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심리학석사 학위논문

Effects of SNS on Social and Emotional Well-being of Older Adults in Korea

SNS 활용이 한국 노인의 사회 및 정서적 안녕에 미치는 효과

2018 년 8 월

서울대학교 대학원

심리학과 인지심리 전공

이 윤 경

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이 논문을 심리학석사 학위논문으로 제출함

2018 년 6 월

서울대학교 대학원

심리학과 인지심리 전공

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이윤경의 석사 학위논문을 인준함

2018 년 8 월

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Abstract

Advances in information and communications technology (ICT) have potential to increase social contacts in later life. However, the possible consequences of using ICT devices on mental health or successful aging of older adults still remain controversial. The purpose of this study was to examine the effect of smartphone applications use on social and emotional well-being of older adults. We investigated the relationship between individual characteristics of participants and frequency of smartphone application use, and compared social network expansion and depression level between low and high users of a social networking service (SNS) application, KakaoTalk. We recruited community-dwelling older adults (N = 107, M_{age} = 68.57, SD_{age} = 6.12) and measured the actual use of smartphone applications using an application tracker, "*App-Logger"* (Park, Hyun, Hahn, & Suh, 2018). We collected digital performance scores, indexes of technological, physical, and cognitive variables as well. Results showed that KakaoTalk was the most used application among other applications (including default ones like calls or messages). High users of KakaoTalk reported of making more social relationships in both private and public networks than low users. High users on average reported more instances of depressive feelings than low users of KakaoTalk but not as

much as to be diagnosed with depression. Additionally, periods of Internet a smartphone use, digital performance, processing speed were found significantly higher in high users.

Keywords: Aging and Technology, Well-being, Social Network, Mobile SNS

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Introduction

Maintaining social relationships is a well-known important factor to successful aging as it offers resources to cope with life challenges. These challenges may include separation with family members, loss of significant others (e.g., spouses), being isolated, and declined functional capacities in both cognitive and physical fitness. Supportive social interaction is a consistent predictor of health in older adulthood (Fiori, Smith, & Antonucci, 2007). For example, positive social relationships substantively contribute to improved health and longevity, as well as to reduced risks of dementia and frailty (Fratiglioni et al., 2000; Tucker et al., 1999).

How do older adults enhance the beneficial effects of social contexts in the face of challenges and demands? Rohr and Lang (2009) addressed this question with regard to the life-span theoretical model of selection, optimization, and compensation (Baltes & Baltes, 1990). The principles of selection, optimization, and compensation conjointly serve to enhance beneficial effects of social contexts. The use of such strategies depends on the availability of personal and environmental resources (Freund & Baltes, 2002).

Over the past decades, as the majority of older adults own cell phones or have access to the Internet, opportunities for technology-

supported contacts have greatly increased, (Smith, 2014). In addition to cell phones, it is frequently reported that using the Internet and social media can potentially enhance the investment of resources for relationship regulation in late life (e.g., Czaja et al., 2006). Findings from longitudinal research suggested that Internet usage is associated with positive change in depressive symptoms among older adults (Cotten, Ford, Ford, & Hale, 2014; Hogeboom et al., 2010). The Internet provides various opportunities for maintaining and enhancing social relationships, including e-mail, instant messaging, social networks, discussion forums, and blogs (Leist, 2013). The empirical evidence still yields mixed results (Boyd & Ellison, 2007; Masi, Chen, Hawkley, & Cacioppo, 2011). It can be argued that online intervention has much potential for compensating the psychological risks in social contexts in late life.

Social networking services (SNSs) are web-based platforms where users can connect with other users while generating and maintaining social connections (Ellison & Boyd, 2013; Seabrook, Kern, & Rickard, 2016). According to the definition by Boyd and Ellison (2007), SNSs contain distinct characteristics such as user-provided content and content provided by other users, visible (and open) network connections between individuals, and consumable contents (i.e., text, image, or videos) that are broadcasted by individuals in a continuous stream of information.

According to a report by PEW research center, the sign-up rate of SNSs continues to grow since 2012 to the present (Smith & Anderson, 2018). Facebook still ranks as the most frequently used social networking platform world-wide. However, statistics on the usage of SNS are heavily oriented toward young and middle-aged population. As usage pattern of SNS applications in older adults above 60 are not researched sufficiently, it is hard to grasp how much time they spend on SNS applications and the purpose of the use. Considering how the real-life application of technology is becoming more of an essential part of our lives, studying the psychological consequences of computer and Internet usage is becoming relevant as well. In this study, we wanted to understand how older adults utilize smartphone devices and online networks to manage psychosocial problems they experience, such as loneliness and depression by getting social support.

The opportunities that usage of SNS can offer varies: from catching up with old friends or making a new relationship, to searching for a new job or seeking a marital relationship. Previous research emphasizes positive aspects of SNS use as it can serve as protection against mental illness through utilizing social support and expanding social capital (Boyd & Ellison, 2007; Wilson, Gosling, & Graham, 2012; Seabrook et al., 2016). Having an online social connection was continuously found to be beneficial

in decreasing loneliness for both young adults (Morgan & Cotton, 2003, Guo, Li, & Ito, 2014; Lee, Noh, & Koo, 2013) and old adults (Cotton et al., 2014). Older adults who utilize the Internet well were able to adjust aged life successfully, had increased self-efficacy, and actively participated in social events. High levels of feelings of belonging and being connected, which are important factors for subjective well-being) were found in individuals who regularly use SNSs. Furthermore, general association with higher levels of life satisfaction and self-esteem, and lower levels of loneliness were found as well (Nabi, Prestin, & So, 2013).

We aimed to find out how SNS application could expand one's social and emotional well-being. For social well-being, we measured expansion of social network of individuals. More specifically, as the concept of 'social network' is too broad, we developed a questionnaire to measure one's social network as private network and public network separately. We defined private network as social relationships made in close ties which include family members, close friends, and old acquaintances. Expanded private network would indicate more contacts and relationships made with those in their private network. We defined public network as a network where an individual has an official (or notably assigned) role/position within the network and communication is made based on the respective role. Transfer of resources and information is made based on

shared responsibilities within a party with multiple-players or a local community. To measure emotional well-being, we looked at participants' depression level as they were consistently found to be associated with frequent use of SNS applications. We assessed physical, cognitive, and social characteristics of older users along with their self-reported ICT efficacy, and digital performance as well, as they can influence smartphone application use.

Furthermore, the predominant methods of measuring SNS use were primarily based on participant estimation, such as self-report questionnaires or focus group interviews. This could be problematic because it can leave a gap between actual behavior and reported behavior of SNS users, especially when examining older adults. Relying on self-report in older adults would increase the occurrence of retrospective bias, as they are more likely to inaccurately remember their daily usage of applications than younger adults (Seabrook et al., 2016). Employing a method that can capture smartphone application use directly from one's device could reduce these biases. Real-time data can give a clearer picture of older adults' engagement in SNSs before we jump into a conclusion how beneficial or detrimental the effects on psychological well-being are. We employed a real-time application logging method by developing an app-tracker, ("*App-Logger*") and analyzed types and number of application used by older adults.

To our knowledge, this is the first study to examine the relationship between the frequency of SNS application use and psychological well-being of older adults, using real-time data. In short, the present study investigated 1) individual characteristics in SNS application use in older adults, 2) whether high use of SNS applications would predict building more social relationships, 3) and whether high use of SNS applications is also associated with high level of depression.

Methods

Participants

We recruited one hundred and seven adults (57 females) with an age range of 60 to 80 (M = 68.57, SD = 6.12) from a local community center. A total of 87 participants were eligible for application installation. These participants were mainly the subscribers of senior education programs and IT classes. The entire experimental session took approximately 2.5 hours and those who volunteered to participate were compensated with a payment of 40,000 KRW (equivalent to USD 50). Information about participation and compensation were given prior to the session.

Materials

Demographic information. For demographic profiling purpose, participant's age, sex, education, income level, technological scope, digital performance, cognitive function, physical fitness were measured. Education level was recorded on a scale of 1 to 4. Household income was recorded on a scale of 1 to 6. To measure technological experience, such as periods of smartphone use and periods of internet use were collected. We developed and collected the scope of ICT devices and self-reported ICT efficacy. Detailed descriptions of scales are listed in the Appendix A and B.

Digital performance. Participants conducted tasks examining smartphone device-setup and application-use ability. These two types of

tasks had 7 levels of difficulty from 1 being the easiest to 7 being the hardest. For each level there were two different tasks, and participants had a 2-minute limit to complete each task. When participants succeeded in both questions in a given level, they moved up to the next level. Detailed descriptions of the tasks are listed in Appendix C.

Cognitive functions. The primary cognitive abilities were assessed using processing speed, spatial operation, executive control, and visual working memory. The tasks were provided online and designed to be used with Samsung galaxy 10" tablet. They were designed so that all responses would be recorded on the touch screen.

Processing speed was measured with stop-signal task (Verbruggen & Logan, 2008). The task began with a 700ms fixation, followed by a black "O" that appeared either on the right or left side of the stimulus window, and served as a target. The target remained on screen for 1500ms. On 25% of the trials, a stop signal (a red "O") appeared at the center of the stimulus window 260ms, 300ms, or 340ms after the onset of the target. Participants responded as quickly as possible to which side the target appeared on, as long as the stop signal did not appear. The total number of trials were 106 and 10 of them were practice trials.

The spatial operation ability was measured with a modified mental rotation task (Cooper & Shepard, 1973). Participants determined whether

the image on display was a mirror image or a regular image of a target. The number “5” and Korean alphabet “ㅋ” were used as target stimuli. The target image was rotated in varying degrees (0°, 60°, 120°, 180° 240°, or 300°). Participants responded whether the image was normal or flipped by tapping the corresponding part of the answer section on the touch display. The number of total trials were 74, including 10 practice trials.

Executive control process was measured based on the performance of tasks of task switching paradigm: element number task and digit number task (Kramer, Hahn, & Gopher, 1999). The task started with a 500 ms presentation of a task cue screen, which stated the goal of the current trial in text. The text was located on the center of the stimulus window. In each trial, the participants were asked either to indicate whether the value of the digit displayed was greater than 5 or to indicate whether the number of digits displayed were more than 5. After 500 ms, a row of digits appeared at the center of the whole display while the task cue remained on screen. The target screen was presented until response. Presented with the row of digits, participants were asked to respond according to the task goal. In 25% of the trials, the task goal changed from the preceding trial. The total number of trials were 106, 10 of which were practice trials.

Visual working memory was measured with a change detection task (Luck & Vogel, 1997). On a 400-pixel by 400-pixel array, an 8 by 8

invisible grid was formed and used as item locations. Such arrays composed of several squares, the colors chosen from “distinct colors” JavaScript libraries. The size of an item was 50-pixel by 50-pixel. The number of items on an array were either 2, 4, 6, or 8. The task began with a 300ms presentation of a sample array. It was followed by a 900ms retention period with a blank screen. Participants were instructed to report whether the sample array matched the test array. After 10 practice trials, participants performed 64 test trials.

Physical fitness. We speculated that physical fitness may also be associated with older adults’ frequency of smartphone application use because physical health is an important factor to gain an access to ICT devices in older adults (Charness & Boot, 2009). We measured physical characteristics of individuals including body mass indices (BMI), hand strength, and cardiovascular fitness. For BMI, body composition measures were collected, and body mass index was calculated for general health indices. InBody 370 (Biospace, Korea) was used to calculate the body mass index, based on bio-electric impedance analysis. Hand strength was measured in both pinch strength and grip strength. Pinch strength was measured with PG60 pinch gauge (Jamar, USA). Grip strength was measured with TKK 5401 (Takei, Japan). Participants were instructed to squeeze the handle with maximum effort. Both left and right hands were

measured twice in an alternating manner. Various measures of finger movement precision including resting state tremor and finger tapping speed, finger tapping amplitude and finger tapping rhythm were assessed with Kinesia One. For cardiovascular fitness, we conducted the Six-Minute Walk Test (6MW) in which participants were instructed to walk as quickly as they could on a designated track (20m by 5m) for 6 minutes.

Application use. We developed and used a tracking application in order to measure the actual usage of applications ("*App-Logger*"; Park, Hyun, Hahn, & Suh, 2018). The "App-Logger" collected data from participants automatically every midnight. The tracker recorded the number of times an application-related contents (e.g., main screen, user profile, notifications, and messages) appeared on the top screen of the smartphone. Due to the privacy issues, we could not track detailed sensitive information such as the exact time spent on the application, number of messages, sender and the receiver of the messages. We installed the *"App-Logger"* in the Smartphone of 87 out of 107 participants. We only installed in Android phones due to compatibility issue with iPhone. We tracked the application use for 4 weeks. We halted collection after 4-week experimental session.

Social network expansion. In order to find out whether an individual's scope of social network (both online and offline) is expanded after usage of smartphone applications, we asked participants 8 questions

asking whether their private and public network had expanded since the usage of smartphone applications. As we verbally asked the participants all demographic information questionnaires and cognitive tasks, participants were likely to be distracted. The scale composed of 4 questions for private networking and 4 questions for public networking. For private networking, we asked questions like "I have more friends who would help if I had problems." For public networking, the questions included "I attended more meetings related to public affairs (e.g., political parties)." For full list of questions, refer to Appendix D.

Depression. We measured whether utilization of smartphone led to emotional well-being of older adults. Although there is a greater general prevalence of depression in older adults compared to other age groups, it showed significant correlation with declining physical health more often in older age groups (Andresen, Malmgren, Carter, & Patrick, 1994). Participants' depression levels were evaluated by using the Korean version of the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). CES-D has consistently shown a high validity and reliability of measuring and predicting both clinical and non-clinical depressive symptoms in all age groups (Andresen et al., 1994). We asked how often the items in the questionnaire were applicable to their frequently experienced mood.

Procedure

Participants first completed their self-report survey of demographic information, ITC efficacy, social network expansion scale, and depression. They then completed the initial physical screening (BMI). Next, they were informed of "App-Logger" and how it works. Those who showed concerns with privacy were opted out of installation. Only those who agreed to install the application proceeded to installation and were reminded to remove the application after the completion of the experimental session. After the installation, participants completed the cognitive tasks and digital performance. For digital performance, two tasks were assigned: device-setup and application-use tasks. Each task contained 7 levels with several sub levels (e.g., "level 2.b"). All participants were randomly assigned to an item among level 4. If participant performed the demanded response successfully within a time limit (max. 2 min), it was regarded as correct performance. If the participant was not aware of the function in question and did not know how to use the function asked, we marked them as incorrect performance. After successful trial, participants moved on to the next trial (e.g., from level 4 to level 5). If failed, they were assigned to an item in easier level (e.g., from level 4 to level 3). If one got an item correct in an easier level, they moved on to the next trial but were assigned any item except the one they already had assigned before. We also provided detailed

explanation on how to use an asked function after completion (regardless of correctness of the performance). Participants were able to attempt an item 5 times at the most. We calculated the score based on the digit number of final level. If the participant succeeded to perform an item at the final level, 0.5 point were added and if not, 0.5 point was deducted in the process of converting the score. After completing digital performance, participants conducted the rest of the physical test including the Six-Minute Walk Test (6MW).

Results

Demographic, technological, cognitive, and physical variables

Out of 87 participants who agreed to install the application, 70 users were eligible for data analysis. Among 70 older adults, 37 were female. Mean age was 67.96 (*SD* = 6.27). Table 1 shows comparison of mean values between low and high users. Due to small sample sizes, we conducted a wild *t*-test with unequal variances. Older adults in the high use group had higher levels of both income and education level. There were significant differences of the periods of smartphone use, $t(60) = -2.25$, $p = .028$; Internet, $t(61) = -2.21$, $p = .03$; and scope of smartphone, $t(67) = -2.73$, $p < .001$ between the two groups. Among self-report ICT efficacy scores, only Internet efficacy was significantly higher in high users, $t(67) = -2.05$, $p = .04$. Reliability of ICT measures were high (Cronbach $a = .94$). For cognitive functions, high users showed higher processing speed than that of low users, $t(68) = 2.44$, $p = .017$. Other cognitive functions such as working memory, $t(58) = -.21$, $p > .05$; task switching, $t(64) = -.45$, $p > .05$; and mental rotation, $t(65) = .24$, $p > .05$ were not significantly different between two groups. All variables for physical fitness such as BMI, $t(68) = -1.55$, $p > .05$; pinch strength, $t(64) = 1.51$, $p > .05$; grip strength, $t(64) = 1.09$, $p > .05$; and cardiovascular fitness, $t(63) = .09$, $p > .05$, were not significantly different between two groups as well.

Table 1

Mean Values of Demographic, Technological, Cognitive and Physical Variables

	KakaoTalk Use			
	Low		High	
	M	*SD*	*M*	*SD*
Age	68.17	6.56	67.74	6.06
Income	3.24	1.69	4.06	1.85
Education	2.89	0.93	3.17	1.09
Periods of smartphone use	4.34	0.94	3.71	1.36
Periods of Internet use	4.37	1.14	3.63	1.63
Scope of ICT devices	5.03	1.65	3.89	1.84
Internet efficacy	21.26	5.04	18.63	5.68
Computer efficacy	19.86	6.57	18.00	7.78
Smartphone efficacy	21.71	4.79	19.83	6.56
Working memory	1.92	1.35	1.87	0.93
Processing speed	785.40	126.25	858.56	124.21
Task switching	0.87	0.11	0.85	0.13
Mental rotation	0.85	0.09	0.86	0.11
Body Mass Index	24.74	2.54	23.81	2.51
Pinch strength	97.84	22.42	106.61	24.56
Grip strength	23.85	6.02	25.48	6.21
Cardiovascular fitness	574.26	47.96	583.80	64.04

Digital Performance

To test a reliability of the performance test we developed, we conducted an preliminary correlation analysis with the self-report smartphone efficacy. With the sample of 103 participants, correlation between self-report smartphone efficacy and digital performance were high, $r(101) = .71$, $p < .01$. Number of participants who were assigned to the questions and percentage of correct response are described in the Appendix D. When the mean scores between high and low users were compared, high users ($M = 4.71$, $SD = 1.67$) scored higher than low users ($M = 3.69$, $SD = 2.05$) in device-setup tasks, $t(65) = -2.30$, $p = .02$. High users ($M = 5.51$, $SD = 1.88$) also scored higher than low users ($M = 4.06$, $SD=2.09$) in application-use tasks, $t(67) = -3.06$, $p = .003$.

Application Use

Table 2 shows the most frequent application used among participants during 4-week experimental period. About half of the most frequently used applications were SNS applications. KakaoTalk was found to be the most frequently used application among all applications. Following it was Youtube which is a video-based social networking platform. Contacts placed third but still there was a significant gap between social networking services and default-applications usage. In short, participants used SNS applications (KakaoTalk and Youtube) almost 6 times more than contacts-

application. This is because KakaoTalk also offers services such as messaging, phone-calls, and sometimes sharing videos which are equivalent to what contact application does. The general pattern of application use in older adults was mostly restricted to using KakaoTalk, Contacts, and Messages. For the analysis, we used the average count of accessing the KakaoTalk application. We apprehended that different characteristics of each application would inflate the time usage for each application, for example, applications that are mainly composed of watching videos (e.g., Youtube) would yield more average time spent than instant messaging applications. We decided to count the application that were at the top of the main screen as used, meaning any application that was on the top of the screen while the participant was active was counted as used. The medium of exposure can vary from notification, sending a message, viewing a profile, or receiving a message from a friend. We included all of these occurrences in our analysis, as we thought all of these occurrences fit into social activity (both the motivation and the characteristics of activity necessitate social interaction). Participants on average used KakaoTalk 136 times (*SD* = 155.55) with maximum value of 713.53. To compare measured variables based on the frequency of SNS application use, participants were separated into low use and high use group. Low users on average showed 33.73 times of using KakaoTalk daily (*SD* = 25.74) with maximum value of 87.27, and

high users on average had 239.04 times (*SD* = 163.25) of access to KakaoTalk daily, ranging from 90.34 to 713.53 (Table 3).

Table 2

The Number of Smartphone Application Used

Name of Applications	Count(s)
KakaoTalk	307,938 (65%)
Youtube	55,514 (12%)
Contacts	42,404 (9%)
Message	35,673 (7%)
Naver	19,182 (4%)
Gallery	13,471 (3%)

Note: Applications in italic (KakaoTalk, Youtube, Naver) are SNS applications. Naver is the most popular search-engine application in Korea where it offers variety of entertaining contents at the same time. We excluded UI indexes (e.g., Samsung Homescreen or Android System UI) as we did not consider them as applications that require social interaction.

Table 3

Comparison of the Number of Application Used between Low and High Users of SNS Application

	Low		High	
	N	*M (SD)*	*N*	*M (SD)*
Number of Access	35	33.73 (25.74)	35	239.04 (163.25)

Social Network Expansion

The difference of total social network expansion (SNE) scores between high users and low users was significant, $t(67) = 2.68$, $p = .009$.

The private SNE scores of low users were smaller than that of high users, $t(55) = 2.38$, $p = .02$. Public SNE scores were also smaller in low users than that of high users with a moderate level of significance, $t(62) = 1.92$, $p = .05$.

Table 4

Comparison of Private and Public Network Expansion Scores between Low and High Users of SNS Application

	Low	High			
Network Types	*M(SD)*	*M(SD)*	*t*	*df*	*p*
Private Network	11.54(2.50)	12.71(1.49)	2.38	55	0.02*
Public Network	9.63(1.97)	10.71(2.70)	1.92	62	0.009**

Depression

The average score of depression in high users was higher than that of low users, $t(55) = 2.68$, $p = .009$. However, according to CES-D scoring criteria, scores higher than 16 are to be considered as 'mild' depression, meaning that although high users did show higher scores of CES-D, they were not depressed.

Table 5

Comparison of Depression Scores between Low and High Users of SNS Application

	Low	High			
	M(SD)	*M(SD)*	*t*	*df*	*p*

Depression	10.37(5.63)	15.40(9.56)	2.68	55	0.009**

Discussion

The purpose of the current study was to examine how frequent use of social networking service applications in older adults could affect them in making more social connections and reduce risk factors like depression. We extracted several important findings from this study that could lead to a greater understanding of how older adults use smartphone applications and the psychological impacts of high use of SNS applications.

Older adults in general used SNS applications remarkably more than non-SNS applications. Among SNS applications, KakaoTalk was the most frequently used. Older adults who used SNS applications more frequently were more likely to be in higher class of income and education level. These results are consistent with cohort effects involving higher education and income as well as greater exposure to technology among younger cohorts (Fazeli et al., 2013). They had used both Internet and smartphone for a longer period of time and had owned more smartphone devices. High users also showed higher level of confidence based on the scores of self-reported Internet efficacy. When actual performance was tested, high users were more familiar with the various functions on smartphone devices and scored higher than low users both in device-setup task and application-use task. For cognitive functions and physical fitness, no significant difference was found between two groups. From the

performance-based efficacy results, we can extrapolate that frequent use of SNS applications was also associated with the ability to utilize smartphone applications. Good smartphone usability performance means that the user is able to utilize smartphone applications based on their personal needs at any time. We attribute high performance in smartphone usability and efficacy in high users to the possibility that older adults who have more social capitals (connection to both online and offline relationships and both private and public networks) would have more exposure to new information on using the device and purchasing new applications. This result supports the current line of findings on proactive shaping of social contexts in accordance with age-specific needs by improving the positive quality of contact and creating meaningful relations. This also gives us an insight that in this digital era, being connected to the online community and gaining new information is necessary regardless of age.

For social well-being, those who frequently use SNS applications were more likely to create social relationships both in private and public networks. For emotional well-being, although high users showed higher tendencies of feeling depressive, it was safe to conclude that neither groups of users were depressed. In short, older adults use SNS applications as a tool of getting social support which are mainly confined to close relationships. Chou and Edge (2012) found the more people spend time using Facebook,

the more they are subject to attribute others' current status based on the positively "presented" contents. We speculate that the high users of KakaoTalk are also more exposed to contents (e.g., profile pictures) that lead them to think that others have better and healthier lives.

The current study met the growing demand for a new methodology for measuring the actual use of smartphone applications and attaining people's natural usage pattern. We used real-time data with an app-usage tracking application which was different the predominant methods, such as self-report questionnaires or focus-group interviews. We were able to avoid biases that these methods would yield due to limited functional capacities such as incorrect record of use based on one's recall or social desirability. Based on the data, we found that older adults used SNS applications more than any other applications. This could mean that KakaoTalk, in specific, serves multiple functions which is not confined to texting, calling, sharing pictures and videos, and even shopping.

Initially, we hypothesized that older adults would avoid making social relationships in open settings and use more voice communications such as making phone calls ("Contacts"). Results show that low and high users of KakaoTalk made more private relationships than public ones. This finding is consistent with previous research revealing that old adults regulate their social relationships as they age and prefer to keep the

interactions within a small group where one can attain more intimate social and emotional support (Fiori et al., 2007). According to socioemotional selectivity theory, as the perspective on life changes, the motivation to seek social supports will gear towards those that satisfy emotionally-gratifying goals (Carstenson, Isaacowitz, & Charles, 1999).

As the number of SNS application users grow steadily, the aspects of social interaction held in online social platforms will be more complex. In this sense, it would be important to categorize behavioral patterns of SNS applications by the level of activeness. For example, creating contents and uploading it on a social platform is more active than passively viewing contents made by others. Additionally, communication via KakaoTalk is only possible when one knows the cell phone number of others, which makes the communication between the users more private than those based in other type of social platforms such as Facebook or Youtube. It is also important to consider trait factors, such as anxiety, loneliness, and depression that could influence older adults' frequency of using SNS applications.

Current study did not further investigate the number of friends and acquaintances that can be fitted into private and public network of an individual due to privacy issues. It will be interesting to study how people perceive social relationships created online as "real" friends who they can

reach out to seek help and feel comfortable to open up about ones' life issues. Future studies should also compare actual number of friends that are formed after using social networking services in older adults. The current study did not include other prevailing well-being measures and future research should consider including subjective well-being (SHS; Lyubormirsky & Lepper, 1999), experience of both positive (Watson, Clark, & Tellegen, 1988) and negative emotions (Cohen, S., Kamarck & Mermelstein, 1983) in daily lives, and loneliness (Hawkely & Cacioppo, 2010) to gain a deeper understanding of either beneficial or detrimental effects of SNS use on psychological well-being of older adults.

References

Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in well older adults: Evaluation of a short form of the CES-D. *American Journal of Preventive Medicine, 10*(2), 77-84.

Antonucci, T. C. (1990). Social supports and social relationships. In R. H. Binstock & L. K. George (Eds.), *The handbook of aging and the social sciences* (3rd ed., pp. 205–226). San Diego, CA: Academic Press.

Baltes, P. B., & Baltes, M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 1–34). New York, NY: Cambridge University Press.

Boyd, D. M., & Ellison, N. B. (2007). Social network sites: definition, history, and scholarship. *Journal of Computer-Mediated Communication, 13*(1), 210–230.

Carpenter, B. D., & Buday, S. (2007). Computer use among older adults in a naturally occurring retirement community. *Computers in Human Behavior*, *23*(6), 3012–3024.

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. *American Psychologist, 54*(3), 165–181.

Charness, N., & Boot, W. R. (2009). Aging and information technology use: Potential and barriers. *Current Directions in Psychological Science, 18*(5), 253-258.

Choi, M., Kong, S., & Jung, D. (2012). Computer and internet interventions for loneliness and depression in older adults: a meta-analysis. *Healthcare Informatics Research*, *18*(3), 191–198.

Chon, K. K., Choi, S. C., & Yang, B. C. (2001). Integrated Adaptation of CES-D in Korea. *The Korean Journal of Health Psychology*, *6*(1), 59–76.

Chou, H. T. G., & Edge, N. (2012). "They are happier and having better lives than I am": the impact of using Facebook on perceptions of others' lives. *Cyberpsychology, Behavior, and Social Networking*, *15*(2), 117-121.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of health and social behavior*, 385–396.

Cooper, L. A., & Shepard, R. N. (1973). Chronometric studies of the rotation of mental images. In *Visual information processing* (pp. 75–176).

Cotten, S. R., Ford, G., Ford, S., & Hale, T. M. (2014). Internet use and depression among retired older adults in the United States: A longitudinal analysis. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences, 69*(5), 763–771.

Czaja, S. J., Charness, N., Fisk, A. D., Hertzog, C., Nair, S. N., Rogers, W. A., & Sharit, J. (2006). Factors predicting the use of technology: findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). *Psychology and Aging*, *21*(2), 333.

Ellison, N. B., & Boyd, D. M. (2013). Sociality through social network sites. In W. H. Dutton (Ed.), *The Oxford Handbook of Internet Studies* (pp.151–172). Oxford, UK: Oxford University Press.

Fazeli, P. L., Ross, L. A., Vance, D. E., & Ball, K. (2013). The relationship between computer experience and computerized cognitive test performance among older adults. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *68*(3), 337–346.

Fiori, K. L., Smith, J., & Antonucci, T. C. (2007). Social network types among older adults: A multidimensional approach, *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences*, *62*(6), 322–330.

Fratiglioni, L., Paillard-Borg, S., & Winblad, B. (2004). An active and

socially integrated lifestyle in late life might protect against dementia. *The Lancet Neurology, 3*(6), 343–353.

Fratiglioni. L., Wang, H.X., Ericsson, K., Maytan, M., & Winblad, B. (2000). Influence of social network on occurrence of dementia: a community- based longitudinal study. *The Lancet, 355* (9212), 1315–1319.

Freund, A. M., & Baltes, P. B. (2002). Life-management strategies of selection, optimization and compensation: Measurement by self-report and construct validity. *Journal of Personality and Social Psychology, 82*(4), 642-662.

Guo, Y., Li, Y., & Ito, N. (2014). Exploring the predicted effect of social networking site use on perceived social capital and psychological well-being of Chinese international students in Japan. *Cyberpsychology, Behavior, and Social Networking*, 17(1), 52–8.

Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness Matters: A Theoretical and Empirical Review of Consequences and Mechanisms. *Annals of Behavioral Medicine*, *40*(2), 218–227.

Hogeboom, D. L., McDermott, R. J., Perrin, K. M., Osman, H., & Bell-Ellison, B. A. (2010). Internet use and social networking among middle aged and older adults. *Educational Gerontology*, *36*(2), 93–111.

Kramer, A. F., Hahn, S., & Gopher, D. (1999). Task coordination and aging: Explorations of executive control processes in the task switching paradigm. *Acta psychologica*, *101*(2-3), 339-378.

Kurniawan, S. (2008). Older people and mobile phones: A multi-method investigation. *International Journal of Human-Computer Studies*, *66*(12), 889–901.

Lang, F. R. (2001). Regulation of social relationships in later adulthood. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *56*(6), 321–326.

Lang, F. R., & Heckhausen, J. (2006). Motivation and interpersonal regulation across adulthood: Managing the challenges and constraints of social contexts. In C. Hoare (Ed.), *Handbook of adult development and learning* (pp. 149–166). New York, NY: Oxford University Press.

Lee, K. T., Noh, M. J., & Koo, D. M. (2013). Lonely people are no longer lonely on social networking sites: The mediating role of self-disclosure and social support. *Cyberpsychology, Behavior, and Social Networking*, *16*(6), 413– 418.

Leist, A. K. (2013). Social media use of older adults: a mini-review. *Gerontology*, *59*(4), 378–384.

Luck, S. J., & Vogel, E. K. (1997). The capacity of visual working memory

for features and conjunctions. *Nature*, *390*(6657), 279.

Lyubomirsky, S., & Lepper, H. S. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social indicators research*, *46*(2), 137-155.

Masi, C. M., Chen, H. Y., Hawkley, L. C., & Cacioppo, J. T. (2011). A meta-analysis of interventions to reduce loneliness. *Personality and Social Psychology Review*, *15*(3), 219–266.

Morgan, C., & Cotton, S. R. (2003). The relationship between Internet activities and depressive symptoms in a sample of college freshmen. *CyberPsychology & Behavior*, *6*(2).133–142.

Nabi, R. L., Prestin, A., & So, J. (2013). Facebook friends with (health) benefits? Exploring social network site use and perceptions of social support, stress, and well-being. *Cyberpsychology, Behavior, and Social Networking*, *16*(10), 721–727.

Nimrod, G. (2011). The fun culture in seniors' online communities. *The Gerontologist*, *51*(2), 226–237.

Nimrod, G. (2013). Probing the audience of seniors' online communities. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *68*(5), 773–782.

Park, G., Hyun, W., Hahn, S., & Suh, B. (2018). Smartphone Usage Research of Elderly People by Application Log Data. In *Proceedings*

of HCI Korea, 1, 880–884.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(3), 385–401

Rohr, M. K., & Lang, F. R. (2009). Aging Well Together - A Mini-Review. *Gerontology, 55*(3), 333–343.

Seabrook, E. M., Kern, M. L., & Rickard, N. S. (2016). Social networking sites, depression, and anxiety: a systematic review. *JMIR mental health*, *3*(4).

Scialfa, C. T., & Fernie, G. R. (2006). Adaptive technology. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the Psychology of Aging* (6th ed., pp. 425–441). Amsterdam: Elsevier Academic Press.

Smith, A. (2014). *Older adults and technology use*. Retrieved from Pew Research Center website: http://www.pewinternet.org/files/2016/04/PIP_Seniors-and-Tech-Use_040314.pdf

Smith, A. & Anderson, M. (2018). *Social Media Use in 2018*. Retrieved from Pew Research Center website: http://assets.pewresearch.org/wp-content/uploads/sites/14/2018/03/01105133/PI_2018.03.01_Social-Media_FINAL.pdf

Tucker, J.S., Schwartz, J.E., Clark, K.M., & Friedman, H.S. (1999). Age-related changes in the associations of social network ties with mortality risk. *Psychology and Aging, 14*(4), 564–571.

Verbruggen, F., & Logan, G. D. (2008). Response inhibition in the stop-signal paradigm. *Trends in cognitive sciences, 12*(11), 418–424.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of personality and social psychology, 54*(6), 1063.

Wilson, R. E., Gosling, S. D., & Graham, L. T. (2012). A review of Facebook research in the social sciences. *Perspectives on psychological science*, 7(3), 203–220.

Appendix A

Demographic Information

Level(s) of each demographic variable(s)

Variable(s)	**Level(s)**
Education	1: Elementary 2: Middle School 3: High School 4: College graduate
Income	1: Under $1,000 2: $1,000 –1,999 3: $2,000 – 2,999 4: $3,000 – 3,999 5: $5,000 and above
Periods of Smartphone Use	1: less than 6 months 2: 6 months to 12 months 3: 1 year to 2 years 4: 2 years to 5 years 5: more than 5 years
Periods of Internet Use	1: less than 6 months 2: 6 months to 12 months 3: 1 year to 2 years 4: 2 years to 5 years 5: more than 5 years

Appendix B

Scope of ICT Devices and ICT Efficacy Questionnaire

Q 1. Scope of ICT devices

Please select the device(s) you have used. Check all that apply.

Name of Device(s)	Check
Desktops	
Laptops ("Notebooks")	
Printers	
Fax Machines (Fax)	
Televisions (TV)	
Video games	
DVD players	
MP3 players ("Digital audio player")	

Q 2. Internet Efficacy

Following questions are to find out your Internet usability. Please indicate how capable you are of performing each activity.

Activities	I do not know how to use it at all	I cannot use it without help	I can use it with little help	I can use it by myself entirely
Search	1	2	3	4
Message	1	2	3	4
Email	1	2	3	4
Online Games	1	2	3	4
Media*	1	2	3	4
Purchase	1	2	3	4
Online community	1	2	3	4

Note: Media includes watching Television, reading newspaper, and listening to music. Cronbach's α = .81(*n*=103)

Q 3. Computer Efficacy

Following questions are to find out your Computer usability. Please indicate how capable you are of performing each activity.

Activities	I do not know how to use it at all	I cannot use it without help	I can use it with little help	I can use it by myself entirely
OS	1	2	3	4
Documentation	1	2	3	4
Excel	1	2	3	4
Single-play game	1	2	3	4
Media Player	1	2	3	4
Presentation	1	2	3	4
Editing	1	2	3	4
Creating webpages	1	2	3	4

Note: 1. OS: Operating System (e.g., Windows, Mac, Linux). 2. Documentation (e.g., Microsoft Office products). 3: Presentation (e.g., MS office *PowerPoint*, *Keynote*). 4. Editing: Photo or Picture editing using designing tools such as Adobe Photoshop. Crobach α =.89 (*n*=103).

Q 4. Smartphone Efficacy

Following questions are to find out your Smartphone usability. Please indicate how capable you are of performing each activity.

Activities	I do not know how to use it at all	I cannot use it without help	I can use it with little help	I can use it by myself entirely

Changing default display settings	1	2	3	4
Wi-Fi connection	1	2	3	4
Transferring a file to PC	1	2	3	4
Transferring a file to other user	1	2	3	4
Utilizing an application	1	2	3	4
Malware/virus inspection	1	2	3	4
Documentation	1	2	3	4

Note: 1. Default display modification: changing default background picture or default ringtone. 2: utilizing an application: installation or deletion of a smartphone application. Crobach α =.86 (*n*=103).

Appendix C

Description of Digital Performance Tasks

C1. Device-setup task

Level	Task(s)	Question (s)
1	Adding a new number	*Do you know how to add a new phone number to your address book? If yes, add the provided phone number to your address book.*
2.a	Adjusting the screen brightness	*Do you know how to change the screen brightness? If yes, change the brightness of the screen at the lowest (Or "at the highest").*
2.b	Vibrate or Silent mode	*Do you know how to change your phone's vibration or ringtone mode? If yes, put your phone to vibration mode (or return to ringtone mode, if necessary).*
3.a	Rotating screen orientation	*Do you know how to change screen orientation? If yes, adjust the screen orientation setting to rotate automatically.*
3.b	Wi-Fi	*Do you know how to turn Wi-Fi on or off? If yes, turn on/off your Wi-Fi.*
4.a	Speed Dial	*Do you know how to register frequently dialed numbers ("Speed dials")? If yes, add the provided number ("010-xxxx-xxxx") to your address and assign a speed dial number ("999").*
4.b	Personal Identification Number (PIN)	*Do you know how to set up a password with numbers only? If yes, please show the researcher how to set up a PIN*

4.c	Blocking a number	*Do you know how to block unwanted numbers by registering them as spam? If yes, register the provided number and register it as spam.*
5.a	Power-save mode	*Do you know how to save your battery power ("power-save mode")? If yes, put your smartphone into a "power-save mode".*
5.b	Font size	*Do you know how to change the font size on the screen? If yes, can you make the letters appear larger or smaller than the default size?*
6.a	Checking storage capacity	*Do you know how to check storage space? If yes, check how much space you have left.*
6.b	Background process	*Do you know what a "background process" is? Please close/remove currently running applications in your background.*
7	Voice Assistant	*Do you know that you can command without having to press the button by hand? If yes, do you know how to set up your device so that it can recognize your own voice? If yes, register your voice.*

C2. Application-use task

Level	Task(s)	Questions
1	Online Social Networking	*Are you a regular user of mobile social networking service application called KakaoTalk? If yes, do you know how to add a new friend to a friends' list in KakaoTalk? If yes, add the provided phone number to your friends' list in KakaoTalk.*
2.a	Camera application	*Do you know how to take a picture of yourself with 'self-camera mode'? If yes, take a photo of yourself with using 'self-camera mode'.*
2.b	Gallery application	*Do you know how to zoom in a photo displayed in your album (or Gallery)? If yes, take a photo, then zoom on the photo you just took.*
3.a	Note-taking	*Do you know how to take a note using your smartphone? If yes, make a note of the name provided by the researcher and save it.*
3.b	Alarm setting	*Do you know how to make set up an alarm to ring on a specific date and time? If yes, set up an alarm to ring 5 o'clock on Saturdays.*
4.a	Managing applications	*Do you know how to get or purchase a new application? If yes, can you find and install an application (with a name provided by the researcher)?*
4.b	Search	*Do you know how to search for a price of something you want to purchase? If yes, find out how much the price of a product (e.g., a laptop) is?*

4.c	Share	*Do you know how to share files (e.g., photos) with other users via your Smartphone? If yes, share an image file. Send a photo you just took to the researcher.*
5.a	Map application	*Do you know how to find directions using a map application? If yes, find a route from the current location to the city hall.*
5.b	Calendar application	*Do you know how to add a schedule using a calendar application? If yes, make a schedule titled 'Happy Holidays' on January 30th in your calendar application.*
6.a	Default settings	*Do you know what a default application is? If yes, show us what your default application for a web browswer.*
6.b	Screenshot	*Do you know how to make a screenshot (or a "capture")? If yes, take a screenshot of the currently displayed screen.*
7	Bookmark webpages	*Do you know how to make a shortcut application to a specific web page? If yes, make a shortcut application of Naver (www.naver.com) on the home screen.*

C3. Number of participants who attempted the question and percentage of successful performance in device-setup task (*N* =103)

Device-setup task			
Level(s)	Items	N	Correct (%)
1	Adding a new number	26	54
2.a	Adjusting the brightness of the monitor	40	35
2.b	Vibrate or Silent mode	24	75
3.a	Screen rotation	63	51
3.b	Wi-Fi mode	68	69
4.a	Speed dial	70	19
4.b	Personal Identification Number (PIN)	68	34
4.c	Blocking a number	59	24
5.a	Power-Save Mode	32	63
5.b	Font size	9	56
6.a	Storage capacity	18	61
6.b	Background Processes	10	50
7	Google Assistant	8	38

C4. Number of participants who attempted each test item and percentage of successful performance in application-use task (*N* =103).

Application-use task			
Level(s)	Items	N	Correct (%)

1	Online social networking	15	0
2.a	Camera	37	73
2.b	Gallery	20	70
3.a	Note-taking	53	40
3.b	Alarm	46	43
4.a	Download/remove an application	97	38
4.b	Search	46	59
4.c	Share	22	64
5.a	Map	54	61
5.b	Calendar	26	96
6.a	Setting an default application	22	14
6.b	Screenshot	39	38
7	Bookmark a webpage	13	69

Appendix D

Social Network Expansion Questionnaire

The purpose of this survey is to understand the changes that have occurred since you started using your smartphone. Please indicate to what extent your social activity changed after using a Smartphone in the scale of 4 (1, "*Not at all" to* 4, "*Very much"*).

1. I made more contact with other people in general by phone, text, and social media (e.g., KakaoTalk).

2. I made more contact with people who I think are close to me such as family, friends, or neighbors.

3. I have more friends who would help if I had problems.

4. I made new acquaintances or friends.

5. I participated in volunteering activities.

6. I visited online community sites to provide feedback or comment.

7. I participated in activities held in public facilities (e.g., local community center, or a fitness center).

8. I attended more meetings related to public affairs (e.g., party parties).

*Question 1 to 4 is for private network expansion, and question 5 to 8 is for public network expansion.

국문 초록

SNS 활용이 한국 노인의 사회 및 정서적 안녕에 미치는 효과

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정보 통신 기술(ICT)의 발전은 노년까지 지속되는 다양한 형태의 사회적 관계를 증가시키고 있다. 하지만 기술의 활발한 사용이 노인의 정신 건강이나 성공적 노화에 어떤 영향을 미칠 수 있는지는 확실히 밝혀지지 않았다. 본 연구의 목적은 스마트폰 애플리케이션 사용이 한국 노인의 사회적 및 정서적 안녕을 아우르는 심리적 안녕에 어떠한 영향을 주는지에 대해 알아보고자 실시하였다. 애플리케이션 사용 시간과 접속 횟수 기록을 위해 기록용 애플리케이션인 “App-Logger”(Park, Hyun, Hahn, & Suh, 2018)을 통해 지역에 거주하는 노인 107 명의 실 사용량을 수집하였다. 본 연구에서는 참여자의 개인적 특성과 스마트폰 애플리케이션 사용량의 관계를 분석하였고, 소셜 네트워킹 서비스(SNS) 애플리케이션 사용 빈도에 따라 고(高) 빈도 사용자와 저(低) 빈도

사용자로 나눈 후 사회적 관계 확장 (Social Network Expansion)의 정도와 우울의 수준을 측정하였다. 스마트폰 기기 또는 애플리케이션 사용량에 영향을 줄 수 있는 인지적, 신체적, 스마트폰 활용능력 요인을 추가로 측정하였다. 결과에 따르면 노인 참여자가 가장 많이 사용하는 애플리케이션은 카카오톡이었다. 또한, 다른 기존 애플리케이션 (예: 전화나 문자 메시지)보다 SNS 애플리케이션을 더 많이 사용함을 알 수 있었다. 고(高) 빈도 사용자의 경우 사적과 공적 네트워크 내에서 사회적 관계를 더 많이 형성한다고 보고했다. 우울의 수준은 고(高) 빈도 사용자가 저(低) 빈도 사용자보다 평균적으로 높게 나타났으나, 우울증으로 진단될 수준에는 미치지 않았다. 그 외 변수 중에서는 고(高) 빈도 사용자가 인터넷, 스마트폰 사용 기간, 스마트폰 기기 활용능력 과제와 인지 기능 중 처리 속도가 더 높은 것으로 나타났다.

주요어: 노인의 기술활용, 심리적 안녕, 사회적 관계, SNS 애플리케이션
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