

Impact of Personal Time-Related Factors on Smart Phone Addiction of Female High School Students

Chan Jung Park, Jung Suk Hyun, Jung Yoon Kim, and Kyong Eun Lee

Abstract—Technology gives human beings good effects such as convenient everyday life. However, it also gives the people bad effects such as technology addiction. Among them, smart phone addiction has become severe these days especially to adolescent. In addition, many research works presented that female students are addicted more than male students. In this paper, in order to develop an educational method for them not to be addicted seriously, we analyze female high school students' personality traits and value such as abstract thinking, mindset, regulatory fit, and time perspective. We defined these traits and value as the time-related factors of the students in this research. And then, we analyze how each of the factors affects on their smart phone addiction. Finally, we show the relationships among the 4 factors and smart phone addiction with a structural equation modeling. By showing the results of our research, educators can find a way how to prevent them from smart phone addiction.

Index Terms—Personality traits and personal value, the behavior identification form, promotion focus, smart phone addiction, future time perspective

I. INTRODUCTION

TECHNOLOGY addiction problem has been treated important, especially in the education field of secondary schools, because adolescent is more vulnerable to the addiction. Internet addiction was an important issue a few years ago. However, smart phone addiction has become a more serious problem recently. In order to prevent the addiction and to provide new educational methods for the secondary school students, many researchers have proposed various kinds of research works such as new addiction measurement scales and the environmental or personal factors that cause the addiction so far [1][2]. This research is interested in the personality traits and the personal value that

affect the smart phone addiction of female high school students. Personality traits are defined as a person's stable patterns of behavior, thoughts, and emotions, whereas personal values can be defined as stable broad life goals [3]. The values can guide the person's judgement and behavior.

On the other hand, Professor Kramer proposed a research work about abstraction's role in computing in 2007 [4]. According to the research, abstraction level is the key to a model design and its implementation. A person's abstract thinking ability is necessary to devise formal models for analyzing programs and for programming [4]. And then, due to the advent of Professor Dweck's self-theory, a person's mindset was divided into two types: fixed and growth. Professor Dweck analyzed the relationship between the academic achievements and the mindsets of students [5]. Also, Professor Murphy and Thomas surveyed their students' behavior when the students met programming errors in their programming course in order to find out the relationship between computer science education and mindset [6]. According to them, a student's growth mindset was more important than his/her intelligence to program well during the programming education [6].

Next, the regulatory focus theory of Professor Higgins suggested that people have two different types of regulatory focuses: promotion and prevention [7]. According to his theory, promotion-focused people are more likely to be sensitive to the gain and the loss of positive results, whereas prevention-focused people are more likely to be sensitive to the gain and the loss of negative results [8]. Promotion-focused people prefer changes than stabilities.

Time perspective provided by Professor Zimbardo is the value about time and is different from individual to individual [9]. Individuals partition the flow of their experiences into time zones. Professor Zimbardo proposed a new individual psychological construct, i.e. time perspective, and defined it as 6 categories; past negative time perspective, past positive time perspective, present fatalistic time perspective, present hedonic time perspective, future time perspective, and transcendental future time perspective [9]. According to his research works, the future time perspective is desirable and the present hedonism is not always bad. He pointed out that people should have the present hedonism in some degree [9]. The time perspective also affected to improve the quality of life and to decrease depressive symptoms of adolescent [10]. Since academic outcomes are influenced by the future time perspective, the research [11] recommended having a positive attitude toward the future for

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C. J. Park is with the Department of Computer Education, Jeju National University, Jeju-do, 690-756 Republic of Korea (e-mail: cjpark@jejunu.ac.kr).

J. S. Hyun is with the Department of Management Information Systems, Jeju National University, Jeju-do, 690-756 Republic of Korea. (corresponding author to provide phone: 82-64-754-3184; fax: 82-64-724-3138; e-mail: jshyun@jejunu.ac.kr).

J. Y. Kim is with the Department of Management Information Systems, Jeju National University, Jeju-do, 690-756 Republic of Korea (e-mail: toki55@naver.com).

K. E. Lee is with the Department of Management Information Systems, Jeju National University, Jeju-do, 690-756 Republic of Korea (e-mail: kelee@jejunu.ac.kr)

the high level of academic achievement.

The factors mentioned in the previous paragraphs are influential for people to act and make decisions. A person’s abstract thinking style, mindset, and regulatory fit belong to the person’s personality traits, whereas the person’s time perspective is the person’s personal value. Recently, a few research works have analyzed the relationship between personal factors and addictions separately. In one of the Professor Higgins’s research [12], the relationship between regulatory fit and hedonic pursuit was analyzed. In the Förster et al.’s research [13], time perspective and abstract thinking were presented. Professor Crews et al.’s research [14] analyzed abstract thinking and addiction in substance abuse. Hyun et al.’s research [15] analyzed how adolescent’s regulatory fit, time perspective, and mindset were changed based on their age and mobile phone addiction. Kim et al.’s research [16] considered time perspective, abstract thinking, and mindset with smart phone addiction. However, the research focused on present time perspective and smart phone addiction. Since regulatory fit is related to mindset, if we consider all the 4 factors together with smart phone addiction and if we find out the structural relationship among the factors, then we can understand the relationship among the smart phone addiction and the time-related factors for female students more accurately.

In this paper, we consider the 4 personal factors such as abstract thinking, growth mindset, future time perspective, promotion-focus, and then analyze how they affect with each other and how they affect the smart phone addiction of female high school students in Korea. In Korea, female students’ smart phone addiction levels are higher than those of male students. Thus, we chose female students as the respondents of our survey. We surveyed 203 female students of a general girls’ high school and analyzed the research results with Structural Equation Modeling.

II. BACKGROUND

In this paper, we define the personality traits as abstract thinking ability, growth mindset, and promotion-based regulatory fit. And, we define the personal value as future time perspective. Next, we adopt the scale for measuring smart phone addiction proposed in [18].

A. Abstract Thinking

Thinking Styles can be divided into two categories: thinking globally (abstract) or locally (concrete). As already mentioned in Section I., Professor Kramer proposed that abstract thinking is important to solve problems [4]. Abstract thinking can also affect to students’ academic achievement. One of the methods to measure thinking styles is the Behavior Identification Form (BIF) [17]. Professor Vallacher and Wegner developed 25 items to measure action identification, which have two alternatives; one is abstract and the other is concrete [17][19]. The following Table I shows the example items of the BIF [19]. In this paper, we give 0 score for concrete interpretations and 1 score for abstract interpretations. And then, we sum the scores and define as the level of abstract thinking.

TABLE I
QUESTIONS OF THE BIF

Questions	Alternative 1	Alternative 2
Making a list	a. Getting organized	b. Writing things down
Reading	a. Following lines of print	b. Gaining knowledge
Joining the Army	a. Helping the Nation's defense	b. Signing up
Washing clothes	a. Removing odors from clothes	b. Putting clothes into the machine
...

B. Growth Mindset

In Professor Dweck’s self-theory, people’s mindset types are divided into 2: the fixed mindset and the growth mindset. According to the theory, people who have the growth mindset usually have a tendency to embrace challenges and to learn from failure [5]. In this paper, we gave 5 questions that asked if human’s intelligence is fixed or changeable (developed). The growth mindset was measured using the items described in [4] as follows:

- *You have a certain amount of intelligence, and you can't really do much to change it.*
- *No matter who you are, you can significantly change your intelligence level.*
- *No matter how much intelligence you have, you can always change it quite a bit.*
- *You can always substantially change how intelligent you are.*
- *You have a certain amount of talent, and you can't really do much to change it.*

C. Promotion Focus

Regulatory fit proposed by Professor Higgins is the self-regulatory mechanism that affects human’s thoughts, affection, and behavior [7]. According to the theory, there are two groups: promotion focus and prevention focus. A promotion-focused person is likely to pursue the better state than now. And thus, s/he can increase the possibility to fulfill the objectives because s/he focuses on the positive outcome. On the other hand, a prevention-focused person is likely to maintain the current stable status because s/he does not want to have a negative outcome. We asked 9 questions to measure our respondents’ promotion focus levels in this paper. The questions are obtained from [20] and listed in the following:

- *I frequently imagine how I will achieve my hopes and aspirations.*
- *I often think about the person I would ideally like to be in the future.*
- *I typically focus on the success I hope to achieve in the future.*
- *I often think about how I will achieve academic success.*
- *My major goal in school right now is to achieve my academic ambitions.*
- *I see myself as someone who is primarily striving to reach my "ideal self"—to fulfill my hopes, wishes, and aspirations.*
- *In general, I am focused on achieving positive outcomes in my life.*
- *I often imagine myself experiencing good things that I hope will happen to me.*
- *Overall, I am more oriented toward achieving success than preventing failure.*

D. Time Perspectives

The research about time perspectives has been performed by Professor Zimbardo and his fellow so far. According to his theory about time, having future time perspective is helpful for people to live successful life and for their happiness [21]. In a Professor McInerney's research, having future time perspective is important for students to achieve their academic goals. We use the questions describe in (<http://www.thetimeparadox.com/zimbardo-time-perspective-inventory/>) for this research. And then, we calculate the value for the future time perspective with the method described in [8]. The measurement items are as follows:

- *I believe that a person's day should be planned ahead each morning.*
- *If things don't get done on time, I don't worry about it.*
- *When I want to achieve something, I set goals and consider specific means for reaching those goals.*
- *Meeting tomorrow's deadlines and doing other necessary work come before tonight's play.*
- *It upsets me to be late for appointments.*
- *I meet my obligations to friends and authorities on time.*
- *I take each day as it is rather than try to plan it out.*
- *Before making a decision, I weigh the costs against the benefits.*
- *I complete projects on time by making steady progress.*
- *I make lists of things to do.*
- *I am able to resist temptations when I know that there is work to be done.*
- *I keep working at difficult, uninteresting tasks if they will help me get ahead.*
- *There will always be time to catch up on my work.*

III. CORRELATION ANALYSIS

In this Section, we present the result of the correlation analysis to show how much they are correlated with each other. Our respondents were 203 female high school student of a general girls' high school located in Jeju Island of Republic of Korea.

Table II shows the results. For the smart phone addiction, all the 4 factors have negative correlations (growth mindset: -.29, future time perspective: -.39, BIF: -.35, promotion focus: -.24) and all are statistically meaningful. Also, all the 4 factors are positively correlated with each other. In addition, all are statistically meaningful ($p < .001$) except the relation between BIF and growth mindset.

TABLE II
 CORRELATION (PEARSON) COEFFICIENTS AMONG THE INPUT COGNITIVE FACTORS AND SMART PHONE ADDICTION

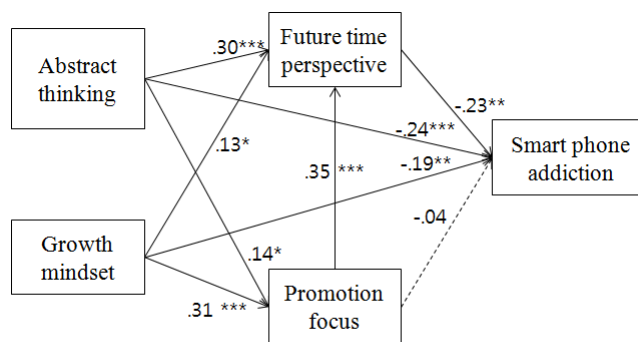
		Growth mindset	Future time perspective	Abstract thinking	Promotion focus
Smart phone addiction	Coef.	-.29	-.39	-.35	-.24
	P	<.001	<.001	<.001	.001
Growth mindset	Coef.		.28	.10	.33
	P		<.001	.142	<.001
Future time perspective	Coef.			.37	.45
	P			<.001	<.001
Abstract thinking	Coef.				.17
	P				.014

Based on the relationships shown in Table II, we performed a structural equation modeling in the following

Section.

IV. STRUCTURAL EQUATION MODELING

In this Section, in order to examine the relationship among the personal time-related factors and smart phone addiction, we propose a model as shown in Fig 1. And then, we analyze the result with the Structural Equation Modeling [22]. From the previous research [5][7][12][13][15], we knew that there existed a positive or negative relationship between two factors. The research [15] is similar to this research. However, it considered abstract thinking, mindset, and present and future time perspectives. In the research [15], time perspectives affected abstract thinking and growth mindset because the authors considered that people's value determines their personality traits. However, according to Parks-Leduc et al.'s research [3], the personality traits also affect the personal value. In this research, we considered the reverse direction among growth mindset, abstract thinking, and future time perspective. Fig. 1 shows the proposed model of our research.



Note: * : $\alpha < .05$, ** : $\alpha < .005$, *** : $\alpha < .001$.

Fig. 1. The proposed model of our research

This research used AMOS 18.0 for the structural equation modeling. As the parameter estimation method, we apply maximum likelihood estimation. The sample size was 203, and there were no missing data. The evaluation method of the hypothesized model uses fit indexes. As $\chi^2(1) = 2.17$ ($p < .14$), the model fits well with the data. The hypothesized model appears to be a good fit to the data. The goodness-of-fit index (GFI) = .99, the Adjusted GFI (AGFI) = .94, the comparative fit index (CFI) = .99, the Tucker-Lewis fit index (TLI) = .92, and the RMSEA = .07. Those values indicate a good fit between the model and the observed data.

The regression coefficients are described in Fig. 1. Abstract thinking ($\beta = .30$, $p < .001$), growth mindset ($\beta = .13$, $p = .032$), and promotion-focus ($\beta = .35$, $p < .001$) affect future time perspective positively. Abstract thinking ($\beta = .14$, $p = .032$) and growth mindset ($\beta = .31$, $p < .001$) also affect promotion-focus positively. In summary, adolescent's thinking style and mindset affect to have a future time perspective and to be promotion-focus. In other words, if the abstract thinking level of a student is higher, then she has a more future-oriented time perspective. Also, she is more promotion-focus.

However, for smart phone addiction, future time perspective ($\beta = -.23$, $p = .001$), abstract thinking ($\beta = -.24$, $p < .001$), and growth mindset ($\beta = -.19$, $p = .004$) had negative

relationships respectively. However, promotion- focus had no relationship with smart phone addiction. There was no multi-collinearity because their VIF (variance inflation factor) values were between 1.08 ~ 1.24 (< 4).

The meanings of the results from the structural equation modeling analysis are as follows: (i) personality traits such as abstract thinking, growth mindset, and promotion-focus affect future time perspective (personal value) positively. And then, future time perspective affects smart phone addiction negatively. Thus, if a student's time value is future-oriented, then her smart phone addiction value is low. Also, as a student's abstract thinking ability is higher, the growth mindset value is higher, and she focuses on positive outcomes more, her time perspective becomes more future-oriented. In addition, as a student's abstract thinking ability is higher and the student has a higher degree of growth mindset, her smart phone addiction level is lower. Thus, it is important for the adolescent to think abstraction, have a future-orientation in time value, and have a promotion-focus for preventing from smart phone addiction.

It is very important to prevent the adolescent from technology addiction because the addiction affects the adolescent's academic achievement [15][25][26]. In fact, even though we did not describe the relationship between smart phone addiction and academic achievement from our survey, we obtained the result that smart phone addiction negatively affected the respondents' academic achievement levels when we performed a regression analysis with the respondents' academic achievements and the smart phone addiction value ($F=7.20$, $t=-2.68$, $p=.008$, $\beta=-.19$).

V. CONCLUSION

In this paper, we started reviewing the relationship between personality traits and personal values. And then, we focused the abstract and concrete thinking style, the growth mindset, and the promotion-focused fit as the students' personality traits. Also, we focused the future time perspective as the students' personal value. All these factors have temporal features, especially future, in a sense. Abstraction is related to distant future positively [23]. The growth mindset is related to the possibility of the intelligence development in the future [5]. The promotion-focused people act for the future positive outcome (goal-oriented) [8]. The addiction is also related to the present in a temporal aspect. Thus, we found out that the three cognitive traits affect the future time perspective, and then all the factors except the promotion-focus affect the smart phone addiction negatively. One of the features of the promotion-focus is related to risk-taking [24]. The risk-taking is also related to the present hedonic time perspective. This feature lowered the relationship between the promotion-focus and the smart-phone addiction.

As already mentioned in the Introduction Section, the adolescent is more vulnerable to technology addiction than adults. Thus, technology addiction is a quite serious problem to them. In order to prevent the addiction problem, educators should devise new methods for our adolescent to have a long time horizon.

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