device electromagnetism which can reduce REM sleep latency, thereby reducing restful sleep. The use of devices before bed reduces the secretion of melatonin during sleep and this causes a person to stay

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awake, thereby reducing the duration of sleep[5]. The difference was that this study also found a positive relationship between subjective sleep quality and daytime dysfunction. Research by Shanmugasundaram et. al (2019) found that college students who used their smartphones close before bedtime tended to have shorter sleep durations[20].

This study revealed that most of the respondents were at high risk of smartphone addiction (62.7%) and as many as 89.1% of respondents slept less than 7 hours a day. This was in line with research by Amez et. al (2020) which found that someone who is addicted to smartphones is more at risk of having poor sleep quality and sleeping less than 7 hours a day[21].

This study also found that there was a positive relationship between the level of smartphone addiction and the component of daytime dysfunction. This was in line with the results of Chung's research (2018) that people at high risk of smartphone addiction tend to experience daytime sleepiness compared to people at low risk because the use of smartphones until late at night will delay sleep onset and result in shorter sleep duration[22]. Rafique et. al (2020) found that screentime of more than 8 hours a day was positively correlated with sleep disturbances and reduced sleep duration[23].

Most of the respondents in this study were at high risk of smartphone addiction and most of the respondents had good sleep quality. However, the percentage of high-risk respondents who have poor sleep quality was greater than that of non-risk respondents. Good sleep quality in high-risk students may be because they could still manage their time so they can still have good quality sleep. Meanwhile, poor sleep quality in students who were not at risk may be influenced by factors other than smartphone use.

Among the factors that might have influenced the use of smartphones was the COVID-19 pandemic. Carroll's study (2020) showed that the rate of increase in screentime during the pandemic in families was 74% for mothers, 61% for fathers, and 87% for children[14]. This was because during the pandemic, work and school were carried out online. In addition, due to the lockdown and social distancing, there had been a shift to entertainment facilities that can be conducted online, for example, consumption of video games increased by 39% in the research by Clement (2021) and 61% of the population experienced an increase in video streaming in the research by Dixon (2022)[24,25].

Other factors that affect sleep quality include genetics, with a heritability of around 34%, and physical activity[26,27]. In a study by Gornicka et. al (2020), it was found that 43% of respondents experienced a decrease in physical activity during the COVID-19 pandemic[28]. Research by Zhang et. al (2021) also found that a decrease in physical activity and an increase in screen time in areas experiencing lockdown were also associated with increased symptoms of depression. Depression can also affect sleep quality[29].

CONCLUSION

The use of gadgets has moderate strong positive relationship with poor sleep quality in medical students. The higher the use of the device, the worse the sleep quality.

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REFERENCES

1. Statista Research Department, Smartphone Users in Indonesia-Statistics & Facts. Statista [online] 2020 [cited: 2020 April 7]. Available from: URL: https://www.statista.com/statistics/266729/smartphone-users-inindonesia/ .

2. Nurhayati-Wolf, H et. al. Frequency of personal internet usage in Indonesia as of January 2018. Statista [online] 2019 Feb [cited: 2020 April 7]. Available from: URL: https://www.statista.com/statistics/803542/frequency-of-personal-internet-usage- indonesia/ .

3. Yoon, JS. Smartphone Usage in South Korea-Statistics & Facts. Statista [online] 2020 [cited: 2020 May 5]. Available from: URL: https://www.statista.com/topics/5340/smartphone-usage-in-southkorea/ .

4. Vaghefi, I, Lapointe, L, Boudreau-Pinsonneault, C. A typology of user liability to IT addiction. Information Systems Journal. 2016; 27(2):125–169.

5. Krisnana, I, Hariani, V, Kurnia, ID, and Arief, YS. The use of gadgets and their relationship to poor sleep quality and social interaction on mid-adolescents: a cross-sectional study. International Journal of Adolescent Medicine and Health. 2020;34(1):1-6.

6. Mohammadbeigi A, Absari R, Valizadeh F, Saadati M, Sharifimoghadam S, Ahmadi A, Mokhtari M, Ansari H. Sleep Quality in Medical Students; the Impact of Over-Use of Mobile Cell-Phone and Social Networks. J Res Health Sci. 2016;16(1): 46-50.

7. Jaya, ES. Confirmatory Factor Analysis of the Indonesian Version of Community Assessment of Psychic Experiences. Makara Human Behavior Studies in Asia. 2017;21(1):1-12.

8. Boonstra, N, Wunderink, L, Sytema, S, Wiersma, D. Improving detection of first-episode psychosis by mental health-care services using a self-report questionnaire. Early Intervention in Psychiatry. 2009;3(4):289– 295.

9. Arthy, CC, Effendy, E, Amin, MM, Loebis, B, Camellia, V, Husada, MS. Indonesian Version of Addiction Rating Scale of smartphone Usage Adapted from smartphone Addiction Scale-Short Version (SAS-SV) In Junior High School. Open Access Macedonian Journal of Medical Sciences. 2019;7(19):3235-3239.

10. Buysse, DJ, Reynolds III, CF, Monk, TH, Berman, SR, and Kupfer, DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry research. 1989;28(2):193-213.

11. Setyowati, A, Chung, MH. Validity and reliability of the Indonesian version of the Pittsburgh Sleep Quality Index in

Journal of Community Medicine and Public Health Research
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adolescents. International Journal of Nursing Practice. 2020;27(5):1-7

12. Rini, MK and Huruah, T. Prevalensi dan Dampak Kecanduan Gadget Pada Remaja: Literature Review. Jurnal Keperawatan Muhammadiyah. 2020;5(1):185-1994.

13. Meng SQ, Cheng JL, Li YY, Yang XQ, Zheng JW, Chang XW, Shi Y, Chen Y, Lu L, Sun Y, Bao YP, Shi J. Global prevalence of digital addiction in general population: A systematic review and meta-analysis. Clin Psychol Rev. 2022;92(10):2128.

14. Carroll, N, Sadowski, A, Laila, A, Hruska, V, Nixon, M, Ma, DWL, Haines, J. The Impact of COVID-19 on Health Behavior, Stress, Financial and Food Security among Middle to High Income Canadian Families with Young Children. Nutrients. 2020;12(8): 2352.

15. Mangkuliguna, G, Sidharta, VM, and Hananta, L. Sedentary screen time as a coping strategy of distance learning-induced distress during COVID-19 pandemic. J Educ Heal Community Psychol. 2021;10(2):175-196.

16. Jahja, F, Hananta, L, Prastowo, N, and Sidharta, V. Sedentary living, screen time, and physical activities in medical students during the coronavirus (Covid-19) pandemic. Sport Mont. 2021;19(3).

17. Rao, WW., Li, W., Qi, H. et al. Sleep quality in medical students: a comprehensive meta-analysis of observational studies. Sleep Breath. 2020;24(3):1151–1165.

18. Jahrami, H, Dewald-Kaufmann, J, Faris, MAI et al. Prevalence of sleep problems among medical students: a systematic review and meta-analysis. J Public Health (Berl.). 2020;28:605–622.

19. Lu L, Wang SB, Rao W, Zhang Q, Ungvari GS, Ng CH, Kou C, Jia FJ, Xiang YT. The prevalence of sleep disturbances and sleep quality in older Chinese adults: a comprehensive Meta-analysis. Behav Sleep Med. 2018;17(6):683– 697.

20. Shanmugasundaram, S, Swetha, NB, and Gopalakrishnan, S. Effect of electronic gadget usage on sleep quality among medical students in Chennai. Indian Journal of Public Health Research & Development. 2019;10(11):1564-1567.

21. Amez, S, Vujić, S, Soffers, P, Baert, S. Yawning while scrolling? Examining gender differences in the association between smartphone use and sleep quality. Journal of Sleep Research. 2020;29(6):1-13.

22. Chung, JE, Choi, SA, Kim, KT, Yee, J, Kim, JH, Seong, JW, Seong, JM, Kim, JY, Lee, KE, and Gwak, HS. Smartphone addiction risk and daytime sleepiness in Korean adolescent. Journal of Paediatrics and Child Health. 2018; 54(7): 800–806.

23. Rafique, N, Al-Asoom, LI, Alsunni, AA, Saudagar, FN, Almulhim, L, and Alkaltham, G. Effects of Mobile Use on Subjective Sleep Quality. Nature and science of sleep. 2020;12:357–364.

24. Clement, J. COVID-19 impact on the gaming industry worldwide - statistics & facts . Statista [online] 2021 [Cited: March 10, 2022]. Available from: URL: https://www.statista.com/topics/8016/covid-19- impact-on-the-gaming-industry-worldwide/#topicHeader wrapper .

25. Dixon, S. COVID-19's impact on video consumption among Generation Z and Millennials worldwide as of October 2020, by video type. Statista [online] 2022 [cited March 10, 2022]. Available from: URL: https://www.statista.com/statistics/1215 173/impact-of-covid-19-on- type-of-video-consumption/.

26. Pinheiro, MB, Morosoli, JJ, Ferreira, ML, Madrid-Valero, JJ, Refshauge, K, Ferreira, PH. Genetic and Environmental Contributions to Sleep

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Vol. 03, No. 02, Month 2022

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Quality and Low Back Pain: A Population-Based Twin Study. Psychosomatic Medicine. 2017;80(3):263-270.

27. Park, H, and Suh, B. Association between sleep quality and physical activity according to gender and shift work. Journal of Sleep Research. 2020;29(6)1-8.

28. Górnicka, M, Drywień, ME, Zielinska, MA, and Hamułka, J. Dietary and Lifestyle Changes During COVID-19 and the Subsequent Lockdowns among Polish Adults: A Cross-Sectional Online Survey Study. Nutrients. 2020;12(8):2328.

29. Zhang, Y., Wu, X., Tao, S. et al. Associations between screen time, physical activity, and depressive symptoms during the 2019 coronavirus disease (COVID-19) outbreak among Chinese college students. Environ Health Prev Med. 2021;26(1):107 (2021).