

## **Effect of Information Characteristics of COVID-19 Vaccine on Acceptance Attitude Through Health Belief Theory**

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### **Abstract**

*COVID-19 vaccines have been developed worldwide in order to prevent the spread of coronavirus infection-19, but some people tend to refuse to be vaccinated against COVID-19. Therefore, we will investigate how people's understanding of COVID-19 vaccines affects their attitude to accept COVID-19 vaccination information. Therefore, the purpose of this study is to examine the determinants that affect the acceptability of COVID-19 vaccine through the informational characteristics of COVID-19 vaccine and the individual health belief theory. This study conducted an offline survey of 215 adult men and women living in Seoul and Gyeonggi-do Province during the period from September 1 to September 10, 2022, and we have conducted a final analysis using a total of 212 questionnaires. The results of our study were as follows. First, among the information characteristics of COVID-19 vaccine, it was confirmed that the amount of information had a significant positive effect on susceptibility, severity, and barriers in health belief theory, respectively. Second, among the information characteristics of COVID-19 vaccine, it was found that the quality of information had a significant positive effect on the susceptibility in health belief theory. Third, susceptibility and barriers in the health belief theory significantly had a positive effect on voluntary attitude and involuntary attitude in acceptance attitude, respectively. And finally, it was found that the severity of the health belief theory had a positive effect on the involuntary attitude in acceptance attitude. The results of this study suggest that policy efforts are needed to make accurate information about COVID-19 vaccine known to the people.*

**Keywords:** *Information Characteristics of COVID-19, Vaccination, Acceptance Attitude, Health Belief Theory*

### **1. Introduction**

COVID-19 vaccines have been developed worldwide in order to prevent the spread of coronavirus infection-19. However, contrary to the intention of developing the COVID-19 vaccine, some people have been showing their tendency to refuse to be vaccinated against COVID-19, be vaccinated against COVID-19. COVID-19 vaccines, developed against coronavirus disease-19 which began to spread in 2020, aimed to form a herd immunity that would allow the majority of people could get out of the crisis if they had Coronavirus disease-19 immunity. Herd immunity can work properly in an environment that lowers the infection reproduction number (an indicator that quantifies how many people a patient infects) to less than

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one[26]. In order to artificially lower the infection reproduction index, herd immunity is exercised when the majority of people with antibodies are formed on their own when the patient recovers after being infected, for example, in case antibodies are formed in the body corresponding patient or artificial antibodies are introduced into the body through vaccination, etc [13]. Considering the situation in which the number of confirmed cases of COVID-19 in Korea was not as large as those of other countries, Korea has to choose artificial vaccination, the latter method, in order to achieve herd immunity. In other words, as many people as possible should get vaccinated against COVID-19 in order to cope with the crisis environment of pandemic infections caused by COVID-19. On the other hand, since vaccination is carried out through the voluntary participation by individuals, the intention of getting vaccinated is very important for each individual. That is, the higher the vaccine receptivity, the more positive the formation of herd immunity can be [24].

And as an example, the vaccine for the flu that occurred in the fall of 2020 reflects that vaccine acceptance can be a problem to be solved in Korea, similar to some phenomena in other countries. Some of the vaccines developed in preparation for the flu that occurred in September 2020 were exposed to room temperature during the distribution processes, making it impossible to guarantee the quality of the vaccines, and accordingly, the vaccination project was temporarily suspended. Subsequently, in October, white some sediment was identified in the flu vaccine, and all the recalls of vaccine by vaccine manufacturer became known as news.

Also, according to an article in the Journal of Korean Medical Science on December 4, 2020, as some deaths were reported every day after the flu vaccination, the vaccination rate of the flu for the elderly aged 65 or older fell by 8.8%p from the previous year to 72.1%. There have also been accidents in which healthy people contracted an unknown disease and died after being vaccinated against COVID-19, which caused anxiety about the vaccine. As a result of these results, the acceptability of the vaccine in relation to the vaccination of COVID-19 has been placed in a situation of great concern for various reasons.

One of the reasons why a vaccine against COVID-19 was first introduced was that it started as a preventive measure before a treatment for COVID-19 was developed. The reason for this was that the COVID-19, which occurred in China at the end of 2019, began to spread within the Chinese and soon spread at a very fast rate around the world. For this reason, in order to prevent the pandemic of COVID-19, research for vaccine development began mainly in developed countries. However, the process for developing a vaccine against COVID-19 was very different from the process of developing a conventional vaccine in general, so a great difficulty was created. Countries around the world have fully supported huge development costs, including the U.S. government's Operation Warp Speed U.S. government, and the government support led to the approval of review process and the development process to progress quickly. Clinical tests were generally a process that proceeded sequentially from pre-clinical test to phase-3 clinical test. But, by proceeding several stages simultaneously, the period of time for clinical development was greatly reduced [45].

As a result, it took less than a year to develop vaccines for COVID-19, compared to other vaccines in the past developed over a long period of time for several years. Starting with CanSino, which was developed in June 2020, Sputnik in August and Pfizer vaccines in November were developed sequentially. Soon, COVID-19 vaccines such as Moderna and AstraZeneca were also introduced to the market. Approval for the use of vaccines in each country was also carried out on a fast track. Several countries have initiated vaccinations using methods such as the approval for emergency or the approval for limited use. In this process, questions about not only the safety of vaccines but also the effectiveness itself began to be raised.

On the other hand, the controversies over the difference in effectiveness did not fade as the results of the research showed that the effectiveness is partially different depending on the vaccine manufacturers. In addition, reports and concerns about side effects of acute hypersensitivity reactions such as "anaphylaxis" or "unusual thrombosis symptoms accompanied by thrombocytopenia" also have been raised. However, as of

September 16, 2022, the number of people vaccinated with the third COVID-19 inoculations nationwide was 65.4%, and the number people vaccinated with the fourth COVID-19 inoculations nationwide was 14.3%. Therefore, the perception of the need for the COVID-19 vaccine is also coexisting. In addition, as the Korean government induces individual participation in the vaccination of COVID-19 as a policy, vaccine acceptability is likely to be highly related to the trust in government [21]. In this study, we intend to examine the effect of characteristics against COVID-19 vaccine on acceptance attitude by health belief theory.

## **2. Theoretical Background**

### **1) Characteristics of Information on COVID-19 Vaccine**

Coronavirus disease has spread worldwide in 2020, soon causing a long-term pandemic crisis for more than two years. To date, many infected people have been counted, and the cumulative death toll exceeded 3.5 million as of May 2021[22].

Since COVID-19 vaccine has been developed, this situation of concern has decreased, and it has begun to be said carefully that it will be possible to declare an end to COVID-19 crisis.

On the other hand, since vaccination is carried out with the voluntary participation of all people, high acceptability of vaccine by the subject to be vaccinated should be an essential prerequisite. But some people are showing their repulsion for vaccination. Some people have raised questions about the safety or effectiveness of the vaccine, and are refusing it for various reasons, including the fear of needles and conspiracy point of view. Moreover, since the development period of a vaccine against COVID-19 was very short compared to the development period of general vaccines, it is raising a lot of questions about the safety or effectiveness of vaccine. Society is demanding that all citizens not only vaccinate but also voluntarily participate in social distancing in order to succeed in preventive measures against pandemic infectious disease such as COVID-19. For example, preventive measures that requires the cooperation of the entire nation can be understood as a large-scale collective action [25].

Furthermore, since the cooperation of the people is necessary for herd immunity and vaccination, it is necessary for the people to participate and adapt to the government's vaccination policy in order to succeed in the prevention, and it is possible when the number of people is small who refuse the process of collective behavior. Above all, according to existing research, it is asserted that the more the people trust the government, the less people escape from collective action [2, 12, 15].

On the other hand, the Internet is in the spotlight as a way to spread the correct information in the field of health care. The reason is that the Internet itself has characteristics such as ease of access, scope of information delivery, possibility of providing customized information, ease of social support, and personal interactions [42].

In the past, health information was the exclusive field of medical professionals, but now the general public can easily find or obtain health information using the Internet. It has become possible to search for health-related information in our daily life without restrictions of time and place. Meanwhile, according to global standards, more than 90 million websites are created every year, about 72 hours of images are posted on YouTube every minute, and Facebook users share more than 3 million posts with each other. In addition, more than 230,000 photos are posted on Instagram every day, and more than 10,000 online books are published every year without a publisher[35]. It is difficult to guess exactly how much health or medical information is occupied in online information such as video, post, photo, book, etc., but by assuming that only about 1% of them are health-related information, the amount of health-related information online is too large to be measured [27]. Therefore, for physical and temporal reasons, the amount of information we perceive is only a small fraction of the total information, and there is much more information that we do not know [35]. For example,

it was found that about 79% of people in the United States used the Internet to search for or obtain health care-related information over the past years, and among the Internet activities conducted by adults, 66% of them searched for information related to medical care or health [19].

In the past, when there was a MERS epidemic, the most frequently used media by people in order to obtain information on health care was the Internet, accounting for 66.2%. Not unlike this, in the current situation of COVID-19, medical information for methods to manage dangerous situations or methods in order to prevent diseases has increased exponentially. In order to confirm the value of information in the world, overflowing with information, the qualitative factor of information must be basically satisfied [49]. The quality of the information can be measured in conformity and precision, accuracy and completeness, and trust [3]. If the level of information related to health care that is wandering online is low, the actual fact that is closely related to health can be limited in distribution. Therefore, the quality of information is an element that cannot be overlooked [36]. Currently in Korea, about 88.4% of Internet users have used the Internet in order to search for and use health information. Of these, about 70.4% of users have accepted Internet health information and have experienced their actions differently [42].

On the other hand, erroneous health information has been circulating through the Internet or SNS. Typical examples include chlorine disinfectant and alcohol to suggest mask disinfection or to prevent diseases by ingesting hydrogen peroxide. If such groundless and false health information or low-quality information is provided through the Internet, safety accidents may occur, and public health may be negatively affected. Low-quality health information not only does not help diagnose or treat diseases, but also has negative effects on patients, such as delaying proper medical treatment or raising false hopes, and health care may be unnecessarily consumed [37].

## **2. Health Belief Theory**

Researchers at the U.S. Public Health Service introduced a model of Health Belief Model in the early 1950s in order to find out why people do not participate in health programs. The Health Belief Model was devised in order to predict the behavior of people for health prevention. Health prevention behaviors appear as a practical action according to expectations by the individual [41].

The health belief model can be divided into four constituent concepts; there are perceived severity and perceived susceptibility as psychological factors, and there are perceived barriers and perceived benefits for evaluations of health behaviors. In general, perceived benefits refer to the likelihood that an action will actually occur and the benefits arising from that action, and the more people feel that they have a greater benefit from their actions, the more likely they are to actually perform their health behaviors [32]. However, the more a person perceives the obstacles or discomfort when performing an action, the less likely it is to perform a health behavior, which is called a perceived barrier. In addition, perceived susceptibility also refers to how sensitive a person is to a health condition, and perceived severity refers to how seriously a person perceives the consequences when faced with a specific risk situation for health. Self-efficacy refers to the degree of trust that a person thinks he or she can perform an action, and cues to action are internal and external environmental factors that encourage a person to perform healthy behavior, so they are stimulants that induce healthy behavior, which can be seen as an important factor arising from the interaction between society and individuals in that individuals belong socially along with their beliefs about health and disease [28, 48].

These constituent factors have an effect on helping people correct their behavior because they cause health behaviors in disease environments, which are health risk situations facing people [8].

Thus, the higher the likelihood that a person will experience a disease (perceived susceptibility), the higher the perceived severity of the disease if the person has the disease (perceived severity), the greater the benefit

the person gains from performing a health behavior (perceived benefit), the less obstacles or discomfort the person has in maintaining healthy behavior (perceived barriers), the greater the perceived internal and external variables of the person that induce specific behaviors related to disease recovery (Cues to action), the more can it be interpreted that the more people think that they can maintain healthy behaviors for disease recovery (self-efficacy), the greater their behavioral intentions. In Korea, researches on the health belief model have been actively conducted. There have been studies that have examined the effects of health belief models and the theory of planned behavior to the vaccination intention of the people in relation to the new influenza [48].

When predicting oral health behavior of infants, there was also a research that analyzed the results of applying the theory of planned behavior and health belief model [44].

In addition, with media campaigns as a clue to behavior, there was a study that analyzed influenza prevention behavior performed by individuals through a health belief model [29].

There was a study that applied a health belief model to analyze the intention of actions taken to detect and prevent cervical at an early stage [9]. Based on the results of previous studies above, in this study we intend to apply the health belief model in order to investigate the effects of the characteristics of vaccine information on health care information and behavior of vaccination in the context of COVID-19.

### **3. Acceptance Attitude (Psychological Reactance Theory)**

When people's freedom to choose is threatened, or when their freedom to choose is suppressed by someone, a desire to achieve freedom arises in some way, which Brehm interpreted through the Psychological Reaction Theory [5].

In previous studies on negative repulsions caused by rejecting them in specific environments, the repulsion was classified as a tendency of situational context [17, 34, 36].

Based on the theory, it is interpreted that a sense of opposition to protect one's freedom, in an environment where freedom is threatened, occurs in everyone's action; and that action is chosen in the direction of recovery to regain suppressed freedom or lost freedom [6, 11, 46].

On the other hand, such psychological resistance may be caused by an unfriendly attitude or an emotion of anger toward a specific person [11, 39, 50].

We have examined various studies on the factors affecting psychological resistance. The influencing factors typically include the relationship between each factor, such as trust in an individual's subjective choice, threats caused by choice behavior, and personal awareness of the sustainability of the threat. On the other hand, the more aware of the threat to freedom or the persistence of the threat, the greater the psychological reactance [5, 7].

In the same context, the psychological reactance that occurs in daily life is strongly expressed when one recognizes the moment when the natural behavior that one has performed in the past was threatened [31, 43].

In other words, psychological reactance appears due to limited behavior. However, there is an interpretation that when the experience of freedom itself is insufficient, the experience or negative perception of threatened freedom is also low [40].

As such, depending on whether the experience of exposure to information for COVID-19 vaccine is passive or subjective, or through other media, the level of awareness of vaccination or safety that people feel and perceive may vary.

## **3. Research Method**

### **1) Sample Design and Measurement Tools**

In this research, we selected adult men and women living in Seoul and Gyeonggi-do Province as subjects of our research in order to investigate the effect of the characteristics of information on COVID-19 vaccine on acceptance attitude through health belief theory. The data collection period was from September 1 to September 10, 2022, and the researcher explained the purpose and contents of the study to the study subjects through an offline questionnaire in order to obtain their consent and received 215 questionnaires from each subject.

The final 215 questionnaires were collected, and among the collected questionnaires, the three questionnaires with omission of records or a prominent tendency toward centralization were judged to have no value as statistical data and were excluded, and a total of 212 questionnaires were used for the final analysis.

As previously discussed in this study, by using previous studies on the characteristics of information on COVID-19 vaccine, health belief theory, and acceptance attitude, we have tried to find out how the characteristics of information on COVID-19 vaccine affect acceptance attitude through health belief theory, and based on the previous studies, the evaluation items were organized by modifying them according to the situation, and the items using the 5-point Likert scale were constructed as follows.

**Table 1. List of measurement items**

Variables	Measurement Items	References
Amount of information	There are many opinions that people have about the information of COVID-19 vaccine. There is a lot of empathy that people have about the information of COVID-19 vaccine. There are many recommendations from people regarding the information of COVID-19 vaccine.	[33, 38]
Quality of information	Information about the COVID-19 vaccine is neither too positive nor too negative. The information about the COVID-19 vaccine accurately expresses the information about the vaccine. Information on the COVID-19 vaccine is generally delivered in detail from an objective point of view.	[33, 49]
Susceptibility	I think I might catch COVID-19 I think I might catch COVID-19 if I don't follow the government's guidelines. I think I should get vaccinated because there are no people around me who have not been vaccinated against COVID-19.	[8, 28, 32]
Severity	I think COVID-19 is a much more serious disease than any other diseases. COVID-19 is a very serious disease because it can cause death. If I catch COVID-19, I think my life will be difficult.	[28, 29, 32]
Barriers	I am afraid of getting disabled after getting the COVID-19 vaccine. I am afraid that I will suffer from the aftereffect after getting vaccinated against COVID-19. I'm afraid of the pain of the few days that I might experience after getting vaccinated against COVID-19.	[8, 28, 32]
Benefits	I think the vaccine against COVID-19 will protect my health. I believe that getting a vaccine against COVID-19 will help reduce anxiety about COVID-19. I think getting a vaccine against COVID-19 will protect my home.	[28,29, 32]
Voluntary attitude	I think we should get a vaccine against COVID-19 if possible. I will encourage people around me to get vaccinated against COVID-19. There is an atmosphere around me that encourages vaccination against COVID-19	[36]
Involuntary	I don't think there's a big chance that you'll actually catch COVID-19 even if you don't get vaccinated against COVID-19.	[36]

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attitude	<p>I am not particularly interested in vaccination because there are many people around me who are not vaccinated against COVID-19.</p> <p>I think people with COVID-19 caught it regardless of vaccination because they did not follow the government guidelines.</p>
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## 2) Research Hypothesis

### 2.1 Relationship Between the Information Characteristics of COVID-19 Vaccine and the Health Belief Theory

Summarizing the results of previous studies, it can be seen that the information on COVID-19 vaccine belongs to medical information as a higher item. Medical information consists of the quality of information, the amount of participation in information, and the characteristics of information reliability, and the medical information can be further interpreted as a factor that can affect the components of health belief theory. The health belief model helps the users or people to anticipate health preventive actions that can be taken, and health preventive actions reflect the values desired by individuals and enable them to be implemented.

As mentioned earlier, we will set up a preliminary hypothesis to study the characteristics of health care information in order to investigate how the three components such as, information quality, amount of information, and reliability, can affect the perceived risks, health knowledge, and self-efficacy by individuals. Because health information is vast in scope, it includes from daily minor health news to life-and-death content. Therefore, because health information can affect an individual's health behavior, the reliability and quality of the information itself are considered very important regardless of whether it has been verified or not[19].

In addition, if the quality of information is maintained high, the reliability of the information is also expected to increase[4].

As a result, users think that information which is relatively easy, understandable, or easily accessible is useful information, and by recognizing useful information, people expect to improve their health knowledge and understanding of vaccine information, and to be more aware of vaccines and their safety. According to the results of the preceding papers summarized above, the hypotheses in this study can be set as follows.

Hypothesis 1: Among the characteristics of information on COVID-19 vaccine, the amount of information will affect health belief theory.

Hypothesis 1-1: Among the characteristics of information on COVID-19 vaccine, the amount of information will affect susceptibility.

Hypothesis 1-2: Among the characteristics of information on COVID-19 vaccine, the amount of information will affect severity.

Hypothesis 1-3: Among the characteristics of information on COVID-19 vaccine, the amount of information will affect barriers.

Hypothesis 1-4: Among the characteristics of information on COVID-19 vaccine, the amount of information will affect benefits.

Hypothesis 2: Among the characteristics of information on COVID-19 vaccine, the quality of information will affect health belief theory.

Hypothesis 2-1: Among the characteristics of information on COVID-19 vaccine, the quality of information will affect susceptibility.

Hypothesis 2-2: Among the characteristics of information on COVID-19 vaccine, the quality of information will affect severity.

Hypothesis 2-3: Among the characteristics of information on COVID-19 vaccine, the quality of information will affect barriers.

Hypothesis 2-4: Among the characteristics of information on COVID-19 vaccine, the quality of information will affect benefits.

## **2.2 Relationship between Health Belief Theory and Acceptance Attitude**

According to the results of previous studies, the components of health belief theory such as perceived risk, health knowledge, and self-efficacy can be interpreted as variables that can affect behavioral intention. Behavioral intention is related to the intention of an individual to actually practice behavior, and is an emotion recognized in the process of using a service or product, which means that the attitude created based on the experiences that occur before or after the use of the service or product is likely to be practiced in the future[33]. In the field of rational behavior theory, purchase intention also implies the possibility that an individual's beliefs and attitude to purchase a service or product will actually appear[30]. When looking at information by extending it to the Internet, there was a study result showing that the information obtained through mutual communication between community users on the Internet is relatively reliable and also increases the purchase intention of users[4].

Accordingly, in this study, we will investigate how knowledge and health information on vaccines affect the intention and behavior of users. In this study, we will examine how people's self-efficacy, such as planning to receive a vaccine in a COVID-19 situation, and perceived risk, such as side effects from vaccination, affect behavioral intentions. According to the results of the preceding paper summarized above, we can set the hypothesis in this study as follows.

Hypothesis 3: Among the health belief theory, susceptibility will affect acceptance attitude.

Hypothesis 3-1: Among the health belief theory, susceptibility will affect voluntary attitude.

Hypothesis 3-2: Among the health belief theory, susceptibility will affect involuntary attitude.

Hypothesis 4: Among the health belief theory, severity will affect acceptance attitude.

Hypothesis 4-1: Among the health belief theory, severity will affect voluntary attitude.

Hypothesis 4-2: Among the health belief theory, severity will affect involuntary attitude.

Hypothesis 5: Among the health belief theory, barriers will affect acceptance attitude.

Hypothesis 5-1: Among the health belief theory, barriers will affect voluntary attitude.

Hypothesis 5-2: Among the health belief theory, barriers will affect involuntary attitude.

Hypothesis 6: Among the health belief theory, benefits will affect acceptance attitude.

Hypothesis 6-1: Among the health belief theory, benefits will affect voluntary attitude.

Hypothesis 6-2: Among the health belief theory, benefits will affect involuntary attitude.



### 3) Analysis Method

In this study, we used the covariance structure analysis devised in order to analyze complex causality, instead of verifying each hypothesis individually to analyze causality between the variables presented. As tools for analysis, SPSS and AMOS were used.

## 4. Analysis Results

### 1) Characteristics of Samples

The demographic characteristics of the sample used for analysis in this study are as follows. By age, 93 people (46.5%) were 30 to 39 years old, 59 people (38.3%) were 20 to 29 years old, 34 people (17.0%) were 40 to 49 years old, and 14 people (7.0%) were over 50 years old. In addition, 123 (61.5%) were married and 77 (38.5%) were unmarried. As for the final educational background, 87 people (43.5%) graduated from colleges of 2-3 years, 9 people (4.5%) graduated from cyber universities, 72 people (36.0%) graduated from four-year-universities, and 32 people (16.0%) enrolled in graduate schools or higher. In terms of work experience, 4 people (2.0%) had less than 1 year, 28 people (14.0%) had less than 1 to 3 years, 48 people (24.0%) had less than 3 to 5 years, and 37 people had less than 5-7 years (18.5%), 83 people (41.5%) had more than 7 years.

### 2) Reliability and Validity of the Measurement Items

The validity of the measurement model was confirmed using the finally collected data (n=212). Reliability test and validity test are commonly used measurement items for the validity verification of the measurement model. Among them, the validity test of measurement items was conducted through the convergent validity and discriminant validity. For reliability verification, Cronbach's  $\alpha$  coefficient (0.6 or more), which is most commonly used in social science researches, was used. And, by using AMOS, factor loading among the results of confirmatory factor analysis were used to verify convergence validity. In general, if the factor loading is  $\pm 0.4$  or more, it is judged to be significant [1]. Discriminant validity is used in order to verify the degree to which two similar concepts are clearly distinguished. For this purpose, the average variance extracted (AVE), proposed by Fomell and Larker (1981), and Pearson's correlation analysis method were used. If the square value of AVE in each construct exceeds the value of the correlation coefficient between the corresponding conceptual construct and other construct, it is considered that discriminant validity exists.

<Table 2> shows the results of testing the reliability and validity of the variables used in this study. As a result of measuring reliability, there was no item that hindered reliability, and the Cronbach's  $\alpha$  value used for reliability verification was distributed from 0.635 to 0.901 and was higher than the recommended value (0.6 or higher), indicating that the reliability of the measurement item was secured. In addition, the factor loading value to verify validity was also higher than the standard value suggested in previous studies, indicating that there was no problem with the validity of the measurement item. Finally, discriminant validity using the mean variance extraction value is judged to be secured because it was found that there was no problem. These results statistically prove the internal consistency and validity of the items in the questionnaire. <Table 2> shows the results of the reliability and validity verification of the measurement model.

**Table 2. Confirmatory factor analysis and reliability result**

Variables	Measurement Items	Factor Loadings	Measurement Errors	Cronbach's $\alpha$	C.R	AVE
Amount of information	Aol3	0.611	0.388	0.766	0.882	0.716
	Aol2	0.811	0.119			
	Aol1	0.823	0.170			
Quality of information	Qol3	0.713	0.293	0.729	0.832	0.626
	Qol2	0.583	0.337			
	Qol1	0.765	0.226			
Susceptibility	Sus3	0.906	0.138	0.920	0.940	0.889
	Sus2	0.904	0.129			
	Sus1	0.863	0.189			
Severity	Sev3	0.743	0.368	0.862	0.893	0.738
	Sev2	0.949	0.072			
	Sev1	0.791	0.299			
Barriers	Bar3	0.809	0.269	0.901	0.922	0.798
	Bar2	0.936	0.106			
	Bar1	0.863	0.202			
Benefits	Ben3	0.661	0.523	0.801	0.838	0.638
	Ben2	0.910	0.131			
	Ben1	0.732	0.370			
Voluntary attitude	VA3	0.789	0.412	0.826	0.857	0.678
	VA2	1.032	-0.056			
	VA1	0.589	0.610			
Involuntary attitude	IA3	0.637	0.369	0.714	0.823	0.609
	IA2	0.718	0.231			
	IA1	0.690	0.297			

### 3) Suitability Verification of Measurement Items

After verifying the reliability and validity of the measurement model, the adequacy test was performed using AMOS in order to verify whether the collected data were suitable for the research model. In order to verify the suitability of the initial measurement model, a total of 24 measurement items were utilized. For suitability verification, the value of  $p$  ( $\geq 0.05$ ) was used, for goodness-of-fit Index (GFI) 0.9 or higher, Normed Fit Index (NFI) 0.9 or higher, Root Mean Square Residual (RMR) 0.05 or less, and comparative fit index (CFI) 0.9 or higher. As a result of verifying the fit of the measurement model, the fit was found to = 687.99 (df = 360),  $p = 0.00$ ,  $\chi^2/df = 1.911$ , GFI = 0.84, NFI = 0.823, CFI = 0.905, RMR = 0.043, and all indices were above the recommended values, so there were no problems with the fit. This can be interpreted that the data we have collected to validate this research model is appropriate [16].

**Table 3. Correlations among Constructs**

Variables	Correlation coefficients between variables							
	1	2	3	4	5	6	7	8
(1) Amount of I	<b>0.846</b>							
(2) Quality of I	0.475**	<b>0.791</b>						
(3) Susceptibility	-0.088	0.045	<b>0.916</b>					

(4) Severity	0.304**	0.275**	-0.121*	<b>0.859</b>				
(5) Barriers	-0.066	-0.076	0.484**	0.048	<b>0.893</b>			
(6) Benefits	-0.018	0.009	-0.069	-0.137*	-0.168*	<b>0.799</b>		
(7) Voluntary A	0.164*	0.013	0.017	0.156*	-0.058	-0.073	<b>0.823</b>	
(8) Involuntary A	0.367**	0.380**	-0.086	0.535**	0.038	0.014	0.082	<b>0.780</b>
Average	3.726	3.764	2.748	3.638	2.651	3.458	3.792	3.541
Standard Deviation	0.584	0.598	0.799	0.786	0.823	0.772	0.846	0.596

\*\* p<.01, \* p<.05, number at the diagonal line is average variance extracted (AVE).

As shown in <Table 3>, the variance extracted index was larger than the square value of the correlation coefficient of each factor. Therefore, the discriminant validity between constituent concepts was secured (Kang, 2013; Hong, 2002).

#### 4) Verification Results of Research Model

After verifying the validity of the measurement model for a total of 212 data, Structural Equation Model (SEM) was performed using Analysis of Moment Structure (AMOS) in order to verify the effect between the variables presented in the research model. By analyzing structural equations, two important results can be derived. The first result is the degree of fit of the structural model. When looking at the fit of the research model,  $\chi^2=764.478(df=371)$ ,  $p=0.000$ ,  $CMIN/DF=2.061$ ,  $RMR=0.05$ ,  $NFI=0.803$ ,  $CFI=0.886$ ,  $GFI=0.826$ ,  $AGFI=0.782$ ,  $TLI=0.866$ , and  $IFI(\Delta 2)=0.888$ , therefore, when we examine the fit indices centering on CFI, TLI, and RMR suggested as model fit indices of Gyesu Kim (2004), it was confirmed that the fit of the research model was generally good.

The results of verifying the hypothesis are as follows.

First, among the information characteristics of COVID-19 vaccine, it was found that the amount of information had a positive (+) effect on the susceptibility with  $\beta=0.440$  in the health belief theory. And it was found that the amount of information had a positive (+) effect with  $\beta=0.241$  on the severity of the health belief theory, and had a positive (+) effect with  $\beta=0.293$  on the barriers of the health belief theory. But, it was found that the amount of information had no effect on the benefit in the health belief theory with  $\beta=-0.051$ . Second, among the information characteristics of COVID-19 vaccine, it was found that the quality of information had a positive (+) effect on the susceptibility with  $\beta=0.319$  in the health belief theory. But, it was found that the amount of information had no effect on the severity and barriers in the health belief theory with  $\beta=-0.099$ ,  $\beta=0.159$ , respectively. But, among the information characteristics of the COVID-19 vaccine, it was found that the quality of information had a negative(-) effect on the benefits with  $\beta=-0.266$  in the health belief theory. Third, among the information characteristics of COVID-19 vaccine, it was found that the susceptibility had a positive(+) effect on the acceptance attitude. If we take a closer look, among the information characteristics of COVID-19 vaccine, it was found that the susceptibility had a positive(+) effect with  $\beta=0.464$  on voluntary attitude and with  $\beta=0.189$  on involuntary attitude. Fourth, among the health belief theory, it was found that the severity had no effect on the voluntary attitude with  $\beta=0.067$ , and it had a positive(+) effect on the involuntary attitude with  $\beta=0.067$ . Fifth, among the health belief theory, it was found that the barriers had a positive(+) effect on all of the acceptance attitude. In detail, the barriers had a positive(+) effect on voluntary attitude with  $\beta=0.399$  and on involuntary attitude with  $\beta=0.706$ , respectively. Finally, among the health belief theories, it was found that the benefits did not have any effect on acceptance attitude. In detail, it was found that the benefits did not have any effect on voluntary attitude with  $\beta=0.09$ , and on involuntary attitude with  $\beta=0.165$ , respectively.

**Table 4. The result of research model**

Hypothesis	Path	Path coefficients	Results
H1-1	Amount of I -> Susceptibility	0.440***	Adoption
H1-2	Amount of I -> Severity	0.241***	Adoption
H1-3	Amount of I -> Barriers	0.293**	Adoption
H1-4	Amount of I -> Benefits	-0.051	Rejection
H2-1	Quality of I -> Susceptibility	0.319***	Adoption
H2-2	Quality of I -> Severity	-0.099	Rejection
H2-3	Quality of I -> Barriers	0.159	Rejection
H2-4	Quality of I -> Benefits	-0.266**	Adoption(-)
H3-1	Susceptibility -> Voluntary A	0.464***	Adoption
H3-2	Susceptibility -> Involuntary A	0.189***	Adoption
H4-1	Severity -> Voluntary A	0.067	Rejection
H4-2	Severity -> Involuntary A	0.165**	Adoption
H5-1	Barriers -> Voluntary A	0.399***	Adoption
H5-2	Barriers -> Involuntary A	0.706***	Adoption
H6-1	Benefits > Voluntary A	0.09	Rejection
H6-2	Benefits -> Involuntary A	0.165	Rejection

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 5. Conclusion

Recently in order to prevent the spread of Coronavirus disease 2019 (COVID-19), COVID-19 vaccines have been developed worldwide. However, contrary to the intention of developing COVID-19 vaccine, some people have been showing their tendency to refuse to be vaccinated against COVID-19. In this study, we have studied the structural relationship to find out the effect of the information properties of COVID-19 vaccine on acceptability based on the health belief theory. We reviewed the literature of previous studies in order to select factors used in the study, established a research model and six higher-order hypotheses, and used appropriate measurement tools, by setting operational definitions of each factor for hypothesis verification. We utilized the accumulated data by conducting a survey, reflecting the research model to analyze the empirical analysis. We have investigated the relationship between the information characteristics of COVID-19 vaccine and its impact on acceptance of the general public, through the health belief theory. Since we have conducted an empirical study on the general public, we modified some of the operational definitions of the variables accordingly. In addition, we used the survey data from the previous study and partially supplemented the measurement tool for this study. Accordingly, the results of the study on the verification of the hypothesis are as follows.

First, among the information characteristics of COVID-19 vaccine, it was found that the amount of information had a positive(+) effect on the susceptibility, severity, and barriers in the health belief theory. According to this result, it shows that users get the severity of COVID-19 infection and the aftereffects of the vaccine caused by the vaccine through the amount of information. Although it may not be a direct impact of the Coronavirus due to the second wave of COVID-19 pandemic, it means that users indirectly feel the seriousness of COVID-19 in that there are still the death toll from COVID-19. In addition, most people are sensitive to reinfection at the present time of COVID-19, but it will affect the sensitivity of people that reinfection can pass lightly as a symptom of cold.

Second, among the information characteristics of COVID-19 vaccine, it was found that the quality of

information had a positive(+) effect on the susceptibility in the health belief theory. This reflects the risk of reinfection similar to the amount of information described above as the quality of information is guaranteed in the characteristics of information on COVID-19 vaccine. It reflects the growing belief that COVID-19 will pass relatively easily in everyday life due to vaccination of people.

Third, among the information characteristics of COVID-19 vaccine, it was found that the quality of information had a negative(-) effect on the benefits in the health belief theory. This result reflects that, among the information characteristics of COVID-19 vaccine, as the quality of information is guaranteed, it does not have a positive effect on reducing the risk or threat of self-awareness of COVID-19. In other words, it is the result of partially reflecting social incentives due to vaccination recently, and even if they are not vaccinated against COVID-19, they can live a social life or can use public places. In addition, it is a result of reflecting the relatively decreased social interest in vaccination itself, and thus the need for vaccination has also decreased.

Fourth, it was found that susceptibility in the health belief theory had a positive(+) effect on the voluntary and involuntary attitude in the psychological reactance theory, respectively. This can be said to be a result of reflecting that the stronger the information about COVID-19 vaccine or personal thoughts about being infected with COVID-19, the more likely it will affect the voluntary or involuntary psychological repulsions.

Fifth, severity in the health belief theory was found to have a positive effect on involuntary attitude according to the psychological reactance theory. This is a result of negatively affecting the severity of the COVID-19 or COVID-19 vaccine, not being considered serious, and reflecting the fact that even if COVID-19 is infected with a mild cold level, the opinion to prescribe and treat drugs at the pharmacy increases, and the attitude against the standpoint of government's policy to encourage vaccination increases.

Sixth, barriers in the health belief theory was found to have a positive(+) effect on the voluntary attitude and involuntary attitude, respectively, in the psychological reactance theory. This means that if people become infected with COVID-19, there may be a variety of views on the tangible and intangible social costs that individuals should pay, with the individuals taken into account. As explained earlier, the view that tangible and intangible damage can be caused by vaccination due to changes in social interest in COVID-19 vaccination and the government policy method and the aftereffects of death in the worst case due to infection with COVID-19 exist together, so it can be seen as a result that reflects people's views on whether or not to vaccinate against COVID-19 according to the government's way of policy.

According to the results of the above study, health and medical information is pouring out from various media in the situation of COVID-19. Since unverified information is included, among them, it can be said that the seriousness of the information is very large because it can lead to health behaviors for users who receive wrong information. In order to solve this problem, the government and other national institutions need to accurately deliver and guide reliable information when people are exposed to confusing information, and it is also necessary to create media that perform a function like this.

Accordingly, the implications of this study are as follows.

First, as a theoretical implication, it is meaningful that in a study conducted on the general public, the effect of the information characteristics of the COVID-19 vaccine on the acceptance attitude was actually confirmed using the health belief theory. As the result of the first study conducted to confirm the effect of information on COVID-19 vaccine using the health belief theory, it has implications that it informed the need to make good use of the information characteristics of COVID-19 vaccine. Second, as a practical implication of this study, an empirical study was conducted on the informational characteristics of COVID-19 vaccine in a study conducted on the general public, so it can be used as a meaningful research result to guide policy proposals or the vaccine information of government in a situation where the pandemic situation of COVID-19 is maintained.

When interpreting the significant results shown in the results of this study, it is necessary to keep the

following limitations of the study in mind.

First, the study we have performed is an empirical study conducted using questionnaires. This study has a limitation in that it did not confirm how much users actually accepted health information and moved to health behavior. In future studies based on the results of this study, if the results of collected data on the actual behavior of the study subjects are used for analysis, it will be a more meaningful research design. Second, we have conducted this study during the progress of COVID-19, but at a time when the risk of COVID-19 is socially considered to be relatively low. Accordingly, the information that the subjects we studied have about COVID-19 vaccine has been more practically and accurately accumulated, therefore, there are some limitations that the results we are trying to obtain in this study may be affected by some biased other results. Third, this study has a limitation in that it is a cross-sectional study. Therefore, by conducting a study that tracks and observes the general public who participated in the study, we propose a study that analyzes the improvement effect to move into action according to the information characteristics of COVID-19 vaccine, using longitudinal studies through comparison of before and after tests. Based on the results of the survey, we think that studies that analyze the effects of acceptance attitude more rigorously need to be carried out.

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