

# Smartphone Usage and Psychological Well-being among Malaysian University Students

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## Abstract

Smartphone has become indispensable in individual daily life in which excessive use of smartphone might interfere with one's psychological well-being. Thus, it is crucial to understand how smartphones give impact on the psychological well-being especially among young people. The objective of present research was to investigate the smartphone usage among students in Universiti Malaysia Sarawak (UNIMAS) and its relation with psychological well-being. The present study was a cross-sectional study and there were 274 undergraduates from UNIMAS had been recruited, age ranged from 19 to 28 years old, with 28.5% males and 71.5% females. Smartphone usage questionnaire, Social Anxiety Questionnaire for Adults (SAQ-A30), Fear of Missing Out Scale (FOMOs), Center for Epidemiologic Studies-Depression Scale (CESD), and Three-Item Loneliness Scale were used in the present study. The result showed that UNIMAS students spent approximately 8 hours ( $SD = 4.26$ ) per day, on Instagram, followed by Twitter, Facebook, WhatsApp, and Wechat. Depressive scores were significantly associated with hours spent on smartphones daily. The result also showed that texting significantly associated with SAQ while social networking and gaming were significantly associated with FOMO scores. FOMO was mediating the hours spent on smartphone and depression scores. When the participants used their smartphone in a day was also mediated by FOMO contributing to their social anxiety scores. The results have practical implications for policymaker and advertisement that is more population targeted in promoting their products or deliver information.

**Keywords:** Smartphone, FOMO, Mediator, Social anxiety, Depression, Loneliness

## Introduction

Smartphone that offers substantial variety of advanced features like a complete operating system (OS), web browsing, and software applications that enables the users to access social media, playing video games, stream videos, having online lectures and online meeting at anytime and anywhere (Alfawareh & Jusoh, 2017). Apart from entertainment and social media, the smartphone is also used for professionals such as business professionals for instant payment as smartphones provide mobile payment services through apps. For example, Sarawak Pay which allows users to make an instant payment using their smartphones (Bezovski, 2016). Smartphone has been used for contactless payments during Covid-19 to avoid direct contact with the virus through cash (Pantano, Pizzi, Scarpi & Dennis, 2020). Meanwhile, health professionals use smartphones as a communication tool in medical wards for its fast reaching to the respective physician, data imaging, and video procedures particularly for anatomical learning and video meeting with other professionals oversea (Wu et al., 2010; Trelease, 2008).

According to Smartphone User Persona Report (SUPR) 2015, it was stated that in Southeast Asia, Malaysia smartphone users used an average of 187 minutes per day which was the highest in hours spent on their devices (Vserv, 2016). This indicates that smartphone is a part of our daily lives and it is important for us to understand more regarding the usage of the smartphone. The problematic usage of smartphones can interfere with our everyday lives and mental well-being (Gligor & Mozos, 2019). The examples of problematic smartphone usage were phantom cell phone ringing without incoming phone notifications which were due to anxiety and constant checking on phones to stay connected with others on social media as of fear of losing connections with them, i.e., fear of missing out, FOMO (Kruger & Djerf, 2016). Turkle (2011) stated that the strong desire to stay connected continuously was dangerous because it encouraged people to use their smartphones even when they were driving and it can cause an accident to happen. A study was conducted in Malaysia reported that undergraduate students who were active social networking users, showing an inverse relationship between the uses of social networking and psychological well-being (Ithnain, Ghazali & Jaafar, 2018).

The use of instant messenger from the smartphone for online communication was proven to be related with depression (Van den Eijnden et al., 2008). Spending time on the smartphone may help them to relieve stress and become one of their coping styles for their overwhelmed emotion. On the other hand, the overuse of smartphones which caused poor communication and decreased interpersonal relationships may also lead to depression (Hwang et al. 2012) and other psychological well-being (Alfawareh & Jusoh, 2017; Gligor & Mozos, 2019). For example, approximately half of the international students in one of the China universities exhibited smartphone addiction symptoms with 5.3% of them experiencing severe loneliness (Jiang, Li, & Shypenka, 2018) that would have mediated the development of depression (Pittman & Reich, 2016).

Social anxiety was highly correlated with the smartphone usage among smartphone users (Gao, Li, Zhu, Liu, & Liu, 2016). They found that individuals who have a higher score in social anxiety tend to use smartphones for texting messages rather than receiving calls (Gao et al., 2016). Individuals with high depressive and social anxiety symptoms reported to have lower social anxiety scores during online interaction as compared to face-to-face interaction (Yen et al., 2012), contributed a higher risk of smartphone addiction in young people (Enez Darcin, Noyan, Nurmedov, Yilmaz, & Dilbaz, 2015). A study was conducted among 174 online game players investigating their interpersonal relationships with their social anxiety level. They found that the duration of time spent online gaming had positive direct relationship with social anxiety and a negative direct relationship with the quality of interpersonal relationships (Wang, Sheng, & Wang, 2019).

Due to the increasing rate of Malaysia smartphone usage (MCMC, 2017), there was a need to investigate the psychosocial impact that smartphone users may experience. Undoubtedly, it also affects the psychological well-being of university students who are away from their family members and they are trying to adapt with the new environment. There is limited study that investigates the relationship between smartphone usage and psychological issues such as social anxiety, loneliness and depression. Most of these studies were conducted in the west in which may have some cultural issues. Therefore, the present study aimed to investigate the relationship between smartphone usage, social anxiety, FOMO, loneliness and depression among university students.

## **Measures**

### ***Participants and procedure***

A total number of 275 participants recruited in the present study aged range from 19 to 28 years old ( $M = 21.59$ ,  $SD = 1.45$ ). There were 78 males (28.5%) and 196 female participants (71.5%).

The Malay participants (52.6%) was the highest percentage in this research ( $n=274$ ), followed by Chinese (16.1%), Ibans (7.7%), Bidayuh (5.1%), Indians (1.8%), and other ethnicities (16.8%).

Participants were recruited based on convenience sampling. The study procedure was explained and the participants' written consent were obtained. They could withdraw from the study without giving any reason and their right as well as confidentiality were protected. A self-administered questionnaire was used in the present study. A pilot study was conducted with 30 participants to check the feasibility of the questionnaires. Permission and ethical approval was sought from the Medical Ethics Committee of the Faculty of Medicine and Health Sciences (UNIMAS).

### ***Sociodemographic Information***

Questions on the participant's social demographic information, this included age, gender, and ethnicity was asked.

### ***Smartphone Usage***

The Smartphone Usage Questionnaire adopted from questionnaire by Osman, Sabudi, Osman and Shiang Yen (2011) was used to investigate smartphone usage among the UNIMAS students. This questionnaire consisted of 5 questions, which includes smartphone functions, social media mostly used, time spent on smartphone, and the approximate duration spent on social media.

### ***Social Anxiety***

Social Anxiety Questionnaire for Adults (SAQ-A30; Caballo, Salazar, Irurtia, Arias, and CISO-A Research Team, 2012) was used to investigate self-reported symptoms associated with social anxiety. This questionnaire consisted of five dimensions, including speaking in public, interaction with opposite gender, assertive expression of annoyance, disgust or displeasure, criticism and embarrassment and interacting with a stranger, each of the dimensions consists of 6 items. The participants were requested to answer all the 30 items based on the 5-point Likert scale, from 1- Not at all or very slight to 5- Very high or extremely high. The higher the score in the specific dimension, the more anxiety the participant has in those dimensions. A 90 was used as the cut-off score to determine the level of SAQ. To examine each dimension of SAQ, cut-off score for Interactions with strangers, Talk in the public, Interaction with opposite gender, Criticisms, and embarrassment and Assertive expression of annoyance, disgust, or displeasure were 16,18,18,20 and 19 respectively. The Cronbach alpha of this scale in this study was 0.91.

### ***Fear of Missing Out***

FOMO (Przybylski, Murayama, DeHann, & Gladwell, 2013) was used to measure participants' FOMO. This questionnaire consisted of ten questions to assess the participant's level of fear of missing out. Participants were required to rate on a 5-point Likert scale, i.e., 1 = Not at all true to 5 = Absolutely true, which gave a range of scores between 10 and 50 with higher the scores, higher the level of fear of missing out. The Cronbach alpha of this scale in this study was 0.82.

### ***Depression***

Center for Epidemiologic Studies-Depression Scale (CESD) (Radloff, 1977), is a scale to measure self-reported symptoms associated with depression for the past one week that consists of 20 items. The participants were required to rate each statement on a 4-Likert scale, from 0 (Rarely) to 3 (Often). The higher the score indicates the presence of symptoms associated with

depression. To examine the level of depression, 27 is used as a cut-off score. The Cronbach alpha of this scale in this study was 0.82.

### ***Loneliness***

Three-Item Loneliness Scale (Hughes, Waite, Hawkey & Cacioppo, 2004). This questionnaire is the adaptation from the Revised UCLA Loneliness Scale (Russell et al., 1980). This questionnaire is a simplified version that consists of 3 items using a 3-point Likert scale (hardly ever= 1, some of the time= 2 and often=3) to rate their loneliness. The higher the score indicates higher level of loneliness. The Cronbach alpha of the scale in this study was 0.89.

### ***Data Analysis***

After data cleaning, descriptive data were presented in the form of simple frequency tables, and independent *t*-test and ANOVA analysis were done to obtain the relationship/ association between the variables. Both tabular and graphical presentations were done in this final report. A *p*-value of less than 0.05 was considered as statistically significant. IBM SPSS version 22.0 was used for data analysis.

Mediation analysis was also conducted using linear regression analysis. The mediator roles of FOMO/ Loneliness with hours spent on smartphone per day and the time the participants used their smartphone per day that might contribute to their depression and social anxiety scores according to the mediation model (Figure introduced by Baron and Kenny (1986). According to Baron and Kenny (1986), the independent variables (i.e. smartphone use) must significantly relate or able to predict the dependent variable (i.e. depression or social anxiety scores) in an unmediated model (Path C). Besides in the mediated model, the smartphone use must also significantly cause or relate with the mediator (i.e. FOMO/ loneliness, Path A). The depression or social anxiety scores was also significantly caused by FOMO or Loneliness (Path B). The relationship between independent variables on depression or social anxiety scores after controlled the mediator (i.e. FOMO or loneliness) has to be significant (Path C').

## **RESULTS**

### ***Characteristic of Smartphone Usage***

The participants spent a total of 7.97 hours on average ( $SD=4.26$ ) on their phones per day. The participants spent an average of 2.68 hours ( $SD=3.00$ ) on social media per session. It was found that the social media used the most was Instagram (58%) followed by Twitter (35.8%), Facebook (33.6%), WhatsApp (21.7%), WeChat (5.8%), YouTube (3.4%) and other social media (4.8%). Majority of them used smartphones as means of Gathering information (86%), Movies and music (77%), texting (87.2%), and calling (78.8%).

Table 1: Smartphone usage among University students ( $N=274$ )

<b>Hours spend on smartphone (<math>M, SD</math>)</b>	$M=7.97$ hours, $SD= 4.26$
<b>Hours spend on media social per session (<math>M, SD</math>)</b>	$M= 2.68$ hours, $SD= 3.00$
<b>Social Media Mostly Use, <math>n</math> (%)</b>	
Facebook	92 (33.6)
Twitter	98 (35.8)
WhatsApp	76 (21.7)
Instagram	159 (58.0)
WeChat	16 (5.8)
YouTube	9 (3.4)
Others	12 (4.8)
<b>Uses of smartphone, <math>n</math> (%)</b>	
Gathering information	237 (86.5)
Gaming	136 (49.6)
Movie and music	211 (77.0)
Texting	239 (87.2)
Calling	216 (78.8)
Other	14 (5.1)

### Relationship between Smartphone Usage and Socio-demographic Information

There was no significant difference in the hours spent on smartphones between males and females,  $t_{(271)} = 1.203$ ,  $p=0.23$ . For smartphone functions, there was no significant difference between gender on gathering information, social networking, movies, and music, texting, and calling except for gaming,  $X^2_{(1)} = 6.18$ ,  $p= .01$ . It was found that males (61.5%) played games via smartphone more than females (44.9%). It was found that there was significant association between gender and WeChat used WeChat,  $X^2_{(1)}= 6.44$ ,  $p= .01$  and more male (11.5%) using this application than female (3.6%).

There was no significant association between ethnicity and hours spend on a smartphone. However, there were significant ethnicity differences using smartphone for gaming,  $X^2_{(5)} = 14.84$ , in which Iban (66.7%) had the highest percentage of gaming followed by others (63.0%), Chinese (50.0%), Malay (47.2%), Indian (20.0%) and Bidayuh (14.3%). There were significant differences in ethnicity in using Facebook via smartphone,  $X^2_{(5)} = 12.82$ ,  $p= .03$ , using Twitter via smartphone,  $X^2_{(5)} = 12.97$ ,  $p= .002$ , and using Instagram via smartphone, in which both Chinese and Bidayuh (50.0%) had the higher percentage of using Facebook, followed by Iban (47.6%), others (30.4%), Malay (26.4%) and Indian (20.0%). While for Twitter, the Malays used it the most (43.1%), followed by other ethnicities (41.3%), Iban (23.8%), Bidayuh (21.4%), Indian (20.0%), and Chinese (18.2%). As for Instagram, it was found that the Indians (80.0%) used Instagram the most, followed by Chinese (70.5%), Malays (61.1%), Bidayuh (57.1%), Iban (42.9%) and others (41.3%). (please refer to Figure 1).

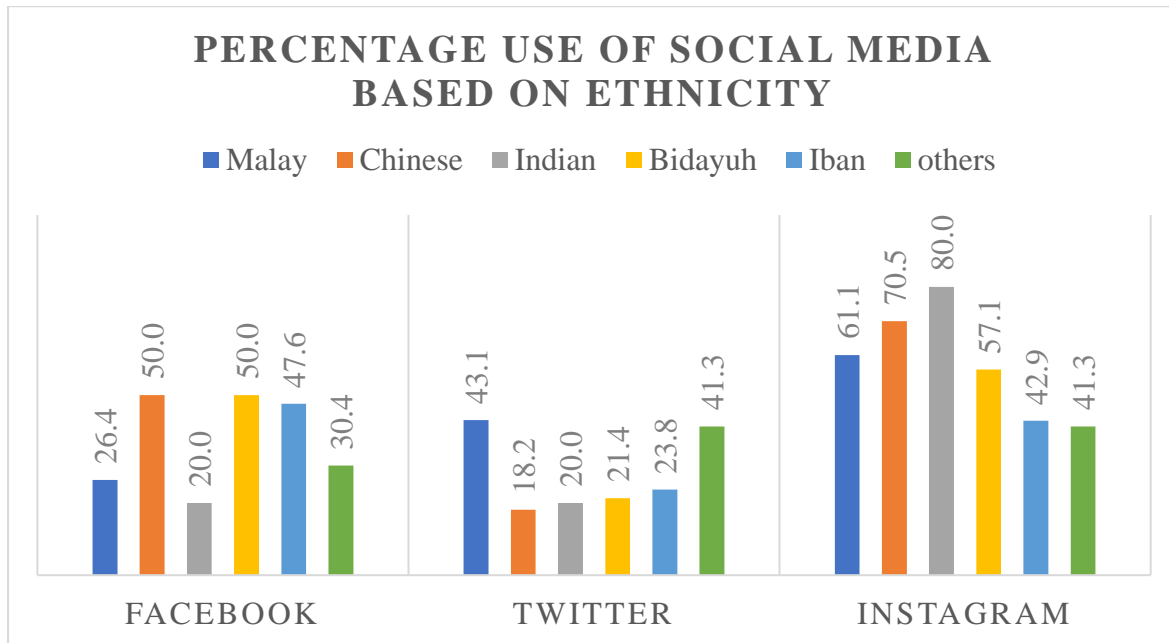


Figure 1: Social media used based on ethnicity

### ***Prevalence of Psychological Well-being***

For the social anxiety part, the mean score was 95.35 with approximately 61% of total participants exhibited social anxiety symptoms. Approximately 69% of participants ( $n = 274$ ) exhibited symptoms of social anxiety when interacting with strangers. More than two-thirds (70%) of participants exhibited the anxiety symptoms when speaking in public, 67% of participants exhibited symptoms when interacting with the opposite sex and 53% of participants exhibited symptoms of social anxiety when facing criticisms and embarrassment. Almost half of the participants (47%) exhibited symptoms of social anxiety when they received expression of annoyance, disgust, or displeasure. The mean score for FOMO was 25.52 with standard variation ( $SD = 7.34$ ). It was found that approximately one-third of the participants (30%) exhibited depressive symptoms. The mean score for loneliness was 5.37 with standard deviation ( $SD = 1.87$ ).

### ***Smartphone Usage and Psychological Well-being***

There was no significant association between the the time spent on smartphones with social anxiety, FOMO, and Loneliness except for depression,  $F_{(1, 266)} = 3.79$ ,  $p = 0.05$ , with those exhibited depressive symptoms ( $M = 8.80$ ,  $SD = 4.55$ ) spent more time on the phone than those without depressive symptoms ( $M = 7.66$ ,  $SD = 4.14$ ).

There are no significant association between social anxiety with the function of smartphones for gathering information, social networking, gaming and calling except for texting,  $X^2_{(1)} = 5.763$ ,  $p = 0.02$ . Those who use smartphone for texting exhibited more social anxiety (42.9%) than those who used less texting (64%). However, further analysis was conducted among those who used smartphone for calling, the present data showed that there was significant association between having anxiety symptoms with hours spending on smartphone,  $F_{(1, 213)} = 4.22$ ,  $p = 0.04$ .

There was significant difference in the FOMO score when smartphone was used for social networking. Those who use smartphone for social networking ( $M = 25.7$ ,  $SD = 7.30$ ) rated a higher FOMO scores than those did not ( $M = 21.5$ ,  $SD = 7.13$ ;  $t_{(270)} = -2.12$ ,  $p = 0.04$ ).

Among those who use smartphone for social networking ( $F_{(34,223)}=1.63, p=.021$ ), gaming ( $F_{(31,102)}=2.00, p=.005$ ), music and movie ( $F_{(32,176)}=1.95, p=.003$ ), texting ( $F_{(34,202)}=1.65, p=.019$ ) and calling ( $F_{(33,179)}=1.80, p=.008$ ) have shown a significant association between FOMO total score and hours spent per day.

There were significant association between the depression scores and smartphone function for movies and music  $F_{(1, 267)} = 3.97, p = 0.05$ , with those used smartphone for movies and music ( $M = 20.63, SD = 11.03$ ) rated a higher depression total scores than those did not ( $M = 17.55, SD = 9.42$ ). Similar result obtained with the loneliness scores ( $t_{(271)} = 2.41, p=0.02$ ), with those played smartphone for movies and music ( $M=5.5, SD=1.89$ ) obtained a higher loneliness scores than those did not ( $M=4.9, SD=1.73$ ).

### **Mediator Role of FOMO and Loneliness**

In order to investigate the mediator role of FOMO and Loneliness on depression scores with hour spent on smartphone per day, the Baron and Kenny's model was used and was shown in Figure 2 (Baron & Kenny, 1986). The result indicated that only FOMO played mediator role in hours spent on smartphone per day and depression symptoms association (Table 2). From the analysis, hours spent on smartphone have significant relationship with the depression symptoms (Path C). Smartphone use were also significantly predicted FOMO scores (Path A). Significant results were also obtained when investigating the Path B. The Sobel's tests of FOMO for hours spent on smartphone and depression scores was significant, indicating an effect of FOMO as a mediator for the relationship between the smartphone use and depression symptoms (Table 2).

Another Baron and Kenny's model (1986) was used to investigate the mediator of FOMO on social anxiety with different timing that participant used their smartphone in the day. The result showed that FOMO played a mediator role on social anxiety when participant used their smartphone immediately after woke up from bed and night before sleep. Both the regression model and Sobel's test showed that FOMO was the mediator for immediately woke up from bed and night before sleep in predicting the social anxiety scores (Figure 3 and Table 3).

Table 2: Mediating Effect of FOMO and Loneliness on Depression ( $N = 275$ )

Mediating factor	$R^2$	$F$ -value	Coefficient	$t$ -value	Sobel Test ( $p$ -value)
FOMO					2.02(0.04)
Path A	.017	4.583*	.129	2.141*	
Path B	.117	35.499**	.343	5.958*	
Path C'	.121	18.31*	<b>.072</b>	1.239	
Path C	.017	3.68*	<b>.117</b>	1.92*	
Loneliness					0.59(0.57)
Path A	.001	.346	.036	.588	
Path B	.428	199.64**	.654	14.13*	
Path C'	.444	105.93**	<b>.098</b>	2.13*	
Path C	.017	3.68*	<b>.117</b>	1.92*	

Note. \* $p < .01$ ; \*\*  $p < .001$ .

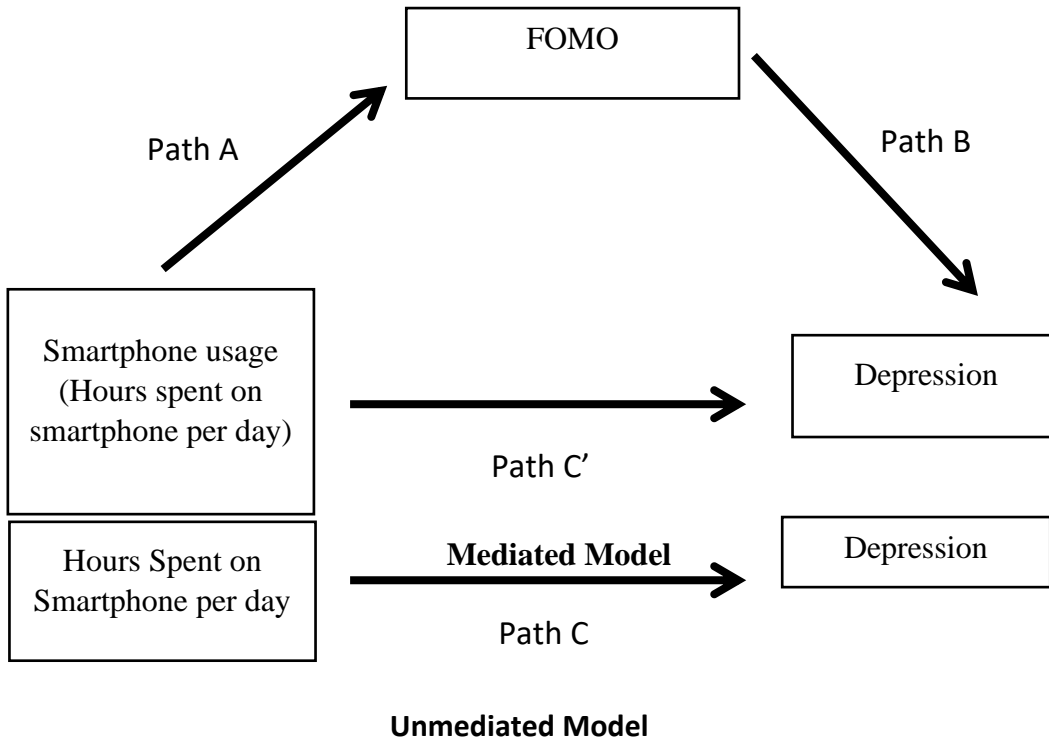


Figure 2: The Mediated and Unmediated Model of FOMO and Loneliness on Depression ( $N = 275$ )

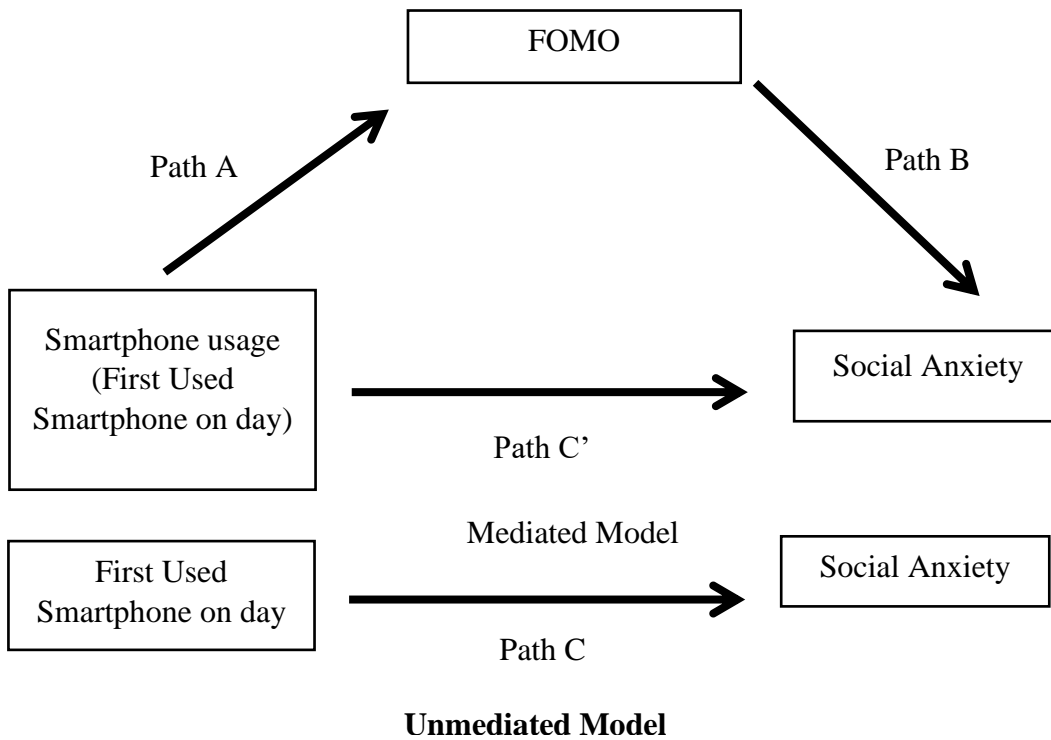


Figure 3: The Mediated and Unmediated Model of FOMO on Time First Used Smartphone on a Day and Social Anxiety ( $N = 275$ )



Table 3: Mediating Effect of FOMO on Time First Used Smartphone on a Day and Social Anxiety ( $N = 275$ )

Mediating factor	$R^2$	$F$ -value	Coefficient	$t$ -value	Sobel Test ( $p$ -value)
Immediately wake up					
Path A	.034	9.628*	.186	3.103*	2.81(0.004)
Path B	.141	44.23**	.375	6.65**	
Path C'	.144	22.61**	<b>.057</b>	.994	
Path C	.016	4.526*	<b>.128</b>	2.127*	
Night before sleep					
Path A	.029	8.00*	<b>.170</b>	2.828*	2.828(0.009)
Path B	.141	44.23**	<b>.375</b>	6.65**	
Path C'	.145	22.87**	<b>.069</b>	1.198	
Path C	.018	5.081*	<b>.135</b>	2.254*	

Note. \* $p < .01$ ; \*\*  $p < .001$ .

### Discussion

Vserv (2016) reported that the average smartphone users in Malaysia spent on smartphone were 187 minutes per day. However, the present study showed that UNIMAS students spent an average of 478 minutes per day, regardless of gender difference. This may due to the increasing habit of checking smartphones and also for professionals puprose through the use of various applications and functions which in turn cause the users to use their smartphones more frequently (Bezovski, 2016). The present study found that males significantly use smartphones for game and WeChat more than the females. Males tend to use smartphones for game purpose because many of the mobile games required the players to have the WeChat account in order for them to log into the games and most gamers use WeChat as the platform to reconnect with their gamer friends as most of the games played they played was originated from China (Gao, Zang, & Krogstie, 2014; Kim, 2013).

The present study found that ethnicity difference in smartphone usage only obtained regarding the smartphone apps that the Malaysian university students used. The present study also found that Ibans tend to use smartphone for game while Chinese and Bidayuh tend to use smartphone to surf the social media like Facebook. For Malays used smartphone to surf Twitter, and Indians used it to surf Instagram . This information was important to be used by the policymaker and advertisement company in targeting to certain population in promoting their product or deliver the information (Kushin & Yamamoto, 2010).

From our findings, it was found that more than half of the students exhibited social anxiety symptoms which correspond with a study by Leary and Jongman-Sereno (2014). A high prevalence of social anxiety symptoms when interacting with strangers and when speaking in public might be due to want have a good impression on themselves to strangers in public which triggers them to be socially anxious when interacting with other people (Leary & Jongman-Sereno, 2014). More than half of the participant in the present study experienced social anxiety when interacting with the opposite sex, facing criticism and embarrassment as these social fears are higher in women with social phobia than men. Social anxiety was common among young adults; women were higher in prevalence for social anxiety than men especially when they had feeling assertive expression of annoyance, disgust, or displeasure (Caballo et al., 2008).

The present study suggested that there was a significant relationship between social anxiety symptoms and the use of smartphones for texting. These findings were supported by the previous research by Gao and his colleagues (2016), that suggested that participants used

smartphone for texting rather than receiving calls to avoid direct talking to the person as they might feel anxious when having a real conversation.

The present study showed there was a significant relationship smartphone usage between having anxiety symptoms when interacting with the opposite gender and speaking in the public as well as depression. There was one-third of the participants (30%) exhibited depressive symptoms while using mobile phones. The prior study had stated that adolescents tend to compare themselves to other via social media to assess their opinion and ability (Kraye, Ingledew, & Iphofen, 2008; Yang, 2016). For example, when individuals used social media more often, they might encounter some post regarding beauty and it may decrease their confidence level and made them feel more anxious when interacting with the public (Bielak & Moscovitch, 2013). In addition, passive usage of social media predicts social comparison and envy which can lead into depression and anxiety (Seabrook et al., 2016; Appel, Gerlach, & Crusius, 2016). A study from Korea with 353 college students showed that depression was a significant independent positive predictor of smartphone addiction (Kim et al., 2015). This was supported by a study by Elhai et al. (2017) and Seabrook et al. (2016) that suggested that this particular relationship could be explained due to social comparison.

According to Turkmen (2016) suggested that as people spending more time being online using smartphone and having less face-to-face relationship and away from the actual environment thus will increase in loneliness. Meanwhile, Kim and colleagues (2017) and Jiang and colleagues (2018) suggested that loneliness has become a reason why participants turn to smartphone as a getaway from reality and his statement was supported by study conducted by Park (2014), Kim, LaRose and Peng (2009) in which both study had found that loneliness was the mediating factor that lead to increase in the smartphone usage. This was inconsistent with the present finding, showing that instead of loneliness, FOMO was the mediating factor that mediated the hours spent on smartphone and depression. The relations between loneliness, depression and smartphone usage can be a vicious cycle as Kara et al. (2019) concluded that the increase in daily usage of smartphones caused the user to feel lonelier and more anxious which consequently increasing their smartphone usage by demonstrating nomophobic behaviours as in fear of being without a mobile phone (Elhai et al., 2018).

The present study found a significant association between FOMO scores and smartphone function for social networking and this finding correspond with the prior findings by Tokunaga (2011) in which they suggested that the use of social networks enables the social surveillance. With a social network, an individual might realize that their friends had gone out without him which means that events are unlikely to go unnoticed. There was a higher tendency of feeling left out and ignored. Thus, in order not to experience the same feelings, they would spend more time using social networking via smartphones to know their friends' whereabouts to stay connected with them and to respond immediately. They tend to reply to the texts and call on their smartphones constantly due to the fear of missing out on rewarding experiences (Elhai et al., 2018; Vaughn, 2012). This supported by the present finding, showing that FOMO as the mediator role on social anxiety as the present participants used their smartphone immediately after woke up from bed and before sleep as Kim et. al (2017) found that people tend to feel insecure when they do not have any kind of healthy attachments and that secured attachment allows them to completely regulate their emotions. The time when the participants used their smartphone in a day was mediated by FOMO contributing to their social anxiety scores. It was known that an individual would be more prone to wonder about what his or her friends are doing when he or she develops a self-concept of which the other people are apart (Triandis & Gelfand, 2012). Therefore, they access social network due to feeling of disconnect with the people around them.

### ***Limitation and Recommendation***

The present study depended exclusively on the participants' self-reports which may affect the accuracy of the data. Besides, all the participants were only involved undergraduates of UNIMAS which may not represent the whole population. Furthermore, small sample size would be one of the limitations of this study. It would be beneficial to study the smartphone usage within a large sample which represents a variety of sociodemographic background.

The validity of self-report of hours spent on smartphone per day and their frequencies in using smartphone app might be questionable, however, Lin et al. (2017) and Kim et al. (2014) have shown that this self-report of frequency was good enough for a cross-sectional study as it was not used to determine the clinical level of problematic smartphone use.

Due to the present findings showing the significant association between smartphone usage and psychological well-being, more studies that focus on early prevention and/or intervention program in promoting good use of smartphone. Cognitive therapy such as meditation and reconstructing thoughts can be beneficial to reframe the smartphone user's behaviours as well as thoughts to constantly staying connected with social medias, and help people with FOMO to be aware of their cognitive distortions and transform them into a more constructive thought (Buglass et al., 2017; Butler, Chapman, Forman, & Beck, 2006). More studies are needed for the policymakers, educators, clinicians, parents, young adults to have a better understanding on the effects of smartphone usage among the university student population by identifying the risk and protective factors, in which it will contribute to the benefits of the technology utilization.

### **Conclusions**

The present study found that the average time spent on smartphones among UNIMAS students was 478 minutes per day. The high usage of smartphones indicates a potential public health problems and concerns especially in terms of psychological issues. Depression was found to be associated with smartphone usage. FOMO was found to be the mediator for the hours spent on smartphone and depression symptoms. FOMO was also mediating when the participants used their smartphone on the day with their social anxiety scores. Thus, it is important for the educator to promote the smart use of smartphone among the students.

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### **References**

- Alfawareh, H. M., & Jusoh, S. (2017). The Use and Effects of Smartphones in Higher Education. *International Journal of Interactive Mobile Technologies (iJIM)*, 11(6), 103-111. doi:10.3991/ijim.v11i6.7453
- Alfawareh, H.M. & Jusoh S.. Smartphones usage among university students: Najran University case. *International Journal of Academic Research Part B*; 2014, 6(2), 321-326
- Anxiety UK (2012, July 9). Anxiety UK study finds technology can increase anxiety. Retrieved from <http://www.anxietyuk.org.uk/2012/07/for-some-with-anxiety-technology- can-increase-anxiety/>
- Appel, H., Gerlach, A. L., & Crusius, J. (2016). The interplay between Facebook use, social comparison, envy, and depression. *Current Opinion in Psychology*, 9, 44–49.

- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182.
- Bezovski, Z. (2016). The future of the mobile payment as electronic payment system. *European Journal of Business and Management*, 8(8), 127-132.
- Bielak, T., & Moscovitch, D. A. (2013). How do I measure up? The impact of observable signs of anxiety and confidence on interpersonal evaluations in social anxiety. *Cognitive therapy and research*, 37(2), 266-276.
- Buglass, S. L., Binder, J. F., Betts, L. R., & Underwood, J. D. (2017). Motivators of online vulnerability: The impact of social network site use and FOMO. *Computers in Human Behavior*, 66, 248-255.
- Butler, A. C., Chapman, J. E., Forman, E. M., & Beck, A. T. (2006). The empirical status of cognitive behavioral therapy: A review of meta-analyses. *Clinical Psychology Review*, 26(1), 17–31. <https://doi.org/10.1016/j.cpr.2005.07.003>.
- Caballo, V. E., Salazar, I. C., Iruña, M. J., Arias, B., & CISO-A Research Team. (2012). Social Anxiety Questionnaire for Adults (SAQ-A30) . Measurement Instrument Database for the Social Science. Retrieved from [www.midss.ie](http://www.midss.ie)
- Caballo, V. E., Salazar, I. C., Iruña, M. J., Arias, B., Hofmann, S. G., & CISO-A Research Team. (2008). Social anxiety in 18 nations: sex and age differences. *Behavioral Psychology/Psicología Conductual*, 16(2), 163-187.
- Elhai, J. D., Dvorak, R. D., Levine, J. C., & Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *Journal of Affective Disorders*. <https://doi.org/10.1016/j.jad.2016.08.030>
- Elhai, J. D., Levine, J. C., Alghraibeh, A. M., Alafnan, A. A., Aldraiweesh, A. A., & Hall, B. J. (2018). Fear of missing out: Testing relationships with negative affectivity, online social engagement, and problematic smartphone use. *Computers in Human Behavior*, 89, 289-298.
- Enez Darcin, A., Noyan, C., Nurmedov, S., Yilmaz, O. & Dilbaz, N. (2015). Smartphone addiction in relation with social anxiety and loneliness among university students in turkey. *European Psychiatry*, 30, 505. [https://doi.org/10.1016/s0924-9338\(15\)30398-9](https://doi.org/10.1016/s0924-9338(15)30398-9)
- Gao, Y., Li, A., Zhu, T., Liu, X., & Liu, X. (2016). How smartphone usage correlates with social anxiety and loneliness. Retrieve from <https://doi.org/10.7717/peerj.2197>
- Gao, S., Zang, Z., & Krogstie, J. (2014, May). The adoption of mobile games in China: an empirical study. In *International Conference on Informatics and Semiotics in Organisations* (pp. 368-377). Springer, Berlin, Heidelberg.
- Gligor, S., & Mozos, I. (2019). Indicators of smartphone addiction and stress score in university students. *Wien Klin Wochenschr*, 131(5-6), 120-125. [doi:10.1007/s00508018-1373-5](https://doi.org/10.1007/s00508018-1373-5)
- Hughes, M. E., Waite, L. J., Hawkey, L. C., & Cacioppo, J. T. (2004). A short scale for measuring loneliness in large surveys: Results from two population-based studies. *Research on aging*, 26(6), 655-672.
- Hwang, K. H., Yoo, Y. S., & Cho, O. H. (2012). Smartphone overuse and upper extremity pain, anxiety, depression, and interpersonal relationships among college students. *The Journal of the Korea Contents Association*, 12(10), 365-375.
- Ithnain N, Ghazali SE, Jaafar N. Relationship between smartphone addiction with anxiety and depression among undergraduate students in Malaysia. *Int J Health Sci Res.*, 8(1):163-171.

- Jiang, Q., Li, Y., & Shypenka, V. (2018). Loneliness, individualism, and smartphone addiction among international students in china. *Cyberpsychology, Behavior, and Social Networking*. <https://doi.org/10.1089/cyber.2018.0115>
- Kara, M., Baytemir, K., & Inceman-Kara, F. (2019). Duration of daily smartphone usage as an antecedent of nomophobia: Exploring multiple mediation of loneliness and anxiety. *Behaviour & Information Technology*, 114. <https://doi.org/10.1080/0144929x.2019.1673485>
- Kim, H. M. (2013). Mobile media technology and popular mobile games in contemporary society. *International Journal of Mobile Marketing*, 8(2).
- Kim, D., Lee, Y., Lee, J., Nam, J. K., & Chung, Y. (2014). Development of Korean smartphone addiction proneness scale for youth. *PLoS One*, 9(5), e97920. <https://doi.org/10.1371/journal.pone.0097920>.
- Kim, E., Cho, I., & Kim, E. J. (2017). Structural equation model of smartphone addiction based on adult attachment theory: Mediating effects of loneliness and depression. *Asian nursing research*, 11(2), 92-97.
- Kim, J., LaRose, R., & Peng, W. (2009). Loneliness as the cause and the effect of problematic internet use: The relationship between internet use and psychological well-being. *Cyberpsychology and Behavior*, 12(4), 451-455.
- Krayer, A., Ingledew, D. K., & Iphofen, R. (2008). Social comparison and body image in adolescence: A grounded theory approach. *Health Education Research*, 23(5), 892—903.
- Kruger, D. J., & Djerf, J. M. (2016). High ringxiety: Attachment anxiety predicts experiences of phantom cell phone ringing. *Cyberpsychology, behavior, and social networking*, 19(1), 56-59.
- Kushin, M. J., & Yamamoto, M. (2010). Did social media really matter? College students' use of online media and political decision making in the 2008 election. *Mass Communication and Society*, 13(5), 608-630.
- Leary, M. R., & Jongman-Sereno, K. P. (2014). Social anxiety as an early warning system: A refinement and extension of the self-presentation theory of social anxiety. In *Social anxiety*, 579-597
- Lin, Y. H., Lin, Y. C., Lin, S. H., Lee, Y. H., Lin, P. H., Chiang, C. L., ... Kuo, T. B. J. (2017). To use or not to use? Compulsive behavior and its role in smartphone addiction. *Translational Psychiatry*, 7(2), 1–6. <https://doi.org/10.1038/tp.2017.1>.
- Malaysian Communications and Multimedia Commission. (2017). Hand phone users survey 2017. Retrieved from <https://www.skmm.gov.my/skmmgovmy/media/General/pdf/HPUS2017.pdf>
- Osman, M. A., Sabudin, M., Osman, A., & Shiang-Yen, T. (2011). Consumer Behaviors toward Usage of Smartphone in Malaysia. *Age*, 867(47.8), 100.
- Pantano, E., Pizzi, G., Scarpi, D., & Dennis, C. (2020). Competing during a pandemic? Retailers' ups and downs during the COVID-19 outbreak. *Journal of Business Research*.
- Park, W. K. (2014). An explorative study on college students' SNS addiction: Using psychological variables as predictors. *Kookmin Social Science Review*, 27(1), 95-125.
- Pittman, M., & Reich, B. (2016). Social media and loneliness: Why an Instagram picture may be worth more than a thousand Twitter words. *Computers in Human Behavior*, 62, 155-167.
- Przybylski, A. K., Murayama, K., DeHaan, C. R., & Gladwell, V. (2013). Motivational, emotional, and behavioral correlates of fear of missing out. *Computers in Human Behavior*, 29, 1814-1848.

- Radloff, L. S. (1977) The CES-D Scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement* 1:385-401.
- Russell, D., Peplau, L. A. & Cutrona, C. E. (1980) The revised UCLA loneliness scale: concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology* 1980, 39, 472–80.
- Seabrook, E. M., Kern, M. L., & Rickard, N. S. (2016). Social networking sites, depression, and anxiety: A systematic review. *JMIR Mental Health*,3(4), e50.
- Tokunaga, R. S. (2011). Social networking site or social surveillance site? Understanding the use of interpersonal electronic surveillance in romantic relationships. *Computers in Human Behavior*, 27(2), 705-713.
- Trelease, R. B. (2008). Diffusion of innovations: smartphones and wireless anatomy learning resources. *Anatomical Sciences Education*, 1(6), 233-239.
- Triandis, H. C., & Gelfand, M. J. (2012). A theory of individualism and collectivism. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (pp. 498-520). Thousand Oaks, CA: SAGE.  
doi:10.4135/9781446249222.n51.
- Turkle, S. (2017). *Alone together: Why we expect more from technology and less from each other*. Hachette UK.
- Turkmen, M. (2016). Violence in Animated Feature Films: Implications for Children. *Educational Process: International Journal*, 5(1), 22-37
- Van den Eijnden, R. J., Meerkerk, G.-J., Vermulst, A. A., Spijkerman, R., & Engels, R. C. (2008). Online communication, compulsive Internet use, and psychosocial well-being among adolescents: A longitudinal study. *Developmental psychology*, 44(3), 655.
- Vaughn, J. (2012). *Fear Of Missing Out (FOMO)*. New York: J. Walter Thompson.
- Vserv. (2016, January 20). Infographic: Smartphone User Persona Report (SUPR) 2015 for Malaysia. Retrieved from <https://www.vserv.com/infographic-smartphone-user-persona-report-supr-2015-malaysia/>.
- Wang, H. Z., Sheng, J. R., & Wang, J. L. (2019). The association between mobile game addiction and depression, social anxiety, and loneliness. *Frontiers in public health*, 7, 247.
- Wu, R. C., Morra, D., Quan, S., Lai, S., Zanjani, S., Abrams, H., & Rossos, P. G. (2010). The use of smartphones for clinical communication on internal medicine wards. *Journal of Hospital Medicine*, 5(9), 553-559.
- Yang, C. C. (2016). Instagram use, loneliness, and social comparison orientation: Interact and browse on social media, but don't compare. *Cyberpsychology, Behavior, and Social Networking*, 19(12), 703-708.
- Yen, J. Y., Yen, C. F., Chen, C. S., Wang, P. W., Chang, Y. H., & Ko, C. H. (2012). Social anxiety in online and real-life interaction and their associated factors. *Cyberpsychology, Behavior, and Social Networking*.  
<https://doi.org/10.1089/cyber.2011.0015>