ARTICLE

Prevalence and Factors Associated with Smartphone Addiction among Adolescents–A Nationwide Study in Malaysia

Kai Wei Lee[1], Siew Mooi Ching[2,*], Norsiah Ali[3], Chor Yau Ooi[4], Shahnul Kamal Hj Sidek[5], Azlin Amat[6], Yusnita Yatim[7], Zaiton Yahaya[8], Nabihah Shamsuddin[9], Idora Ibrahim[10], Fauzia Abdul Majid[11], Fazlin Suhana Othman[12], Nik Suhaila Zakaria[13], Artini Abidin[14], Nor Hazlin Talib[15] and Dhashani Sivaratnam[16]

[1]Department of Pre-Clinical Sciences, Faculty of Medicine and Health Sciences, Universiti Tunku Abdul Rahman, Kajang, Selangor, 43000, Malaysia

[2]Department of Family Medicine, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, 43400, Malaysia

[3]Klinik Kesihatan Masjid Tanah, Ministry of Health Malaysia, Masjid Tanah, 78300, Malaysia

[4]Department of Family Medicine, Universiti Malaysia Sarawak, Kota Samarahan, 94300, Malaysia

[5]Klinik Kesihatan Tanjung Malim, Ministry of Health Malaysia, Tanjung Malim, 35900, Malaysia

[6]Klinik Kesihatan Hiliran, Ministry of Health Malaysia, Kuala Terengganu, 20300, Malaysia

[7]Klinik Kesihatan Bandar Pekan, Ministry of Health Malaysia, Pekan, 26600, Malaysia

[8]Klinik Kesihatan Sandakan, Ministry of Health Malaysia, Sandakan, 90000, Malaysia

[9]Klinik Kesihatan Serting Hilir, Ministry of Health Malaysia, Bandar Seri Jempol, 72120, Malaysia

[10]Klinik Kesihatan Kuala Perlis, Ministry of Health Malaysia, Kuala Perlis, 02000, Malaysia

[11]Klinik Kesihatan Kempas, Ministry of Health Malaysia, Johor Bahru, 81200, Malaysia

[12]Klinik Kesihatan Kuala Kedah, Ministry of Health Malaysia, Kuala Kedah, 06600, Malaysia

[13]Klinik Kesihatan Bandar Gua Musang, Ministry of Health Malaysia, Gua Musang, 18300, Malaysia

[14]Klinik Kesihatan Kepala Batas, Ministry of Health Malaysia, Kepala Batas, 13200, Malaysia

[15]Klinik Kesihatan Kajang, Ministry of Health Malaysia, Kajang, 43000, Malaysia

[16]Department of Ophthalmology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, 43400, Malaysia

*Corresponding Author: Siew Mooi Ching. Email: sm_ching@upm.edu.my

ABSTRACT

Smartphone ownership among adolescents is getting common in this decade especially in Malaysia; Adolescent are strongly devoted to their smartphone and this may lead to smartphone addiction. Studies have reported that smartphone addiction has become an emerging social and health problem especially among the youth in many countries however there is lack of study among adolescents in Malaysia. This study aimed to examine the pre-valence and factors associated with smartphone addiction among adolescents in Malaysia. This was a cross-sectional study involving adolescents from 15 primary care clinics throughout the country. Respondents were assessed on their smartphone activities using the Malaysian short version of the Smartphone addiction scale (SAS-M-SV). Multiple logistic regression was used to determine the predictors of smartphone addiction among adolescents. The study was conducted among 921 adolescents with 49.6% male ($n = 457$). The mean age of ado-lescents was 16.4 ± 2.4 years. The ethnicity distribution were 74.6% Malay, 7.3% Chinese, 4.7% Indian and 13.4% other ethnicities. The prevalence of smartphone addiction was 37.1% (342/921); 37.4% in male and 36.9% in

female. Based on multiple logistic regression analysis, longer duration of smartphone use per week was associated with higher odds of smartphone addiction among adolescent (odd ratio = 1.005%, 95% confidence interval = 1.000–1.009, p-value = 0.039). Smartphone addiction is present in nearly four in ten adolescents in Malaysia. Adolescents who spend longer duration in smartphone usage per week were associated with higher odds of having smartphone addiction. Parents should be more alert and vigilant about this finding. Hence, parents should limit their children from spending too much of time with smartphone in order to prevent their children from getting smartphone addiction.

KEYWORDS

Addiction; smartphone; adolescents; Malaysia; internet

Abbreviations

SAS-M-SV Smartphone addiction scale Malay-short-version
OR Odd ratio
CI Confidence interval

1 Introduction

In Malaysia, smartphone owners account for 74% of the population with adolescents making up around 10% [1]. According to the survey, adoption rate of smartphone owners were highest in adolescents which was 86.9%. Multiple studies reported increase usage of smartphone leads to smartphone addiction [2,3]. Studies showed that the prevalence of smartphone addiction among adolescents vary from country to country. Prevalence of smartphone addiction among adolescents were 10% in United Kingdom [4], 16.9% in Switzerland [3], 33.3% in India [5] and 35.6% in South Korea [6].

What is smartphone addiction? It could be referred to excessive, problematic or maladaptive smartphone use however their consequences do not meet the severity levels of those caused by substance addiction yet persistent smartphone addiction could finally lead to severe effects on physical and psychological health [7]. Such physical consequences include giddiness, myopia, kerato conjunctivitis sicca and musculoskeletal disorders especially on the wrist and neck [8,9]. In terms of psychological health, adolescents may suffer from depression, anxiety, insomnia and psychological distress [10]. This is worrisome as addiction to smartphones can ultimately lead to disturbances in their daily lives [9]. This include strained social and interpersonal relationship due to negligence of friends and family, difficulties in school such as poor performance academically and indifference towards homework; isolation and mental or physical restlessness [11]. However, when the individual ceases his or her smartphone addiction behaviour, excessive fatigue, deprivation and changes in sleep patterns, impatience, sexual deviations, violence, eating disorder and withdrawal symptoms ensue [11].

Studies reported that factors associated with smartphone addiction were female gender, students in higher school grade, students with poor academic performance, longer duration of smartphone, use shorter time period until first smartphone use in the morning, indicating social networking as the most personally relevant smartphone function, influence of parental attachment, students with reported lower physical activity, and those reporting higher stress [3,6]. Among all age groups, adolescents are specifically at higher risk in developing smartphone addiction [12]. This is evident by a survey which revealed adolescents in a smartphone addiction risk group were about 2.9 times higher compared to adults [13].

The present study focused on smartphone addiction and its associated factors among adolescents. This is the first nationwide survey on this topic as well as the first to focus on adolescent participants, besides one study done on medical students which showed a prevalence of 46.9% of smartphone addiction [14]. The major objectives of this study were to determine the prevalence and factors associated with smartphone addiction among adolescents in Malaysia.

2 Materials and Methods

2.1 Setting and Population

This was a cross-sectional study of adolescents registered with 15 primary care clinics throughout the country involving 13 states and 1 federal territory. These clinics are run by family medicine specialists and other medical officers. The duration of the study was 1 year, from May 2017 to May 2018.

2.2 Inclusion and Exclusion Criteria

All adolescents aged 10 to 19 years whom have being smartphone user during the time of the study in regardless of owning smartphone or not were eligible for the study. We also included adolescents whom agree to participate in this study and their parents' consent their participation. Adolescents were excluded from this study if they were not smartphone users during the time of the study.

2.3 Sample Size Calculation

The sample size was calculated by using Epi Info 7.0, based on two studies in Korea with the prevalence of smartphone ranged from 30.9%–35.2% [2,3,6]. The estimated sample size was 818 with 99% power, 95% confidence interval (CI), and statistical significant level (α) at 5 per cent. The total number of respondents needed was 908, after taking into account a non-respondent rate of 10%. Pre-study calculation of the required sample size is warranted in the majority of quantitative study to detect a clinically relevant observation.

2.4 Data Collection

Interested individuals who responded to our call to participate in this study were invited to a face-to-face meeting on 11th March 2016 in Kuala Lumpur to discuss the details of the study and the data collection format. These co-investigators were briefed on the objectives of the study, inclusion criteria of participants, questionnaire and template for data entry.

Patients were selected using a systematic random sampling method. After explaining the nature and confidentiality of the study, respondents' parents were approached to participate in the study using face-to-face interview. A standardized-questionnaire on socio-demographic data (which include age, gender, ethnicity, parents' age and their highest education level being obtained and monthly household income) and questions assessing smartphone addiction (which include smartphone ownership, duration of smartphone use in a week and 10-item Malaysian short version of the Smartphone Addiction Scale (SAS-M-SV)) was given to the respondents. Prior to the assessment, the respondents were informed about the research and intended use of information obtained. A request for a written informed consent was sought from both parents and the respondents.

2.5 Study Instrument

There were three sections in the study instruments. The purpose of first section was to obtain socio-demographical data of respondents like adolescent's age, gender, ethnicity, highest education their fathers and mother had obtained and monthly household income. Second section captured information related to smartphone use such as question like do you own a smartphone? And How long do you use your smartphones each week (hours). Third section was the smartphone addiction questionnaire–10 items [15].

Smartphone addiction questionnaire was initially invented by Min Kwon et al. [9] and validated locally in Malaysia (33 items) [14]. The 10-items Malaysian short version of the Smartphone Addiction Scale (SAS-M-SV) was validated locally [15] which showed good internal consistency (Cronbach's alpha = 0.80) and high concurrent validity in parallel to Smartphone addiction scale Malay version–33 items, which their intra-class correlation was 0.941 (p-value < 0.001) [15]. In addition, SAS-M-SV is a reliable tool with a sensitivity of 70.2% and specificity of 72.5% [15]. In general, SAS-M-SV questionnaire is a self-completed, 6-point Likert scale with 10 items (1 = strongly disagree to 6 = strongly agree) reflecting the frequency of the symptoms. The total score of SAS-M-SV ranges from 10 to 60. Smartphone addiction is defined when the score test is more or equal to 36 points for male and 35 for female [15].

2.6 Statistical Analysis

All statistical analysis was done using the Statistical Package for Social Sciences (SPSS version 25; SPSS IBM, New York, USA). The continuous data were described as median and interquartile range. Categorical data are reported as proportions (percentage). Chi-square test was used for the categories or dichotomous predictors. All analyses were done with 95% confidence intervals (CI). The variable with p-value less than 0.25 [16] in univariate analysis were entered into multiple logistic regression analysis with a backward LR method. A multiple logistic regression analysis was then used to look for the predictors of smartphone addiction. The assumption of the multiple logistic regression has been fulfilled as the outcome was binary (smartphone addiction-yes or no). Second, there was no repeated measurement or matched data here. Third, the multicollinearity among the independent variables was small. The sample size is big we had 921 subject in our study.

3 Results

A total of 921 respondents were included in the study. Table 1 shows the percentages of the respondents according to socio-demographic characteristics. Mean age of adolescents was 16.4 ± 2.4 years old with half of the population was female (50.4%) with majority are Malay (74.6%). The median hours of smartphone use per week was 12 h (Interquartile range = 30). The prevalence of smartphone addiction among adolescents in this study was 37.1% (342/921) based on self-reported score using SAS-M-SV questionnaires. The frequency distribution of the 10-item of the questionnaire was shown in Appendix 1.

Table 1: Socio-demographic characteristics of respondents (n = 921)

Variables	n (%)
Adolescent's age, years	16.38 ± 2.4
Gender	
Male	457 (49.6)
Female	464 (50.4)
Ethnicity	
Malay	687 (74.6)
Chinese	67 (7.3)
Indian	43 (4.7)
Others	124 (13.4)
Father's education	
Secondary and below	426 (70.5)
Tertiary	178 (29.5)

(Continued)

Table 1 (continued)

Variables	n (%)
Mother's education	
Secondary and below	444 (71.4)
Tertiary	178 (28.6)
Monthly household income, Ringgit Malaysia†	3281 ± 3786
Do you own a smartphone	
Yes	853 (92.6)
No	68 (7.4)
Smartphone Addiction Score for male	
<36 (Without smartphone addiction)	286 (62.6)
≥36 (With smartphone addiction)	171 (37.4)
Smartphone Addiction Score for female	
<35 (Without smartphone addiction)	293 (63.1)
≥35 (With smartphone addiction)	171 (36.9)
Presence of smartphone addiction in total	
No	579 (62.9)
Yes	342 (37.1)
How long do you use your smartphones each week, hours	12 (Interquartile range = 30)

Note: Data are presented in either n (%), mean ± SD or median (Interquartile range); †1US Dollar = 4 Ringgit Malaysia.

Table 2 shows the association of the socio-demographic characteristics among adolescents with and without smartphone addiction using univariate analysis. Among those with smartphone addiction behaviour, they were associated with older age ($p = 0.002$) and longer period of smartphones use each week ($p < 0.001$). In addition, we found monthly household's income ($p = 0.191$) and mother's age ($p = 0.199$) may have possible association with smartphone addiction in adolescents for the reason that the p-value of these variables were < 0.25 in univariate analysis. Therefore, we included adolescent's age, smartphones use each week averagely, monthly household's income and mother's age in multiple regression analyse to seek for factors associated with smartphone addiction in adolescents.

Table 2: Association between socio-demographic factors with smartphone addiction using univariate analysis ($n = 921$)

Variables	Without smartphone addiction	With smartphone addiction	p-value
Gender			0.859
Male	286 (62.6)	171 (37.4)	
Female	293 (63.1)	171 (36.9)	
Ethnicity			0.463
Malay	430 (62.6)	257 (37.4)	
Chinese	43 (64.2)	24 (35.8)	
Indian	23 (53.5)	20 (46.5)	
Others	83 (66.9)	41 (33.1)	

Table 2 (continued)

Variables	Without smartphone addiction	With smartphone addiction	p-value
Father's education			0.396
Secondary and below	262 (61.5)	164 (38.5)	
Tertiary	116 (65.2)	62 (34.8)	
Mother's education			0.500
Secondary and below	274 (61.7)	170 (38.3)	
Tertiary	115 (64.6)	63 (35.4)	
Do you own a smartphone			0.268
No	47 (69.1)	21 (30.9)	
Yes	532 (62.4)	321 (37.6)	
Adolescent's age, years	16.2 ± 2.4	16.7 ± 2.3	<0.002*
Monthly household income, Ringgit Malaysia	3419 ± 4157	3047 ± 3041	0.191
Father's age, years	48.4 ± 8.5	48.7 ± 9.6	0.727
Mother's age, years	45.4 ± 6.3	46.0 ± 6.3	0.199
Duration of smartphones use each week averagely, hours	23.5 ± 33.8	34.3 ± 36.2	<0.001*

Note: Data are presented in either n (%) or mean ± SD* Indicates statistically significant.

Table 3 shows the predictors of smartphone addiction among adolescents using multiple logistic regression analysis. This study revealed that duration of smartphones use each week was the only significant predictor of smartphone addiction (OR = 1.005, CI = 1.000–1.009, $p = 0.039$).

Table 3: Predictors of smartphone addiction among adolescents using multiple regression analysis ($n = 921$)

Variables	OR	95% CI	p-value
Adolescent's age	1.070	(0.999–1.147)	0.054
	1.002	(0.977–1.029)	0.853
Smartphones use each week averagely	1.005	(1.000–1.009)	0.039*
Monthly household's income	1.000	(1.000–1.000)	0.443

Note: *Indicates statistically significant.

4 Discussion

Prevalence of smartphone addiction among adolescents in our study was 37.1%. This is surprisingly higher compared to studies done in other countries like Korea and India [2,5,6]. One study in South Korea among middle school students found that only 30.9% of adolescents were at risk of having smartphone addiction [2] while another study in the same country had a similar result of 35.2% of smartphone addiction [6]. Our prevalence also higher than a study among the Indian adolescents whereby 33.3% had smartphone addiction [5]. Moreover, when comparing our study to a study done among students in Switzerland, the result was even more drastic as a mere 16.9% of the respondents had

smartphone addiction [3] and a mere 10% in the United Kingdom had smartphone addiction [4]. Our study reported that 92.6% of the study population owned smartphone and this may explain the reason for the high prevalence of smartphone addiction. According to a local survey, percentage of smartphone users continued to increase from 68.7% in 2016 to 75.9% in 2017 with adolescents accounting for the highest adoption rate of smartphone owners (86.9%) [1]. Furthermore, the seriousness of smartphone addiction among Malaysian adolescents can be due to the result of inexpensive devices, peer pressure, subsidies, aggressive campaigns and promotions by smartphone service providers, affordable voice-data packages, increasing usage and dependence on smartphones-based applications [1]. In comparison to prevalence of smartphone use among adolescents from our neighbouring countries in Southeast Asia, we had fairly similar prevalent rate of smartphone addition among adolescents in Philippines (34.7%) [17] but much lower than in comparison to adolescents in Indonesia (44.9%) [18]. A possible explanation could be due to van Deursen et al., only involve adolescents aged 11 and 12 years; whereas the average age of adolescent in our study was 16.4 years. It is not surprising that older adolescents have higher self-awareness on the dangers of excessive smartphone use and better self-controlled of overly use of smartphone as compared to younger adolescents. This is supported by literatures which show a negative correlation between age and smartphone addiction [19–21].

Another factor contributing to high prevalence of smartphone addiction in adolescents could be due pattern of smartphone use of their parents. However, we did not capture duration of smartphone use among parents. Nevertheless, previous studies indicated not only adolescent but parents could also be subjected to over dependent on smartphone usage [22]. This in turn influences the adolescents to behave in a similar way as their parents.

Moreover, adolescents in our study spent around 12 h per week using their smartphone which is a lot more than the study done in Switzerland [3]. According to the study among Swiss population, longer duration of smartphone use was positively associated with smartphone addiction (more than 6 h: OR = 10.98, p-value < 0.01) [3]. Hence, that justifies the higher prevalence of smartphone addiction in our study.

Our study demonstrated the duration of smartphones use each week was the only significant predictor of smartphone addiction as longer duration of smartphone use weekly was 1.005 times more likely to have smartphone addiction. Previous study reported that more than half (70.4%) of smartphone user used smartphone longer than intended and as much as 66.5% of them engaged even longer duration without self-empowerment [23]. Even though they were using their smartphone for various reasons however there could be a manifestation of addiction behaviour in using smartphone. This could be supported (Appendix 1) by the fact that 50.1% of them could not achieve they daily work plan due to the use of smartphone (Item number 1 in SAS-M-SV), 46.4% of respondents had rated for a positive behaviour on item number 2 in SAS-M-SV which denoted for problem of having difficulty to concentrate in class and doing homework due to smartphone use. 62.5% of them had noticed they have had pleasant feeling when using smartphone (item number 3 in SAS-M-SV), 56.2% of them feeling confident when using smartphone (item number 4 in SAS-M-SV). 52.9% of respondents had rated for a positive behaviour on item numbers 9 and 10 in SAS-M-SV which denoted for problem in their fully charged smartphone's battery could not sustain in one day and problem in using smartphone longer than expected. Due to the above reasons, we could observe that adolescents with smartphone addiction have had unexplainable joy and pride when using smartphone even though smartphone was overly used and had severely interrupted their daily routine.

Our study reported that age of adolescents was not associated with smartphone addiction. There is a conflicting result compared to a study in Switzerland whereby smartphone addiction was more prevalent in young adolescents (15–16 years) compared with young adults (19 years and older). Consequently, owning a smartphone would further contribute to having smartphone addiction (p-value = 0.06).

Contradictory to our hypothesis, smartphone addiction was not related with gender even though one local study reported female gender as one of the predictors of smartphone addiction among medical students [14]. This is not the case for our study and the possible reason could be due to the female age (16.2 ± 2.3 years) in our population is relatively younger than male (16.6 ± 2.4 years) with p-value of 0.007. Nevertheless, these results are consistent with other studies that reported that smartphone addiction as not significantly related with gender [9,24–26].

Our present study has several strengths and some limitations. This is the first study of smartphone addiction among adolescents in Malaysia. The strength of our study is that it was done nationwide where the findings give a better generalization. Secondly, our sample size is large enough to investigate the correlation of smartphone addiction and the associated factors. This gives a more significant view of the relationship between age and smartphone addiction in the general population as compared to other studies with similar population [14,27]. A further strength of our study is the use of a validated SAS-M-SV questionnaire [15]. One of the limitations of our study is that smartphone addiction is not yet recognized by Diagnostic and Statistical Manual for Mental Disorders (DSM-5; American Psychiatric Association, 2013) thus there is no established diagnostic criterion for smartphone addiction in the spectrum of addiction disorder. In addition, we did not capture information on problematic smartphone use of adolescents' parents whom may have pronounced influent on their children. Therefore, interpretation of our analysis should be done cautiously.

In conclusion, the prevalence of smartphone addiction among adolescents in Malaysia was 37.1%, as almost four tenth of the adolescents was liable to having it. A significant association was link to longer duration of smartphone use are more susceptible to this issue. This new finding may reassure the importance of parental action on monitoring their children smartphone use.

References

1. Commission MCaM: Hand phone users survey year 2017 (2017). Kuala Lumpur: Malaysian Communications and Multimedia Commission.

2. Cha, S. S., Seo, B. K. (2018). Smartphone use and smartphone addiction in middle school students in Korea: Prevalence, social networking service, and game use. *Health Psychology Open, 5(1)*. DOI 10.1177/2055102918755046.

3. Haug, S., Castro, R. P., Kwon, M., Filler, A., Kowatsch, T. et al. (2015). Smartphone use and smartphone addiction among young people in Switzerland. *Journal of Behavioral Addictions, 4(4),* 299–307. DOI 10.1556/2006.4.2015.037.

4. Lopez-Fernandez, O., Honrubia-Serrano, L., Freixa-Blanxart, M., Gibson, W. (2014). Prevalence of problematic mobile phone use in British adolescents. *CyberPsychology, Behavior, and Social Networking, 17(2),* 91–98. DOI 10.1089/cyber.2012.0260.

5. Soni, R., Upadhyay, R., Jain, M. (2017). Prevalence of smart phone addiction, sleep quality and associated behaviour problems in adolescents. *International Journal of Research in Medical Sciences, 5(2),* 515–519. DOI 10.18203/2320-6012.ijrms20170142.

6. Lee, C., Lee, S. J. (2017). Prevalence and predictors of smartphone addiction proneness among Korean adolescents. *Children and Youth Services Review, 77(C),* 10–17. DOI 10.1016/j.childyouth.2017.04.002.

7. Panova, T., Carbonell, X. (2018). Is smartphone addiction really an addiction? *Journal of Behavioral Addictions, 7(2),* 252–259. DOI 10.1556/2006.7.2018.49.

8. Lee, H., Choi, Y. S., Lee, S. (2012). Mobile posture monitoring system to prevent physical health risk of smartphone users. *Proceedings of the 2012 ACM Conference on Ubiquitous Computing*, Pittsburgh, USA, 592–593.

9. Kwon, M., Lee, J. Y., Won, W. Y., Park, J. W., Min, J. A. et al. (2013). Development and validation of a smartphone addiction scale (SAS). *PLoS One, 8(2),* e56936. DOI 10.1371/journal.pone.0056936.

10. Thomée, S., Härenstam, A., Hagberg, M. (2011). Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults–a prospective cohort study. *BMC Public Health, 11(1),* 66. DOI 10.1186/1471-2458-11-66.

11. Alavi, S. S., Ferdosi, M., Jannatifard, F., Eslami, M., Alaghemandan, H. et al. (2012). Behavioral addiction versus substance addiction: Correspondence of psychiatric and psychological views. *International Journal of Preventive Medicine, 3(4),* 290–294.

12. Chóliz, M. (2012). Mobile-phone addiction in adolescence: The test of mobile phone dependence (TMD). *Progress in Health Sciences, 2(1),* 33–44.

13. Agency NIS: Survey on the side effect of Internet addiction (2013). Daegu: National Information Society Agency.

14. Ching, S. M., Yee, A., Ramachandran, V., Lim, S. M. S., Sulaiman, W. A. W. et al. (2015). Validation of a malay version of the smartphone addiction scale among medical students in Malaysia. *PLoS One, 10(10),* e0139337. DOI 10.1371/journal.pone.0139337.

15. Ching, S. M., Lee, K. W., Yee, A., Sivaratnam, D., Hoo, F. K. et al. (2020). The malay version of smartphone addiction scale: Development, factor structure and validation of a short form for Malaysian adolescents. *Medical Journal of Malaysia, 75(5),* 467–473.

16. Bursac, Z., Gauss, C. H., Williams, D. K., Hosmer, D. W. (2008). Purposeful selection of variables in logistic regression. *Source Code for Biology and Medicine, 3(1),* 17. DOI 10.1186/1751-0473-3-17.

17. Buctot, D. B., Kim, N., Kim, J. J. (2020). Factors associated with smartphone addiction prevalence and its predictive capacity for health-related quality of life among Filipino adolescents. *Children and Youth Services Review, 110,* 104758. DOI 10.1016/j.childyouth.2020.104758.

18. Dhamayanti, M., Dwiwina, R. G., Adawiyah, R. (2019). Influence of adolescents' smartphone addiction on mental and emotional development in West Java, Indonesia. *Behavioral Disorders, 51(1),* 46–52.

19. van Deursen, A. J., Bolle, C. L., Hegner, S. M., Kommers, P. A. (2015). Modeling habitual and addictive smartphone behavior: The role of smartphone usage types, emotional intelligence, social stress, self-regulation, age, and gender. *Computers in Human Behavior, 45,* 411–420. DOI 10.1016/j.chb.2014.12.039.

20. Horwood, S., Anglim, J. (2018). Personality and problematic smartphone use: A facet-level analysis using the five factor model and HEXACO frameworks. *Computers in Human Behavior, 85,* 349–359. DOI 10.1016/j.chb.2018.04.013.

21. Erdem, C., Uzun, A. M. (2020). Smartphone addiction among undergraduates: Roles of personality traits and demographic factors. *Technology, Knowledge and Learning, 27,* 579–597. DOI 10.1007/s10758-020-09467-1.

22. Grauers, J., Wall, E. (2012). *Preventing stress through smartphone usage*. Goteborgs University, The Swedish.

23. Subramani Parasuraman, A. T. S., Yee, S. W. K., Chuon, B. L. C., Ren, L. Y. (2017). Smartphone usage and increased risk of mobile phone addiction: A concurrent study. *International Journal of Pharmaceutical Investigation, 7(3),* 125–131. DOI 10.4103/jphi.JPHI_56_17.

24. Attamimi, A. (2011). The reasons for the prevalence of BlackBerry cellphones and the resulting educational effects from the perspective of secondary school students in Abo-dhabi. *Conference on the Negative Effects of Cellphones on Secondary School Students*, pp. 105–130. UAE.

25. Chung, N. (2011). Korean adolescent girls' addictive use of mobile phones to maintain interpersonal solidarity. *Social Behavior and Personality: An International Journal, 39(10),* 1349–1358. DOI 10.2224/sbp.2011.39.10.1349.

26. Prezza, M., Pacilli, M. G., Dinelli, S. (2004). Loneliness and new technologies in a group of roman adolescents. *Computers in Human Behavior, 20(5),* 691–709. DOI 10.1016/j.chb.2003.10.008.

27. Mad Lazim, H., Sasitharan, D. (2014). The smartphone technology acceptance among Malaysian young adults. *4th International Conference on Technology and Operations Management (ICTOM04)*, Kuala Lumpur.

Appendix

Appendix 1: Frequency distribution for 10 items of Malaysian short version of the Smartphone addiction scale

Item number	Questions	Generally disagree			Generally agree		
		1 = Sangat tidak setuju (Strongly disagree)	2 = Tidak setuju (Disgree)	3 = Agak tidak setuju (Slightly disagree)	4 = Agak setuju (Slightly agree)	5 = Setuju (Agree)	6 = Sangat setuju (Strongly agree)
Item 1	Kerja yang dirancang tidak dapat dilakukan akibat penggunaan telefon pintar	127 (13.8)	176 (19.1)	157 (17.0)	225 (24.4)	166 (18.0)	70 (7.6)
Item 2	Sukar memberi tumpuan dalam kelas, semasa membuat tugasan, atau semasa bekerja akibat penggunaan telefon pintar	134 (14.5)	196 (21.3)	165 (17.9)	209 (22.7)	164 (17.8)	53 (5.8)
Item 3	Berasa seronok dan teruja semasa menggunakan telefon pintar	55 (6.0)	102 (11.1)	188 (20.4)	317 (34.4)	192 (20.8)	67 (7.3)
Item 4	Berasa yakin semasa menggunakan telefon pintar	73 (7.9)	126 (13.7)	205 (22.3)	299 (32.5)	163 (17.7)	55 (6.0)
Item 5	Sentiasa terfikir tentang telefon pintar saya walaupun semasa saya tidak menggunakannya	179 (19.4)	239 (26.0)	212 (23.0)	184 (20.0)	87 (9.4)	20 (2.2)
Item 6	Saya tidak akan berhenti daripada menggunakan telefon pintar walaupun kehidupan harian saya sangat terganggu olehnya	170 (18.5)	227 (24.6)	245 (26.6)	175 (19.0)	82 (8.9)	22 (2.4)
Item 7	Terasa perit seperti kehilangan rakan jika tidak dapat meggunakan telefon pintar	262 (28.4)	251 (27.3)	165 (17.9)	144 (15.6)	78 (8.5)	21 (2.3)
Item 8	Berasa rakan di telefon pintar lebih memahami saya berbanding rakan sebenar	265 (28.7)	259 (28.1)	188 (20.4)	116 (12.6)	70 (7.6)	24 (2.6)
Item 9	Bateri telefon pintar yang telah dicaj penuh tidak dapat bertahan sehari	108 (11.7)	137 (14.9)	189 (20.5)	197 (21.4)	161 (17.5)	129 (14.0)
Item 10	Menggunakan telefon pintar lebih lama daripada yang saya jangkakan	84 (9.1)	147 (16.0)	202 (21.9)	285 (30.9)	140 (15.2)	63 (6.8)