Original Article

Differentiation of stress and depressive symptoms between university students with either addictive or non‑addictive smartphone behavior

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Abstract

The study aimed to determine the differences in stress and depression levels in students demonstrating behavior of smartphone addiction and students without smartphone addiction. The sample consisted of 460 university students nationwide in Thailand. The instruments used in the data collection were a demographic form, SAS-VS-T, SPST-20, and CES-D and the reliabilities were 0.958, 0.972, and 0.975, respectively. Data were analyzed and the stress and depression levels were compared in the participants based on independent *t*-test. According to the findings, it was shown that the males and females with addictive smartphone behavior spent more money and time on a smartphone than the males and females without addictive smartphone behavior. Furthermore, the stress and depression scores in the males and females with addictive smartphone behavior were statistically higher than the other group (t=16.223, P<0.000 vs. t=10.307, P<0.000).

1. Introduction

Over the past 10 years, smartphones have come to play increasingly important roles in people's lives. In fact, nowadays, we often see people holding and using their smartphones in restaurants, on the bus, sky train, and subway. Moreover, some people may feel that a smartphone is the fifth basic item that they simply cannot live without. In the modern world, smartphones can do much more than making a phone call. Rather, smartphones support many new forms of communication, such as Facebook, Twitter, Instagram, LINE, Myspace, or other channels. Furthermore, a survey report entitled "Digital in 2017" compiled by We Are Social, which is a renowned digital agency based in Singapore, presented statistics and information on the Internet and social media use worldwide from both collective and individual perspectives in countries across the world. In Thailand, over 34 million people were found to use social media through smartphones out of a total population of 68 million people (42.5%) (Kemp, 2017). Other findings have revealed smartphones as the most popular digital device and represents 64% of all digital devices used in this country. Moreover, Thai people spend nearly four hours daily playing or performing activities with their smartphones. Among the demographics the first use of smartphones is for online social communication. It was found that 9 million adolescents aged 13−19 years old use smart-phones for this purpose out of 38 million people surveyed from all age groups (Kemp, 2017).

Advances made in communication technology have totally changed the lifestyles of people in society. People in society now give greater importance to online social commu-nication than face-to-face communication with real people. Nearly the entire day of some people is spent staring at a smartphone screen for communication, or keeping up with news, or even conducting various transactions, all of which can be done on smartphones rather than going outside and

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taking part in activities in other places such as exercising, shopping in department stores, or performing other activities. With these changes in the lifestyles of people in society, it cannot be denied that smartphones help make people's lives more comfortable.

Nevertheless, smartphones not only create entertainment and increase our comfort, but also serve as a source for numerous physical and psychological health problems, such as the obvious symptoms of muscle inflammation and aches in the back, shoulders, arms or wrists which is generally called the office syndrome. These symptoms occur as a result of using smartphones for long periods in inappropriate postures without physical movements. Other potential symptoms include numb hands, inflamed ligaments, and locked fingers from smartphone use, which requires that hands and fingers remain tense at all times. Moreover, eye strain and headaches can be caused by constantly staring into brightly lit screens. People might also experience insomnia caused by anxiety of always wanting to know the news and activities in the social world (Leonard, 2016; The Physio Company, 2017; İNal, Demİrcİ, Çetİntürk, Akgönül, & Savaş, 2015; Yang, Chen, Huang, Lin, & Chang, 2017). In terms of frequently encountered psychological health problems, some examples are stress, anxiety, depression, lower self-esteem, poorer self-control, and decreased life satisfaction (Samaha & Hawi, 2016; Demirci, Akgönül, & Akpinar, 2015; Thomee, Harenstam, & Hagberg, 2011; Shapiro, & Margolin, 2014; Y. Touitou, D. Touitou, & Reinberg, 2016; Haug, Castro, Kwon, Filler, Kowatsch, & Schaub, 2015). Previous studies in Thailand on the correlations among smartphone addiction and physical and psychological health problems among adolescents are limited in scope, particularly concerning the correlations among smartphone addiction and psychological problems. It is well known that psychological health and physical health are related to each other. When psychological problems occur, they also bring physical problems. Moreover, some psychological problems, such as depression and stress, are one of the most important causes of self-harm and suicide in adolescents. Thus, the present study aimed at improving our understanding of the correlations between smartphone addiction and psychological health problems in adolescents with the intention of providing guidelines to prevent and resolve health problems in this group.

1.1 Research question

Are stress and depression levels different between university students with addictive smartphone behavior and university students with non-addictive smartphone behavior?

1.2 Research Objective

To study the differences between stress and depression levels between university students exhibiting addictive smartphone behavior and university students exhibiting non-addictive smartphone behavior

1.3 Hypotheses

1.3.1 Hypothesis 1

Stress and depression levels are different between university students exhibiting addictive smartphone behavior and university students exhibiting non-addictive smartphone behavior.

1.3.2 Hypothesis 2

Male university students exhibiting addictive smartphone behavior and male university students exhibiting non-addictive smartphone behavior have different levels of stress.

1.3.3 Hypothesis 3

Male university students exhibiting addictive smartphone behavior and male university students exhibiting non-addictive smartphone behavior have different levels of depression.

1.3.4 Hypothesis 4

Female university students exhibiting addictive smartphone behavior and female university students exhibiting non-addictive smartphone behavior have different levels of stress.

1.3.5 Hypothesis 5

Female university students exhibiting addictive smartphone behavior and female university students exhibiting non-addictive smartphone behavior have different levels of depression.

1.4 Research Scope

The present study was a cross-sectional descriptive design conducted in 460 subjects composed of male and female university students aged 18−25 years old nationwide in Thailand.

2. Materials and Methods

The present research was based on a cross-sectional descriptive design and aimed to study the differences between stress and depression levels in university students exhibiting addictive smartphone behavior and university students exhibiting non-addictive smartphone behavior. The participants were 460 male and female subjects from across Thailand. The inclusion criteria were adolescents aged between 18 and 25 years old. The exclusion criteria were participants who did not complete the questionnaires and participants diagnosed with depression.

2.1 Research instruments

The instruments employed in the research included four evaluation forms.

2.1.1 Sociodemographic interview Form

This evaluation form was constructed by the researcher and contained multiple choice and fill-in-the-blank questions covering gender, age, education, overall monthly income received from family, monthly telephone bills, time

spent using one's smartphone each day, and marital status of the parents.

2.1.2 Smartphone Addiction Scale-Short version-Thai-version (SAS-VS-T)

This instrument was developed by Kwon Kwon, Kim, Cho, & Yang (2013) to evaluate smartphone addiction. The researcher asked permission to translate the instrument into Thai (forward translation) and then asked a professional translator to retranslate the instrument from Thai back into English (backward translation) before asking another expert in translation/editing to verify the equivalency between the instruments. The reliability was 0.958. The questionnaire contained ten 6-point Likert scale questions (1 means "Highly Disagree" while 6 means "Highly Agree"). The scores ranged from 6 to 60 points. The cut-off points for the scores were determined according to the gender of the participant. If a male scored ≥ 31 points, the subject was considered to be addicted to smartphones. If a female scored ≥ 33 points, the subject was considered to be addicted to smartphones.

2.1.3 Center for Epidemiologic Studies-Depression Scale (CES-D)

The Thai version was developed by Umaporn Trankasombut (Trangkasombat, & Likanapichitkul, 1997). The CES-D scale is widely used to evaluate depression in adolescents and the reported reliability was 0.975. The scales are based on severity or frequency of depressive symptoms and have four levels (0 means no depression while 3 means depressed all the time). The scores ranged from 0 to 60 points. The cut-off point for the scores was 22 points. If the total the score exceeded 22 points, the subject was considered to be depressed.

2.1.4 Suangprung Stress Test-20

This instrument was developed by Suwat Mahat-nirankul (Department of Mental Health, Ministry of Public Health, Local Mental Health Survey Program Project, 2002) (Mahatnirunkul, Pumpaisanchai, & Tarpunya, 2002). This evaluative form assesses overall stress over the past six months using 5-point Likert scales (with 0 meaning no stress and 4 meaning the highest level of stress). Scores were translated into four levels with scores ranging from 0 to 23 points (low stress), 24 to 41 points (moderate stress), 42 to 61 points (high stress), and >62 points indicated severe stress and the reported reliability was 0.972.

2.2 Data collection

The researcher received approval for the research project from the Institutional Review Board on Research Involving Human Subjects, Thammasat University, Board No. 3, in the field of science. Next, the researcher contacted male and female university students aged 18−25 years through student representatives acquainted with the researcher and asked the candidates to invite people interested and willingly to participate in the research project by sending the QR code of the project. Documents were used to describe the project objectives and the researcher was available for contact by

telephone as well as the researcher's email, LINE, and Facebook addresses through Facebook, Twitter, Line, or email. The researcher sent questionnaires online (Google Forms) in addition to informed consent forms for participation in the research through Facebook, Twitter, LINE, and email. The online questionnaires were the Sociodemographic Interview Form, the Smartphone Addiction Scale-Short Version-Thai Version (SAS-VS-T), the Suanprung Stress Test-20 (SPST-20), and the Center for Epidemiologic Studies-Depression Scale (CES-D). To confirm the identity and make sure that the participants who returned the questionnaires were the same as the intended participant, the consent form also had to be returned. If the consent form was not returned, the questionnaire of that participant was removed. Once all of the information was obtained, the researcher subjected the data collected to statistical analysis using the Statistical Package for Social Sciences (SPSS) version 22. In those participants who had a higher score of stress or depression than the standard score, the researcher suggested that they see a doctor.

2.3 Data analysis

The researcher verified the integrity of all the data obtained from the record forms and then subjected the data to statistical analysis using the SPSS software package. The demographic data for the sample were analyzed using descriptive statistics (i.e., frequency, percentage, mean, and standard deviation). The sample scores obtained from the Smartphone Addiction Scale-Short Version-Thai Version (SAS-VS-T), Suanprung Stress Test-20 (SPST-20), and Center for Epidemiologic Studies-Depression Scale (CES-D) between university students with addictive smartphone behavior and university students with non-addictive smart-phone behavior were statistically analyzed using the independent t-test.

3. Results and Discussion

3.1 Demographic data of the sample

3.1.1 Demographics

The present study collected data from 460 subjects. A total of 232 subjects were male (50.4%) while 228 subjects were female (49.6%). The mean (SD) age was 19.45 (1.11) years. Over one-third of the sample (49.1%) lived in student dormitories (Table 1). The monthly telephone bills of the sample were different between the male and female university students exhibiting addictive smartphone behavior and those exhibiting with non-addictive smartphone behavior. Nearly half of the male university students with addictive smartphone behavior (48.6%) paid over 1,000 baht per month, while the majority of the male university students with non-addictive smartphone behavior paid under 1,000 baht per month. At the same time, about half of the female university students with addictive smartphone behavior paid over 1,000 baht per month and the majority of female university students exhibiting non-addictive smartphone behavior paid less than 1,000 baht per month (Table 2). The mean daily times spent by both the male and female university students were higher in the addictive smartphone behavior group than the mean daily times of the non-addicts (Table 3).

Table 1.   Demographic data.

Demographics	N=460 (n)	Percentage (%)
Gender		
Female	232	50.4
Male	228	49.6
Age (Years)		
18	103	22.4
19	126	27.4
20	176	38.3
21	39	8.5
22	4	0.9
23	12	2.6
Education		
Bachelor year 1	139	30.2
Bachelor year 2	121	26.3
Bachelor year 3	188	40.9
Bachelor year 4	12	2.6
Total monthly income from parents (baht per month)		
3,001–5,000	96	20.9
5,001–7,000	163	35.4
7,001–9,000	142	30.9
9,001 were statistically significantly higher 12,000	59	12.8
Telephone bills (baht per month)		
300–500	107	23.3
501–1,000	204	44.3
1,001–1,500	133	28.9
1,501–2,000	16	3.5
Time spent using smartphones (h/day)		
Less than 1 h	54	11.7
1–2 h	56	12.2
2–3 h	44	9.6
3–4 h	28	6.1
4–5 h	42	9.1
5–6 h	181	39.3
More than 6 h	55	12
Marital status of parents		
Married	236	51.3
Divorced	172	37.4
Widowed	52	11.3
Living situation		
With both parents	136	29.6
Father only	48	10.4
Mother only	50	10.9
Student dormitory	226	49.1

3.1.2 Analysis of the data from the stress and depression evaluation forms

1) Hypothesis 1

The mean stress scores of the male and female

university students with addictive smartphone behavior were higher than the non-addicts with scores at 60.25 and 61.73 points, respectively. On the other hand, the male and female university students who exhibited non-addictive smartphone behavior scored 41.30 and 40.83 points, respectively (Table 4). The male and female university students with addictive smartphone behavior had high stress and severe stress levels while the male and female university students with non-addictive smartphone behavior had moderate and high stress (Table 5). The findings indicated that the male and female university students who exhibited addictive smartphone behavior had higher mean depression scores than the non-addicts. The mean depression scores of the male and female university students who showed addictive smartphone behavior were 42.31 and 44.35 points, respectively, while the depression scores for the male and female university students with non-addictive smartphone behavior were 29.24 and 19.61 points, respectively (Table 6).

2) Hypothesis 2

In testing Hypothesis 2, the results of the comparison between the stress scores among the male university

Table 3.   Differences in time spent using smartphones (hours per day).

	Addictive		Non-addictive	
	Male	Female	Male	Female
Time spent using smartphones (h/day)	6.11	2.39	5.73	3.27

Table 4.   Suangprung Stress Test-20 Score.

	Normal Range	Addictive		Non-addictive	
		Male	Female	Male	Female
Stress score, mean	0–80	60.25	61.73	41.30	40.83

Table 5.   Stress levels by severity of stress.

	Addictive		Non-addictive	
	Male	Female	Male	Female
Stress				
Low	0	0	0	0
Moderate	0	0	56(45.5%)	56(77.8%)
High	64(58.7%)	88(56.4%)	67(54.5%)	4(5.6%)
Severe	45(41.3%)	68(43.6%)	0	0

Table 2.   Differences in telephone bills (baht per month).

		Addictive		Non-addictive	
		Male	Female	Male	Female
Telephone bills (baht per month)	300–500	0	39(25.0%)	32(26.0%)	36 (50%)
	501–1,000	56 (51.4%)	38 (24.4%)	86 (69.9%)	24(33.3%)
	1,001–1,500	49 (45%)	67 (42.9%)	5 (4.1%)	12 (16.7%)
	1,501–2,000	4 (3.6%)	12 (7.7%)	0	0

Table 6.   Center for Epidemiologic Studies-Depression Scale (CES-D) scores.

	Normal Range	Addictive		Non-addictive	
		Male	Female	Male	Female
CES-D score, mean	0–60	42.31	44.35	29.24	19.61

students exhibiting addictive smartphone behavior and the male university students exhibiting non-addictive smartphone behavior were obtained through two independent sample *t*-tests. The conclusion was that the male university students who exhibited addictive smartphone behavior and the male university students who exhibited non-addictive smartphone behavior had statistically significant different levels of stress (P<0.05) which was consistent with the research hypothesis.

3) Hypothesis 3

In testing Hypothesis 3, the results of the comparison between the depression levels of male university students exhibiting addictive smartphone behavior and the male university students exhibiting non-addictive smartphone behavior were obtained through two independent sample *t*-tests. The conclusion was that the male university students who exhibited addictive smartphone behavior and those who exhibited non-addictive smartphone behavior had statistically significant different levels of depression (P<0.05) which was consistent with the research hypothesis.

4) Hypothesis 4

In testing Hypothesis 4, the results of the comparison between stress score among female university students who exhibited addictive smartphone behavior and those who exhibited non-addictive smartphone behavior were obtained through two independent sample *t*-tests. The conclusion was that female university students with addictive smartphone behavior and female university students with non-addictive smartphone behavior had statistically significant different levels of stress (P<0.05) which was consistent with the research hypothesis.

5) Hypothesis 5

In testing Hypothesis 5, the results regarding the comparison between the depression levels in female university students exhibiting addictive smartphone behavior and female university students exhibiting non-addictive smartphone behavior were obtained through two independent sample *t*-tests. The conclusion that the female university students who exhibited addictive smartphone behavior and the female university students who exhibited non-addictive smartphone behavior had statistically significant different levels of depression (P<0.05) which was consistent with the research hypothesis.

4. Conclusions

The subjects in the present study consisted of 460

Table 7.   Comparison between the stress scores for the male university students exhibiting addictive smartphone behavior and those exhibiting non-addictive smartphone behavior.

	N	Mean (SD)	t	P value
University students exhibiting addictive smartphone behavior	109	60.26 (8.31)	16.223	0.000
University students exhibiting non-addictive smartphone behavior	123	41.31 (9.35)		

Table 8.   Comparison between the depression scores for male university students exhibiting addictive smartphone behavior and those exhibiting non-addictive smartphone behavior.

	N	Mean (SD)	t	P value
University students exhibiting addictive smartphone behavior	109	42.31 (7.06)	10.307	0.000
University students exhibiting non-addictive smartphone behavior	123	29.24 (11.89)		

Table 9.   Comparison of the stress scores between female university students exhibiting addictive smartphone behavior and that exhibiting non-addictive smartphone behavior.

	N	Mean (SD)	t	P value
University students exhibiting addictive smartphone behavior	156	61.74 (8.73)	10.372	0.000
University students exhibiting non-addictive smartphone behavior	72	40.83 (16.04)		

Table 10.   Comparison of the depression scores between the female university students exhibiting smartphone behavior and the female university students exhibiting non-addictive smartphone behavior.

	N	Mean (SD)	t	P value
University students exhibiting addictive smartphone behavior	156	44.35 (5.93)	12.865	0.000
University students exhibiting non-addictive smartphone behavior	72	19.61 (15.81)		

subjects. A total of 232 subjects were male (50.4%) and 228 subjects were female (49.6%) with a mean age of 19.45 years. More than one-third of the subjects were studying in the third year of their bachelor's degree courses (40.90%). The mean income that the sample received from family members ranged from 5,000 to 7,000 baht per month (35.4%). Approximately one-third of the subjects spent more than 1,000 baht each month on telephone bills (32.4%), while over half of the

sample spent more than five hours daily using their smart phones (51.3%), and nearly half of the sample lived in a student dormitory (49.1%). Additionally, the male and female university students who exhibited addictive smartphone behavior paid higher monthly telephone bills than the university students who exhibited non-addictive smartphone behavior. Moreover, the time spent on daily use of their smartphones by the male and female university students who exhibited addictive smartphone behavior was also greater than the university students who exhibited non-addictive smartphone behavior. Thus, the findings indicated that both time and telephone bills were the factors that reflected smartphone addiction among the university students.

The study compared the stress and depression levels of university students and found that the stress and depression levels among the male university students exhibiting addictive smartphone behavior and the male university students exhibiting non-addictive smartphone behavior were different. The mean stress and depression scores for the smartphone addicted students were statistically significantly higher than the male university students who were not addicted to smartphone behavior (t=16.223, P<0.000 vs. t=10.307, P<0.000). This finding was consistent with the study of the stress and depression levels among the female university students exhibiting addictive smartphone behavior and female university students exhibiting non-addictive smartphone behavior.

The mean stress and depression scores for the female university students exhibiting addictive smartphone behavior were found to be higher than the scores for the university students that exhibited non-addictive smartphone behavior with statistical significance (t=10.372, P<0.000 vs, t=12.865, P<0.000). The findings of this research confirmed and restated the clear severity of the impacts and problems caused by smartphone addiction. Stress and depression are important psychological symptoms requiring close care because these problems lead to a multitude of other serious problems, particularly suicide. Following adolescent development, it is known that one of the most important missions of all adolescents is to find their own identity and self-esteem. We can see that adolescents always compare themselves with others. Before the digital period, comparisons occurred between a real person and a real person who lived in the same vicinity, such as siblings in a family, classmates in school, or among athletes in a team. In contrast, nowadays, they compare themselves with others although they never know the lives of the other people very well. Self-esteem and identity frequently takes a hit when they start to compare themselves too much with others. One study showed that viewing selfies often led to decreased life satisfaction (Wang, & Haigh, 2017). Another study found that girls who spend more time looking at pictures on Facebook reported higher dissatisfaction and self-objectification (Gray, & Meter, 2014). Once self-esteem and identity are destroyed, consequent problems always occur, especially stress and depression. The findings of the present study are consistent with other studies on the relationships between smartphone addiction and physical and psychological health conditions. Smartphone addiction is a cause of many physical and psychological problems, particularly frequently-encountered psychological problems such as stress, anxiety, depression, lower self-esteem, reduced self-control, and lower satisfaction in life (Samaha & Hawi, 2016, Demirci, Akgonul & Akpinar, 2015; Thomee, Harenstam, Hagberg, 2011;

Shapiro & Margolin, 2014; Touitou, Touitou & Teinberg, 2017; Haug, Castro, Kwon, Filler, Kowatsch & Schaub, 2015). These problems can also be due to the fact that adolescence is the age of self-searching and seeking one's true self. However, the online social world is a form of fabricated society where everyone tries to present him or herself as outstanding, more attractive, better and wealthier than he/she is in reality. These things that adolescents see all the time might cause them to constantly compare their personal lives with the lives viewed online. This can lead to feelings of inferiority in terms of not being as good them, not being as attractive as others, or not being as capable as others. Eventually, this causes negative feelings about one's self and can lead to stress and depression.

5. Recommendations for Application of the Research Findings

The present research demonstrated that smartphone addiction is a major factor linked to stress and depression in smartphone addicts and nowadays we know quite clearly that these problems can bring more problems into the lives of the adolescents. Therefore, all parties involved, such as families, schools, communities, and society, should be aware and give importance to preventing and supervising the use of smartphones in order to ensure that smartphones are used within appropriate limits. Beginning with families, parents should give importance to talking or coming to an agreement with their children about their smartphone use from the start, even before purchasing a smartphone. Furthermore, for cases where smartphones have already been purchased, conversations must be had about the appropriate rules for smartphone use by children. Moreover, parents have to act as good role models in using smartphones because good examples are more valuable than words of teaching alone.

6. Recommendations for Future Research

Experimental studies should be conducted to create programs aimed toward limiting smartphone use among adolescents, combined with promoting knowledge and awareness about the impacts of excessive smartphone use. Furthermore, awareness should be raised on the part of parents and teachers concerning the significant problems and impacts that might result from excessive smartphone use in order to better resolve problems that might arise from excessive smartphone use among adolescents.

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