

“Social impacts of the continuous usage of digital healthcare service: A case of South Korea”

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SOCIAL IMPACTS OF THE CONTINUOUS USAGE OF DIGITAL HEALTHCARE SERVICE: A CASE OF SOUTH KOREA

Abstract

As untact communication is promoted in the era of the COVID-19 pandemic, special attention is paid to remote medical examination and customized healthcare trends. General digital healthcare services among social community members positively affect individuals' healthcare and reduce medical social services' burden, contributing to the development of society. Accordingly, it is necessary to induce healthcare behaviors through the continuous usage of digital healthcare services among social community members and to examine significant social impact factors in this regard. This study empirically analyzes the impact of three social impact factors – social capital, social support, and social value – on the continuous usage of digital healthcare service with healthcare behaviors and e-health literacy as media. To this end, a survey was conducted among 363 individuals who had used digital healthcare services in Korea, and the statistical data were analyzed. Social capital and social value were found to affect healthcare behaviors, e-health literacy, and continuous usage intentions, but social support did not. Based on this result, it was confirmed that the factors regarded by digital healthcare service users as necessary were the values and perceptions shared in society and the group, information and active communication rather than direct public support.

Keywords

digital healthcare service, social impact, health-related behavior, e-health literacy, continuous usage

JEL Classification

I11, M31, Z10

INTRODUCTION

As advanced technologies such as AI (artificial intelligence), IoT (internet of things), and big data are incredibly converged with medical technology, various IT digital devices and medical services such as customized medical service and precision health service emerge in the medical service market (Saheb & Lzadi, 2019; Badri et al., 2018). Particularly in this age of the COVID-19 pandemic, mobile and easily usable personal medical devices and app-based services increase, along with the increasing demands for digital healthcare services based on the untact service. And this situation is accelerating around the global interest about healthcare in all generations (Papa et al., 2020; Shapiro et al., 2016).

Particularly, digital healthcare service is affected by factors such as personal will and activeness. It is related with users to actively participate in content recommended through healthcare service to enhance such a healthcare service's effectiveness. Personal health promotion and prevention activities with such services finally are essential to maintain and manage a healthy society (Kalem & Turhan, 2015). Sun and Medaglia (2019) pointed out that social community members' health-promoting behaviors positively affect the community's public

health. On the other hand, the local community's active support is essential to induce its members' good health management behaviors. And the voluntary and continuous healthcare behavior of community members can have socio-economic impacts (Wald, 2020; Agrawal & Hyrkas, 2020).

In the correlation between social environments and personal health management, health concerns of society members are not merely a matter of an individual's illness but are recognized as related to the entire social community, such as viral infection and environmental contamination (Gereffi, 2020; Harris & Guten, 1989). In addition, as digital media proliferate, the internet, smart-phones, and various other SNS channels are changing the social base. Such environmental changes and the active information exchange in the broadened social network affect individuals' healthcare and medical service consumption behaviors (Mu et al., 2018).

However, there is a limitation of many of the recent studies on digital healthcare because they focus merely on the technical acceptability of digital devices and verification of efficacy among older people. As digital healthcare service and system elements spread worldwide rapidly based on big data and AI (artificial intelligence), the relation between community members' use of digital healthcare service and the society needs to be examined more closely (Lupton, 2013).

Accordingly, this study identified the social impact factors such as social capital, social support, and social value, and developed a research model that is designed to examine the impact of the continuous usage of digital healthcare with healthcare behaviors and e-health literacy as media. By clarifying this relation, this study seeks to verify the importance of their social roles in inducing continuous digital healthcare service usage among community members and suggests specific social activities that can improve healthcare behaviors.

1. LITERATURE REVIEW AND HYPOTHESES

1.1. Social impact factors of digital healthcare service use

Lee and Lee (2018) point out that social impact significantly affects wearable healthcare devices' continuous acceptance among users. A number of studies suggest that users of digital healthcare devices or services are sensitive to social interests and trends and that such factors may affect the continuous usage of such digital healthcare services (Rosis et al., 2020). Notably, Kim and Yoon (2020) point out that service quality and social impacts positively affect the continuous usage of remote medical services. In other words, as users learn and recognize from the social environments that the use of digital healthcare services is essential for personal health and needs to be practiced continually, the impacts are enhanced. Social impact elements that affect such continuous healthcare behaviors may be classified as social capital, social support, and social value in the social-be-

havioral perspective (Nutti et al., 2016). Based on these previous studies, this study defines the three social impact factors affecting healthcare behaviors of digital healthcare service users as social capital, social support, and social value.

First, social capital may be defined as tangible or intangible capital that an individual or group accumulates (Jang et al., 2011). Social capital may be formed through information exchange in social interactions and make possible coordination and cooperation for group members to achieve goals and mutual profits through such factors as trust, norm, and network (Coleman, 1988). Social capital affects information sharing, smooth communication, and community activity with others using digital healthcare services for continuous disease prevention.

Second, social support means various types of resources that an individual receives in social relations; affection, acknowledgment, information, and material, and includes support from family, relatives, friends, supervisors, or companions within the organization (Cohen, 1983). Such social support positively affects physical and mental

health, happiness, and life satisfaction (House & Kahn, 1985). Consumers intending to maintain health with digital healthcare services are affected by perceived threats. A perceived threat means the extent that a patient is affected mentally and physically about his/her disease (Visconti & Morea, 2020). In this regard, social support messages from acquaintances and medical centers reduce perceived threats (Hermes et al., 2020) and positively affect one's conviction about his/her behaviors.

Third, social value contributes to the public good and the development of a community in every area, including society, economy, environment, and culture. Such value is granted by the community and shared with others. Thus, the entire society aims to realize desirable and rightfully promoted values (Balliet et al., 2009). The social value may be divided into economic value, cultural value, and social value (Klamer, 2004). Social value includes the standard complex value elements such as a change in members' self-esteem, psychological stability, community spirit development, and social consensus.

1.2. Healthcare behavior and e-health literacy

Healthcare behaviors are acts of people who are assured that a disease can be prevented. Such behaviors include regular exercise, sound living habits, dietary habits, and sufficient rest (Lafferey 1990). Likewise, a series of healthcare behaviors to maintain or recover a healthy state are defined as self-care behaviors. Since disease management requires the patient's sense of commitment and active participation, it is pointed out that self-care needs to continue for disease management, particularly among patients with chronic illness (Asghar et al., 2017).

According to Wood et al. (2014), social learning and perception about immunization lead to immunization's dynamic behavior. As highly educated people and city residents are highly motivated to take immunity and preventive measures, it is highly probable that rather than an individual's value, the social community's value and information sharing through communication affected such dispositions. As suggested by Green et al. (2020), with their health belief

model, social support from others in the community is vital to make its members find value from disease prevention behaviors and take the initiative.

This tendency may be observed among digital healthcare service users. In many cases, products and services for healthcare behaviors are purchased not merely as a reflection of one's personal needs but also on learning from society about disease prevention and acquaintances' recommendations (Vainieri et al., 2016).

E-health literacy is also an extended concept of 'e-health.' It means the ability to pursue, explore, understand, and evaluate health information through the internet or mobile devices, and also the ability to apply and deliver the knowledge acquired in order to solve health problems. As medical information media and access systems are digitized today, an individual's e-health literacy affects the intent of pursuing health information and practicing health-promoting behaviors (Mackert et al., 2014).

Several previous studies also report that health information available on the Internet affects behavioral changes concerning disease prevention. Pursuing information on health through various digital media has a positive and significant impact on personal needs for healthcare (Mathews et al., 2019; Antonio & Antonella, 2020).

Health literacy means the ability to understand information on health maintenance and improvement. Using this ability makes it possible to consider cognitive and social skills based on motivation (Nutbeam et al., 2018). Cognitive skills are related to an individual's subjective perception of health. Individuals whose subjective perception of health is relatively high are more likely to maintain a good health state and healthy behavior than individuals whose subjective perception of health is low (Carroll et al., 2015). Social skills are one of the health policy issues that are considered necessary in addition to a patient's health-related decision-making, safety pursuit, medical cost-saving, and life quality improvement (Nutti et al., 2016). People of high health literacy pursue health informa-

tion efficiently through media in a social network. Furthermore, they enhance health literacy through experts in a social system accessible only by medical professionals (Larrucea et al., 2020).

1.3. Continuous usage of digital healthcare service

Karnoe et al. (2018) pointed out that the intention of continuous usage is the most critical factor for healthcare promotion behaviors through digital healthcare services. When continuous usage is secured, along with the effectiveness of and satisfaction with the use, disease prevention can be better. As examined in previous studies, factors that affect the acceptance of digital healthcare service and the continuous usage include innovativeness, self-efficacy, pleasure, information content characteristics, and cost (Bolton, et al. 2018). Among such factors, service users' interest in health and their disposition of information pursuits are emphasized. Even if the service quality and contents are excellent, there would be limitations in developing the healthcare impacts of the continuous usage unless users have the will and ability to do otherwise (Laurenza et al., 2018).

Conner and Sparks (1995) examined the acceptance of technology-based healthcare service and related behaviors, not with the IT acceptance theory but with the health belief model. The health belief model is a social perception model that has been used to predict disease preventive behaviors. This model suggests that IT-based healthcare service users' behaviors, including perceived consciousness, self-efficacy, and intention of information sharing, can positively affect the acceptance and continuous service usage (Hsieh & Tsai, 2013). As stated in previous studies on healthcare behaviors (Mackert et al., 2014) and e-health literacy (Nutbeam et al., 2018; Carroll et al., 2015), personal healthcare behaviors and e-health literacy significantly affect the acceptance and continuous usage of healthcare service.

Based on the previous studies and arguments, this study aims to empirically clarify the relationship between the digital healthcare service's social impact elements and continuous usage of the social members with mediating healthcare behaviors

and e-health literacy. The following hypotheses are put forward:

- H1. *Social capital for digital healthcare services will have a positive (+) impact on healthcare behaviors.*
- H2. *Social support for digital healthcare services will have a positive (+) impact on healthcare behaviors.*
- H3. *Social value for digital healthcare services will have a positive (+) impact on healthcare behaviors.*
- H4. *Social capital for digital healthcare services will have a positive (+) impact on e-health literacy.*
- H5. *Social support for digital healthcare services will have a positive (+) impact on e-health literacy.*
- H6. *Social value for digital healthcare services will have a positive (+) impact on e-health literacy.*
- H7. *Healthcare behaviors for digital healthcare services will have a positive (+) impact on the intention of continuous service usage.*
- H8. *E-health literacy for digital healthcare services will have a positive (+) impact on the intention of continuous service usage.*

2. METHOD

2.1. Research model and hypotheses development

This study analyzes the effects of social impact factors on the continuous usage of digital healthcare services. Social impact factors are 'social capital,' 'social support,' and 'social value.' Additionally, this study examines the effects of social impact factors on the continuous usage of healthcare behaviors and e-health literacy as media. Regarding this correlation, the study model, as shown in Figure 1, was designed with the presented hypotheses that are based on previous studies.

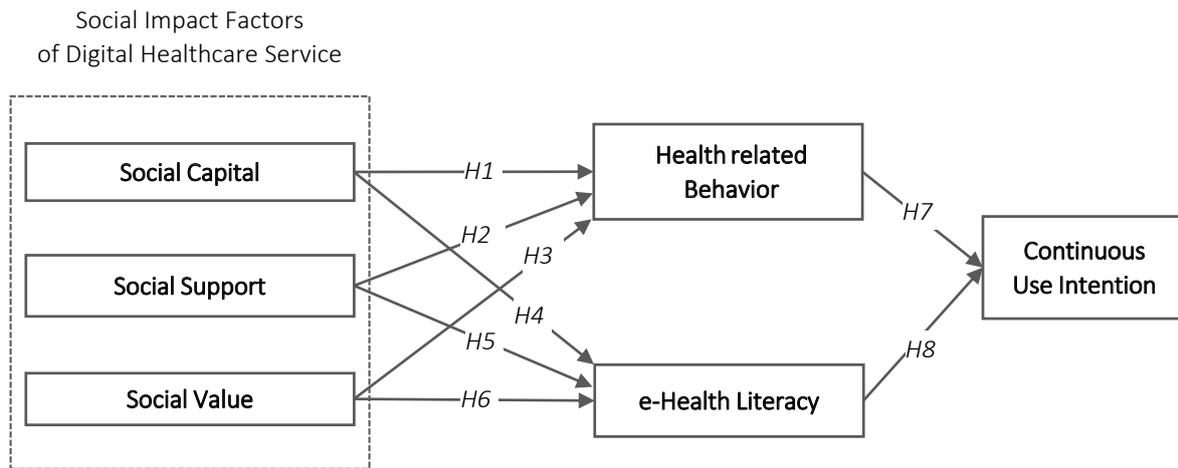


Figure 1. Research model

2.2. Measurement variables and data collection

As shown in Table 1, the variables defined above were reflected in 19 questions of the survey. An online survey was organized among randomly selected subjects in their 20s to 60s who lived in seven main areas (Seoul, Gyeonggi-do,

Chungcheong-do, Gyeongsang-do, Jeolla-do, Gangwon-do, and Jeju) of Korea and had the experience of using digital healthcare service. The survey was carried out for 36 days, from August 15 to September 20, 2020. Four hundred questionnaires were collected, and 364 were analyzed, while 36 with incomplete answers were excluded.

Table 1. Variable definitions and measurement items

Factors	Measurement items	References
Social capital	I often and freely share information on digital healthcare services with my acquaintances	Lee and Lee (2011)
	I often talk with my family and friends about the use of digital healthcare services	Jang et al. (2011)
	I actively participate in communities where I can exchange opinions on purchasing or using digital healthcare services	Coleman (1988)
Social support	My family actively support my use of digital healthcare services	Cohen and Hoberman (1983)
	My friends show interest in my use of digital healthcare services and share information with me	Babin and Boles (2018)
	My doctor and medical center view my healthcare with digital healthcare services positively	
Social value	The state and government would support my healthcare with digital healthcare services actively	
	People view healthcare with digital healthcare services as paramount	Klamer (2004)
	It will contribute to social development if people practice healthcare with digital healthcare services	Amoah (2018)
Healthcare behaviors	Sound healthcare with digital healthcare services would contribute to medical cost saving in the socio-economic perspective	
	I make efforts to acquire much information and knowledge for my health	Harris and Guten (1989)
	I tend to be careful when selecting a hospital or doctor when I'm ill	Lafferey (1990)
E-health literacy	I pay constant attention to healthcare products and services to maintain my health	
	I am skillful in manipulating computers and mobile devices for the use of digital healthcare services	Nutbeam et al. (2018)
	I understand and make fair use of information provided with digital healthcare services	
Continued usage	I have the knowledge necessary for digital healthcare services	
	I will continue to use digital healthcare services for my healthcare	Lin (2011)
	I believe that digital healthcare service is helpful for my health	Hsieh and Tsai (2013)
	I think that the continuous usage of digital healthcare services is essential for my healthcare	

2.3. Demographic information of the data

This study was conducted among digital healthcare service users in Korea. 51.6% of them were male, and 48.4% were female. As for the age groups, 19.8% were in their 20s, 23.9% in their 30s, 25.8% in their 40s, and 30.5% in their 50s, respectively. As for the residential area, the most considerable portion (55.5%) was living in Seoul. 14.6% were living in Gyeongsang-do, 10.2% in Chungcheong-do, and 6.6% in Gyeonggi-do. As for occupations, the most substantial portion (51.3%) was office workers. 14.6% were professionals, 9.6% students, and 8.0% self-employed persons. As for academic backgrounds, 72.2% were college graduates, and 16.5% completed a graduate school course. Most subjects were highly educated. As for the period of digital healthcare service use, the largest portion (44%) answered '1-3 years,' 32.4% '3-5 years,' and 11.8% '5-10 years.' Most subjects used digital healthcare service use for at least 1 year. As for reasons of use, 67% answered 'healthcare,' and 26.7% answered 'life rhythm management.' Only 4.7% answered 'disease management.' Most subjects were using such a service for healthcare.

3. RESULTS

3.1. Reliability and validity analysis results

As shown in Table 2, it turned out that the factor load was all between 0.604 and 0.880 (0.5 or higher), which was sufficient. As to the internal reliability, the composite reliability level was between 0.798 and 0.872, which was significant. Since the value of *t* was at least 6.5, it was statistically significant. The average sampling variance (AVE) value was between 0.693 and 0.863, and Cronbach α was between 0.776 and 0.821. Hence, the proper level of composite validity was secured. The correlation coefficient was analyzed to ensure discriminant validity (see Table 3).

As the measurement model's fitness was analyzed, χ^2 (df) was 337,940, and χ^2 /degree of freedom was 2,759. The value of Goodness-of-Fit-Index (GFI) was 0.907, that of Adjusted Goodness-of-Fit-Index (AGFI) 0.871, that of Normal Fit Index (NFI) 0.882, and that of Root Mean Square Error of Approximation (RMSEA) 0.036. Thus, the measurement model fitness values were statistically significant.

Table 2. Reliability and convergent validity test results

Classification	Variables	Standard load	Standard error	t value	CR	AVE	Cronbach α
Social capital (SC)	SC 1	0.744	–	–	0.719	0.830	0.804
	SC 2	0.777	.073	14.170***			
	SC 3	0.761	.072	13.930***			
Social support (SS)	SS 1	0.765	–	–	0.697	0.798	0.691
	SS 2	0.653	.136	9.612***			
	SS 3	0.639	.127	9.473***			
	SS 4	0.643	.124	9.510***			
Social value (SV)	SV1	0.701	–	–	0.863	0.855	0.880
	SV2	0.880	.081	13.309***			
	SV3	0.734	.079	12.706***			
Healthcare behaviors (HRB)	HRB1	0.734	.124	–	0.692	0.811	0.782
	HRB2	0.833	.093	9.276***			
	HRB3	0.814	.088	11.952***			
E-health literacy (EHL)	EHL1	0.811	–	–	0.795	0.872	0.776
	EHL2	0.719	.075	12.173***			
	EHL3	0.771	.088	12.736***			
Intention of continuous usage (CUI)	CUI1	0.824	–	–	0.782	0.866	0.760
	CUI2	0.732	.071	13.133***			
	CUI3	0.604	.075	12.683***			

Note: Measurement model fit: χ^2 (df) 337,940, χ^2 /degree of freedom 2.759, RMR 0.031, GFI 0.907, AGFI 0.871, NFI 0.882, TLI 0.901, CFI 0.920, RMSEA 0.036. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3. Correlation matrix and AVE

Factor	AVE	SC	SS	SV	HRB	EHL	CU
Social capital (SC)	0.819	0.830					
Social support (SS)	0.797	0.798	.645**				
Social value (SV)	0.863	0.855	.634**	.845**			
Healthcare behaviors (HRB)	0.892	0.811	.659**	.752**	.741**		
E-health literacy (EHL)	0.795	0.872	.769**	.810**	.711**	.711**	
Intention of continuous usage (CUI)	0.782	0.866	.687**	.752**	.806**	.742**	.779**

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ / The square root of AVE is shown in bold letters.

3.2. Structural model analysis results

As shown in Table 4, as the structural model’s suitability was analyzed, $\chi^2(p)$ was 290.431(0.000), and $\chi^2/\text{degree of freedom}$ was 1.632. The GFI and NFI were 0.938 and 0.882, respectively, and the latter was smaller than 0.9. However, the Root Mean Square Residual (RMR) was 0.025, the AGFI 0.866, and the RMSEA 0.039, respectively. The suitability factors were satisfactory in general, and thus the model suitability was viewed as verified. The CFI value, which is not affected by the sample but represents the model’s explanatory power, was 0.911. The value of TLI, which indicates the explanatory power of the structural model, was 0.937. Thus, it was viewed that the basic model was entirely appropriate.

As hypotheses were examined through the structural equation model’s path analysis, two out of the eight hypotheses were rejected (see Table 4). It turned out that among the social factors affecting the use of digital healthcare services, social capital had a positive (+) effect on healthcare behaviors as much as 6.236 ($p < 0.001$), and on e-health literacy as much as 4.176 ($p < 0.01$). Social value also

had a positive (+) effect on healthcare behaviors as much as 6.043 ($p < 0.001$), and on e-health literacy as much as 6.170 ($p < 0.001$). Thus, this hypothesis was also accepted. However, social support failed to affect healthcare behaviors or e-health literacy, and thus this hypothesis was rejected. Healthcare behaviors had a positive (+) effect on continuous usage by as much as 7.482 ($p < 0.001$), as well as on e-health literacy by as much as 9.192 ($p < 0.001$). Thus, this hypothesis was accepted.

4. DISCUSSION

This study analyzes the correlation between the social impact factors of digital healthcare service and healthcare behaviors and e-health literacy. It also empirically analyzes their impacts on the continuous service usage. The following are analysis results: First, social capital, a type of intangible capital formed through information exchange in social interactions, affected the continuous usage of digital healthcare service most significantly. It also affected healthcare behaviors and e-health literacy. This result indicates that communications with acquaintances and social networks can significantly affect the continuous digital healthcare

Table 4. Hypothesis test results

Hypothesis	Hypothesis (path)	Standardized regression weights	t value	Hypothesis adoption	R ²
H1	Social capital → healthcare behaviors	0.310	6.236***	Supported	0.440
H2	Social support → healthcare behaviors	0.063	1.181	Rejected	
H3	Social value → healthcare behaviors	0.285	6.043***	Supported	
H4	Social capital → e-health literacy	0.270	4.176**	Supported	0.405
H5	Social support → e-health literacy	0.181	1.269	Rejected	
H6	Social value → e-health literacy	0.336	6.170***	Supported	
H7	Healthcare behaviors → intention of continuous usage	0.333	7.482***	Supported	0.349
H8	E-health literacy → intention of continuous usage	0.409	9.192***	Supported	

Note: Structural model fit: $\chi^2(\text{df})$ 290.431, $\chi^2/\text{degree of freedom}$ 1.632, RMR 0.025, GFI 0.938, AGFI 0.866, NFI 0.882, TLI 0.937, CFI 0.911, RMSEA 0.039* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

service usage. As pointed out in previous studies, communication with medical centers and specialists is vital in the context of disease treatment behaviors. As for disease prevention and healthcare, however, spaces of information exchange in daily life affect individuals far more significantly. The continuous usage of digital healthcare services is not an exception in this regard.

Second, it turned out that social support did not affect either healthcare behaviors or e-health literacy, or continuous digital healthcare service usage. This result may suggest that digital healthcare service users' behaviors to select and maintain such services are often understood as consuming service products according to personal needs rather than behaviors of receiving public goods based on government's support, medical centers, or acquaintances. As pointed out in previous studies, social support may be adequate for society members who need financial and systematic support, such as the elderly and the disabled.

However, disease prevention and digital healthcare services based on a customized management system do not significantly affect society members.

Third, it turned out that social value positively affects digital healthcare service users, specifically regarding their continuous usage, healthcare behaviors, and e-health literacy. This situation means that society members are well-aware that it can positively affect society as they maintain their health properly. In addition, this result suggests that healthcare plays a vital role in terms of social development and citizenship. As emphasized by Hibbard et al. (2003), this result corresponds to previous studies' findings that point out that citizenship, social support, and shared information directly affect citizens' disease preventive behaviors. Healthcare behaviors of society members, mainly through digital healthcare services, can be promoted further when there is a high social consensus and value sharing.

CONCLUSION

Based on the findings stated above, this study shows that the social impact factors such as social capital, social support, and social value are important to improve the people's healthcare behaviors and e-health literacy. When it comes to digital healthcare, organizations operating in the digital healthcare service sector will need to consider the social impacts and environmental issues of healthcare, as well as technical and industrial matters, to ensure effective service improvement in this post-COVID, hyper-technology era.

Furthermore, healthcare behaviors of modern people are closely related to sharing of social values and promoting social capital through active communication in the social network, as evidenced by the results of this study. In other words, both digital healthcare enterprises and governmental institutions that take the lead of healthcare policies need to go beyond the boundary of medical policies focusing on traditional social support and develop services and policies that will raise awareness of the importance of dynamic healthcare behaviors and information sharing.

This study has found that the user's healthcare behaviors and e-health literacy ability on digital healthcare services directly affect continuous usage. It should be explained that the conviction about a society member's self-behaviors based on digital healthcare positively affects continuous disease prevention behaviors in their social commitment. In this respect, this study suggests that digital healthcare services need to lead the community members' participation in existing disease preventive social promotion policies.

Despite the implications stated above, this study is limited to digital healthcare service users only in Korea. Since digital healthcare services are distributed globally and there may be differences between countries depending on their social environments, future research needs to collect samples from various countries in order to expand the research scope and conduct a comparative analysis of data.

AUTHOR CONTRIBUTIONS

Conceptualization: Boyoung Kim.
 Data curation: Boyoung Kim.
 Formal analysis: Jaewon Lee.
 Funding acquisition: Jaewon Lee.
 Investigation: Jaewon Lee.
 Methodology: Jaewon Lee.
 Project administration: Boyoung Kim.
 Resources: Jaewon Lee.
 Supervision: Boyoung Kim.
 Validation: Boyoung Kim.
 Writing – original draft: Jaewon Lee.
 Writing – review & editing: Boyoung Kim.

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