



# The Effects of Smartphone Use on Life Satisfaction in Older Adults

## The Mediating Role of Depressive Symptoms

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As the number of smartphone use by older adults increases, investigating the effects of smartphone use on health outcome become important in healthcare. This study aimed to investigate the effects of smartphone use on life satisfaction and the mediating role of depressive symptoms in older adults. This is a secondary data analysis study using the 2017 Korean Media Panel Survey. A total of 2071 respondents aged 65 years and older were analyzed to examine the effects of mobile phone type (no mobile phone/2G phone/smartphone) on life satisfaction. Among the respondents, data from 680 smartphone owners were analyzed to find the effects of the level of smartphone use on life satisfaction. The 2G mobile phone and smartphone owner groups showed significant positive effects on life satisfaction compared with the no mobile phone group, respectively. The level of smartphone use showed significant positive effects on life satisfaction. Depressive symptoms played a mediating role in both models. Smartphone use showed positive effects on life satisfaction in older adults. Nurses should promote the well-being of older adults and minimize the digital health gap in the future by increasing older adults' smartphone use through multi-level approaches.

**KEY WORDS:** Cell phone, Depression, Korea Media Panel Survey, Quality of life, Older adults

**D**uring the recent COVID-19 pandemic, most people have had little contact with others and spent more time at home. Many social activities have become contactless through the Internet with information and technology devices such as computers or smartphones. As a result, the importance of information and communication technologies has drawn increased attention. Among the information and communication technology devices, a mobile phone has become the most important device in many

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The authors have disclosed that they have no significant relationships with, or financial interest in, any commercial companies pertaining to this article.

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DOI: 10.1097/CIN.0000000000000867

people's lives because it is convenient and portable. In 2019, 91% of adults in the United States 65 years and older owned a mobile phone, and 53% owned a smartphone.<sup>1</sup> In South Korea, in 2019, 76% of those 60 years and older owned a smartphone.<sup>2</sup> In addition, South Korea ranked first in the world with a smartphone ownership rate of 95% among adults,<sup>3</sup> making it suitable for smartphone-related research. Although older adults use smartphones significantly less often than younger people and mostly use them as a standard feature phone,<sup>4</sup> the development of information and communication technologies has rapidly increased smartphone ownership worldwide. Smartphones are likely to soon become indispensable devices in the daily life of older adults, and they are expected to revolutionize their daily lives.

Given the strengths of mobile phones, health-related industries are seeking to take advantage of health intervention methods using mobile devices including smartphones. Medical and public health practices supported by mobile devices are called “mHealth,” which is a part of “eHealth.”<sup>5</sup> The devices include mobile phones, patient monitoring devices, and other wireless devices.<sup>5</sup> Systematic review studies on mHealth have revealed that mobile phone text messaging interventions have had a positive impact on clinical outcomes, medical adherence, health behavior changes, disease management, and medical attendance rates.<sup>6</sup> Health-related applications on smartphones have also been effective in weight management by tracking physical activity, medication adherence, and managing mental health such as depression and anxiety.<sup>7</sup> In addition, by connecting wearable devices to smartphones, it is possible to monitor many physical signs and activities such as falls, blood pressure, blood sugar, and electrocardiogram to prevent and manage diseases including mental health such as stress and depression.<sup>8</sup> Because of these mobile phone functions, mHealth can improve older adults' self-care, self-efficacy, lifestyle, and medication adherence.<sup>9</sup> Recently, digital health has been introduced, including mHealth. Digital health is a broad term encompassing health information technologies such as advanced computing sciences in “big data,” genomics, and artificial intelligence.<sup>5</sup> Thus, mobile phones, especially smartphones, are becoming basic essential devices with utilization capabilities for health management in this digital health era.

Mobile phones help manage older adults' physical health and health behavior as well as mental health and life satisfaction. Older adults are more likely to feel lonely, depressed, and isolated due to lower physical function, relatively few social activities, and less person-to-person contact after retirement.<sup>10</sup> However, few studies in Asian countries have shown that older adults have lower levels of depression solely by owning or using a mobile phone.<sup>11-14</sup> In particular, older adults without a mobile phone were more likely to have depressive symptoms than those who searched for information or news using a smartphone,<sup>13</sup> and smartphone use positively affected participation in social activities, welfare, and life satisfaction in older adults.<sup>15</sup> Smartphone-based video-conferencing in nursing homes effectively improved older residents' feelings of loneliness, and physiological health, vitality, and pain.<sup>16</sup> In addition, educating community-dwelling older adults on smartphone functions has been shown to facilitate active smartphone use, resulting in closer and higher quality family relationships.<sup>17</sup> Therefore, utilizing and taking advantages of mobile phone functions in nursing intervention can have positive consequences for the health of older adults.

Despite the proven benefits, the use of smartphones in older adults aged 65 years and older is lacking in research compared with younger adults such as college students and children, especially in terms of mental health.<sup>18,19</sup> Also, many studies have addressed the negative effects of smartphone addiction and dependency that can result in depression, anxiety, and lower self-esteem in younger people.<sup>18</sup> However, previous studies have shown that smartphones appear to be beneficial in managing the physical and mental health of older adults, and furthermore, they have the potential to improve the quality of life of older adults.<sup>11-17</sup> Therefore, nurses should pay attention to older adults' smartphone use and the role of smartphones in order to maximize positive health outcomes during their health intervention. In particular, smartphone can be utilized for nurses who work for in-home nursing, discharge nursing, or nursing homes.

Before using smartphones to achieve positive health outcomes, it is necessary to investigate the ability to use smartphone functions by older adults and the factors influencing smartphone use in this group. For example, the shelter-in-place order during the COVID-19 pandemic has meant that older adults have a more isolated social network, which has resulted in greater loneliness and depression,<sup>20</sup> but smartphone use may lessen their loneliness. Thus, it is important to determine the positive effects of smartphone use and promote smartphone utilization for frontline nurses to manage older adults' mental well-being. Few studies have identified the positive effects of smartphone use in older adults; however, previous studies simply classified groups as having or using smartphone or not. In order to identify the effectiveness of the smartphone, more specific classification of the

types of mobile phones is required, and it is necessary to verify not only whether or not a smartphone is owned but also the ability of utilizing smartphone functions and how it affects mental health as the degree of utilization increases.

Therefore, this study aimed to investigate the effects of using smartphones on life satisfaction in two separate models using the 2017 Korean Media Panel Survey. Model 1 was set with the type of mobile phone and its effects on life satisfaction among respondents 65 years and older. In this study, the type of mobile phone is classified into "no mobile phone," "2G mobile phone," and "smartphone," and 2G mobile phone refers to a mobile phone that only has text message and voice call features, and a smartphone is a mobile phone that has Internet network capability with Wi-Fi and cellular data. Specifically, to confirm the ability to use smartphone functions on life satisfaction, we extracted older adult smartphone owners and examined this group in Model 2. Mediating roles of depressive symptoms were also estimated in each model.

## METHODS

### Study Design and Data Source

This study was a secondary data analysis study using the 2017 Korean Media Panel Survey raw data provided by the Korea Information Society Development Institute. This is an ongoing nationwide survey conducted every year since 2010 to understand media usage patterns and variation of domestic households and individuals. Every year, the survey modifies the questions according to the media use trends and adds a special section on current topics. All questions were consulted with experts, and data were collected by visiting households with trained interviewers after participants' informed consent. Data are available for all researchers from the Korea Information Society Development Institute Web site (<https://stat.kisdi.re.kr/>).

The full 2017 Korean Media Panel Survey was completed by 9425 individuals in 4203 households with individuals aged 6 years and above using two-stage stratified sampling. We used the 2017 survey in this study because it included a special section on life satisfaction and depressive symptom. For the current study, 2071 respondents aged 65 years and older were analyzed to examine the effects of mobile phone type on life satisfaction (Model 1). Among them, 680 smartphone owners were investigated to identify the effects of the ability to utilize smartphone functions on life satisfaction (Model 2). This study was approved by the institutional review board of the authors' university.

### Variables

#### Mobile Phone Type

This study classified three groups based on mobile phone type including (1) no mobile phone, (2) owning a 2G mobile phone, and (3) owning a smartphone.

### Ability to Utilize Smartphone Functions

The ability to utilize smartphone functions was measured using nine questions with total scores ranging from 0 to 9, calculated by assigning 1 point to each positive response. A participant with a higher score indicates a higher ability to utilize smartphone functions. Table 1 presents the nine questions of the ability to utilize smartphone functions with their frequencies and total mean score.

### Depressive Symptoms

Depressive symptoms were measured using a question on depressive and anxious feelings during the day. The groups were classified into three levels: “not anxious/depressed,” “somewhat anxious/depressed,” and “very anxious/depressed.”

### Life Satisfaction

The Korea Information Society Development Institute measured life satisfaction using the Flourishing Scale.<sup>21</sup> The Flourishing Scale consists of eight items on a 7-point Likert scale from “strongly disagree” to “strongly agree.” Total scores range from 7 to 56, with higher scores indicating that the respondent has many psychological resources and strengths.

### Covariates

Covariates were determined based on previous studies examining common factors that affect older adults' life satisfaction. Gender, education level, and monthly income were included as covariates.

**Table 1. The Ability to Utilize Smartphone Functions (N = 680)**

Items	Yes	
	n (%)	Mean (SD)
1. Can you check mobile phone text messages?	574 (84.4)	3.69 (2.38)
2. Can you type and send mobile phone text messages to others?	522 (76.8)	
3. Can you check received messages from an instant messaging (eg, Kakao talk or Line)? <sup>a</sup>	450 (66.2)	
4. Can you type and send text messages using an instant messaging?	427 (66.2)	
5. Can you set up a wireless network (Wi-Fi)?	166 (24.4)	
6. Can you search for information by entering search terms on the Internet portal site or search site?	194 (28.5)	
7. Can you do Internet banking?	66 (9.7)	
8. Can you do online shopping or make an online reservation for a movie/show?	63 (9.3)	
9. Do you use social media (eg, Facebook, Instagram)?	49 (7.2)	

<sup>a</sup>Kakao talk and Line are Korean instant messaging applications that are similar to Facebook messenger or WhatsApp in the United States.

### Data Analysis

Demographic characteristics, depressive symptoms, and life satisfaction of the participants were calculated using descriptive statistics. The differences in general characteristics, depressive symptoms, and life satisfaction of the three types of mobile phone groups were confirmed with a  $\chi^2$  test and one-way analysis of variance using IBM SPSS Statistics version 27.0 (IBM Corp., Armonk, NY, USA). Correlation analysis was conducted to confirm the correlation between the variables. We also conducted path analysis to verify the two models of the type of mobile phone and the effects on life satisfaction among all older adults (Model 1), the effects of the ability to use smartphone functions on life satisfaction among smartphone owners (Model 2), and the mediating role of depressive symptoms in the relationship between the two models using Mplus version 8.3 (Muthén & Muthén, Los Angeles, CA, USA). The parameters in the path models were estimated using the robust maximum-likelihood estimation method to statistically adjust for non-normality.  $\chi^2$  Statistics, comparative fit index, Tucker-Lewis index, and root mean square error of approximation were presented for the goodness-of-fit indices.<sup>22</sup> Comparative fit index and Tucker-Lewis index values above 0.95 and root mean square error of approximation less than or equal to 0.06 indicate an acceptable fit.<sup>23</sup>

## RESULTS

### Characteristics of the Participants

Table 2 demonstrates the characteristics of the participants. The mean age of the 2071 participants was 75.22 years, 61% were female, 76.7% earned less than 1 million won (equivalent to USD 900) per month, 60.9% had attained an elementary school education, and 3.5% had attained a bachelor's degree. As for depressive symptoms, 72.5% of participants had no depressive symptoms, and 27.5% showed depressive symptoms. The life satisfaction score was 34.74 (SD, 7.33) with a range of 7-56. All variables showed significant differences among the three groups (no mobile phone, 2G mobile phone, and smartphone). In addition, compared with other groups, the smartphone owners were more likely to be younger and male, have higher income and education, have lower depressive symptoms, and have higher life satisfaction.

### Effects of Mobile Phone Types and the Ability to Use Smartphone Functions on Life Satisfaction

Table 3 and Figure 1 show the effects of mobile phone type (Model 1) and the ability to use smartphone functions (Model 2) on life satisfaction. In Model 1, with all older adults in this study (N = 2071), the 2G mobile phone ( $\beta = 0.13$ ,  $P < .001$ ) and smartphone ( $\beta = 0.21$ ,  $P < .001$ ) owner groups showed significant positive effects on life satisfaction compared with the no mobile phone group. In Model 2, with the population of smartphone owners (N = 680), the ability to use smartphone functions showed significant positive effects on life satisfaction

# CONTINUING PROFESSIONAL DEVELOPMENT

**Table 2.** General Characteristics of the Participants (N = 2071)

Variables	Total N = 2071	Mobile Phone Type			$\chi^2$ or F	P
		No Mobile Phone	2G Mobile Phone	Smartphone		
		N = 319	N = 1072	N = 680		
n (%) or Mean $\pm$ SD						
Age, y	75.22 $\pm$ 6.89	81.06 $\pm$ 7.27	75.75 $\pm$ 6.19	71.64 $\pm$ 5.48	262.35	<.001
65–74	1005 (48.5)	59 (5.9)	457 (45.5)	489 (48.7)		
75–84	847 (40.9)	151 (17.8)	526 (62.1)	170 (20.1)		
$\geq$ 85	219 (10.6)	109 (49.8)	89 (40.6)	21 (9.6)		
Gender						
Female	1264 (61.0)	242 (75.9)	681 (63.5)	341 (50.1)	34.13	<.001
Male	807 (39.0)	77 (24.1)	391 (36.5)	339 (49.9)		
Monthly income (10 000 KRW) <sup>a</sup>						
<100	1589 (76.7)	303 (95.0)	870 (81.2)	416 (61.2)	88.58	<.001
$\geq$ 100	482 (23.3)	16 (5.0)	202 (18.8)	264 (38.8)		
Educational attainment						
Elementary	1261 (60.9)	271 (85.0)	727 (67.8)	263 (38.7)	287.02	<.001
Middle	435 (21.0)	37 (11.6)	219 (20.4)	179 (26.3)		
High	303 (14.6)	10 (3.1)	105 (9.8)	188 (27.6)		
Bachelor's or above	72 (3.5)	1 (0.3)	21 (2.0)	50 (7.4)		
Depressive symptoms						
Not depressed	1501 (72.5)	179 (56.1)	735 (68.6)	587 (86.3)	64.39	<.001
Somewhat depressed	533 (25.7)	124 (38.9)	319 (29.8)	90 (13.2)		
Depressed	37 (1.8)	16 (5.0)	18 (1.7)	3 (0.4)		
Life satisfaction (range, 7–56)	34.74 $\pm$ 7.33	31.49 $\pm$ 7.67	34.26 $\pm$ 7.21	37.04 $\pm$ 6.61	71.49	<.001

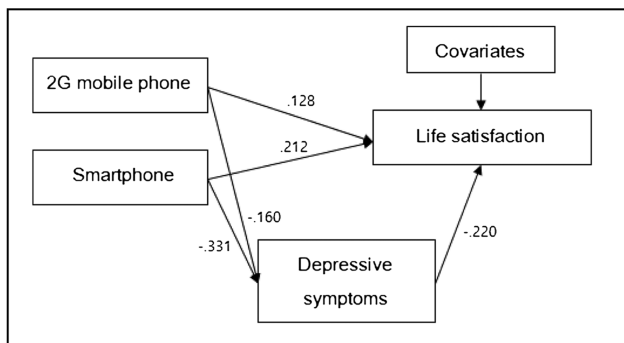
<sup>a</sup>10 000 KRW is approximately equal to USD 9.

**Table 3.** The Path Analysis Results of Effects on Life Satisfaction

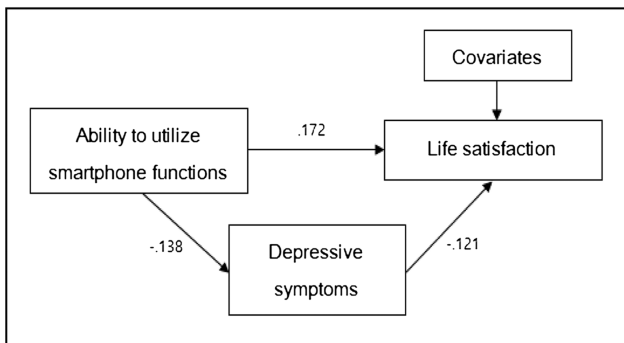
Variables		Model 1 (N = 2071)			Model 2 (N = 680)		
		Estimate	SE	P	Estimate	SE	P
Mobile phone type	Smartphone	0.21	0.03	<.001			
	2G mobile phone	0.13	0.03	<.001			
	No mobile phone (ref.)	1					
Ability to utilize smartphone functions					0.17	0.04	<.001
Depressive symptoms		–0.22	0.02	<.001	–0.12	0.04	.002
Gender	Male	–0.03	0.02	.258	0.04	0.04	.369
	Female (ref.)	1			1		
Monthly income	$\geq$ 100	0.06	0.02	.007	0.02	0.04	.716
	<100 (ref.)	1			1		
Educational attainment	Above bachelor's degree	0.09	0.02	<.001	0.05	0.04	.197
	High	0.08	0.02	<.001	0.05	0.04	.280
	Middle	0.07	0.02	.004	0.04	0.04	.397
	Elementary (ref.)	1			1		
Model fit indices		$\chi^2(5) = 31.102$ ( $P < .001$ ), RMSEA = 0.050, CFI = 0.944, TLI = 0.833			$\chi^2(5) = 5.389$ ( $P = .370$ ), RMSEA = 0.011, CFI = 0.994, TLI = 0.984		

Estimates are standardized coefficients.

Abbreviations: CFI, comparative fit index; ref., reference; RMSEA, root mean square error of approximation; TLI, Tucker-Lewis index.



[Model 1: N = 2,071]



[Model 2: N = 680]

**FIGURE 1.** Path model results. Covariates are gender, monthly income, and education level. Model 1 is the effect of phone type on life satisfaction in reference to no mobile phone. Model 2 is the effect of the ability to utilize smartphone functions on life satisfaction. All coefficients are standardized and statistically significant.

( $\beta = 0.17, P < .001$ ). In terms of depressive symptoms, both Model 1 and Model 2 showed significant negative effects on life satisfaction ( $\beta = -0.22, P < .001$ , and  $\beta = -0.12, P = .002$ , respectively).

### Mediating Effect of Depressive Symptoms

Table 4 presents the mediating effect of depressive symptoms. In Model 1, depressive symptoms partially mediated the pathway to life satisfaction for both the 2G mobile phone owner group ( $\beta = 0.04, P < .001$ ) and the smartphone owner group ( $\beta = 0.07, P < .001$ ). Model 2 also showed a mediating effect of depressive symptoms through the ability to use smartphone functions to life satisfaction ( $\beta = 0.02, P = .014$ ). In summary, this study confirmed that the smartphone ownership and the ability to use smartphone functions had a positive effect on life satisfaction even mediated by depressive symptoms.

## DISCUSSION

Before the dramatic increase in older adults' smartphone ownership, previous studies mainly studied effects of older

adults' computer or Internet use.<sup>24–27</sup> Computer and Internet use in older adults has proved as a great source of health education and promotion<sup>28</sup> and has also reduced social isolation and loneliness by increasing virtual contact with others.<sup>29</sup> However, due to the widespread use of smartphones in recent years, older people tend to use smartphones more than computers,<sup>2</sup> so recent research has mainly focused on the effects of smartphones. The present study has implications as a part of the trend of the information age by confirming the effect of smartphone use on the depressive symptoms and life satisfaction of older adults.

In this study, the smartphone owner group showed a significant positive effect on life satisfaction compared with the no mobile phone group (Model 1) and a significant positive effect of the ability to utilize smartphone functions on life satisfaction (Model 2). In short, older adults who have smartphone and utilize smartphone more are more likely to have higher life satisfaction. In addition, even though depressive symptoms showed direct negative effects on life satisfaction, the smartphone ownership and the ability to utilize smartphone functions had a positive effect on life satisfaction even mediated by depressive symptoms. These results are in line with a previous study showing that smartphone use exhibited a significant positive effect on life satisfaction and social activity of older adults.<sup>15</sup> Mediating effects of depressive symptoms of this study support the findings of previous studies that the no mobile phone group had more depressive symptoms than those who have smartphones or actively use smartphones.<sup>11–14</sup>

As such, owning or using a smartphone had a positive effect on the mental health and life satisfaction of older adults. Although this study was unable to determine the rationale for these results, it can be predicted from other previous studies. One study found that smartphone use on life satisfaction was mediated by social activity participation, which means that smartphone had a positive effect on social activity participation and, consequently, increased life satisfaction.<sup>15</sup> Another qualitative study revealed that the effects of smartphone use on older adults included having higher self-esteem from acquiring new technology.<sup>30</sup> They also found that using a smartphone allowed older adults to easily access information, get closer to others by using the instant messenger application (eg, Facebook messenger or WhatsApp), and have fun exploring the functions of a smartphone. The other study revealed that older adults who used a longer period of smartphone or social media application had lower levels of depression and loneliness.<sup>31</sup> In addition, it was found that older adults who used social media application with a smartphone are more likely to have frequent contact with their friends or neighbors.<sup>31</sup> The current study also had a question about whether you do social media with a smartphone in the variable of ability to utilize smartphone functions. Although the effect of social media use on life satisfaction was not directly

**Table 4.** The Mediating Effect of Depressive Symptoms

Model	Pathway	Effect	Estimate	SE	P
Model 1 (N = 2071)	2G mobile phone → life satisfaction	Total	0.16	0.03	<.001
		Indirect	0.04	0.01	<.001
		Direct	0.13	0.03	<.001
	Smartphone → life satisfaction	Total	0.29	0.03	<.001
		Indirect	0.07	0.01	<.001
		Direct	0.21	0.03	<.001
Model 2 (N = 680)	Ability to utilize smartphone functions → life satisfaction	Total	0.19	0.04	<.001
		Indirect	0.02	0.01	.014
		Direct	0.17	0.04	<.001

Estimates are standardized coefficients. Model 1 is the effect of phone type on life satisfaction in reference to no mobile phone; Model 2 is the effect of the ability to use smartphone functions on life satisfaction.

confirmed, it can be assumed that older adults who use social media are more likely to have more chances to have contact with others and have a higher ability of utilizing smartphones.

Therefore, it can be concluded that smartphone use or ability to utilize smartphones has positive effects on the mental health and life satisfaction of older adults for various reasons.

The present study also revealed that depressive symptoms had a positive mediating effect on the relationship between smartphone use and life satisfaction. As with the results of previous studies showing low levels of depression in smartphone users,<sup>11–14</sup> it is estimated that smartphone use positively affects life satisfaction among older adults with depressive symptoms and provides overall positive engagement in psychological aspects. Therefore, researchers and policymakers should pay further attention to the positive effects of smartphone use and utilize smartphones as a health intervention method for older adults or those with depressive symptoms. Although many health intervention methods using smartphones such as mHealth are being developed, they are not yet widely used in the real life of the older adults due to severe usability issues such as their low cognitive or physical functions, and application interfaces.<sup>32</sup> Frontline nurses caring for older adults at home or in hospitals need to assess whether older adults have or can use a smartphone, and help them to use apps, from simple text messages to health-related applications, and these efforts will help them have a positive impact on life satisfaction and mental health. Also, it would be helpful to have a group class where community health nurses educate older adults on how to use health-related applications. When nurses encourage older adults to use smartphones for healthcare services, it will help older adults in self-care or chronic disease management in the long term. Considering the results of a previous study that smartphone-based videoconferencing at nursing homes had a positive effect on older adults' overall quality of life,<sup>16</sup> in the future, nurses should pay more attention to nursing intervention using smartphones.

Although the smartphone ownership among older people has increased and the benefits of smartphones have been confirmed, older people still struggle to use some smartphone

features.<sup>4,33</sup> As seen from this study (Table 1), more than half of the participants were able to check and send a message, which is the basic function of a mobile phone. However, only a quarter of the participants were able to search for information and use Wi-Fi on a smartphone, and less than 10% of the participants were able to do Internet banking, shopping, and social media. These results reveal a serious “digital divide,” which is defined as a gap between those who can access information and communication technologies and those who cannot.<sup>28</sup> This gap can also lead to a digital health divide in the long term. Given that health-related information and interventions are increasingly being provided via smartphone applications, the ability to utilize a smartphone is even more important. To minimize the digital health divide for older adults and increase their understanding of digital health literacy, it is necessary for nurses to understand the barriers of older adults to the use of smartphones. Older adults face many issues when using a smartphone, such as a cost burden, small buttons and arrangement, and complex design.<sup>33</sup> These technical and sociocultural problems in using smartphones can increase the digital divide and, consequently, make it difficult to realize the positive effects of smartphone use. Since this study indicated that age, gender, education level, and income were significantly different among the three mobile phone groups, it is necessary for care-providing nurses to consider a multi-level approach (eg, education, policy, and aging-friendly design) to encourage smartphone use and to induce older adults' positive health outcomes.

This study has limitations that can lead to further study. Given that this study used secondary data, we were unable to explore the rationale for smartphone use on life satisfaction. However, from previous studies, we can estimate that smartphone use increases life satisfaction through increased social activities, contacts with others, and self-esteem. Further study is needed to confirm the mechanism of smartphone use on life satisfaction in older adults. Second, this study only examined smartphone use and the ability to utilize smartphone functions. Other factors related to older adults' smartphone use could be explored at a deeper level including the

purpose, motivation, and attitude about smartphone use to understand the effects of smartphone use in older adults by using a mixed-method design including a qualitative study. Finally, COVID-19 has increased the amount of time spent at home as well as the need for information and activities via smartphones. Thus, it is advisable to investigate the effectiveness of using and ability to utilize smartphone functions in older adults with more recent data that incorporate information from 2020.

## CONCLUSION

This study found that the more advanced the mobile phone was used, the higher the life satisfaction of older adults. In the case of owning a smartphone, the higher the ability to use smartphone functions, the higher the life satisfaction of older adults. The present study also revealed a partial mediating role of depressive symptoms in the relationship between smartphone use and life satisfaction. In sum, this study revealed positive effects of smartphone use on life satisfaction in older adults. Therefore, frontline nurses who care for older adults at home or in hospitals need to understand the role of smartphones when giving nursing interventions and be able to utilize them appropriately as assistive tools. In addition, it is necessary to consider multi-level approaches to enhance older adults' smartphone utilization to increase their well-being and to minimize the digital health divide in the future.

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