Exploring Gender-Dependent Relationships between Mobile Phone Screen Addiction and Sleep Quality

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ABSTRACT

Objective – This research's main purpose is to assess whether smartphone addiction have a significant effect on sleep quality moderated by gender.

Methodology – The respondents in this study were specifically young adults, and a quantitative methodology was employed. Questionnaires were distributed to participants, and the researchers used the responses to compile quantitative data. Like the preceding example, the survey conducted through purposeful sampling would be classified as quantitative due to its use of closed-ended questions with multiple choice responses on a 5-point Likert scale.

Findings – The results of the study show that although gender is not a significant moderating influence, smartphone addiction does have an effect on sleep quality.

Novelty – The research presents novel managerial strategies, including the creation of technology-free zones for designated periods of time and the encouragement of a work environment that places a high value on work-life balance. These useful recommendations do more than just identify the issue; they also include doable solutions that may be applied in a variety of work environments.

Keywords: smartphone addiction, sleep quality, gender, mobile phones

I. INTRODUCTION

High-level engagement is now made feasible in the technological age through using the internet, producing, sharing, or taking part in a virtual world, as well as ingesting high-level picture stimulation. From the most fundamental household appliance—a refrigerator—to transportation, virtual reality, or augmented reality glasses, there are many diverse technical instruments, all of which are still under development. In order to use and exhibit all of the aforementioned technologies, the "screen" is a crucial element. Mobile technological tools, which are getting increasingly intertwined with individuals, such in the case of phubbing (Macit & Kavafoğlu, 2019), have an influence on people's every moment.

A study using DSM-5 criteria for addiction found that 44.7% of a total of 300 individuals satisfied at least one of the nine criteria for screen addiction (Boudard et al., 2022). According to statistics on screen addiction, people between the ages of 8 and 28 spend an average of 44.5 hours per week gazing at screens, which suggests that they may be addicted to electronics (Georgiev, 2023). The average amount of time spent online every day since 2013 is broken down in Table 1.

In total, daily screen time increased by 49 minutes, or 13%, between 2013 and 2021 (see Table 1), and Indonesia is one of the 20 countries with the highest screen time usage, with 4 hours 56 minutes per day spent on mobile devices and 3 hours 41 minutes per day spent on computers, for a total of 8 hours 37 minutes (Howarth, 2023). Figure 1 from the Statista (2019) website depicts the smartphone penetration rate in Indonesia, which is expected to rise until 2028. By that time, there are expected to be 269 million smartphone users in Indonesia.

Table 1. Average Global Screen Time 2013-2021

Year	Average Screen Time	Change over Previous Years
Q3 2013	6 hours 9 minutes	-
Q3 2014	6 hours 23 minutes	3.8% increase
Q3 2015	6 hours 20 minutes	0.8% decrease
Q3 2016	6 hours 29 minutes	2.4% increase
Q3 2017	6 hours 46 minutes	4.4% increase
Q3 2018	6 hours 48 minutes	0.5% increase
Q3 2019	6 hours 38 minutes	2.5% decrease
Q3 2020	6 hours 54 minutes	4% increase
Q3 2021	6 hours 58 minutes	1% increase

Our capacity to reason, recall, pay attention, and control our emotions can all be impacted by smartphone addiction (Ratan et al., 2021). In addition to causing physical and psychological harm, smartphone addiction has been linked to automobile accidents brought on by texting or other smartphone usage while driving (Rathakhrisnan et al., 2021), depression, sleep difficulties, anxiety, relationship issues, digital eye strain, and neck problems. One of the risk factors for inadequate sleep quality was discovered to be smartphone addiction (Ozcan & Acimis, 2021). By reducing physical activity, such as walking, smartphone addiction may have a negative impact on physical health (Kim et al., 2015). This increases body fat and depletes lean muscle mass, both of which have detrimental impacts on health.
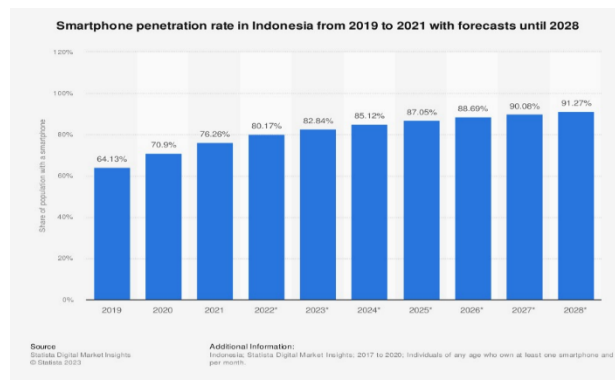

Figure 1. Smartphone Penetration in Indonesia

Thus, the goals of this study contribute to the knowledge of smartphone addiction in a few different ways. This study started by examining how smartphone addiction influenced the quality of sleep. Numerous academics have looked into this theory in analogous circumstances, and it has received widespread acceptance (Lane et al., 2021; Lee et al., 2021). Next, this study examined the moderating impact that gender had in this research environment in order to better understand the viewpoints and outcomes of young participants.

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II. LITERATURE REVIEW

This study develops a conceptual model by adopting the variables/factors in the study: smartphone addiction, sleep quality, and gender. Table 2 shows the previous studies related to the variables in this study and therefore helps in formulating the hypotheses.

Table 2. Previous Studies

Author and Year	Country and Samples	Findings
Lane et al. (2021)	China, N=422, M=111, F=364, mean age 20.22±2.34 years	Smartphone addiction signs and the anticipatory concern personality characteristic may be indicators of people's inability to get enough sleep.
Lee et al. (2021)	Korea, N=105, F=49, mean age 40.61±11.62	A behavioral intervention aimed at problematic smartphone use may reduce irregular sleep patterns and altered sleep-related cognition.
Prado et al. (2022)	Brazil, N=546, F=407, mean age 24.9±5.5	Due to the nature of technology addiction and how it affects sleep, sleep bruxism behavior may result
Selçuk & Ayhan (2019)	Turkey, N=408, F=331, M=77, mean age 20.13±2.43	Future health care workers' increased risk of smartphone addiction was not related to how much sleep they got, but rather to a rise in psychosocial issues including ADHD, depression, and anxiety.
Rathakrishnan et al. (2021)	Malaysia, N=323, M=161, F=162, mean age 20-27	Teenagers' bad sleep habits and smartphone addiction have a severe impact on their academic achievement. According to the study, smartphone addiction affects university students' sleep as well as their academic performance when it comes to teens.
Alotaibi et al. (2022)	Saudi Arabia, N=545, M=248, F=297, age <21 until more than 24	Compared to non-addicted students, smartphone addicts are more likely to have a poorer GPA, poor physical health, and a major mental disorder.
Farooq et al. (2021)	Pakistan, N=352, M= 62%, F=38%, Age 20-35	Consumer health and academic performance are negatively impacted by smartphone addiction.
Masoed et al. (2021)	Australia, N=1014, M=345, F=669, age 12-17	Addiction to social media has risen among teenagers, with negative effects on their ability to sleep and overall happiness.
Alli et al. (2022)	Nigeria, N=100, M=49, F=51, age 10-19	It has been shown that extensive social media use causes the fear of missing out (FoMO), which has a negative impact on secondary school students' mental health. Smartphone addiction is similar to drug misuse in that it can cause children to develop nomophobia, an illogical dread of being without a phone.
Lin et al. (2019)	Iran, N=3807, M=2022, mean age 15.3±1.9	People in the group who were most likely to get addicted to smartphones were often men, had significant levels of emotional discomfort, and engaged in other addictive internet-related activities.
Mengistu (2023)	Ethiopia, N=1232, M=750, F=482, age 15 until 25+	Students at universities used their smartphones and social media in a substantial and harmful way. The psychological and sociodemographic traits that call for therapy were identified by this investigation.

From the theoretical perspective, this research uses the Self-Determination Theory (SDT) to understand the relationship between smartphone addiction, sleep quality and gender. The Self-Determination Theory (SDT) is a psychological framework that focuses on human motivation and the factors that influence individuals' choices and behaviors (Vallerand et al., 2008; Ryan et al., 2009; Ryan & Deci, 2000). It proposes that people have three innate psychological needs: autonomy (the need to feel in control of their actions and choices), competence (the need to feel capable and effective in their activities), and relatedness (the need for social connections and relationships).

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Autonomy: In the context of smartphone addiction, individuals may have varying degrees of autonomy in managing their smartphone use. SDT suggests that those with a higher sense of autonomy may be better at regulating their smartphone usage and, consequently, experience fewer negative consequences like sleep disturbance. The study can explore how individuals with different levels of autonomy in managing their smartphone use are affected by addiction.

Competence: Smartphone addiction might impact individuals' feelings of competence, especially if they struggle to control their usage. SDT posits that individuals who perceive themselves as competent in managing their smartphone habits may have a better ability to maintain a healthy balance between smartphone use and sleep. The research can investigate the relationship between perceived competence and sleep quality among smartphone users.

Relatedness: The study's focus on gender as a moderator in the relationship between smartphone addiction and sleep quality can be linked to relatedness. SDT suggests that individuals with strong social connections may have better emotional well-being. Therefore, exploring how gender influences this relationship can be related to SDT's concept of relatedness.

Overall, the Self-Determination Theory provides a valuable lens through which to examine how individuals' innate psychological needs for autonomy, competence, and relatedness relate to their smartphone usage, addiction, and its consequences, such as sleep disturbance. Understanding these relationships can inform interventions and programs aimed at helping individuals manage their smartphone use more effectively, ultimately benefiting their sleep quality and overall well-being.
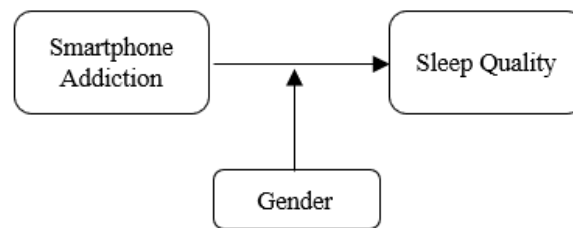

Figure 2. Conceptual Framework with Gender as a Moderating Variable

Relationship between Addiction to Smartphones and Sleep Quality
Using smartphones can boost productivity in specific circumstances, such as while searching for information, coming up with solutions as a team, and having brief conversations about a project. The perceived performance does, however, tend to deteriorate when it becomes an addiction. Furthermore, people use their cellphones for everything, including work and socializing, and they get more worried when they are without one because of how important and versatile a smartphone is (Li & Lin, 2019). The dread of missing out, which unintentionally contributes to a decrease in mental health and other problems, is also connected to smartphone addiction (Hiustra et al., 2023). People who use their cellphones all day frequently struggle to fall asleep due to their difficulties putting their gadgets down before bed and their poor quality of sleep (Sohn et al., 2021).

Consumers most frequently report mood changes, such as depression or irritability (33%), waking up with a dry mouth or sore throat (30%), difficulty concentrating during the day (30%), and excessive daytime sleepiness (29%), according to a survey by ResMed Inc. (2023) with more than 20,000 respondents from 12 countries during January 2023. When used outside of the bed, cellphones do not reduce the quality of sleep, according to research (Kheirinejad et al., 2023). The hormone that regulates the sleep/wake cycle or

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circadian rhythm, melatonin, might be produced less as a result of the blue light emitted by mobile devices (Rafique et al., 2020). Thus, the following is the study's initial hypothesis:
H1: Smartphone addiction improves the quality of sleep.

Relationship between Addiction to Smartphones and Gender

Due to the widespread use of smartphones, multiple studies (Sohn et al., 2021; Chen et al., 2017; Rafique et al., 2020) have reported inconsistent gender differences in smartphone addiction across diverse student populations. According to a Korean study of elementary school students, boys were more likely than girls to become addicted to smartphones, though the difference was not statistically significant (Lee & Kim, 2018). The study also found that 79.2% of Korean children own smartphones, and 80.4% of participants started using smartphones before the age of 10 (Lee & Kim, 2018). Smartphone addiction grew more prevalent as individuals aged (Taywade & Khubalkar, 2019) due to an increase in the proportion of teenage owners and the fact that women used cellphones more frequently than males.

Male and female teens were found to use cellphones differently, with men spending more time gaming and making purchases while females were more likely to use social networking applications (Taywade & Khubalkar, 2019). Similar smartphone usage patterns were seen among medical college students, where males favored gaming apps while girls were more likely to use a variety of media applications (Chen et al., 2017). Additionally, it was discovered that procrastination trait is linked to smartphone addiction in males (Yang et al., 2020) and that gender reduced the association between procrastination trait and smartphone addiction in both gender groups (Yang et al., 2021). The second premise of this research is thus:
H2: The relationship between smartphone addiction and sleep quality is moderated by gender.

III. METHODOLOGY

In order to determine whether smartphone addiction (the independent variable) has a positive impact that suggests a positive correlation with participants' sleep quality (the dependent variable), moderated by gender, and may have an impact on hypothesized relationships, this study used a quantitative approach with young adults as the specific target of the respondents (see Figure 2). Participants were given questionnaires, and the researchers used the replies to gather quantitative data. Similar to the previous example, the purposeful sampling survey would fall under the quantitative category because it included closed-ended questions with multiple choice answers on a 5-point Likert scale (ranging from 1 for "Strongly disagree" to 5 for "Strongly agree") so that researchers could draw a conclusion based on the sample of data.

The survey instrument, which contains all the components that the model suggests, was developed to investigate the pertinent hypotheses. After studying the pertinent research and literature, the survey questions were created. The survey questionnaire is divided into four pieces. The initial portion was created with the intention of describing samples. The Smartphone Addiction Scale-Short Version (SAS-SV), which has seven markers including Daily Life Disturbance, Disturbance of Reality Testing, Positive Anticipation, Withdrawal, Cyberspace-Oriented Relationship, Overuse, and Tolerance, is used to evaluate smartphone addiction in the second section (Kwon et al., 2013). The questionnaire's questions were modified from research by Esmaeilpour et al. (2021), Arthy et al. (2019), and Nikolic et al. (2022). Some examples of the things include "missing planned work due to smartphone use," "feeling pain in the wrist or at the back of the neck while using smartphone," and "feeling impatient and fretful when I am not holding my smartphone."

The Pittsburgh Sleep Quality Index is used in the third segment to assess the following seven characteristics of sleep quality: daytime dysfunction, habitual sleep efficiency, sleep disturbances, sleep latency, and sleep duration (Buysse et al., 1989). The questionnaire's questions, which were adapted from

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Buysse et al.'s (1989) study, including "when have you typically gone to bed at night during the past month," "how long (in minutes) has it typically taken you to fall asleep each night during the past month," and "when have you typically gotten up in the morning during the past month."

IV. RESULTS AND DISCUSSION

Fifty-four people participated in this study; of those, 25.9% are between the ages of 17 and 21; 59.3% are between the ages of 22 and 26; and 14.8% are between the ages of 27 and 31. With 66.7% of the total, women make up the majority. The majority of our respondents (68.5%) use their cellphones for more than 4 hours every day, followed by 18.5% who use them for roughly 3–4 hours every day, 9.3% who use them for 1–2 hours, and 3.7% for less than an hour.

In this study, Smart PLS 4 was used to validate the measurements, ensure their reliability, and test the hypotheses in relation to the dependent variable. The results of reliability and validity assessment using the factor loading, Cronbach's Alpha, and Composite Reliability show that all the latent constructs are reliable and valid as all of its values were above 0.7 (Hair et al., 2018). This is after we eliminated three items from the Sleep Quality constructs for having loading factors below the threshold. Additionally, the average variance extracted (AVE) is above 0.5, which Fornell and Larcker (1981) considers to be an acceptable result. As a result, it may be claimed that each variable's item is consistent (see Figure 3).

The SEM findings supported hypothesis H1 by showing that only the direct channel of smartphone addiction significantly affects sleep quality. According to Table 2's findings, the significant value for hypothesis one is 0.000 0.05, which indicates that the relationship between smartphone addiction and sleep quality has a coefficient of 0.780. This indicates that lower sleep quality is a result of a higher level of smartphone addiction. The findings of this study are consistent with those of other studies (Sohn et al., 2021).
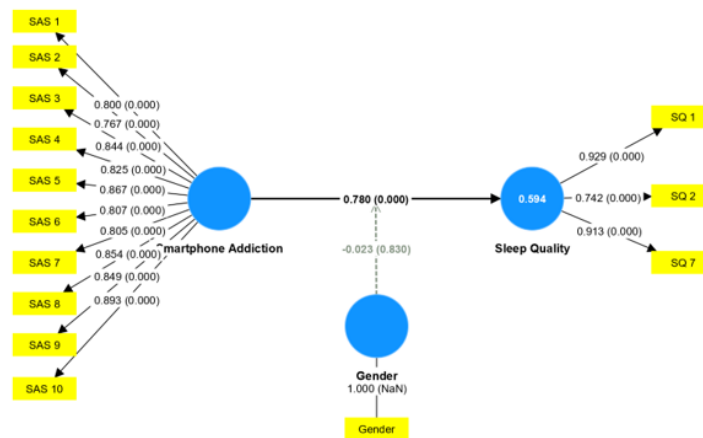

Figure 3. Validity and Reliability

The calculations' findings show that adding the moderating variable Gender makes the impact of smartphone addiction on sleep quality more significant than the findings of hypothesis 1. This is shown by the decreasing coefficient value of the smartphone addiction variable, which is 0.780 to -0.023. As a result, it may be inferred that in the second regression analysis, the constant value has no impact on changes in the variable associated with sleep quality. Given that the moderator Gender has a significance level of 0.05 and

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a significance value of -0.023, it cannot be said with certainty that it is a moderating variable. As a result, it may be said that H0 is accepted and H2 is refused.

Table 3. Hypothesis Result

Path	Coefficients (β)	Sample Mean	Std. Dev.	t Statistics.	P values	R²
SAS → SQ (Direct)	0.780	0.820	0.099	7.901	0.000	0.594
Gender*SAS → SQ (Moderating)	-0.023	-0.000	0.110	0.214	0.830	

V. CONCLUSION

There are several key management implications to the research findings showing that smartphone addiction negatively affects sleep quality, and that gender does not significantly mitigate this association. First and foremost, employers and managers need to understand how common smartphone addiction is among workers and how it could affect their sleep habits. Better general well-being can result from putting awareness-raising tactics into action on responsible technology use and from arming staff members with tools to help them deal with smartphone addiction. Furthermore, treatments and policies intended to address this issue can be applied to all genders because gender does not significantly moderate the impact of smartphone addiction on sleep. In an effort to lessen the detrimental impacts of smartphone addiction on sleep quality, businesses should think about establishing technology-free zones during specific hours, assisting staff in setting healthy boundaries with their devices, and cultivating a work-life balance-focused workplace culture. In the end, these initiatives may improve worker productivity, happiness, and health.

Without exploring the long-term effects, the current study exclusively focuses on the short-term effects of smartphone addiction on sleep quality. A longitudinal approach may provide information about the long-term impacts of smartphone addiction on sleep habits and general well-being. Future studies could also profit from examining the efficacy of different policies and treatments recommended to reduce smartphone addiction, as this could offer useful information about how well they work and how often they do so.

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