

A Study on Correlation Analysis of Smart Phone Addiction and Age Groups in Korea

Woochun Jun

Professor, Dept. of Computer Education, Seoul National University of Education, Korea
wocjun@snue.ac.kr

Abstract

As information and communication technology develops, it brings various benefits to our lives. However, information and communication technology has had various side effects in our lives. Representative side effects include internet addiction, smartphone addiction, copyright violation, personal information infringement, cyber bullying and hacking. Recently, smart phone addiction rate is increasing with the spread of smart devices in Korea. In this study, we analyze the correlation between age group and smartphone addiction. In order to obtain fair and objective results, statistical analysis was performed based on the national statistical data of the National Information Society Agency. The results showed that the infant group and the adult group were correlated with the smartphone addiction rate. In this study, we analyzed the causes of smartphone addiction for different age groups. We also discuss dangers of smartphone addiction for different age groups. In additions, we proposed various ways to prevent and cure smartphone addiction for infants, adults, and senior citizen group. The results of this study are expected to be widely used as a remedy for smartphone addiction and future smartphone addiction research works.

Key words: *Smartphone Addiction; Internet Addiction; Information and Communication Ethics; Information and Communication Technology; Correlation, Addiction Prevention; Addiction Treatment*

1. INTRODUCTION

The development of the latest information and communication technology and smart technology has provided various benefits to modern people. Adolescents as well as adults own and use a variety of smart devices, PCs and laptops, and have come across a variety of information in real time. Also, as information and communication technology and smart technology are used in all areas of daily life, the use and literacy of information technology is becoming an essential capability of modern people.

Information and communication technology offers a variety of benefits, but also causes various side effects. These side effects, which did not appear before the information society, are causing various problems in our society along with the rapid spread of information culture. These side effects occur in various ways, such as cyber crime, personal information leakage, internet addiction, smartphone addiction, cyber gambling addiction,

copyright infringement. These side effects cause a variety of problems such as seclusion and maladjustment in the real world, and it is becoming a national responsibility to provide and operate treatment programs along with various preventive measures.

Among these side effects, smartphone addiction is causing a lot of problems. Unlike other side effects, smartphone addiction affects various social members and ages, and smartphone addiction causes various physical problems including brain diseases, and mental problems[1-5].

In Korea, each year National Information Society Agency has announced nation-wide internet addiction and smartphone addiction status report since 2004. The agency has reported smartphone addiction status since 2011. According to status reports[6-10], smartphone addiction rate has been increasing gradually. This is due to the increasing distribution of smartphones and the increasing use of smartphones in everyday life. Smartphone addiction, as discussed earlier, causes a variety of physical, emotional and social side effects. Smartphone addiction is particularly harmful to teenagers. Teenagers not only lack the ability to control smartphone use, but also cause a variety of academic problems.

The purpose of this paper is to investigate correlation between age groups and smartphone addiction. We divide age groups into 4 groups: infant(age 3-9), teenager(age 10-19), adult(age 20-59), and senior citizen(age 60-69), respectively. Based on correlation between smartphone addiction rate and various age groups, we analyze the causes of smartphone addiction and provide various preventive and healing measures for different age groups.

The rest of this paper is organized as follows. In Section 2, we introduce related works. We discuss the introduction of smartphone addiction and present related research works. In Section 3, we present correlation analysis between age groups and smartphone addiction rate. In Section 4, we present the causes of smartphone addiction and various prevention and healing measures for different age groups. Finally, in Section 5, we conclude our works and introduce further research works.

2. RELATED WORKS

2.1 Introduction of Smartphone Addiction

Smartphone addiction is defined as various ways. Comprehensively smartphone addiction is described as follows. In [11], smartphone addiction is a dependent and compulsive behavior by excessive use of smartphones, and when the smartphone is not present, it feels compulsive symptoms such as anxiety and nervousness. In addition, too much immersion in the use of the smartphone causes problems in everyday life. Also, features of behavioral addiction, such as failure to control smartphone use can appear.

In [6], the term ‘smartphone overdependence’ is used. Smartphone overdependence is a state in which salience is increased, self-control is failed, and serious consequence is experienced. Salience means that life patterns using smartphones in personal life are more prominent and most important activities than other behaviors. Also, self-control failure implies poor self-regulation of smartphone usage against user's subjective goals. On the other hand, serious consequence means continuous use of a smartphone despite experiencing negative consequences physically, psychologically and socially due to the use of a smartphone.

Smartphone overdependence is measured using the following standards. To reduce confusion in terms, the meaning of overdependence and addiction is considered the same in this paper. First, for infants, the following standards are used as in Table 1.

Table 1. Smartphone Addiction Test Standards for Infants

Factor	Standards
Self-control Failure	① I follow parental guidance on smartphone use. ② I finish smartphone use well in accordance with the set time. ③ I can stop smartphone use without taking it away
Saliency	④ I always want to play with my smartphone ⑤ I like to play with my smartphone more than anything else ⑥ I try to use my smartphone from time to time.
Serious Consequence	⑦ I often fight with my parents because of the smartphone. ⑧ Smartphones interfere with other games and learning. ⑨ My eyesight or posture is poor due to the use of smartphones.

On the other hand, for teenagers, adults, and senior citizens, the following standards are used as in Table 2.

Table 2. Smartphone Addiction Test Standards for Teenagers, Adults, and Senior Citizens

Factor	Standards
Self-control Failure	① Every time I try to reduce my smartphone time, it fails ② It is difficult to control the smartphone usage time ③ It is hard to keep proper usage time for smartphones
Saliency	④ If a smartphone is next to me, it's difficult to focus on other tasks. ⑤ Smartphone thoughts do not leave my mind ⑥ I strongly feel the urge to use my smartphone
Serious Consequence	⑦ I have had health problems because of smartphone use ⑧ I had a hard time fighting with my family because of my smartphone ⑨ I have experienced severe conflicts in my friends, colleagues or social relationships because of my smartphone ⑩ I have difficulties in carrying out work (study or job) due to smartphone

2.2 Previous Works

There have been many research works for real or potential danger from smartphone addiction[12-17]. We introduce some of the results as follows.

In [12], they examined whether narcissistic disposition and fragmented personality traits play a mediating role in smartphone addiction affecting the relational aggression of middle school girls. The major findings are as follows. First, smartphone addiction showed a significant positive correlation with narcissistic propensity, fragmented personality traits and relational aggression. Second, narcissistic disposition played a full role in the process of smartphone addiction affecting relational aggression. Third, in the relationship between smartphone addiction and relational aggression, fragmented personality traits played a partial

mediation role.

In [13], the study analyzes the structural relationship between smartphone addiction, resilience, aggression, and school adaptation. In this study, a research model was established based on the factors inferred to be related to adolescents' smartphone addiction, and the relationships among variables were analyzed based on the collected data. The results showed that smartphone addiction has a significant effect on aggression and school adaptation through the media of resilience. The direct path to aggression and school adaptation of smartphone addiction was not significant, but it was interpreted as a result of the emphasis on the importance of resilience. As a result, resilience was found to completely mediate the relationship between aggression and school adaptation of smartphone addiction.

In [14], the purpose of this study is to verify the relationship between smartphone addiction and offline delinquency in adolescents, and to examine the mediating effects of online delinquency on the relationship between two variables. As a result, the more teenagers with high smartphone addiction, the more online flight and offline flight. The higher the online flight, the higher the offline flight. However, the direct relationship between smartphone addiction and offline flights has not been verified. Therefore, online delinquency has proved to be completely mediating in the relationship between smartphone addiction and offline delinquency of adolescents.

In [15], the purpose of this study was to analyze the effects of adolescents' smartphone use motivation on smartphone addiction and the moderating effect of social support. The main results of the study are as follows. First, the motivation for pursuing information among smartphones was negatively affected by smartphone addiction, and the motivation for pursuing entertainment had a positive effect on smartphone addiction. Second, social support has a negative effect on smartphone addiction. Third, social support was found to have a moderating effect on relationship driving motivation and static, and time spending motivation.

In [16], the purpose of this study was to investigate the effects of digital literacy of children and adolescents, smartphone addiction level of mothers, parental interventions of mothers, and digital literacy of mothers. The results are as follows. First, the higher the mother's smartphone addiction level, the higher the child's smartphone addiction level, while the higher the mother's functional digital literacy level, the lower the child's smartphone addiction level. In addition, mother intervention was not related to children's smartphone addiction level, but the media-critical communication between peer group, which is one of the control variables, showed negative relationship with smartphone addiction level. They confirmed that the role of peers may be more important than mothers.

There have been some research works regarding correlation between internet addiction (and smartphone addiction) and various social groups [17-19]. We introduce some results as follows.

In [17], they investigated the correlation between dual-income family home children and internet addiction. The statistical analysis showed that although the internet addiction rate of dual-income families was higher than that of single-income families, there was no significant correlation between the double-income families and internet addiction.

In [18], correlation between internet addiction and smartphone addiction of teenagers is investigated. According to the analysis, it is concluded that there is a significant correlation between internet addiction and smartphone addiction for teenagers.

In [19], the purpose of this study was to investigate correlation between internet addiction and occupations. Statistical analysis showed no significant correlation between occupation and internet addiction. In other words, among the five occupational groups, there was a high and low internet addiction rate by occupation group, but there was no statistical correlation between occupation and internet addiction.

3. PAPER TITLE AND AUTHOR INFORMATION

In this Section, we present a statistical analysis on correlation between age groups and smartphone addiction.

3.1 Analysis Data and Tool

For the correlation analysis of this paper, we used national-wide statistical data from National Information Society Agency(<http://www.nia.or.kr>)[6-10]. The agency has announced internet addiction status report since 2004. The report is based on nation-wide samples all over Korea. The agency has also reported smartphone addiction status report since 2015.

For objective analysis, the agency has collected various data based on gender, occupation, age groups, etc. Also, for accurate analysis, the agency has adopted a household visit survey method. Sample size has been increasing gradually. According to the latest report[6], sample size includes 10,000 households(28,575 interviewee). Also, survey period was 3 months.

In this study, the collected data of this study were analyzed using SPSS WIN 25.0 program. Our concern in this study is to analyze correlation between smartphone addiction and 4 different age groups. As we mentioned earlier, 4 age groups are infant(age 3-9), teenager(age 10-19), adult(age 20-59), and senior citizen(age 60-69), respectively.

3.2 Smartphone Addiction Survey Data

Smartphone addiction rate based on statistical data from National Information Society Agency[6-10] is summarized as in Table 3 and Table 4, respectively.

Table 3. Overall Smartphone Addiction Rate by Year

Year	Smartphone Addiction Rate
2011	8.4%
2012	11.1%
2013	11.8%
2014	14.2%
2015	16.2%
2016	17.8%
2017	18.6%
2018	19.1%

Table 4. Smartphone Addiction Rate by Age Group

Year	Infant	Teenager	Adult	Senior Citizen
2015	12.4%	31.6%	13.5%	-
2016	17.9%	30.6%	16.1%	11.7%
2017	19.1%	30.3%	17.4%	12.9%
2018	20.7%	29.3%	18.1%	14.2%

As we can see from above table 3, overall smartphone addiction rate has been increasing year by year. From the table 4, smartphone addiction rate of all age groups except teenager has been increasing as well. It is interesting that smartphone addiction rate of teenager group has been decreasing gradually. It is noted that survey on smartphone addiction rate for infant group has started since 2015. On the other hand, survey on smartphone addiction rate for senior citizen group has started 2016.

In this research, we are interested in correlation between smartphone addiction and age groups. In order to achieve this purpose, we set the following hypothesis.

Hypothesis 1: There is a correlation between smartphone addiction rate and infant group.

Hypothesis 2: There is a correlation between smartphone addiction rate and adult group.

Hypothesis 3: There is a correlation between smartphone addiction rate and senior citizen group.

3.3 Correlation Analysis Results

After a statistical analysis, the following results are obtained. First, for the correlation between infant group and smartphone addiction, the analysis results are shown in table 5.

Table 5. Correlation between Infant Group and Smartphone Addiction

Division	Smartphone Addiction Change
Infant Group Smartphone Addiction Change	0.991** (0.009)

** p<.01

The change trend of smartphone addiction in infant group showed a statistically significant correlation with the trend of smartphone addiction ($r = .991$, $p < .01$). Therefore, it can be seen that hypothesis 1, 'the smartphone addiction rate and the infant group addiction rate have a correlation' was supported.

Second, for the correlation between teenager group and smartphone addiction, the analysis results are shown in table 6. The change trend of smartphone addiction in teenager group showed a negative correlation with the trend of smartphone addiction ($r = -.959$, $p < .05$).

Table 6. Correlation between Teenager Group and Smartphone Addiction

Division	Smartphone Addiction Change
Teenager Group Smartphone Addiction Change	-0.959* (0.041)

* p<.05

Third, for the correlation between adult group and smartphone addiction, the analysis results are shown in table 7.

Table 7. Correlation between Adult Group and Smartphone Addiction

Division	Smartphone Addiction Change
Adult Group Smartphone Addiction Change	1.000** (0.000)

*** p<.001

The change trend of smartphone addiction in adult group showed a statistically significant correlation with the trend of smartphone addiction ($r = 1.000$, $p < .001$). Therefore, it can be seen that hypothesis 2, 'the smartphone addiction rate and the adult group addiction have a correlation' was supported.

Finally, for the correlation between senior citizen group and smartphone addiction, the analysis results are shown in table 8.

Table 8. Correlation between Senior Citizen Group and Smartphone Addiction

Division	Smartphone Addiction Change
Senior Citizen Group Smartphone Addiction Change	0.989 (0.099)

The change trend of smartphone addiction in senior citizen group did not showed a statistically significant correlation with the trend of smartphone addiction ($r = .989$, $p > .05$). Therefore, it can be seen that hypothesis 3, 'the smartphone addiction rate and the senior citizen group addiction have a correlation', was not supported.

4. ANALYSIS OF RESULTS

In this section, we discuss causes of smartphone addiction for different age groups. We also discuss the dangers of smartphone addiction for different age groups.

4.1 Infant Group

According to [6], characteristics of infant smartphone addiction are shown as follows.

- Boys are more vulnerable to smartphone addiction than girls.
- Infants between the ages of 6 and 9 are more vulnerable to smartphone addiction than those between the ages of 3 and 5.
- Infants with both parents working are more vulnerable to smartphone than those with only one income.

For infant group, the main cause of smartphone addiction results from their parents[20]. It means that easily handing parents' smartphone to their child to soothe a crying child at home or in public or to free up personal time has led to a child's smartphone addiction. For example, children are constantly exposed to smartphones because parents take their time and give their smartphones to children everywhere, including restaurants, homes and public transportation.

According to [20], excessive use of smartphones at an early stage can seriously affect growth. The impact of electromagnetic waves generated by smartphones or the deterioration of vision caused by watching digital screens for a long time is a concern. In addition, the process of personality formation can be a major obstacle. If a smartphone is used for a long time during an infant's time when the brain needs to develop evenly, there is a risk that it will develop only visually. Especially, one-way communication with a smartphone rather than face-to-face interaction can cause serious social and emotional development of infants, leading to a lack of attention later on.

4.2 Adult Group

In [6], characteristics of adult smartphone addiction are shown as follows.

- Adult women are more vulnerable to smartphone addiction than adult men
- Smartphone addiction rate by age: 20s > 30s > 40s > 50s

The reason of higher smartphone addiction rate in adult women is analyzed as follows. In [11], it is reported that the high rate of smartphone addiction among female teenagers seems to be related to the rapid increase in social network service(SNS) usage among female teenagers. Also, women focus more on sharing emotions through smartphones than men, and have a higher desire to communicate with others, so they are easily addicted to smartphones that can communicate easily. Also, the younger the smartphone addiction rate is higher because the younger the age group uses smartphones more.

According to a work[21], the main causes of smartphone addiction are stress, depression, and anxiety, which

are similar to alcohol or drug addiction. The survey of university students showed that they use smartphones twice as much as ordinary people when they find stress, depression and anxiety. Smartphone addiction was 2.19 times higher in people with high stress, 1.91 times higher in people with depression and anxiety over a year, and 2.24 times higher in people with suicidal thoughts.

4.3 Senior Citizen Group

According to [6], characteristics of senior citizen smartphone addiction are shown as follows.

- Senior men are more vulnerable to smartphone addiction than adult women
- Senior citizens with jobs are more vulnerable to smartphone addiction than those without jobs.

The reason of higher smartphone addiction rate of senior men is that senior men are more active and engaged in various social activities. Reason of higher smartphone addiction rate of senior citizens with jobs are also explained as same. That is, senior citizens with jobs seem to be more active and engaged in social activities including their job activities.

According to [22], dangers of smartphone addiction for senior citizens are as follows. Older people have difficulty using smartphones due to ageing or fine hand tremors, so they can feel more tired even if they use them for a short period of time. The risk of pain in the neck or wrist is also greater than that of young people. The use of smartphones by older people can also adversely affect eye health. With the function of the tear glands off, it is also easy to experience symptoms of dry eye syndrome in proportion to the time of smartphone use. Excessive use can lead to cataracts, a condition in which the lens becomes congested and blurred vision. Older people often stick out their heads to see the screen of smartphones due to eye problems. However, neck disc can often occur if the neck posture is maintained for a long period of time. Since the degenerative changes in the disk have progressed compared to younger people, it is easy to develop into pain and illness even if they strain it a little bit.

5. CONCLUSIONS AND FURTHER RESEARCH WORKS

With the spread of smart devices, we can enjoy various benefits in our lives, but there are also various side effects. A typical side effect of smartphones is smartphone addiction. In particular, smartphones have become necessities in our lives and smartphone addicts is growing every day and getting serious. Smartphone addiction can occur at any age and can cause a variety of mental, physical and social problems.

The main purpose of this study is to identify the correlation between age group and smartphone addiction. Also, based on correlation results, the causes of smartphone addiction are analyzed by age, and various preventive measures and remedies are presented. To this end, correlation was analyzed based on national statistical data.

Correlation analysis results are as follows. The analysis of the correlation between four age groups -- infants, teenagers, adults and senior citizens -- and smartphone addiction rates with the infant and adult groups. In other words, the higher the smartphone addiction rate, the higher the addiction rate for infants and adults. Based on these results, the causes of smartphone addiction among infant, adult and senior citizen groups were analyzed. Prevention and treatment measures for 3 age groups are also proposed.

The future research works of this study are as follows. First, it is to analyze the causes of smartphone addiction by subdividing each age group more and also suggest various remedies. Second, it is now to develop and verify a relatively simple existing smartphone addiction diagnosis standards in more detail.

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