



The Mediating Effect of Digital Literacy on the Relationship between Smartphone Use Motives and Life Satisfaction for Senior Citizens in Korea

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Abstract

Background: The purpose of this study was to verify the effects of smartphone usage motives on life satisfaction in older adults, and to examine the mediating effect of digital literacy in the relationship between smartphone use motives and life satisfaction.

Methods: Data from 2004 participants of the 2018 Smartphone overdependence survey were analyzed by structural equation modeling.

Results: Smartphone use for communication had a positive impact on life satisfaction, and smartphone use for leisure negatively influenced life satisfaction. However, smartphone use for information seeking was not directly related to life satisfaction. Communication and information-seeking use motives positively influenced digital literacy, but smartphone use for leisure did not affect. Digital literacy was also positively related to life satisfaction. Finally, communication use motives influenced life satisfaction partially mediating digital literacy, and smartphone use for information seeking influenced life satisfaction, fully mediating digital literacy.

Conclusion: By explaining how smartphone use motives significantly affect senior citizens' life satisfaction, this study established the further meaningfulness of digital literacy.

Keywords: Smartphone use motives; Digital literacy; Life satisfaction; Senior individuals

Introduction

According to The Korea Media Panel Survey of Korea Information Society Development Institute (1), the penetration rate of smartphones among Koreans aged six years and over was 90.9% in 2018. In particular, the penetration rate among senior citizens aged 55 yr and over was 69.1%. In recent decades, smartphone penetration rate has

increased rapidly, and many studies have been conducted to analyze the negative impact of smartphone overuse on mental health (2,3). However, the high-risk group of smartphone addiction is 2% of the total population (4) and it is also true that most people use smartphones in their daily life. Recently, the increase of research on the positive effects of smartphone use reflects this phenomenon, and studies have focused



on the impact of smartphone use on life satisfaction and psychological well-being (5,6). The Uses and Gratifications theory of media use assumes that people use media to satisfy unmet needs (7,8). People are using smartphones for various motives such as information seeking, interactions with others, and entertainment (9). In particular, interaction with others, one of humans' basic needs, is one of the main purposes of smartphone use (10), and is closely related to life satisfaction and subjective well-being (11). Life satisfaction refers to subjective satisfaction in major areas of life such as interpersonal relationships, work, and leisure (12).

Smartphone use motives refer to the purpose of smartphone use and, in general, researchers distinguish smartphone usage motives as information seeking, leisure (or entertainment), and communication type (13,14). Smartphone use motives are related to psychological well-being and life satisfaction. In particular, smartphone use for communication with others was shown to have a positive impact on psychological well-being (5,11,15). In modern society, online activities using smartphones are very important for interpersonal communication and participation in the community. In particular, smartphones may play an important role in experiencing intimacy with others and interacting with social communities, for the elderly who have reduced social activities (16). Experiencing bonds with others and a sense of belonging with society is a key factor in life satisfaction, and smartphone use for communication may positively enhance life satisfaction (9,17).

Few studies examine the relationship between smartphone use for information seeking, and leisure and life satisfaction, and the relationship among the variables remains unclear. In a study, of 1,715 college students, information need was positively associated with social participation, while entertainment need had no impact on social participation (14). In college students, smartphone use for information seeking was not related to psychological well-being (9).

People can use smartphones to gather information anywhere, anytime. In particular, for senior citizens, seeking information by using smartphones may help improve life satisfaction by providing the necessary information on major areas of life, such as health and economy (18). In addition, smartphones provide a variety of apps that can make use of leisure time. Listening to music, viewing videos, or playing games on smartphones provides pleasure, but as the use of smartphones for leisure increases, users are more likely to experience difficulties in self-control, and academic and occupational achievement may be hindered; as a result, psychological satisfaction may be reduced (13,19).

Previous studies have encountered the following problems in the methodology. First, as the frequency and time of smartphone use increased, smartphone dependence increased in many studies (2). Therefore, it is necessary to control smartphone dependence due to smartphone overuse to accurately understand the relationship between the smartphone usage motive and life satisfaction. However, previous studies have verified the relationship between the variables through bivariate analysis (20). Second, many studies were conducted with college students and young adults, which limits their generalizability to senior citizens.

Smartphone usage motives have a significant impact on life satisfaction, but they have not explained the specific mechanism of why smartphone usage affects life satisfaction. To explain this, it is necessary to understand the positive impacts of smartphone usage on our society, one of which is may be a solution to the digital divide. The digital divide can be defined as the difference in Internet use between those who can use the new Information and Communication Technologies (ICT) and those who do not. This divide is also reflected in economic and social disparities between those on either side of it (21,22).

Recently, the issue of the digital divide has shifted from accessibility to digital literacy, which is related to the practical use of digital devices. This change is because the lack of

accessibility to technology and information, which is characteristic of the digital divide has been solved by the increase in the smartphone penetration rate; and information literacy has consequently become more important (23). Digital literacy means the ability to acquire information using ICT, to verify the accuracy and reliability of information, and to use the necessary information effectively (24,25). That is, digital literacy has expanded beyond the use of digital devices and information seeking the ability to interpret, judge, and transform information (26).

Can the use of smartphones reduce the digital divide between generations and enhance digital literacy? Smartphone use reduces the information divide (27,28). People can learn how to effectively search for and acquire information by using smartphones for information seeking (29). People may improve their ability to judge the accuracy and reliability of information while sharing information with others. Older individuals, as well as teenagers and young adults, may communicate with family, friends and acquaintances through instant messengers and social networking services. Individuals may share ways to transform and create information through interactions with others. Smartphone use reduces the digital divide and improves the internet literacy of senior citizens (16). Specifically, smartphone usage affected the ability of senior individuals to access content, participate in communities, and engage in communication.

Can digital literacy enhanced through the use of smartphones increase life satisfaction? The ability to acquire and use information using digital devices in modern society may be closely related to psychological well-being (16). In particular, for senior citizens whose physical functions have deteriorated, and whose social activities and participation have been greatly reduced, digital literacy may help to minimize the disadvantages that ensue and to alleviate the absence of feeling of belonging and alienation (30,31). Furthermore, digital literacy may increase psychological satisfaction by enabling older citizens to effectively acquire and use necessary in-

formation about daily life, such as health information (32). In other words, elderly people who proficiently handle and use digital devices for communication and information seeking are expected to experience social belonging, feel less lonely, and be more satisfied with life (33). In a recent study (34) of adults over 60, higher digital literacy was related to higher psychological well-being and life satisfaction.

The purpose of this study was to examine the effects of smartphone usage motives on life satisfaction after controlling for smartphone dependency in older individuals. We also examined the mediating effect of digital literacy on the relationship between smartphone use motives and life satisfaction.

Materials and Method

Participants and survey

This research utilized the data of the smartphone overdependence survey in 2018, which was organized by Ministry of Science and Technology and National Information Society Agency. The survey population is those aged 3–69 living in 17 metropolitan cities across the nation. In the sampling design, the extraction of the 680,795 survey areas was based on the systematic sampling of the probability proportion to size and systematic sampling was used for the extraction of the households. Trained professional interviewers visited the selected households, explained the purpose of the survey, and participants signed consent form. Finally, interviewers confirmed that participants completed the questionnaire. In this study, data from 2,004 adults (965 men and 1039 women) aged 60–69 yr were analyzed. This study that does not require ethical approval used data freely available in the public institute.

Measures

Smartphone use motives

Twelve items with an 8-point scale (never = 0 to very frequently = 7) developed by National Information Society Agency (4) were used to measure smartphone use motives.

The information seeking motives consisted of five items, and the degree of use of each item was measured: viewing news, searching for academic/business, searching for goods/services, searching for traffic and location information, and general web surfing. The leisure motive was composed of four items, and the degree of use of each item was measured: movie/TV/video, music, radio, and e-book/web-toon/web-novel. The communication motive was composed of three items, and the degree of use of each item was measured: e-mail Messenger, and SNS (Instagram, Facebook, Twitter, etc.). The Cronbach's alpha of each smartphone use motive was as follows: information seeking=0.74, leisure=0.70, and communication=0.60.

Smartphone dependence

To measure the degree of smartphone dependence, the S scale developed by the National Information Society Agency (35) was used. This inventory consists of ten items with a 4-point response scale (never = 1 to strongly agree = 4). The higher the total score, the stronger smartphone dependence is. The specific contents of each item are as follows. Every time you try to reduce your smartphone usage time, it fails. Thoughts of my smartphone are always in my head. Owing to smartphone, it is difficult to carry out work (academic or occupational). Cronbach's alpha for samples of the scale in this study was .88.

Digital literacy

The digital use competency scale developed by the National Information Society Agency (4) was used to measure the level of digital literacy. This scale consists of six items with a 4-point response scale (never=1 to strongly agree= 4). A higher total score is associated with greater digital useability. The specific contents of each item are as follows. You can find the information and contents you need online. It is possible to judge whether information acquired online is reliable. I can

create and edit digital contents. The Cronbach's alpha of the scale for participants in this study was .83.

Life satisfaction

Seven items with a 4-point scale response (very unsatisfied=1 to very satisfied=4) developed by the National Information Society Agency (2018) (4) were used to measure life satisfaction. The higher the total score, the higher the overall life satisfaction is. The specific contents of each item are as follows. How satisfied are you with your overall personal relationship with your family, relatives, friends, neighbors, and colleagues? How satisfied are you with your present work? How satisfied are you with your health condition? Cronbach's alpha of the scale for participants in this study was 0.79.

Analysis

First, confirmatory factor analysis was performed using the AMOS 20.0 program to determine whether the measurement variables accurately measure the construct. Next, to verify the fitness of the research model and the significance of each path, structural equation modeling was performed using the AMOS 20.0 program. The chi-square value, CFI, TLI and RMSEA index were considered together to verify the model fit. The chi-square value is highly sensitive to the number of samples and therefore it is highly probable that the null hypothesis is rejected. Therefore, it is necessary to also check the CMIN/df value. If the CMIN/df value is less than three if the CFI and TLL are above .95, and if the RMSEA is below .05, it can be judged as an acceptable model (36). Finally, the bootstrap test was conducted to analyze the mediating effect.

Results

Mean and Standard deviation of variables, and Correlation between variables are presented in Table 1.

Table 1: Mean, standard deviation, and correlation between variables, N=2,004 (**<.001)

Variable	1	2	3	4	5	6
1. Information seeking type						
2. Leisure type	.52***					
3. Communication type	.58***	.55***				
4. Smartphone addiction	.25***	.25***	.21***			
5. Digital literacy	.39***	.25***	.31***	.27***		
6. Life satisfaction	.11***	.01	.11***	.01	.25***	
Mean	11.97	5.93	7.82	16.74	12.50	19.60
Standard deviation	7.53	5.38	4.17	4.80	3.28	3.21

Because of the model test, the fit of the model is considered to be acceptable (Chi-square=108.614, $df = 47$, CMIN/df=2.311, CFI=992, TLI = 986, RMSEA=0.026). This result means that the measurement variables adequately

measure the construct.

Because of structural equation analysis (Table 2), the fit of the research model is acceptable (chi-square=182.420, $df = 70$, CMIN/df=2.606, CFI=989, TLI=978, RMSEA=0.028).

Table 2: Coefficient estimates and standard error for the final model (**<.01, ***<.001)

Path	Estimates	SE	t
Information seeking motive → Digital literacy	.029	.002	12.927***
Leisure motive → Digital literacy	.005	.003	1.550
Communication motive → Digital literacy	.010	.004	2.735**
Digital literacy → Life satisfaction	.199	.019	10.198***
Information seeking motive → Life satisfaction	-.001	.002	-.594
Leisure motive → Life satisfaction	-.016	.003	-6.448***
Communication motive → Life satisfaction	.019	.003	5.803***
Smartphone addiction → Life satisfaction	-.005	.002	-2.703**

The coefficients of the specific path are as follows. Smartphone use for communication was positively associated with life satisfaction ($\beta = .019$, $P < 0.001$). However, smartphone use for leisure was negatively related to life satisfaction ($\beta = -.016$, $P < 0.001$), and smartphone use for information seeking did not directly influence life satisfaction. Smartphone use for communication was positively associated with the digital literacy ($\beta = 0.010$, $P < 0.001$) and smartphone usage for information seeking was positively related

to digital literacy ($\beta = 0.029$, $P < 0.001$). However, smartphone use for leisure did not have an impact on digital literacy. Finally, digital literacy was positively related to life satisfaction ($\beta = 0.199$, $P < 0.001$).

The bootstrap test (Table 3) indicated that smartphone use for communication influenced life satisfaction by partially mediating digital literacy ($\beta = 0.026$, $P < 0.05$). In addition, smartphone use for information seeking had an impact on life satisfaction by fully mediating digital literacy ($\beta = 0.121$, $P < 0.01$).

Table 3: Indirect effects in Final model (* $P < .06$, ** $P < .01$)

Path	Indirect effect		95% CI	
	B	SE	Lower	Upper
Information → digital literacy → life satisfaction	.121**	.014	.099	.165
Leisure → digital literacy → life satisfaction	.014	.009	-.002	.036
Communication → digital literacy → life satisfaction	.026*	.011	.000	.045

Note: Information = Information seeking use motive, Leisure = Leisure use motive, Communication = Communication use motive

Discussion

This study examined the effect of smartphone usage motives on life satisfaction and verified the mediating effect of digital literacy on the relationship between smartphone usage motives and life satisfaction. In particular, it explained the mechanism of how smartphone use motives influence the life satisfaction of senior citizens. The discussions and implications of the results are as follows.

First, the effects of smartphone usage motives on life satisfaction differed according to the type. In other words, smartphone use for communication had a positive effect on life satisfaction, which is similar to previous studies of college students and young adults (5,17). This study verified the relevance of communication use and life satisfaction for senior citizens, which contributed to the generalization of previous research results to senior citizens (11).

Seniors aged 60 and over are likely to experience psychological withdrawal due to reduced physical functioning and social activities after retirement (15). In particular, elderly Koreans greatly decrease contact with their children because of the child's employment and marriage; this may lead to emotional alienation and loneliness. Recently, with the increase in the smartphone penetration rate, many older adults are using Messenger and SNS, which help to facilitate interactions with children and acquaintances. That is, smartphone use for communication may contribute to enhancing emotional intimacy with family and friends, maintaining social belonging, and as a result, increasing interpersonal satisfaction (15).

Smartphone use for leisure was negatively related to life satisfaction. Watching movies/TV/videos/e-books/web-toons/web-novels and listening to music using a smartphone can temporarily provide enjoyment. However, as the use of smartphones for leisure increases, learning and job performance may be hindered, resulting in lower subjective satisfaction. In this study, smartphone use for information seeking did not have an impact on life satisfaction. Smartphone

use for information seeking includes viewing news, searching academic/business information, product/service searching, searching traffic and location information, and general web surfing. However, previous studies have not sufficiently measured these details, which may lead to inconsistent results. This study implies that smartphone use for information seeking itself is unlikely to directly affect life satisfaction.

Second, smartphone use motives were positively associated with digital literacy. Smartphone use for communication may improve the skills to communicate with others, such as using Messenger and SNS or sending photos and videos (37). In addition, smartphone use for communication may improve community participation skills such as participation in blogs and communities, using online bulletin boards, and participating in public discussions (38). The use of smartphones for information also seeking may improve the ability to search for information, news reading, searching traffic information, and internet banking (29).

Third, digital literacy had a positive effect on life satisfaction. Digital literacy may be more important to senior citizens than younger people (30) because they are limited in the acquisition and use of information, and social activities. Elderly people with a high level of digital literacy may acquire accurate information in various fields such as health and financial management. Further, the elderly who are using Messenger and SNS proficiently may feel less lonely (16,32). Digital literacy may improve the subjective satisfaction of major areas of life, such as economic, health, and interpersonal relationships.

The results of the mediating effect suggest that smartphone use for communication, directly and indirectly, impact life satisfaction in elderly people. On the other hand, the smartphone use of information seeking increases digital literacy, which in turn, indirectly influences life satisfaction rather than being directly related to life satisfaction in elderly people.

The contribution of this study is to explain specific mechanism of how smartphone usage (especially smartphone usage for communication and information seeking) influences life satisfaction.

In an aging society, the role of senior citizens in various areas of society will increase. More importantly, digital literacy may play an important role in senior citizens sharing their knowledge and know-how with younger generations and society, and this may increase their life satisfaction. Thus, our society needs to strengthen regular education on digital media use for senior citizens. The limitations of this study are as follows. Because it was conducted only with adults 60–69 yr old, generalizing the results to those aged 70 and over should be done with care. Second, because this study was carried out using a cross-sectional design, it is not possible to confirm the causal relationships but only to identify the relationship between the variables. In future research, it will be necessary to verify this study's model through a longitudinal study design.

Conclusion

Smartphone use may influence the quality of life of elderly. In particular, the use of smartphones for information seeking and communication may increase digital literacy and, consequently, increase their life satisfaction.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

There is no conflict of interest

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