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RESEARCH ARTICLE

A Mediating Analysis of Mental Health Impacts in the Relationship of Digital Device and Digital Communication with Academic Performance

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ARTICLE INFO	ABSTRACT
	In this digital era, smartphones and social media play an irreplaceable role in the lives of youth. Whether for studying, entertaining, or relaxing, they serve various purposes as needed. This study analyzes the relationship between digital devices and digital communication with mental health and academic performance, along with mediating variables such as CGPA, smartphone and social media usage habits, and current mental states. Seven variables and a sample size of 104 were collected to identify how smartphone and social media usage habits affect the mental state of youth as well as their academic performance. Pearson Correlation and mediating analysis (PROCESS MACRO) were used to analyze the sampled data to find relationships between the variables. This research highlights the relationship between smartphone and social media usage and the mental health states of youth and their academic performance. The results of the Pearson Correlation and Mediating Analysis have shown that 10 of the hypotheses are accepted and 8 of the hypotheses are rejected. This study significantly contributes to understanding of the impact of excessive digital usage on youth mental health in Malaysia, providing crucial insights for future research.

1.0 INTRODUCTION

As we fully enter the digital age of the 21st century, the number of digital users in Malaysia has dramatically increased over the past years. At the start of 2024, there were a total of 33.59 million internet users in Malaysia, accounting for 97.4 percent of the total Malaysian population (34.49 million). According to Kemp (2024), the number of digital users increased by a total of 357 thousand between January 2023 and January 2024. As of early 2024, 28.68 million and 44.55 million users are connected with each other through social media and smartphones, respectively. In today's standards, social media and smartphones have become the most common way for people to communicate with each other.

Anyone could face mental health problems at any time in their life. However, in Malaysia, the chances of youths between the ages of 16 and 19 having mental health problems is 1 in 3, which is higher than the nationwide average of 29.2% (Datil Seri Dr. S. Subramaniam, 2016). The most common factors of mental health problems are financial problems, work-related issues, and family issues. In recent years, more and more studies have found that digital technology could be one of the factors that cause mental health issues such as anxiety, depression, and sleep issues (Li et al., 2020). This is especially true for youths and students, who are yet to mature in their mindsets and can easily become addicted and overly reliant on digital technologies.

Currently, a few common ways to overcome mental health issues involve engaging with close partners of the mentally ill patients, such as their school teachers, friends, and parents, to address the issues to them as they can provide necessary help and support to those who are mentally ill (Datil Seri Dr. S. Subramaniam, 2016). However, there are no close studies about digital technology, such as smartphones and social media, that could cause mental health issues among youth and affect their academic performances. Therefore, we have conducted a quantitative analysis against youth to find out the mediating analysis of mental health impacts in the relationship of digital devices and digital communication with academic performance among Malaysian youth.

Problem statement

In today's digital age, almost every youth is a digital user, owning a smartphone, having an online social media account, or both. As such, it is common for youth to spend a significant amount of time in their digital lives. Research into the causes and consequences of this shift has primarily focused on objective measures such as time spent on smartphones, digital trends among youths, and social interactions between youths. Previous studies have shown that smartphones and social media can positively affect a youth's daily life, enhancing productivity, creativity, and IT innovation. However, excessive usage of digital communication and digital devices by youths has raised problematic issues in recent years, with the most visible impacts being on academic performance and mental health. Despite this, there has been limited research exploring how smartphones and social media can affect youth's mental health and academic performance. This problem statement aims to address this research gap, focusing on the impact of smartphones and social media on youth's mental health and academic performance in Malaysia. By exploring this area, we can gain a fuller understanding of how smartphones and social media influence youths.

Research contribution

This study makes several significant contributions to the field of youth development and digital usage. It highlights that excessive usage of digital communication and digital devices is a major factor contributing to mental health issues among youths in Malaysia, providing a deeper understanding of the effects of digital technology on youth mental health. The study also offers valuable insights into the complex relationship between digital usage and youth development, which can guide future research in this area and help to further our understanding of how youths interact with digital technology and the impacts of these interactions. The data collected through questionnaires in this study, when contextualized with recent research, provides a more comprehensive view of the relationship between smartphone and social media usage among youths. This contributes to a richer and more nuanced understanding of youth digital behavior. Furthermore, the insights from this study can inform the Malaysian Ministry of Youth and Sports, the Malaysian Ministry of Education, and universities in their efforts to promote health education and develop new digital guidelines. This can help to improve the mental well-being of youth and ensure that they engage with digital technology in a healthy and productive manner. In conclusion, this study contributes to the field by enhancing our understanding of the impacts of digital usage on youth, providing valuable insights for future research, and informing policy and practice to improve youth mental health. This research is a step forward in understanding and addressing the challenges posed by the digital age to youth development and well-being.
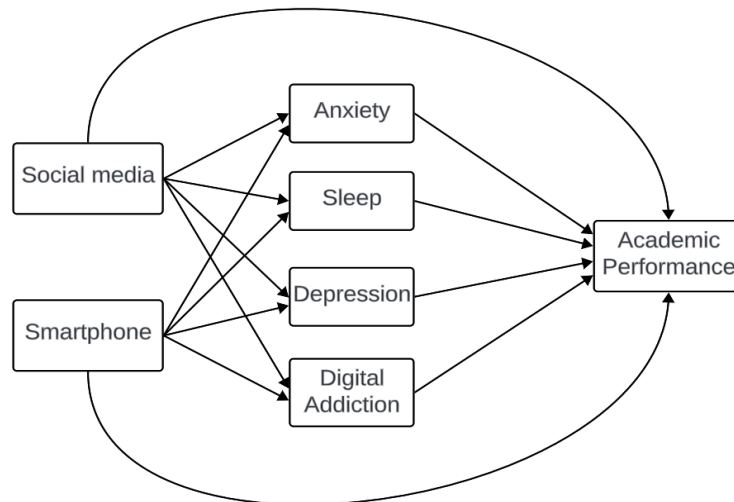
Conceptual framework

Figure 1: Conceptual framework

Research hypotheses

H1: Social Media will impact Academic Performance negatively.

H2: Smartphones will impact Academic Performance negatively.

H3: Social media will impact sleep negatively.

H4: Social media will impact anxiety negatively.

H5: Social media will impact depression negatively.

H6: Social media will impact Digital Addiction negatively.

H7: Smartphones will impact sleep negatively.

H8: Smartphones will impact anxiety negatively.

H9: Smartphones will impact depression negatively.

H10: Smartphones will impact Digital Addiction negatively.

H11: Sleep mediates the relationship between smartphone and academic performance.

H12: Anxiety mediates the relationship between smartphone and academic performance.

H13: Depression mediates the relationship between social media and academic performance.

H14: Digital Addiction mediates the relationship between smartphone and academic performance.

H15: Sleep mediates the relationship between social media and academic performance.

H16: Anxiety mediates the relationship between social media and academic performance.

H17: Depression mediates the relationship between smartphone and academic performance.

H18: Digital Addiction mediates the relationship between social media and academic performance.

2.0 LITERATURE REVIEW

Social media & academic performance

Social media offers the convenience of building rapport with others and serves as an information source, enabling users to learn new things from anywhere. Therefore, the impact of using social media is based on the user's pattern of use. A student's academic performance may be affected by social media, which is determined by their pattern of social media use and its appeal to them. Social media may distract them from their studies, even leading to addiction, and result in poor academic performance (Habes et al., 2018). Hameed et al. (2022) found that the effect of social media usage is

associated with the purpose of use; it only affects academic performance if used for non-academic purposes. Information is updated rapidly, and some students may leverage this information for their academics (Habes et al., 2018).

Smartphone & academic performance

Smartphones can help students to achieve their tasks efficiently and effectively. For example, searching for information on the internet and accessing the school's online database or Google Classroom. On the other hand, if a student consistently uses it for entertainment purposes, it may lead to some problems, especially academic-related problems (Lepp et al., 2014). A researcher suggests that smartphone use does not significantly affect much to academic performance (Amez & Baert, 2020). However, the heavy use of smartphones will still have a negative impact on academic performance. Thus, the impact of smartphone use on academic performance depends on the purpose of use as well as the personal use pattern of the smartphone instead of generally concluding that the smartphone has a good or bad impact on academic performance (Lin et al., 2021; Amez & Baert, 2020).

Social media & sleep

Restful sleep is necessary for healthy mental health and physical health. In recent years, the problem of social media and its effect on sleep quality in youth has been increasing causing youths to not get enough sleep and affecting their daily life (Alonzo et al., 2021). Previous studies (Scott & Woods, 2019), suggest that frequent use of social media will bring negative effects on sleeping habits such as shorter sleep time, delayed bedtimes and poor sleep quality. In conducted research that consists of 1870 participants (Tandon et al., 2020), 30% (561) of them often use social media 30 minutes before sleep and have experienced disturbed sleep. Fear of missing out (FoMO) is what keeps them checking on their social media at all times to stay connected and avoid missing out on news. Another study (Katerina et al., 2020) finds that many youths put their phone in a reachable distance when sleeping, preferably next to them, so they can easily check their social media status after waking up in the middle of sleeping. Doing this could increase sleep disturbances. It is also proven that using social media closer to bedtime will increase one's cognitive arousal, which leads to delayed sleep latency and difficulties maintaining sleep (Alonzo et al., 2021).

Social media & anxiety

Meshi & Ellithorpe (2021) research that social media is associated with anxiety levels and also other mental health issues. However, social media use does not bring a one-sided effect of mental health problems to a person who has normal real-life social. The research has mentioned that the increase in the anxiety level caused by problematic social media use can be controlled or reduced by real-life socialising. Moreover, it also states that social media is not significantly associated with anxiety levels if social media is not used in a problematic way (Meshi & Ellithorpe, 2021). Problematic social media usage may initiate the social anxiety of a student. This may affect their communication skill with people since they feel comfortable in a social environment due to anxiety. Therefore, they might prefer to communicate with others through social media instead of face-to-face communication and interaction. Over time, they may isolate themselves from the crowd in the real world and cause some mental diseases (O'Day & Heimberg, 2021).

Social media & depression

Social media use among adolescents and children shows a small but statistically crucial relation with depressive symptoms (Best et al., 2014). An expanding amount of evidence has also identified that there is an association between these two aspects. One of the factors that social media usage may cause depression is the occurrence of social comparison. Social media that causes the issue of social comparison and cyberbullying have received serious scrutiny. Individuals may compare themself with others in terms of ability, capability, skills, appearance and maybe living standard. This behaviour might probably occur among adolescents when compared to young children and adults (Festinger, 1954; Krayer et al., 2007). Adverse online interactions, including cyberbullying and exposure to harmful content, are directly linked to higher rates of depression. The severity and frequency of such negative experiences contribute significantly to the development of depressive symptoms (Seabrook et al., 2016). Correspondingly, social media platforms like Facebook can lead to

social comparison and feelings of envy due to highlighting idealized lifestyles and achievements. These comparisons may contribute to a sense of inadequacy and dissatisfaction among users and may lead to depression (Appel et al., 2016).

Social media & digital addiction

One of the strengths of the study lies in its comprehensive assessment of both psychological and physical health problems linked to social media addiction among adolescents (Michael & Rosemary, 2021). Moreover, Singh et al. (2017) study examine the psychological mechanisms underlying social media addiction such as the factors like social comparison and fear of missing out contribute to the development and maintenance of social media addiction. Ravi (2020) and Abi et al. (2020) also discusses the addictive nature of social media platforms, pointing out features like notifications and likes that contribute to compulsive usage. Excessive use of social media can lead to isolation and a decline in face-to-face interactions, negatively impacting social bonds and support networks. Social media addiction among young people is a multifaceted issue with implications for mental health, social relationships, and overall well-being. Understanding the underlying mechanisms driving addiction and implementing effective interventions are crucial steps in addressing this growing problem (Xuan et al., 2020; Aslan et al., 2020; Hou et al., 2019; Ravi, 2020; Abi et al., 2020).

Smartphone & sleep

Smartphone usage has become one of the main negative impacts that affect the sleep quality of youth (Wang et al., 2019) as the sleep quality of youth has continuously declined over the past three decades (Cárthaigh et al., 2022; Huang et al., 2020). By getting sufficient sleep, many mental health and physical health issues will decline. On the contrary, insufficient sleep will lead to severe mental health issues such as insomnia (Cárthaigh et al., 2022). In Changsha, China, a group of researchers have conducted research to find out the relationship between smartphone usage and sleep quality among university students (Huang et al., 2020). There were a total of 439 participants. 9.8% of them are facing sleep problems and all of them have over five hours of daily smartphone use this proves that excessive usage of smartphones and longer exposure to the light emitted by smartphone screens may cause bad quality of sleep and affect sleep time. In Brazil, out of 177 participants aged from 11 to 18, 51.7% (91) of them face sleep issues due to having phone usage longer than an average person. It is shown that longer use of cell phones can be attributed to shorter sleep duration and poorer sleep quality (Caumo et al., 2020) because of the significant bluish wavelengths it produces that could interfere with biological circadian processes and affect sleep regulation. In a Korean study (Yoon et al., 2021), Korean youths have 36.2 hours of smartphone usage per week, which is more than Korean adults by 12.7 hours. 3 out of 10 youths have more than 63.5 hours of smartphone usage per week, which they present to have sleep issues.

Smartphone & anxiety

The relationship between problematic smartphone use and anxiety is bidirectional, which means that both of them can affect each other (Elhai et al., 2019). For example, problematic smartphone use by students causes anxiety levels to increase. On the other hand, high levels of anxiety cause heavy smartphone use by students to seek pleasure. The excessive use of smartphones is associated with anxiety but the smartphone itself may not linked with anxiety. The usage of smartphones is the reason to trigger the anxiety of a student (Harwood et al., 2014). For example, tons of messages from school, family and friends may lead to negative effects on a student. This may cause "text message dependency" in a student, which means a student is addicted to text messages which causes a lack of self-control over the messages (Liese et al., 2018).

Smartphone usage & depression

The usage of smartphones is correlated with psychological and mental issues and will usually raise the occurrence of those issues (Bianchi & Phillips, 2005). A growing body of evidence has unequivocally demonstrated the correlation between mental health problems and problematic smartphone use, and consistently shown the harmful impact of excessive smartphone usage on mental health issues such as depression and has established a clear link between smartphone use and symptoms of depression. (Augner & Hacker, 2011; Fırat et al., 2018; Stanković et al., 2021). The problematic smartphone usage causes many problems including the decreasing health-related

activities such as outdoor activities. These problems contribute to the development of mental health issues (Thomee, 2018). Moreover, individuals who experience depression often turn on their smartphones to alleviate their negative emotions. They believe this behaviour may help them to boost their spirit and emotions. However, actually, this kind of behaviour is already leading to the excessive use of smartphones (Kim et al., 2015). However, the relationship between excessive smartphone use and the onset of depression remains unclear.

Smartphone & digital addiction

Chuong & Yoke, 2020 the research examined the neurobiological basis of smartphone addiction, shedding light on the brain regions and neurotransmitter systems involved in addictive behaviors. Moreover, the detrimental effects of smartphone addiction on musculoskeletal problems, and vision-related issues (Prof. Kadir et al., 2014). Ratan et al., 2021 and Oluwafemi et al., 2021 studies highlight the addictive nature of smartphones, characterized by excessive use, withdrawal symptoms, and negative consequences on mental health. Reinforcement from social media platforms, impulsivity and escapism highlight the role of individual vulnerabilities and environmental influences in shaping addictive behaviors towards digital devices (Chuong & Yoke, 2020; Lee et al., 2015). Addictive features of smartphone and digital platforms, highlighting factors such as the design of mobile applications, gamification elements, and social media algorithms. They are designed to capture users' attention and foster compulsive usage, ultimately leading to addiction. (Oluwafemi et al., 2021; Suliman et al., 2016).

Sleep & smartphone & academic performance

Electronic screen media use has become one of the most dominant forms of entertainment among youths (Mao et al., 2022). According to a study conducted by Rathakrishnan et al., (2021), it is proven that excessive use of smartphones could cause poor sleep quality, which directly leads to memory, decision making and concentration of students in class and daytime activities. For youths, those with longer sleep duration are more likely to get higher grade point averages (Yao & Wang, 2022), and the duration of sleep is usually associated with the technostress they have gained from using smartphones. Youths who have spent more than 7 hours a day on electronic screens have higher odds of achieving poor academic performance, and this statistic is mediated by their daily bedtime lengths (Mao et al., 2022). Those who have more pre-bedtime smartphone usage are more likely to have poor sleep quality which in turn has a negative impact on academic performance.

Anxiety & smartphone & academic performance

Smartphones are one of the necessary items in the current decade, especially for the youth who are currently still studying. The daily use of smartphones may become problematic, this will affect their academic performance and also their mental health. Therefore, there is some relationship between smartphones, anxiety and academic performance. These three terms are associated with each other. Problematic smartphone use may distract or interrupt the focus of a student from their academics. The anxiety of the student will also impact academic performance which may include the social anxiety and test anxiety that might happen to a student. Social anxiety is associated with the social skills of a student, which means that they might resist or have some problems communicating and interacting with others such as feeling afraid, stressed or anxious to do a conversation with others. (Przepiorka et al., 2021; Seipp, 1991). For example, they frequently use their smartphone during lecture time or in class. The more smartphone use, the higher the anxiety level and the lower the academic performance. (Lepp et al., 2014).

Depression & social media & academic performance

Social media and mental health are related and social media influences mental health by the way that people interact, interpret and maintain social networks. This relationship can be justified by behaviour theory. It is the theory that an individual has limited self-control and when they face a challenging situation, they tend to engage in behavior that may bring instant fulfillment which is not consistent with their long-term target. Hence, individuals will pursue social media use which leads to the excessive use of social media. (Khalaf et al., 2023; Duckworth et al., 2016; Karim et al., 2020). O'Reilly et al. (2018) study revealed that usage of social media platforms such as Facebook may be related to negative symptoms such as depression, anxiety and stress. Besides, numerous studies

revealed that depression among youth is related to symptoms such as loss of interest and low concentration which affect academic performance (Liu et al., 2022; Wagner et al., 2022).

Digital addiction & smartphone & academic performance

Chuong & Yoke (2020) study revealed a significant association between excessive smartphone use and negative outcomes like decreased academic performance. Moreover, much research suggests that students with higher levels of smartphone addiction may experience greater difficulty in maintaining focus, completing assignments, and achieving academic goals (Ozer, 2020; Ahmed et al., 2020; Gerosa et al., 2022). Ghazanfar et al. (2020) and Ahmed et al. (2020) studies also highlight the negative effects of excessive internet use, social media addiction, and online gaming on students' academic engagement and achievement. Furthermore, much research discusses how excessive screen time and compulsive internet use can impair attention, memory, and executive functions, hindering students' learning outcomes and overall productivity. (Prof. Kadir et al., 2014; Al-Barashdi et al., 2014; Ghazanfar et al., 2021; Alotaibi et al., 2022; Simon & Stijin, 2020). Excessive time on digital devices may be more prone to procrastination, poor study habits, and decreased academic motivation (Ghazanfar et al., 2020; Ahmed et al., 2020).

Sleep & social media & academic performance

Internet usage has risen rapidly over the last decade, and engagement in social media has grown a lot among youths. Social media use was found to be negatively correlated with sleep, however, it has no significant correlation between sleep, social media and academic performance (Fung et al., 2021). In another study, by Suwayri & Mohammed (2016), students who spent more time on social media than others had poorer sleep quality over weekdays and weekends. Still, variables found in this study also show that social media and sleep together have no significant effect on one's academic performance. However in another study carried out by (Evers et al., 2020), social media usage can affect both sleep quality and academic performance negatively. Even worse, academic decrement could lead to losing confidence in their learning abilities which causes exhaustion in schoolwork, which leads to further drops in academic performance.

Anxiety & social media & academic performance

Problematic use of social media platforms, such as Instagram, may affect students' academic performance and increase social anxiety due to excessive use (Foroughi et al., 2021). During the pandemic, problematic social media use increased university students' anxiety levels. This was due to online classes necessitating the use of social media to receive the latest updates about school-related information, leading to an increase in student anxiety levels (Jiang, 2021). However, some research suggests that social media use does not affect students' academic performance and anxiety levels (Newsome & Constantine, 2019; Anto et al., 2023). Social media can either decrease anxiety through social activity, helping to alleviate students' anxiety and stress, or increase anxiety through negative experiences such as comparison, stress, and procrastination (Anto et al., 2023).

Depression & smartphone & academic performance

Sohn et al. (2019) study revealed that the correlation between the issues of smartphone overuse and mental disorders among university students and also in similar populations like youth become widely concern in society. However, there exists an inconsistency between different studies by two researchers. Demirci et al. (2015) suggest that smartphone overuse has a unidirectional relation with the high depression score, these aspects are independent. In contrast, Matar Boumosleh & Jaalouk (2017) suggest an inverse opinion to Demirci's study. There is a study that reveals the relationship between smartphone overuse and mental disorders. smartphones can be used as an alternative to increase mood levels. When individuals try to engage in smartphone use, their mood might be enhanced by behaviour such as checking the notifications on their smartphone. However, this may lead to a negative mood that contributes to depressive symptoms when that behaviour is not engaged by an individual. This behaviour contributes to the excessive use of smartphones and results in decreasing face-to-face interaction, and also personal contact between individuals and hence leads to social isolation. All of these effects may cause depression (Lim et al., 2020; Sumesh Kumar, 2014). Depression is a mental disorder that influences someone's mood, capability to engage in daily activity and also academic performance (Cassady et al., 2019). Research by Eisenberg (2016) also indicates

that the loss of interest of depressed individuals is directly proportional to depression symptoms, and this contributes to lower GPAs. the depressed individuals who experience both anxiety and depression will have poorer academic performance than their counterparts.

Digital addiction & social media & academic performance

Xuan et al. (2020) found that excessive use of social media among young people is associated with negative outcomes which as academic performance. However, it's essential to acknowledge the potential pitfalls associated with excessive social media use. Many research shows a negative association between prolonged social media use, particularly during study periods, and student's academic performance, citing distractions, procrastination, and decreased productivity as contributing factors (Manjur et al., 2021; Maartje et al., 2021; Chen et al., 2020). Eoin et al., 2020 suggested that excessive use of social media platforms such as Facebook and Instagram negatively affected students' concentration levels and time management skills, ultimately leading to poor academic outcomes. Rahmatullah & Zhao, 2020 study revealed a negative correlation between the frequency of social media use and students' GPA, highlighting the detrimental effects of excessive screen time on academic success.

3.0 RESEARCH METHODOLOGY

A study was conducted to explore the correlation between digital device usage, digital communication, and academic performance among Malaysian youth. The population was selected using simple random sampling, targeting the youth in Malaysia. The data collection method selected is questionnaire and it was designed using credible sources, including articles obtained from reputable internet sources.The researchers distributed the questionnaire using Google Forms via social media platforms which are Whatsapp, Wechat and Instagram to peers and relatives, all of whom fall within the youth category, facilitating convenient data collection. The survey was distributed for a duration of two weeks, during which a total of 104 respondents participated in the study.

The questionnaire is divided into seven sections.The content of each section is as follow : Section A - demographic information (3 questions); section B - smartphone usage (5 questions); section C - social media usage (15 questions); section D - digital addiction (10 questions); section E - sleep (7 questions); section F - anxiety (7 questions); section G - depression (9 questions) (from Table 1). Section A consists of two multiple choice questions about gender and age, and also 1 short answer question about CGPA, in order to obtain a more accurate result. In section B, there is multiple choice and check-box questions about smartphone usage. From section C until section G, a 5-point Likert scale ranging from 1 to 5 is being used. In section C, D, F, G, the questionnaire focuses on whether respondents have experienced symptoms or behaviors related to the study's topic.The scale in section C is ranging from 1 (Never) to 5 (Very often) while section D, F, G is ranging from 1 (Not at all) to 5 (Nearly everyday). In section E, the questions primarily focused on whether respondents experienced difficulties related to the situations inquired. The scale in section E is ranging from 1 (no problem) to 5 (problematic) .The 5-point Likert scale was chosen for its simplicity, making it convenient for respondents to use and also requiring less effort for design.

The data collected from the questionnaire will be cleansed and analysed by IBM SPSS statistics 26 and Process Macro. Four different mental health measurements will be calculated and reported using descriptive analysis, including anxiety, sleep, digital addiction and depression. IBM SPSS statistics 26 is used to test the mental health impacts and digital devices and digital communication as well as academic performance (H1-10). Process Macro is used to test the relationship between the mental health impacts, digital devices and digital communication and academic performance (H11 - H18).

The methodology we used to analyse data are Pearson Correlation and Mediation Analysis. Pearson Correlation is used to measure the linear correlation relationship between the variables (Social Media, Smartphone, Mental Health and Academic Performance). Mediating Analysis is to check the effect of the independent variable (Social media and Smartphone) on the outcome can be mediated by the changes in the mediating variable (mental health).

Table 1: Questionnaire questions

Question	Resources
Section A: Demographic 　1.　Age 　2.　Gender 　3.　CGPA	-
Section B: Smartphone 　1.　Average number of hours you spend using your smartphone each day 　2.　How long do you usually typically spend on your smartphone each time 　3.　Proportion of time spend using smartphone for learning 　4.　How do you determine your smartphone usage? 　5.　What do you usually use your smartphone for?	(Fook et al., 2021)
Section C: Social Media 　1.　How often do you use social media to communicate with others? 　2.　How often do you use social media to avoid face-to-face communication? 　3.　How often do you use social media to maintain existing relationships? 　4.　How often do you use social media to avoid boredom? 　5.　How often do you use social media for fun and relaxation? 　6.　How often do you use social media to watch videos or view photos? 　7.　How often do you use social media to feel good about yourself? 　8.　How often do you use social media to compare yourself with others? 　9.　How often do you feel jealous after comparing yourself to others on social media? 　10.　How often do you use social media to search for news and information? 　11.　How often do you use social media as a primary source of information? 　12.　How often do you use social media to learn new things? 　13.　How often do you use social media because it is easy and convenient? 　14.　How often do you use social media because it saves time? 　15.　How often do you use social media because it is accessible?	(Weissman, 2023)
Section D: Digital Addiction 　1.　Do you notice that you spend hours on the digital, although your intention is to spend a few minutes? 　2.　Do you often look at your personal account and control your email every minute? 　3.　Do you feel hurry to reach your digital when you should keep away from it? 　4.　Do you feel bored if you cannot use a digital device? 　5.　Do you end up spending more time using digital devices than initially planned? 　6.　Do you use a digital device while eating? 　7.　Do you keep an eye on your digital device during lecture lessons? 　8.　Do you play or chat on your device while walking on the street? 　9.　Do you feel grumpy when you cannot use digital devices? 　10.　Do you feel the urge to use it again as soon as you put your device away?	(Erciş & Başar, 2020) (Seema, Heidmets, Konstabel, & Varik-Maasik, 2021)
Section E: Sleep 　1.　Do you have problem falling asleep? 　2.　Do you have problem staying asleep? 　3.　Do you have a problem waking up too early? 　4.　Do you think that sleep problems interfere with your daily life? 　5.　Do you think your sleeping problem is noticeable to others?	(Talkspace, n.d.)

6. Do you have problem with your current sleep pattern? 7. Do you think your current sleeping problem is worrying?	
Section F: Anxiety 1. Have you feeling nervous, anxious, or on edge 2. Not being able to stop or control worrying 3. Worrying too much about different things 4. Trouble on relaxing during free time. 5. Being so restless that it is hard to sit still 6. Becoming easily annoyed or irritable 7. Feeling afraid, as if something awful might happen	(Mental Health America, 2023)
Section G: Depression 1. Little interest or pleasure in doing things 2. Feeling down, depressed, or hopeless 3. Trouble falling or staying asleep, or sleeping too much 4. Feeling tired or having little energy? 5. Poor appetite or overeating? 6. Feeling bad about yourself - or that you are a failure or have let yourself or your family down 7. Trouble concentrating on things, such as reading the newspaper or watching television 8. Moving or speaking so slowly that other people could have noticed/ or the opposite - being so fidgety or restless that you have been moving around a lot more than usual? 9. Thoughts that you would be better off dead, or of hurting yourself	(Mentari Malaysia, n.d.)

4.0 RESULTS AND DISCUSSIONS

Table 2 shows a total 104 demographic data of 104 respondents: age, gender, current CGPA (Questionnaires Section A).

Table 2: Data from the demographics of the respondents

		No. of Respondents	Percentage (%)
Age	< 15	4	3.8
	15 - 17	5	4.8
	18 - 20	19	18.3
	21 - 24	67	64.4
	> 24	9	8.7
Gender	Male	57	54.8
	Female	47	45.2
Current CGPA	3.50 - 4.00	50	48.1
	3.00 - 3.49	42	40.4
	2.50 - 3.00	8	7.7
	2.00 - 2.49	2	1.9
	< 2.00	1	1.0

Table 3: Reliability measurement of questionnaire questions

Sections	Number of questions	Cronbach's alpha
Smartphone	3	0.680
Social Media	15	0.899
Digital Addiction	10	0.851
Sleep	7	0.884
Anxiety	7	0.879
Depression	9	0.880

Table 4: Pearson correlation

	Predictor	DV	r	sig	Result
H1	Social Media	Academic Performance	0.284**	0.004	accepted
H2	Smartphones	Academic Performance	0.255**	0.009	accepted
H3	Social Media	Sleep	0.222*	0.024	accepted
H4	Social Media	Anxiety	0.245*	0.012	accepted
H5	Social Media	Depression	0.237*	0.016	accepted
H6	Social Media	Digital Addiction	0.574**	<0.001	accepted
H7	Smartphones	Sleep	0.262**	0.007	accepted
H8	Smartphones	Anxiety	0.116	0.24	rejected
H9	Smartphones	Depression	0.310**	0.001	accepted
H10	Smartphones	Digital Addiction	0.356**	<0.001	accepted

Table 5: Mediating analysis (PROCESS MACRO)

	Predictor	Mediator	DV	DE	IE (BOOTLLCI, BOOTULCI	Result
H11	CGPA	Sleep	Smart Phone	0.143	-0.426 (-0.1233, 0.0079)	rejected
H12	CGPA	Anxiety	Smart Phone	0.122	0.0014(-0.372, 0.446)	rejected
H13	CGPA	Depression	Social Media	0.1842	-0.0005(-0.0705, 0.596)	rejected
H14	CGPA	Digital Addiction	Smartphone	0.1405	-0.0371 (-0.1125, 0.0395)	rejected
H15	CGPA	Sleep	Social Media	0.2062	-0.344(-0.869, 0.0093)	rejected
H16	CGPA	Anxiety	Social Media	0.1886	-0.0072(-0.687, 0.0526)	rejected
H17	CGPA	Depression	Smartphone	0.125	-0.0048(-0.991, 0.879)	rejected
H18	CGPA	Digital Addiction	Social Media	0.2741	-0.1392(-0.2602, -0.0011)	accepted

H1: Social Media will impact Academic Performance negatively.

Based on Table 5, the significance of H1 is significant and therefore H1 is accepted. According to Owusu-Acheaw & Larson (2014), the usage of social media impacts academic performance directly. This might be due to the student using social media for entertainment and also, the long time spent on social media leads to academic procrastination (Üztemur, 2020).

H2: Smartphones will impact Academic Performance negatively.

Based on Table 5, the significance of H2 is significant and therefore H2 is accepted. The result is consistent with Kibona et al. (2015) who stated that most students have problems controlling smartphone usage which has a positive impact on academic performance. This might be due to the smartphone distracting the student from their classes and missing any important information in the lesson. The heavy entertainment purpose usage of smartphones wastes their study time and leads to poor academic performance (Shakoor et al., 2021).

H3: Social media will impact sleep negatively.

Based on Table 5, the significance of H3 is significant and therefore H3 is accepted. The result is consistent with the study conducted by Tandon et al. (2020). According to Tandon and his team's study in 2021, when individuals use social media such as Instagram 30 minutes before sleep, this may harm their sleeping time. The bright light caused by devices when using social media may delay circadian effects that may also contribute to sleep disturbance.

H4: Social media will impact anxiety negatively.

Based on Table 5, the significance of H4 is significant and therefore H4 is accepted. This might be due to the students using multiple social media platforms at a time which may have too much information or messages coming in at the same time. According to Dobrean et al. (2016), this research mentioned that the usage of Facebook and time spent on Facebook can lead to anxiety increment.

H5: Social media will impact depression negatively.

Based on Table 5, the significance of H5 is significant and therefore H5 is accepted. According to Puukko et al. (2020), passive social media in use will increase depression mood since they prefer

social media interactions rather than face-to-face interactions. Fear of missing out and perceived social support in online interaction influences nuances in social media effects.

H6: Social media will impact Digital Addiction negatively

Based on Table 5, the significance of H6 is significant and therefore H6 is accepted. Compared to M.A. et al. (2020), overuse of social networks after a period of time develops behavioural addiction to social media use. They experience unpleasant physical and emotional symptoms when social media usage is restricted or stopped.

H7: Smartphones will impact sleep negatively.

Based on Table 5, the significance of H7 is significant and therefore H7 is accepted. This is due to the lighting emitted from the smartphone screens that could cause bad quality of sleep. The longer one is exposed to the light or using a smartphone, the worse the consequences (Caumo et al., 2020).

H8: Smartphones will impact anxiety negatively.

Based on Table 5, the significance of H8 is not significant and therefore H8 is rejected. According to Mannion et al. (2020), higher mean anxiety was experienced when they could hear the phone ringing but were unable to answer it. When they are unable to respond to the incoming notifications, feelings of fear of missing out and anxiety will engage.

H9: Smartphones will impact depression negatively.

Based on Table 5, the significance of H9 is significant and therefore H9 is accepted. Compared to the study conducted by Thomee et al. in 2007 and van den Eijnden et al. in 2008, the excessive usage of smartphones for online communication is related to depression symptoms. This study proves that smartphone usage has a negative impact on depression symptoms. Furthermore, there is a six-month study showing that the application on smartphones, which is instant messaging, increases the probability of development of depression among adolescents. Therefore, the result is consistent with their research.

H10: Smartphones will impact Digital Addiction negatively.

Based on Table 5, the significance of H10 is significant and therefore H10 is accepted. Oluwafemi et al. (2021), excessive use of smartphones due to their various functionalities which include watching sports, online games, online shopping, social media and chatting.

H11: Sleep mediates the relationship between smartphone and academic performance.

Based on Table 6, the significance of H11 is not significant and therefore H11 is rejected. This is different from research conducted by Yao and Wang, where sleep problems and poor sleep quality are caused by excessive use of smartphones, which will directly lead to memory or students and their daytime performance in classes. In another study (Mao et al., 2022), those who have spent more hours on phones than others, are having higher odds of achieving poor academic results, and this statistic is mediated by their bedtime lengths. Both of these findings do not align with our research results.

H12: Anxiety mediates the relationship between smartphone and academic performance.

Based on Table 6, the significance of H12 is not significant and therefore H12 is rejected. According to Przepiorka et al. (2021), the use of smartphones in checking notifications and awareness of being online will reduce and increase anxiety. Their excessive smartphone use endangers successful education. The mediation role of anxiety on smartphones and academic performance was not investigated.

H13: Depression mediates the relationship between social media and academic performance.

Based on Table 6, the significance of H13 is not significant and therefore H13 is rejected. According to Salisi et al. in 2019, their research indicates that social media usage has no significant effect on the academic performance of students. Additionally, no depression symptoms were observed among respondents. Students are able to achieve good academic results while using social media, with no evidence of negative effects contributing to depression. Their research outcome also demonstrates

that there is no association between social media usage and depression among students. Their findings align with our research results.

H14: Digital Addiction mediates the relationship between smartphone and academic performance.

Based on Table 6, the significance of H14 is not significant and therefore H14 is rejected. According to Alinejad et al. (2022), the numerous benefits of smartphones can be associated with high time management skills and poor time management. Due to virtual and online education, students may become more dependent on smartphones, ultimately leading to smartphone addiction. The mediation role of academic performance on smartphone addiction was not investigated.

H15: Sleep mediates the relationship between social media and academic performance.

Based on Table 6, the significance of H15 is not significant and therefore H15 is rejected. Comparing this result to the research conducted by Suwayri and Mohammed in 2016, bad sleeping quality could be caused by the amount of time youths spend on social media. However, the research found that social media and sleep quality together will not affect academic performance significantly, which aligns with our research result.

H16: Anxiety mediates the relationship between social media and academic performance.

Based on Table 6, the significance of H16 is not significant and therefore H16 is rejected. This might be due to the social media usage does not affect the anxiety levels of the student meanwhile academic performance might be affected by social media usage or the anxiety level. Good social media usage could have decreased anxiety levels and might have increased academic performance due to increased life satisfaction. (Anto et al., 2023).

H17: Depression mediates the relationship between smartphone and academic performance.

Based on Table 6, the significance of H17 is not significant and therefore H17 is rejected. Compared to the research by Eisenberg D et al. in 2009 and RottenBerg in 2015, depression has a negative impact on academic performance as it lowers academic productivity. Depression also raises the usage of smartphones to address negative emotions. Both research do not align with our research results.

H18: Digital Addiction mediates the relationship between social media and academic performance.

Based on Table 6, the significance of H18 is significant and therefore H18 is accepted. The result is consistent with Üztemur (2020) who stated that social media addiction gives rise to academic procrastination and leads to bad academic performance.

5.0 CONCLUSIONS

This study aimed to investigate the correlation between smartphone usage, social media and academic performance, while also considering the mediating roles of sleep, depression, anxiety and digital addiction. The findings suggest that social media use and smartphone usage are associated with academic performance. On the other hand, this research proves the concept that, although smartphones cause digital addiction, the addiction might not negatively impact academic performance. It highlights the importance of considering digital addiction as a potential factor influencing students' academic outcomes. However, other factors such as sleep, depression and anxiety do not appear to mediate the relationship between social media, smartphone and academic performance. These findings open a new discussion on how to utilize smartphones as a platform in education. The generation changed and smartphones in return changed how the new generation communicates, works, relaxes and learns. Is there a new positive term to replace 'digital addiction' to interpret the level of dependency on smartphones with minimal or without negative effects? Smartphones will become useful tools or main channels or the fastest way to educate people on new knowledge. The new issue will be how smartphones should be integrated to fulfil different purposes with minimal negative impacts.

Several limitations were encountered during the research. The most significant limitation was the time constraint for data elicitation. We were on a tight schedule, with only two weeks available to ensure sufficient time for completing the data analysis through SPSS. Additionally, the low response rate to the questionnaire resulted in a smaller sample size than expected, as the number of respondents was lower than our initial projection. Furthermore, the scope of the research was limited to the youth studying at TARUMT, which may not represent the broader population. This specificity of the sample might affect the generalizability of the research findings.

For further investigation, we shall separate smartphone usage and social media usage for a more in-depth exploration of digital usage, rather than combining both. Additionally, the types of digital devices considered should include the latest popular technology devices or communication platforms, such as virtual devices, TikTok, and so on. Furthermore, the scope of the research should be expanded to include a broader population and multiple countries.

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