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A Study on Health Status, Attitudes toward Robots, and Demand for Robots between Baby Boomers and Elderly Generations in Korea*

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ABSTRACT

The purpose of this descriptive study was to compare the health status, attitudes toward robots and demand for human care robots, targeting Korean baby boomers and elderly generations who are end-users of human care robots. Through this study, it was intended to provide basic data for the development of strategies to improve the software technology of the human care robot and increase its utilization. The number of subjects was calculated using the G*Power 3.1.9.2 program. Data were collected from April 23 to May 17, 2019, for a total of 250 people (117 baby boomers and 133 elderly people). The collected data were analyzed using the SPSS WIN 18.0 program. The difference in the main variables between the two groups was analyzed using t-test, χ^2 test, and Fisher's exact test, and the correlation between the main variables was analyzed through Pearson correlation coefficient. As a result of the study, in the case of the health status of the baby boomers was better than the elderly generation (t=2.68, p=0.008). The attitudes toward robots was more positive for the elderly generation (t=6.22, p<0.001). The elderly generation also had a higher demand for robots (t=-3.72, p<0.001). In the correlation analysis between variables, there was a significant correlation between attitudes toward robots and demand for robots (r=-.327, p<0.001), and the more positive the attitudes, the higher the demand. The health status was not significant correlate with the attitudes toward robots and demand for the robots. Compared to the baby boomers, the elderly generation had less experience using information and communication products and were not familiar with using them, but there was a high demand for robots. Therefore, it is necessary to develop software that meets the needs of the elderly generation and to develop educational programs to increase robot utilization.

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1. Introduction

In Korea, life expectancy is increasing faster than other OECD(Organization for Economic Cooperation and Development) countries (Yan et al., 2010). The baby boomers born between 1955 and 1963 account for 14.6% of the Korean population, and the aging rate is rapidly progressing as they enter the elderly generation from 2020. As the number of elderly people increases to 20.3% in 2025, an 'super-aged society' is predicted (KOSIS, 2012; KOSIS, 2021).

As the elderly population increases, the government has set up a health plan and manages national health with the goal of extending healthy life expectancy rather than increasing life expectancy (Ministry of Health and Welfare, 2021). The reason for focusing on extending healthy life expectancy is that disease prevention and health promotion activities reduce social costs and ultimately affect the improvement of the quality of life of the people (Crimmins & Saito, 2001). Another reason is that healthy life expectancy is extending slower than life expectancy (Kwon et al., 2017). Healthy life expectancy is a major indicator of the quality of life (Kim & Kim, 2016; Wang et al., 2020). However, healthy life expectancy in Korea continues to decline (KOSIS, 2021). The gap in healthy life expectancy is due to inequality between socioeconomic classes (Crimmins & Saito, 2001). Therefore, it is necessary to compare the characteristics of the existing elderly generation and the baby boomer generation entering the elderly generation.

To solve the aging society problem, the Korean government is approaching health and welfare services at the national level through long-term care insurance in 2008, comprehensive nursing care service policy in 2016, and community care initiatives. In addition, efforts are being made at the local government level, such as operating community-visiting nurses, Seoul care workers, and family support centers. With the Korean elderly population expected to be 20.3% in 2025 and 43.9% in 2060 (KOSIS, 2021), it is recognized that face-to-face services alone cannot handle social problems due to aging. In particular, the recent pandemic of infectious diseases such as COVID-19 has resulted in limitations in the operation of welfare programs for the elderly, and most facility programs that have been conducted face-to-face are also feared to spread the infection, emphasizing the need to switch to non-face-to-face. As one of the alternatives, information and communication technologies are emerging, including robots (Esposito et al., 2018; Kim, 2021; Moyle et al., 2014; Oh et al., 2015; Robinson et al., 2016), computerized cognitive rehabilitation (Byeon, 2019), and chatbots (Noh et al., 2018). Previous studies (Byeon, 2019; Noh et al., 2018) that applied information and communication technology to the elderly reported positive changes in emotion, activities of daily living, perception of robots, conversation characteristics, attitudes toward robots, cognitive function, and usage. As one of the alternative methods for elderly care due to face-to-face service restrictions amid changes in demographic structure and infectious diseases, there is a study that expects services using information and communication technology to be effective in providing elderly care services (Jo et al., 2019; König et al., 2014). However, there is no research examining the user's attitude and demand for robots.

Therefore, the purpose of this study is to provide basic data for the development of software technology and strategies to increase robot utilization by identifying the health status, attitudes toward robots and demand for robots, targeting Korean baby boomers and elderly generations.

2. Research Design & Methods

2.1 Research design

This study was a descriptive research to compare the health status, attitudes toward robot, and demand for robots between baby boomers and elderly generations in Korea, who are end-users of human care robots, and to understand the correlation between variables.

2.2 Research subjects and procedure

As a result of calculating the number of subjects in this study using the G*power 3.1.9.2 program, at least 210 were required. The significance level .05, the power 95%, and the t-test to identify the difference between the two groups were considered. The study was conducted after receiving IRB deliberation and approval (IRB2-7008167-AB-N-01-201902-HR-001-01) by the Institutional Review Board of S College. Considering the dropout rate of the subjects, the baby boomers targeted 117 people aged 55 to 64 living in Seoul and Gyeonggi. A total of 250 elderly people were targeted. This includes 133 elderly people aged 65 or older who use a total of three institutions, including the E Senior Care Integrated Support Center in Seoul and the G Senior Welfare Center in Gyeonggi Province. The subjects were explained on the purpose of the study, anonymous processing, and that there were no disadvantages in the discontinuation of the study, and if they voluntarily agreed to participate, a questionnaire was conducted and a return gift was provided. In consideration of the dropout rate, a questionnaire was distributed to 250 people, collected, and used for analysis.

2.3 Variables and measurement

2.3.1 Health status

In order to measure the health status of baby boomers and the elderly generation, a Korean health status measure for the elderly tool (KoHSME V1.0) developed by Shin et al. (2002) was used. This tool consisted of 44 items and 6 domains, including physical function(10 daily life activities, 6 physical strengths, 3 physiological functions by aging), emotional function (13 items), social function (6 items), sexual function (1 item), general health perception (3 items), and body pain (2 items). The internal consistency of this tool is as follows: physical function Cronbach's α =.93, emotional function Cronbach's α =.92, social function Cronbach's α =.85, general health perception Cronbach's α =.74, body pain Cronbach's α = .79. In this study, the reliability of the entire tool was Cronbach's α = .97.

2.3.2 Attitudes toward robots

In order to measure attitudes toward robots, the Robot Attitudes Scale (RAS) tool developed by Broadbent et al. (2010) was translated and used. This tool consists of 12 questions asking about the attitude of the elderly toward the robots, such as their thoughts and feelings, and the lower

the score, the more positive the attitude toward the robot is. The reliability of the study by Broadbent et al. (2010) was Cronbach's α =.86, and the reliability of this study was Cronbach's α =.93.

2.3.3 Demand for robots

In order to measure demand for robots, we referred to Lee & Cho (2013)'s parental perception and demand questionnaire of R-learning, which was revised and supplemented based on Yoon (2010)'s parental questionnaire for service robots and related literature. Additionally referred to previous study (Kim, 2005) on welfare services for the elderly with disabilities. Finally, this research team modified and supplemented the questionnaire by referring above studies.

The content validity of the tool was reviewed by five nursing professors, and the content validity CVI was 0.93, and all items were 0.75 or more. This tool consists of a total of 27 questions and 5 sub-elements, including 4 questions on robot appearance, 9 questions on robot function, 4 questions on robot use targets, 4 questions on the important factor of robots, and 6 questions on support system of robot. This tool is a 5-point scale, ranging from 1 point of “strongly disagree” to 5 points of “strongly agree,” and the higher the score, the higher the subject's demand for robots. In this study, the reliability of the tool was Cronbach's α =.91.

2.4 Data analysis

The data were analyzed using the SPSS 18.0 program as follows. 1) The general characteristics of the subjects were analyzed by frequency and descriptive statistics analysis. 2) For the difference in major variables between baby boomers and the elderly generation, t-test, χ^2 test, and Fisher's exact test were conducted. 3) Pearson correlation coefficient was used for correlation analysis between major variables.

3. Results

3.1 General characteristics of the subjects

The average age of the study subjects was 69.2 years old: 60.6 years old for the baby boomers and 76.7 years old for the elderly. Women accounted for 67.6%. As for the final education, high school graduation was the most at 41.1%. As for the type of cohabitation, “living with spouse” was the most common at 43.9%, and 40.7% lived with their family. 82.3% usually exercise, 68.9% go out more than once a week, and 2.4% do not go out at all. The number of friends visiting for 33.6% was 1 to 2, 28.0% had more than 5, while 15.2% had no one visiting them. 64.8% had experience using computers, and 80.0% had experience using smartphones. In the case of computer or smartphone usage proficiency, 30.0% of the respondents had no difficulty, while 30.0% had difficulty. 78.0% had an experience of seeing a robot (Table 1).

Among the general characteristics, there were differences between baby boomers and the elderly

in terms of education level, residence type, exercise, frequency of going out, number of friends visiting, experience using computers, and proficiency in using computers and smartphones, and there was no difference between them in gender and an experience of seeing a robot (Table 1).

Table 1. Characteristics of the subjects (N=250)

Characteristics	Categories	Total	Baby boomer	Elderly	χ^2/t(p)
		N(%) or M±SD	N(%) or M±SD	N(%) or M±SD	
Age (years)	M±SD	69.2±9.66	60.6±2.45	76.7±7.04	-24.65 (<0.001)*
Gender**	Male	80(32.4)	34(29.1)	46(35.4)	1.13 (0.341)
	Female	167(67.6)	83(70.9)	84(64.6)	
Education**	Non	5(2.0)	0(0.0)	5(3.8)	26.42 (<0.001)*
	Elementary school	39(15.7)	7(6.1)	32(24.1)	
	Middle school	49(19.8)	19(16.5)	30(22.6)	
	High school	102(41.1)	61(53.0)	41(30.8)	
	College or higher	53(21.4)	28(24.3)	25(18.8)	
Living arrangement**	Living alone	38(15.4)	11(9.5)	27(20.8)	6.15 (0.048)*
	Living with spouse only	108(43.9)	56(48.3)	52(40.0)	
	Living with family	100(40.7)	49(42.2)	51(39.2)	
Exercise**	No	44(17.7)	30(25.6)	14(10.6)	9.64 (0.003)*
	Yes	205(82.3)	87(74.4)	118(89.4)	
Frequency of going out**	≥1 time per week	171(68.9)	73(62.4)	98(74.8)	9.22 (0.023)*
	1~3 times per month	49(19.8)	28(23.9)	21(16.0)	
	<1 time per month	22(8.9)	15(12.8)	7(5.3)	
	none	6(2.4)	1(0.9)	5(3.8)	
Number of visiting friends	≥5	70(28.0)	31(26.5)	39(29.3)	16.50 (0.001)*
	3~4	58(23.2)	38(32.5)	20(15.0)	
	1~2	84(33.6)	39(33.3)	45(33.8)	
	none	38(15.2)	9(7.7)	29(21.8)	
Experience with computer	No	88(35.2)	31(26.5)	57(42.9)	7.31 (0.008)*
	Yes	162(64.8)	86(73.5)	76(57.1)	
Experience with smartphone	No	50(20.0)	5(4.3)	45(33.8)	34.00 (<0.001)*
	Yes	200(80.0)	112(95.7)	88(66.2)	
Proficiency in using a computer or smartphone**	No difficulty	74(30.0)	32(27.4)	42(32.3)	20.25 (<0.001)*
	Moderate	99(40.0)	63(53.8)	36(27.7)	
	Difficulty	74(30.0)	22(18.8)	52(40.0)	
Experience with robot	No	55(22.0)	88(75.2)	107(80.5)	1.00 (0.360)
	Yes	195(78.0)	29(24.8)	26(19.5)	

*p<0.05, **non-responders were excluded from the analysis

3.2 Differences in health status between baby boomers and elderly generations.

Of the five points for the health status, the baby boomers scored 3.75 points and the elderly scored 3.49 points. In other words, the health status of the baby boomers generation was significantly

higher than that of the elderly generation (t=2.68, p=0.008). In the case of physical and social function scores among health conditions, the baby boomers generation was significantly higher than the elderly. In the case of emotional function, body pain, sexual function, and general health perception, there was no difference between baby boomers and elderly generation (Table 2).

Table 2. Difference in health status between baby boomer and elderly *generations* (N=250)

Contents	Baby boomer	Elderly	t	*p*
	M±SD	M±SD		
Physical function	4.15±0.75	3.71±0.92	4.14	<0.001*
Emotional function	3.98±0.87	3.86±0.93	1.03	0.306
Social function	4.01±0.89	3.47±1.19	4.07	<0.001*
Body pain	3.41±0.93	3.23±1.18	1.36	0.176
Sexual function	3.41±1.18	3.28±1.59	0.75	0.452
General health perception	3.54±0.68	3.38±0.76	1.68	0.093
Total	3.75±0.66	3.49±0.87	2.68	0.008*

*p<0.05

3.3 Differences in attitudes toward robots between baby boomers and elderly generations.

In the case of attitude toward robots, out of 8 points, baby boomers scored 5.21 points and elderly 3.89 points, and the elderly generation was more positive than baby boomers (t=6.22, p<0.001) (Table 3).

Table 3. Difference in attitudes toward robots between baby boomer and elderly *generations*

(N=250)

Contents	Baby boomer	Elderly	t	*p*
	M±SD	M±SD		
Attitudes toward robots	5.21±1.72	3.89±1.61	6.22	<0.001*

*p<0.05

3.4 Differences in demand for robots between baby boomers and elderly generations.

The demand for robots was 3.65 points for the baby boomer generation and 3.91 points for the elderly generation out of a scale of 5, which was significantly higher than that of the baby boomers generation (t=-3.72, p<0.001).

The demand for robot appearance, robot use targets, robot important factors, and robot support was significantly higher in the elderly generation than in the baby boomers generation. There was no difference in the demand for robot functions between baby boomers and the elderly generation (Table 4).

Table 4. Differences in *demand for* robots between baby boomers and elderly *generations* (N=250)

Contents	Baby boomer	Elderly	t	*p*
	M±SD	M±SD		
Appearance of robot	3.01±0.70	3.31±0.57	-3.76	<0.001*
Function of robot	3.94±0.83	3.97±0.80	-0.28	0.781
User of robot	3.54±0.92	3.79±0.74	-2.35	0.020*
Important factor of robot	3.71±0.93	4.11±0.84	-3.60	<0.001*
Support system of robot	4.04±0.82	4.39±0.63	-3.74	<0.001*
Total	3.65±0.62	3.91±0.49	-3.72	<0.001*

*p<0.05

3.5 Correlation between health status, attitudes toward robots and demand for robots

In the correlation between health status, attitudes toward robots and demand for robots, there was a significant correlation between attitudes toward robots and demand for robots (r=-.327, p<0.001), and the more positive the attitudes, the higher the demand. However, the correlation between health status and the demand for robots was not significant, also there was no significant correlation between health status and attitudes toward robots (Table 5).

Table 5. Correlations between health status, attitudes toward robots and demand for robots (N=250)

Variable	Health status r(p)	Attitudes toward robots r(p)	Demand for robots r(p)
Health status	1		
Attitudes toward robots	-.079 (0.214)	1	
Demand for robots	.067 (0.292)	-.327 (<0.001)*	1

*p<0.05

4. Summary and suggestion

This study identified the differences in health status, attitudes toward robot and demand for robots between baby boomers entering the elderly and the current elderly generation, also understood the correlation between health status, attitudes toward robots and demand for robots. It was carried out to provide basic data necessary for the development of robot programs to provide care services for the elderly and strategies to increase robot utilization. As a result of the study, the elderly generation was in worse health condition than the baby boomer generation, but the attitudes toward robots was more positive, and the demand for robots was also higher. In addition, a significant correlation was confirmed between attitudes toward robots and demand for robots.

In this study, the baby boomers were generally in better health condition than the elderly, and in particular, their physical and social function scores were higher. This is because the elderly experience rapid physical changes due to aging (Lee & Lee, 2020), while the average age of baby

boomers is relatively younger, so their physical function is considered to have been better. In addition, in the case of social functions, the baby boomers are more likely to maintain various social functions before retirement than the elderly, so the social function score is higher.

The attitudes of the baby boomers and the elderly generation toward robots participating in this study differed considerably. While the baby boomers generation was somewhat negative about robots, the elderly generation showed a positive attitudes toward robots. This was similar to the results of the elderly showing more positive or similar results for robots than other age groups in previous studies (Broadbent et al., 2010; Han & Park, 2019). The elderly living in silver towns showed a more positive attitudes than their family members or employees (Broadbent et al., 2010), and this is also similar to the results of this study. In a study by Han & Park (2019), both the elderly and their families showed positive attitudes, and it was reported that there was no difference between the two groups. The fact that there was no difference between the two groups was different from this study, but the fact that the elderly generation showed a positive attitude toward robots was similar. The elderly who participated in this study had less experience using smartphones than the baby boomers, and many recognized that it was difficult to use computers or smartphones. Even though there were few cases of seeing robots, they showed a positive attitudes toward robots. This was different from the results of previous studies (Flandorfer, 2012; Han & Park, 2019), in which the experience of using information and communication products was related to a positive attitudes toward robots. It is predicted that the elderly have a positive attitudes toward robots, but they have little experience using information and communication products, so if they use them in real life, they may find it somewhat difficult. Therefore, it is believed that there will be a need for opportunities or education to use products that incorporate information technologies such as computers and smartphones so that the elderly can use robots without difficulty.

In this study, the demand for robots was higher for the elderly than for the baby boomers. There were no prior studies investigating robot demand for the elderly and baby boomers, so compared to similar previous studies (Han & Park, 2019), there were some differences from the results of the survey on robot use intentions for the elderly and family members. In previous studies, there was no difference in the intention of the elderly and family members to use silver care robot technology, and there was no difference between the ages of 60-70 years old, 70-80 years old, and 80 years or older. In this study, the reason why baby boomers before entering the elderly generation have lower demands for robots than the elderly generation is believed to be because they can perform various physical, social, and mental activities on their own. Although not many prior studies have been conducted on the elderly's robot demand, robot development for the elderly generation is actively being developed both at home and abroad, expecting robot service technology to be effective in providing care services for the elderly.

In this study, as a result of the correlation analysis between the subject's health status, attitude toward robots and demand for the robots, the health status and demand for the robot were not significant, but a significant correlation was confirmed between attitude toward robots and demand for the robot. This was consistent with the results of previous studies (Jo et al., 2019; Turja et al., 2020; Lee et al., 2018), which showed higher demands as the attitude toward robots was positive. A study (Jo et al., 2019) that investigated the intention to use robots for the elderly also showed

that the intention to continue using robots according to subjective health conditions was not significant, which is interpreted in a similar context to the results of this study. In addition, in a study of professionals such as nurses and nursing assistants at elderly care institutions (Turja et al., 2020), attitudes toward robots were identified as influencing factors on robot use intention, and in a study of elementary school teachers (Lee et al., 2018), teachers with positive attitudes and intend to use educational robot were consistent with this study. Based on the results of this study and previous studies, it is necessary to develop robots that meet their needs so that the elderly can actively use robots in the future, and to find various strategies to enable the elderly to use them smoothly in a familiar and positive manner. This includes distributing robot utilization guidelines, promotional brochures, and providing leisure methods using robots.

It is necessary to extend the correlation results between elderly and baby boomers, their health status, attitudes toward robots, and differences in robot demand and other variables. To this end, it is considered necessary to expand the number of study subjects, which is a limitation of this study, or to re-test the results through repeated studies.

5. Conclusion

In this study, we collected data from a total of 250 people to understand the differences in health status, attitude toward robots and demand for robots between baby boomers entering the elderly as end-users of human care robots, and elderly generations. The results are as follows.

1. The baby boomers had better health conditions than the elderly generation, but in the case of attitudes toward robots, the elderly generation was found to be more positive, and they also had higher demands for robots.
2. In the correlation analysis between health status, attitude toward robots, and demand, the more positive attitudes toward robots, the higher the demand for robots.

In this study, the elderly generation, who are end-users of human care robots, had less experience using information and communication products and were not familiar with using them than the baby boomers generation, but the demand for robots was higher. Accordingly, it is necessary to develop various strategies such as software development that meets the characteristics and needs of the elderly and education programs to increase robot utilization.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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