A study on the smartphone addiction and physical pain in the university students.

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Abstract

This study is a descriptive correlation study to identify the characteristics of smartphone usage, smartphone addiction, and physical pain in college students and to identify the correlation between variables. The subjects were college students attending G-University. The degree of addiction to the smartphone was 32.10, and sub-factors of a pathological commitment is 6.79 points (5 points scaled score of 1.86 points), living disorder 7.62 points (5 points scaled score 1.79 points), the loss control 8.70 points (5 points scaled score 2.19 points), compulsive symptoms 8.99 points (5 points score 1.72). Subjects who experienced physical pain smartphone use were 39.1%. Wrist, finger pain, and neck pain were in the order of joints. There was a statistically significant difference between the smoker's addiction and gender and daily average data usage time. As a result of examining the difference of smartphone addiction according to physical pain, the degree of addiction in the case of physical pain was 32.10 points. There were statistically significant differences between the subscales: pathological commitment of 6.79, life disorder of 7.62, loss of control of 8.70, and obsessive symptom of 8.99. We hope that this study will be used as basic data to improve symptoms of smartphone addiction and physical pain due to the use of smartphone.

Introduction

The domestic smartphone surge, but only after the first 800,000 people have been introduced the time in 2009, as of March 2015 smartphone subscribers has surpassed the approximately 4,126 ten thousand people [1].

As a smart phone is the daily necessity, it is playing various roles through penetrating the general routine such as SNS, messenger, music listening, and video viewing. Especially, the smart phone users are utilizing a smart phone in order to use contents such as app and internet surfing during niche time in daily life [2].

20's is a period of transition from adolescence to adulthood, in which individuals are physically and emotionally independent of their parents, map out specific plans for their lives and carry them out. In this period, however, depression and anxiety are compounded as academic stress and difficulties in employment and interpersonal relationships provoke psychological deprivation and emotional troubles [3].

University students account for 20.5% of adult smartphone addicts, up 2.4% from last year, and it's reported that they are relatively most vulnerable to addiction. Also, it's reported that college students who are at risk of smartphone addiction spend a mean of 5.5 h using smartphones on a daily basis and put more time into it than at-risk adults who spend 5.3 h. The average number of their daily smartphone use is 26.4, which is higher than that of elementary school students (19.6), middle school students (23.3) and high school students (23.5) [4]. They are able to use smartphones freely regardless of time and place, and unlike elementary and secondary school students, they are not under control or supervision. The frequency of their smartphone use is on the steady rise probably for these reasons [5].

Smartphone addiction is defined as a state that one experiences physical, psychological or social maladjustment or deviation due to excessive smartphone use, is overly reliant on or obsessed with smartphone use, can be satisfied when they make more use of smartphones, or feels anxious when they stop using them [6].

Kim defined it as a state that one has difficulty in daily lives because of smartphone overuse or flow, undergoes psychological anxiety on account of excessive dependence and seeks after relationship building in the cyberspace [7]. Shin defined it as obstacles to everyday life such as nervousness and anxiety, which stem from excessive smartphone flow [8]. The concepts of smartphone addiction have something in common that withdrawal, tolerance; virtual world orientation and daily living disorder are all included. In smartphone addiction, "withdrawal" is a phenomenon that one makes excessive use of a smartphone and feels anxious or nervous when it's not around

[9]. "Tolerance" is a symptom that one doesn't feel satisfaction even when using a smartphone a lot and falls into the habit of spending much time using it.

"Virtual world orientation" refers to a state that one concentrates his or her attention only on the virtual world instead of reality, and that communicating on the smartphone is far more comfortable and natural than being with families or friends [9].

The symptom of "daily living disorder" is that one finds himself or herself to be addicted to his or her smartphone and decides to spend less time using it but fails to do that. Another symptom is that one is under financial pressure because of excessive use, or does harm to others or is in conflict with them by failing to do what he or she has to do in class or at work.

Smartphone addiction gives rise to youth problems in various areas such as physical, mental and social ones. Adolescents who are more addicted to smartphones are in worse health, having a pain in the neck, shoulder or wrist. Smartphones come into their mind frequently even when they don't use them, and they often feel anxious or nervous when they aren't able to use them [10].

Moreover, a higher level of smartphone addiction may be accompanied by brain dysfunction phenomenon called "popcorn brain." and that is followed by losing touch with reality, deteriorated cognitive function and attention, a lack of self-control over particular actions and eventually symptoms like ADHD [11]. At the same time, it may cause eye fatigue, muscular pain or nervous system disorders, and it may lead to waning eyesight, dry eye syndrome, carpal tunnel syndrome, forward head posture, shoulder pain or upper limb pain [12,13].

Figuring out a research on a mental impact concerning the smart phone usage, the 'smart phone addiction' was mentioned to have a significant correlation with 'obsession,' 'anxiety,' 'hostility' and 'psychosis' and especially to have the highest correlation with 'psychosis' according to Rauschennberger [14]. Based on the research result that analyzed a relationship between the appearance of the smart-phone addicted usage and the scale of schizophrenia, it was indicated that there is a significant difference in 'schizophrenia' and 'hypomania' between the smart-phone addicted usage group and the non-addicted usage group [9]. Also, the adolescents with the smart phone addiction are being shown to be high in 'impulsiveness' and 'depression.' Compared to the non-addicted usage group, the addicted group was significantly high in 'schizophrenia' and 'hypomania' [15,16].

Inspecting the existing researches related to smart phone, those were released a research on a pain and an abnormal symptom in terms of the smart phone usage [17,18], a research on smartphone addiction and mental health [19,20].

Recently, researches on smart phones have been increasing and the scope of them has been expanding. However, research on smartphone addiction symptoms and physical symptoms of college students using smartphones has not been conducted. In this study, we investigated the characteristics of smartphone use, smartphone addiction, and physical pain in college students who were somewhat alienated from smartphone addiction. Identify the relationship between the variables and to form the basis of the intervention of the preferred smart phone use.

Research Method

Research design

This study is a descriptive correlation study to identify the characteristics related to smartphone usage, smartphone addiction and degree of physical pain of university students and to identify the correlation between variables.

Research subjects

The subjects of this study were: A University students in Kangwon province and university students in B University in Chungcheong province, the number of subjects was selected by referring to previous studies. The sample size was calculated using the G*power 3.1 program, the effect size was 0.20, significance level 0.05, power 0.95, and regression analysis. The dropout rate (15%) was taken into consideration, and the number of participants was 300. The final 277 questionnaires were analyzed except for the 23 questionnaires which were insufficient.

Research tools

1) Characteristics related to smartphone use: To identify the characteristics of the subject's use of the smartphone, the total usage period of smartphones, the usage period of current smartphones, the increase in the use time of the smart phone compared to 1 y ago, and the average daily use time of the calls, compared to 1 y ago, And average daily data usage time per day, average usage rate per month, places where smart phones are mainly used, times when smart phones are mainly used, and functions that are mainly used for smart phones.

2) Smartphone addiction: The addicts of the smartphone used Lee's 'Korean mobile phone addiction scale', which was modified by Park [21,22]. This instrument has four sub-factors, including pathological commitment, life disorder, loss of control, and compulsive symptoms a total of 25 questions. Each question means consists of a Likert scale 'not at all' from zero to "Strongly agree" with four points, the higher the score the sum of each item smartphone addiction is high. Cronbach's α was 0.905 at the time of tool development, and was 0.930 in Park's study and 0.949 in this study [22].

3) Physical pain: Physical pain associated with smartphones are Kim et al. [23] studies the National Occupational Safety and Health Institute based; continued (NIOSH National Institute of Occupational Safety and Health) is symptoms more than a week at least to define or pain for the "if you experience this past year one or more symptoms lasting at least neck, shoulder, elbow, wrist, fingers at least once a month (pain,

tingling, stiffness, burning sensation, numbness or tingling crumbling). In the case of having a pain, it was divided into 4 points from 'no pain' to 0, 'weak pain', 'middle pain', 'severe pain' and 'very severe pain'.

Procedure of data collection

The data collection period of this study was from April 1, 2017 to June 30, 2017 before collecting the data, the purpose of the study, the data collection, and the method of discarding the data at the end of the study were explained, and then the questionnaire was conducted after receiving the written consent from the person who wanted to participate. Explain that the questionnaire can be discontinued when withdrawing from the study during the questionnaire preparation, and guided that there is no disadvantage. The average time spent in the questionnaire was 10~15 min.

Statistical analysis

The collected data were analyzed using the SPSS 21.0 program, and the details are as follows.

The general characteristics of the subjects, the characteristics related to the use of the smartphone and degree of physical pain analyzed by frequency, the percentage was calculated, and smartphone addiction was calculated as mean and standard deviation.

Physical pain according to the general characteristics and smartphone related characteristics of the subjects was performed a chi-square test and symptoms of smartphone addiction were analyzed using t-test, ANOVA test, Duncan test.

The correlation between the degree of pain in the body parts of the subjects and the symptoms of addiction to the smartphone was analyzed using Pearson's correlation.

Research Results

Subject's smartphone addiction and physical pain

The degree of addiction to the smartphone was 32.10 (± 18.40), and the sub-factor were pathological commitment 6.79 (± 4.41) points (range 0-18, score 51.86), life disorder 7.62 (± 5.27) points (range 0-20, score 51.79), loss of control 8.70 (± 4.49) points (range 0~20, score 52.19 points) and obsessive symptoms 8.99 (± 5.68 points) (range 0~26, score 5 points 1.72 points). The highest score of control loss and the lowest score of compulsive symptom score (Table 1).

As a result of checking the physical pain of the subject, 108 subjects (39.1%) had physical pain. Joint neck pain were 96 subjects (34.9%), shoulder pain were 84 subjects (30.3%), arm pain were 65 subjects (23.5%), wrist pain were 66 subjects (23.8%), finger pain were 50 subjects (18.1%), the most frequent subjects with neck pain. Degree body-specific pain in the neck 3.00 (± 1.09) points, shoulders, 2.39 (± 1.28) points, the arm is 2.28 (± 1.03) points, the wrist is 1.65 (± 0.48) points the finger point is 1.97 (± 0.93). The neck pain was the highest (Table 2).

Table 1. Physical pain and smartphone addiction according to general characteristics and characteristics of smartphone usage.

Variables	Categories	Physical Pain				X^2	p	Addiction		t or F	p
		Yes		No				Mean ± SD			
Gender	Male	21	24.1%	66	75.9%	11.99	0.001	25.76 ± 17.45		-3.98	<0.001
	Female	87	46.0%	102	54%			35 ± 18.13			
Age (y)	<25	97	39.8%	147	60.2%	0.74	0.692	33.04 ± 18.13		2.71	0.068
	25~29	9	37.5%	15	62.5%			24.96 ± 17.70			
	≥ 30	2	25%	6	75%			25.75 ± 24.38			
Religion	None	65	41.1%	93	58.9%	1.59	0.811	29.92 ± 18.79		1.6	0.204
	Protestant	30	38.5%	48	61.5%			34.68 ± 18.47			
	Catholic	5	27.8%	13	72.2%			31.28 ± 17.93			
	Buddhist	6	40%	9	60%			32.73 ± 18.76			
	Others	2	28.6%	5	71.4%			30.46 ± 18.35			
Grade	First grade	25	33.3%	50	66.7%	3.5	0.174	34.89 ± 18.94		0.42	0.795
	Second grade	45	46.4%	52	53.6%			32.73 ± 15.60			
	>Third grade	38	36.5%	66	63.5%			27.43 ± 17.45			
Satisfaction with school life	Very satisfaction	3	14.3%	18	85.7%	9.09	0.059	29.38 ± 19.59		1.27	0.282

		n	%	n	%	χ²	p	Mean ± SD		F	p
	Satisfaction	29	37.2%	49	0.628%			30.68 ± 17.47			
	Usually	65	45.8%	77	54.2%			33.31 ± 18.19			
	Dissatisfaction	8	30.8%	18	69.2%			35.54 ± 18.12			
	Very dissatisfaction	3	33.3%	6	66.7%			22.7 ± 25.13			
Using smartphone	Elementary school	4	40%	6	60%			29.3 ± 18.37			
	Middle school	47	39.8%	71	60.2%	1.8	0.616	34.16 ± 18.18		1.15	0.328
Starting point	High school	44	41.9%	61	58.1%			31.52 ± 17.26			
	>20 y	13	30.2%	30	69.8%			28.51 ± 21.41			
	1-3	10	25.6%	29	74.4%			33.95 ± 18.37			
Smartphone usage period (y)	3-5	35	40.2%	52	59.8%	4.99	0.172	29.97 ± 17.56		1.65	0.179
	5-7	47	45.2%	57	54.8%			34.59 ± 19.03			
	≥ 7	16	34.8%	30	65.2%			28.87 ± 18.11			
Using calls	Yes	50	36.2%	88	63.8%	0.97	0.324	33.33 ± 18.64		1.26	0.263
Increase	No	58	42%	80	58%			30.86 ± 18.13			
Daily average call	<30 min	44	41.5%	62	58.5%			30.64 ± 18.21			
	30 min~1 h	23	34.8%	43	65.2%			34.06 ± 17.71			
Usage time	1 h-1 h 30 min	17	37.8%	28	62.2%	1.16	0.884	31.53 ± 19.46		0.77	0.546
	1 h 30 min-2 h	9	45%	11	55%			29 ± 19.44			
	>2 h	14	36.8%	24	63.2%			35.18 ± 18.54			
Using data	Yes	90	40.9%	130	59.1%	1.44	0.23	32.63 ± 18.10		0.91	0.34
Increase	No	18	32.1%	38	67.9%			30 ± 19.54			
Daily average	<1	14	40%	21	60%			25.5 ± 18.83	a	6.67	
	1-2 h	15	31.9%	32	68.1%			25.26 ± 17.54	a	(a<b<c)	
Data usage time	2-3 h	25	33.3%	50	66.7%	4.72	0.317	30.15 ± 17.40	b		<0.001
	3-4 h	23	50%	23	50%			36.8 ± 17.34	c		
	>4 h	31	42.5%	42	57.5%			38.79 ± 17.71	c		
	<30,000 won	8	30.8%	18	69.2%			29.65 ± 20.68			
	3-50,000 won	26	35.6%	47	64.4%			30.09 ± 19.10			
Monthly average rate	5-70,000 won	43	0.478	47	0.522%	4.96	0.292	34.02 ± 17.81		0.84	0.504
	7-90,000 won	14	0.318	30	0.682%			30.61 ± 17.96			
	>90,000 won	17	0.395	26	0.605%			34.51 ± 17.48			

Smartphone addiction and physical pain according to general characteristics of the subject and characteristics related to smartphone use

As a result of examining the difference of physical pain according to the general characteristics of the subjects and the characteristics related to the use of the smartphone, the physical pain was different according to gender (Table 1). There were 21 men (24.1%) and 87 women (46.0%) in the gender, and women were more likely to have physical pain than men, with a statistically significant difference (χ^2=11.99, p=0.001). There were statistically significant differences in smartphone addiction according to gender and daily average data usage time, women were male 25.76 (± 17.45) points, female 35.00 (± 18.13) was higher than that in men there was a statistically significant difference (t=-3.98, p<0.001). Average data use is that the use of less than an hour of data 25.50 (± 18.83), 1~2 h 25.26 (± 17.54) points, 2-3 h 30.15 (± 17.40) points, 3-4 h 36.80 (± 17.34) points, and 38.79 (± 17.71) points for more than 4 h, a statistically significant difference (F=6.67, p<0.001). Post-test results is less than one hour and the lowest collective use of 1 to 2 h, higher smartphone

addiction scores as a group in order to use more than 2-3 h groups, 3 to 4 h and 4 h of use.

Table 2. *Physical pain and level of addiction.*

Variables	Yes	No	Mean ± SD	Range
Physical pain	108 (39.1)	168 (60.9)		
Neck	96 (34.9)	179 (65.1)	1 ± 1.55	0~4
Shoulder	84 (30.3)	193 (69.7)	0.48 ± 1.12	0~4
Arm	65 (23.5)	212 (76.5)	0.55 ± 1.10	0~4
Wrist	66 (23.8)	211 (76.2)	0.39 ± 0.74	0~2
Finger	50 (18.1)	227 (81.9)	0.45 ± 0.94	0~4
Addiction			32.1 ± 18.40	0~79
Pathological commitment			6.79 ± 4.41	0~18
Living disorder			7.62 ± 5.27	0~20
Loss of control			8.7 ± 4.49	0~20
Compulsive symptoms			8.99 ± 5.68	0~26

Table 3. *The difference between addiction symptoms of physical pain.*

Variables	Physical pain			
	Yes	No	t	p
Addiction	36.3 ± 17.91	29.59 ± 18.16	3.01	0.003
Pathological commitment	7.3 ± 4.36	6.51 ± 4.41	1.46	0.146
Living disorder	8.75 ± 5.14	6.93 ± 5.23	2.83	0.005
Loss of control	9.94 ± 4.28	7.96 ± 4.43	3.67	<0.001
Compulsive symptoms	10.31 ± 5.77	8.19 ± 5.45	3.09	0.002

Difference of smartphone addiction due to physical pain

Were confirmed smartphone addiction in accordance with the physical pain, addiction scores (t=3.01, p=0.003), living disorder (t=2.83, p=0.005), loss of control (t=3.67, p<0.001) and compulsive symptom score (t=3.09, p=0.002) were statistically significant. In the case of physical pain, addiction is 36.30 (± 17.91) points; living disorders 8.75 (± 5.14) points, loss of control 9.94 (± 4.28) points, compulsive symptoms, 10.31 (± 5.77) points higher than in the absence of pain (Table 3).

Discussion

The subjects in this study got 32.10 in smartphone addiction level (in a range of 0 to 79, equal to 2.03 out of 5). This is a little lower than the score 2.19 of nursing college students who were investigated in a study (a range of 1-4, 2.85 out of 5) [22]. This corresponds to the finding of another study that college students who didn't major in nursing scored lower in smartphone addiction than nursing majors [23].

Among the sub-factors, they got 6.79 in pathological commitment (a range of 0-18, 1.86 out of 5); 7.62 in living disorder (a range of 0-20, 1.79 out of 5); 8.70 in a loss of control (a range of 0-20, 2.19 out of five); 8.99 in compulsive symptoms (a range of 0-26, 1.72 out of 5). They scored highest in a loss of control, followed by pathological commitment, living disorder and compulsive symptoms. This coincides with the findings of a study that university students who weren't nursing majors scored highest in tolerance and got the second highest score in living disorder [24].

As a result of measuring the physical pain of the students that resulted from smartphone use, the rate of the students who experienced physical pain stood at 39.1%. This is higher than the rate in Eom's study that stood at 18.8%, and the difference seemed to be attributed to an increase in smartphone user groups [25].

By the region of joint, neck pain was experienced by 96 (34.9%); shoulder pain, by 84 (30.3%); arm pain, by 65 (23.5%); wrist pain, by 66 (23.8%); finger pain, by 50 (18.1%). The largest number of the students had a pain in the neck, and the number of the students who had a pain in the finger was smallest. As for the level of pain by the area of the body, they got 3.00 in the neck area; 2.39 in the shoulder; 2.28 in the arm; 1.65 in the wrist; 1.97 in the finger. When the wrist pain score was added by the finger pain score, the total was 3.62, which showed that the pain in the hand area was strongest. This coincides with the finding of a study that the pain score in the hand/wrist/finger was highest, followed by that in the neck, shoulder and arm/elbow [25].

Whether there were any differences in physical pain according to their general characteristics and characteristics related to smartphone use was analyzed. As a result, there were gender differences in physical pain. 21 men (24.1%) and 87 women (46.0%) answered they had a physical pain. The women who had a physical pain outnumbered the men who did, and the difference was statistically significant (χ^2=11.99, p=0.001). Lots of studies established that women complained of more symptoms related to musculoskeletal diseases [25,26]. The reason that women suffer from more pain seems that they are more active in expressing themselves, and that their muscular strength is weaker than that of men. Differences in the distribution of muscular fibers and in physiological factors including hormone seem to be another reason [27]. There were statistically significant differences in smartphone addiction according to gender and average daily hours for smartphone data use. By gender, the men got 25.76, and the women got 35.00. The women scored higher than the men, and the difference was statistically significant (t=-3.98, p<0.001). The women who suffered from physical pain and who were more addicted to smartphones outnumbered the men who did.

As for average daily hours for smartphone data use, the students who used smartphone data for less than an hour got 25.50; for 1 or 2 h, 25.26; for 2 or 3 h, 30.15; for 3 or 4 h, 36.80; for 4 h or more, 38.79. The differences were statistically significant (F=6.67, p<0.001). This corresponds to the finding of a study that made an analysis of variance after dividing

adolescent smartphone users into three groups according to hours for smartphone use and found the students who used smartphones a lot were more addicted than the students who didn't [28].

Whether there were differences in smartphone addiction according to physical pain was analyzed. As a result, their addiction scores statistically significantly varied (t=3.01, p=0.003). Among the sub-factors, statistically significant differences were found in scores in living disorder (t=2.83, p=0.005), a loss of control (t=3.67, p<0.001) and compulsive symptoms (3.09, p=0.002). The students who had a physical pain got 32.10 in addition level (a range of 0-79, 2.03 out of 5). To be specific, they got 6.79 in pathological commitment (a range of 0-18, 1.86 out of 5); 7.62 in living disorder (a range of 0-20, 1.79 out of 5); 8.70 in a sense of loss (a range of 0-20, 2.19 out of 5); 8.99 in compulsive symptoms (a range of 0-26, 1.72 out of 5). The students who suffered from physical pain scored higher than the others who didn't. This coincides with the finding of a study that excessive smartphone use which is attributed to smartphone addiction brings about physical pain and takes a great toll on physical function by making the user keep inclining his or her head for a long time, by putting pressure on muscles and frame and eventually by turning the C-shaped cervical vertebral into a straight one or making the user take a forward head posture [29].

In this study, the characteristics of smartphone usage, the symptoms of smartphone addiction, and the degree of physical pain in college students were investigated and correlations between variables were analyzed. We hope that this study will be used as basic data to improve the symptoms of smartphone addiction and physical pain due to the use of smartphone.

Conclusion

This study is a descriptive correlation study to identify the characteristics of smartphone usage, smartphone addiction, and physical pain in college students and to identify the correlation between variables. The subjects were college students attending G-University. The degree of addiction to the smartphone was 32.10, and sub-factors of a pathological commitment is 6.79 points (5 points scaled score of 1.86 points), living disorder 7.62 points (5 points scaled score 1.79 points), the loss control 8.70 points (5 points scaled score 2.19 points), compulsive symptoms 8.99 points (5 points score 1.72). Subjects who experienced physical pain smartphone use were 39.1%. Wrist, finger pain, and neck pain were in the order of joints. There was a statistically significant difference between the smoker's addiction and gender and daily average data usage time. As a result of examining the difference of smartphone addiction according to physical pain, the degree of addiction in the case of physical pain was 32.10 points. There were statistically significant differences between the subscales: pathological commitment of 6.79, life disorder of 7.62, loss of control of 8.70, and obsessive symptom of 8.99. We hope that this study will be used as basic data to improve symptoms of smartphone addiction and physical pain due to the use of smartphone.

Conflict of Interest

The authors report no conflicts of interest related to this study. The author does not have any financial interest in the companies whose materials are included in the article.

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