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A Study on the Utilization Plan for Functionally Lost Reservoirs: Focused on Daegu and Gyeongbuk

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Abstract

Purpose: Korea has a climate with significant seasonal variation in precipitation. There were often difficulties in the agricultural season due to the lack of rainfall. Since ancient times, many reservoirs have been built for irrigation facilities. This study aims to suggest utilization plans by analyzing the size, population of the surrounding area, the surrounding ecological grade, and accessibility for the functionally lost reservoirs.

Method: Researchers analyzed 155 reservoirs with loss of function and low utilization among reservoirs in Daegu and Gyeongbuk. The reservoir size was classified based on the total storage amount of 50,000m³, and the surrounding area's population was based on 10,000 people. The ecological grade around reservoirs was based on the ecological and natural map of the Ministry of Environment, and the accessibility was classified based on road networks connected around reservoirs.

Results: As a result of analyzing the functionally lost reservoirs by size, 10 places belonged to the 'upper' group, and 145 places belonged to the 'lower' group. By surrounding area's population, 28 places belonged to the 'upper' group, and 127 places belonged to the 'lower' group. By surrounding ecological grade, 93 places belonged to the 'upper' group, and 62 places belonged to the 'lower' group. By accessibility, 59 places belonged to the 'upper' group, and 96 places belonged to the 'lower' group.

Conclusion: The 8 reservoirs can be used as water-friendly reservoirs with easy access. The 3 reservoirs can be used as leisure types with sufficient size. It would be able to use 11 ecological experience type sites and 79 ecological preservation type sites, considering nearby conditions. The 48 reservoirs can be used to supply electricity to nearby households. The 6 reservoirs can be used as an emergency type for drought. In this study, the utilization types of reservoirs were classified according to various conditions. However, as these are only a rough guide for the direction of reservoir use, further research is needed to refine the utilization plans or find alternatives according to the characteristics of each reservoir.

Keywords: Reservoir, Loss of Function, Water-Friendly Type, Ecological Experience Type, Ecological Preservation Type

1. Introduction

Korea has a climate with significant seasonal variation in precipitation. Floods are concentrated from summer to autumn, and there is little rainfall from winter to spring, resulting in drought[1]. Therefore, many irrigation channel facilities have been built since ancient times because of the lack of precipitation when farm work requires much water. In particular, agricultural reservoirs have developed a lot[2][3].

Daegu and North Gyeongsang Province were very developed agricultural regions, but the precipitation was the lowest in the country. In order to solve the difficulty of supplying agricultural

water in these areas, it was essential to construct farming reservoirs. As a result, these regions are distributed the most significant number of agricultural reservoirs in the country [4].

However, with urbanization and industrialization, the farmland area is shrinking, and the number of farm households is decreasing due to the migration of farmers. Agricultural reservoirs are also being reduced or no longer needed in urban areas. Accordingly, reservoirs that have lost their function are being demolished in many cases [2][5][6].

As the demolition of the reservoirs is delayed due to opposition from the residents, there is also a need for a utilization plan for the agricultural reservoirs that have lost their function.

In Korea, reservoirs have been essential for farming since ancient times, but the paradigm of the reservoir business is changing according to changes in the social environment [7]. In the 1960s and 1980s, reservoirs were used to obtain simple agricultural water. However, in the 1990s, it was implemented as a rural water development project to provide agricultural, living, and environmental water needed in rural areas. Since 2009, it has been implemented as a multi-purpose rural water development project with all the necessary functions, including water-friendly spaces and water needed in rural areas [2][8][9].

Recently, in addition to supplying agricultural water, which is the original role of agricultural reservoirs, various utilization methods are being sought according to the demand for multifunctional functions of rural water for reservoirs with loss of function and underused [10]. It is also required to enhance the value of rural water by increasing the use of reservoirs and water-friendly functions such as landscape formation, waterside parks, and water play facilities [2][11][12].

Among agricultural reservoirs in Daegu and Gyeongsangbuk-do, agricultural reservoirs whose functions have been changed and lost will go through the procedure of disuse. However, there are increasing cases of recognizing the possibility of various uses and making new attempts [13][14].

Kang SH(2014) studied the use of untended reservoirs in flood control. Park JY(2002) studied the space utilization plan considering the area's characteristics around the reservoir in a study on the plan of waterfront utilization plan in urban areas. Goo MS(2011) studied the use of reservoirs for ecological park creation targeting Wonju-si Maeji Reservoir in the development plan for the ecological park of a reservoir in a suburban area [2][15]. Yeo, WG et al.(2016) tried to find a way to reuse the under-utilized agricultural reservoirs in a study on alternative utilization methods of agricultural reservoirs in Gyeongbuk province [2][16][17].

To find a way to utilize agricultural reservoirs whose functions have changed and their use has been abolished or underutilized, it is also necessary to research to categorize them according to the reason for the loss of function and the area's characteristics around the reservoir.

This study aims to suggest utilization plans by analyzing the size of reservoirs, the population of surrounding areas, the ecological grade around reservoirs, and the accessibility to reservoirs for the reservoirs with loss of function or underutilization among reservoirs.

2. Methods

2.1. Gathering data

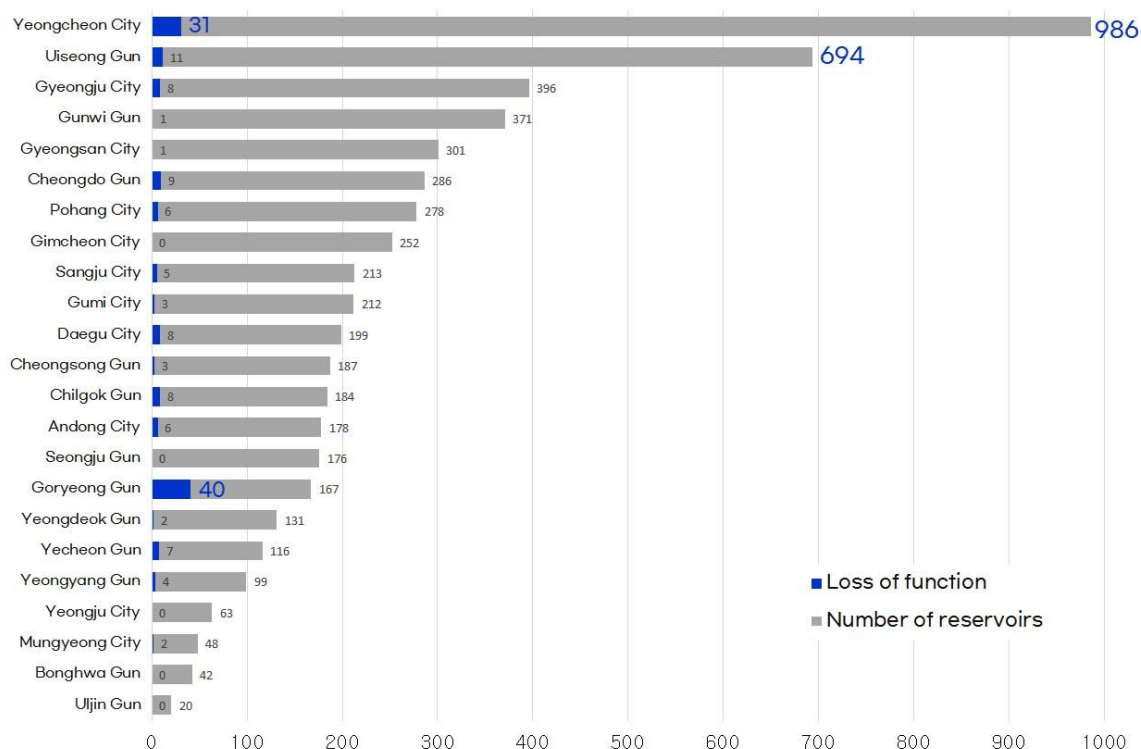
To analyze the current status of reservoirs in Daegu and Gyeongbuk, researchers used the agricultural reservoir status, KOSIS(Korean Statistical Information Service) data, and rural water system statistical data [18][19]. The temporal range is from 2005 to 2021, and this study used

the latest statistical data from 2019 for analysis. This study analyzed 155 agricultural reservoirs with loss of function from the 2017 national safety inspection results <Table 1>, <Figure 1>.

Table 1. The number of research subjects.

Research scope	Number of reservoirs	Loss of function	Ratio
Daegu city	199	8	4.0
Pohang city	278	6	2.2
Gyeongju city	396	8	2.0
Gimcheon city	252	0	0.0
Andong city	178	6	3.4
Gumi city	212	3	1.4
Yeongju city	63	0	0.0
Yeongcheon city	986	31	3.1
Sangju city	213	5	2.3
Mungyeong city	48	2	4.2
Gyeongsan city	301	1	0.3
Gunwi gun	371	1	0.3
Uiseong gun	694	11	1.6
Cheongsong gun	187	3	1.6
Yeongyang gun	99	4	4.0
Yeongdeok gun	131	2	1.5
Cheongdo gun	286	9	3.1
Goryeong gun	167	40	24.0
Seongju gun	176	0	0.0
Chilgok gun	184	8	4.3
Yecheon gun	116	7	6.0
Bonghwa gun	42	0	0.0
Uljin gun	20	0	0.0
Total	5,599	155	2.8

Figure 1. Analysis graph of the research subjects.



2.2. Data analysis

This study examined previous studies on agricultural reservoirs. It analyzed the size of reservoirs, the population of surrounding areas, the ecological grade around reservoirs, and the accessibility of reservoirs, targeting low-utilization reservoirs in Daegu and Gyeongbuk[2][20][21]. The size of reservoirs was divided into 'upper' and 'lower' group based on the total storage volume of 50,000m³. The population in surrounding areas was divided into 'upper' and 'lower' group based on the 10,000 people around reservoirs in 'myeon' and 'dong' regions. The ecological grade around reservoirs was divided into 'upper' group with 1st and 2nd grades and 'lower' group with 3rd grades based on the ecological and natural map of the Ministry of Environment[2][22][23]. The accessibility of reservoirs was divided into 'upper' and 'lower' group based on the number of road networks connected around reservoirs <Table 2>[24][25]. The researchers analyzed the quantified data and suggested ways to utilize functionally lost reservoirs.

Table 2. Classification of utilization types of functionally lost reservoirs.

Use factors	Criteria for type classification
Reservoir size	- How will the reservoir be utilized by dividing it into 'upper' and 'lower' based on the total storage amount of 50,000(m ³)?
The population of surrounding areas	- The population in surrounding areas was divided into 'upper' and 'lower' based on the 10,000 people around reservoirs in 'myeon' and 'dong' regions.

Ecological grade of surrounding areas	<ul style="list-style-type: none"> - How valuable is the reservoir ecologically? - The ecological grade around reservoirs was divided into 'upper' with 1st and 2nd grade and 'lower' with 3rd grade.
Reservoir accessibility	<ul style="list-style-type: none"> - How easily will users be able to visit after the reservoir is developed? - Divided into 'Upper' and 'Lower' based on the two road networks connected to the reservoir.

3. Results & Discussion

3.1. The size of functionally lost reservoirs

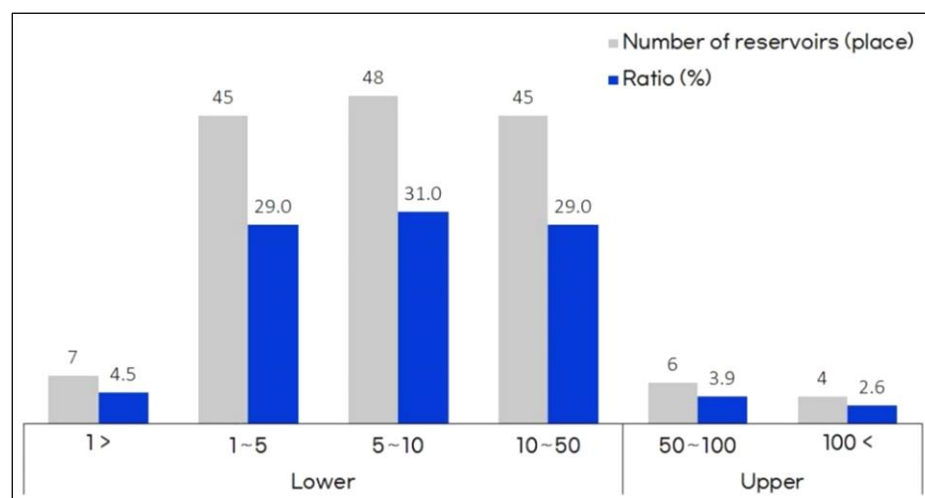
The size of reservoirs has a significant influence on utilizing the reservoir. The size of a reservoir was judged by the total amount of water storage in it. <Table 3> and <Figure 2> show the results of reservoir analysis by size. Reservoirs with water storage amounts of 5,000 to 10,000 m³ were the most at 48 places(31.0%). There were 45 places(29.0%) with water storage amounts of 1,000~5,000m³, 45 places(29.0%) of 10,000~50,000m³, 7 places(4.5%) of less than 1,000m³, 6 places(3.9%) of 50,000~100,000m³, and 4 places(2.6%) of more than 100,000m³.

As a result of the analysis by size, there were 10 reservoirs belonging to 'upper' and 145 reservoirs belonging to 'lower'. The reservoirs belonging to 'lower' were 14.5 times more than those belonging to 'upper'.

Table 3. Analysis results by size of functionally lost reservoirs.

Grade	Total storage amount(1,000m ³)	Number of reservoirs (place)	Ratio (%)
Lower	1 >	7	4.5
	1~5	45	29.0
	5~10	48	31.0
	10~50	45	29.0
Upper	50~100	6	3.9
	100 <	4	2.6
Total		155	100

Figure 2. Analysis graph by size of functionally lost reservoirs.



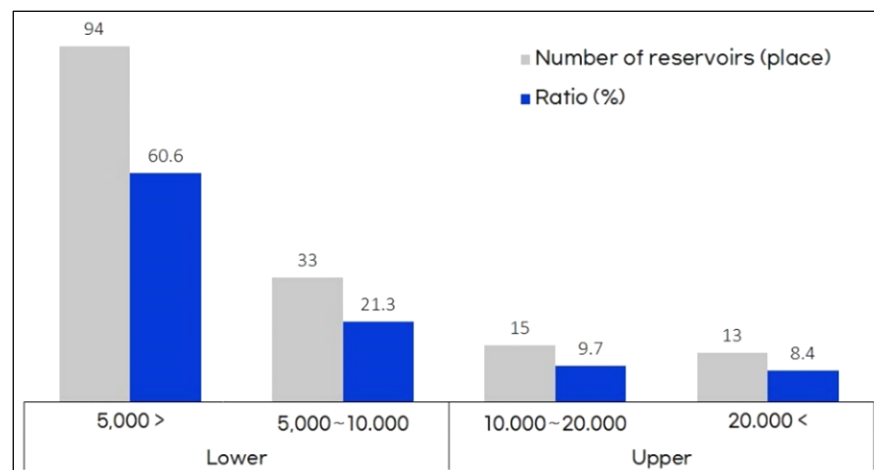
3.2. The population around functionally lost reservoirs

The population around reservoirs is directly related to the beneficiaries of reservoir development and affects the degree of benefits of reservoir development. The population around reservoirs was judged by the number of people in the surrounding towns and cities. <Table 4> and <Figure 3> show the results of reservoir analysis by population. Reservoirs with a nearby population of fewer than 5,000 people were the most at 94 places(60.6%). There were 33 places(21.3%) with nearby population of 5,000 to 10,000 people, 15 places(9.7%) of 10,000 to 20,000 people, and 13 places(8.4%) of more than 20,000 people. As a result of the analysis by population, there were 28 reservoirs belonging to 'upper' and 127 reservoirs belonging to 'lower'. The reservoirs belonging to 'lower' were 4.5 times more than those belonging to 'upper'.

Table 4. Analysis results by population around functionally lost reservoirs.

Grade	Population(person)	Number of reservoirs(place)	Ratio(%)
Lower	5,000 >	94	60.6
	5,000~10,000	33	21.3
Upper	10,000~20,000	15	9.7
	20,000 <	13	8.4
Total		155	100

Figure 3. Analysis graph by population around functionally lost reservoirs.



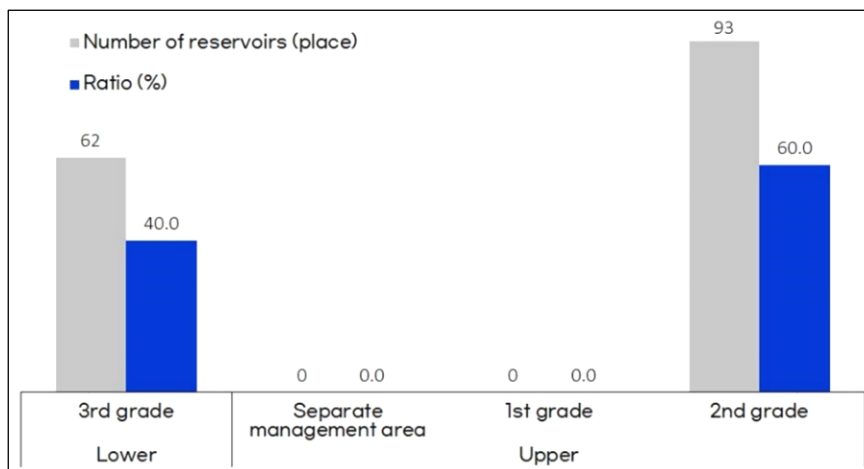
3.3. The ecological grade around functionally lost reservoirs

The ecological grade represents how valuable the reservoir is ecologically and can be used to judge the ecological use around the reservoir. The ecological grade around reservoirs was analyzed using the ecological and natural map of the Ministry of Environment, focusing on the grades of large areas. <Table 5> and <Figure 4> show the results of reservoir analysis by ecological grade. There were 93 places(60.0%) with grade 2 and 62 places(40.0%) with grade 3 in the ecological grades.

As a result of the analysis by ecological grade, there were 93 reservoirs belonging to 'upper' and 62 reservoirs belonging to 'lower'. The reservoirs belonging to 'upper' were 1.5 times more than those belonging to 'lower'.

Table 5. Analysis results by ecological grade around functionally lost reservoirs.

Grade	Ecological grade	Number of reservoirs(place)	Ratio(%)
Lower	3rd grade	62	40.0
Upper	Separate management area	-	-
	1st grade	-	-
	2nd grade	93	60.0
Total		155	100

Figure 4. Analysis graph by ecological grade around functionally lost reservoirs.

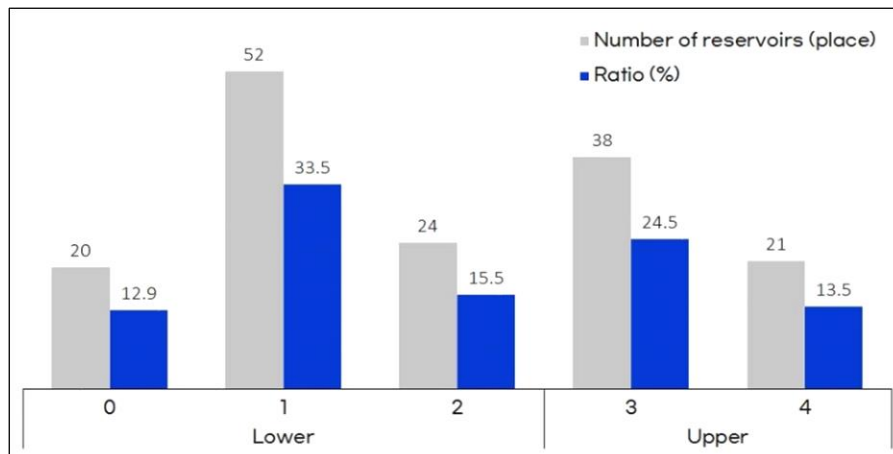
3.4. The road network around functionally lost reservoirs

Reservoir accessibility is a measure that can predict how easily users will be able to visit after utilizing the reservoir. The road system affects the selection of beneficiary reservoirs, and the accessibility of reservoirs was analyzed by the number of road networks connected to the reservoir. <Table 6> and <Figure 5> show the results of reservoir analysis by road network. Reservoirs with one road network were the most at 52 places(33.5%). There were 38 places(24.5%) with three road networks, 24 places(15.5%) with two road networks, 21 places(13.5%) with four road networks, and 20 places(12.9%) with zero road networks. As a result of the analysis by road networks, there were 59 reservoirs belonging to 'upper' and 96 reservoirs belonging to 'lower'. The reservoirs belonging to 'lower' were 1.6 times more than those belonging to 'upper'.

Table 6. Analysis results by road network around functionally lost reservoirs.

Grade	Road networks	Number of reservoirs(place)	Ratio(%)
Lower	0	20	12.9
	1	52	33.5
	2	24	15.5
Upper	3	38	24.5
	4	21	13.5
Total		155	100

Figure 5. Analysis graph by road network around functionally lost reservoirs.



4. Conclusion

Korea has a climate with considerable seasonal variations in precipitation, where floods are concentrated from summer to autumn and drought occurs with a bit of rainfall from winter to spring[26][27]. Therefore, there were often difficulties in the agricultural season, which requires much water due to insufficient precipitation. Many facilities to irrigate water have been built since ancient times, and in particular, agricultural reservoirs have been developed widely[1][28]. There are about 17,141 agricultural reservoirs nationwide and 5,599 reservoirs in Daegu and Gyeongbuk, where rainfall is the lowest, accounting for about one-third of the nation's agricultural reservoirs. Among these reservoirs, 85.9% have been aged for more than 50 years[8][29]. According to the phenomena of leaving rural, industrialization, and urbanization, farmland has been reduced, and the number of reservoirs with reduced or lost functions is increasing[30]. Currently, most of these reservoirs are in the process of being abolished[31][32]. The waterside of reservoirs has a multi-function that provides various benefits to residents, local communities, and ecosystems. It is necessary to view the reservoirs as a new resource in Daegu and Gyeongsangbuk-do with various potentials[33][34]. Therefore, this study tries to seek utilization plans for 155 such functionally lost reservoirs. Since there are many agricultural reservoirs, there is a limit to studying the reservoirs separately. So the reservoirs were evaluated by size, the population of surrounding areas, surrounding ecological conditions, and accessibility items. Researchers suggested utilization ways of functionally changed reservoirs according to the evaluated results.

First, the eight reservoirs, which have high potential demand due to the large population in the vicinity and have many visitors due to easy access, can be used as water-friendly reservoirs.

Second, it would be good to use the three reservoirs with sufficient reservoir size as leisure types.

Third, although the surrounding ecology grade is high and accessibility is low, it would be able to use 11 ecological experience-type sites and 79 eco-preservation-type sites considering the nearby population.

Fourth, the 48 reservoirs, which have low usefulness due to small population and low ecological grade, can be used to install floating solar power to help the local economy and supply electricity to the facilities of nearby households.

Fifth, it would be good to use the six reservoirs, which have a small size, low accessibility, and low ecological grade but a sizeable surrounding population, as an emergency water type reservoir in preparation for water shortages such as drought.

In order to increase the usability of reservoirs, it is necessary to investigate the basic features and surrounding conditions of the reservoir. In addition, for proper utilization, data construction must be preceded. Although it is possible to carry out individual projects for each reservoir in an area where small reservoirs are clustered, it can be an excellent method to use the reservoir group in connection with local resources. In the case of small reservoirs, it was sometimes difficult to identify the location of the reservoirs, so it was not easy to understand the condition around the reservoirs.

In this study, the utilization types of reservoirs were classified according to various conditions. However, as these are only a rough guide for the direction of reservoir use, further research is needed to refine the utilization plans or find alternatives according to the characteristics of each reservoir.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	CK	-Set of concepts <input checked="" type="checkbox"/> -Design <input checked="" type="checkbox"/> -Getting results <input checked="" type="checkbox"/> -Analysis <input checked="" type="checkbox"/> -Make a significant contribution to collection <input checked="" type="checkbox"/>
Corresponding Author*	HL	-Final approval of the paper <input checked="" type="checkbox"/> -Corresponding <input checked="" type="checkbox"/> -Play a decisive role in modification <input checked="" type="checkbox"/> -Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/>
Co-Author	WL	-Participants in Drafting and Revising Papers <input checked="" type="checkbox"/> -Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>

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Implications of Human and Psychological Trauma in the Era of the Pandemic

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Abstract

Purpose: In the name of fear and prevention of corona infection, human society is branded as an infected individual or group. In serious infectious disease situations, the scapegoat of transferring tension and fear to some members of the community can cause dissociation and cultural trauma. The scapegoat violence, which is blamed for the expectation of collective psychological purification, lives in an era of confusion that requires a healthy alternative. Therefore, in this situation, this study aims to examine the implications of human and psychological trauma to us from a historical point of view.

Method: Modern times, violence that eludes and condemns some members because of the expectation of collective psychological cleanup is living in an era of confusion that requires healthy alternatives. This study is to examine previous studies and data related to trauma and to suggest the implications of trauma phenomenon in the pandemic era.

Results: We are part of a post-trauma society, as is society, where individuals and societies who have experienced violence and trauma are overwhelmed by fear. It is undoubtedly true that the Pandemic era increases the frequency and intensity of depression and anxiety in humans, as it causes "group trauma" in many people. Personal trauma is an emotional wound that begins with a shocking event that occurred to one person or a small number of people.

On the other hand, collective trauma is a trauma that occurs because of the shock of society as a whole, not an individual or a small number. Trauma is widely understood as a variety of psychological and spiritual wounds in large and small forms experienced in everyday life. If this concept of broadness is premised, trauma can happen to anyone, anytime, anywhere, in various contexts of life. After the fall of mankind, constant war, natural disasters and talent, terrorism, and social oppression have left untouchable scars on many people.

The core of trauma relief(therapy) is to restore the relationship through the recovery of broken communication, and it is necessary to provide in-depth support with interest at the national level.

In addition, it is necessary to approach trauma from a phenomenological point of view and to make it possible to understand the victim more generally considering the sociocultural context intertwined with the complex life and experience of the victim experiencing trauma as a de-evidence paradigm.

Conclusion: This study suggests implications for the meaning of social human and psychological trauma to us in the current Pandemic situation and also it is expected to be a basic foundation for in-depth papers that can lead to follow-up studies.

Keywords: Trauma, Pandemic, Posttraumatic Stress Disorder, Trauma Therapy, Phenomenological Approach

1. Introduction

We are part of a post-trauma society, as is society, where individuals and societies who have experienced violence and trauma are overwhelmed by fear[1]. It is undoubtedly true that the

Pandemic era increases the frequency and intensity of depression and anxiety in humans, as it causes “group trauma” in many people[2].

Personal trauma is an emotional wound that begins with a shocking event that occurred to one person or a small number of people. On the other hand, collective trauma is a trauma that occurs because of the shock of society as a whole, not an individual or a small number. In other words, if personal trauma comes from personal experience such as child abuse, school violence, sexual violence, etc., collective trauma is caused by war, natural disaster, pandemic[3].

Group trauma can change history. Group trauma can change the society as a whole. “Group trauma changes memory and history,” Dr. Dan Leidenberg, a mental health expert, said in a Huff Post in the U.S. media. Corona 19 Pandemic can be seen as a typical event that causes collective trauma. Many people around the world are infected and have family members experience serious conditions or death. It has become difficult to meet families living far away, and some people have lost their jobs or are in financial crisis[4].

The events that cause collective trauma are historical events, which change the way individuals think and act, and change the policies and international standards of each country. Each individual uses hand disinfectants, wears masks, works at home, and exercises. In addition, non-face-to-face infrastructure will be built globally and new systems will be available to respond to infectious diseases[2][5][6].

In these times, the scapegoat of transferring tension and fear to some members of the community in serious infectious disease situations can cause dissociation and cultural trauma. The scapegoat violence, which ostracizes and blames some members because of the expectation of collective psychological cleanup, lives in an age of chaos that requires healthy alternatives. Therefore, in this situation, this study will examine the implications of human and psychological trauma to us from the viewpoint of the times.

2. Understanding of Trauma

2.1. Trauma and brain

The term trauma derived from ancient Helaic has the meaning of "scathing" or "thorax" in general. From a modern psychotherapeutic perspective, trauma is a trauma experienced when a physical, psychological, social, or spiritual self is in intense shock to the point of feeling the threat of death, referring to psychological traumas that involve self-controllable symptoms such as cognitive function or memory damage, dissociation, unrealized, excessive emotional awakening, flashback, nightmares, etc[7][8].

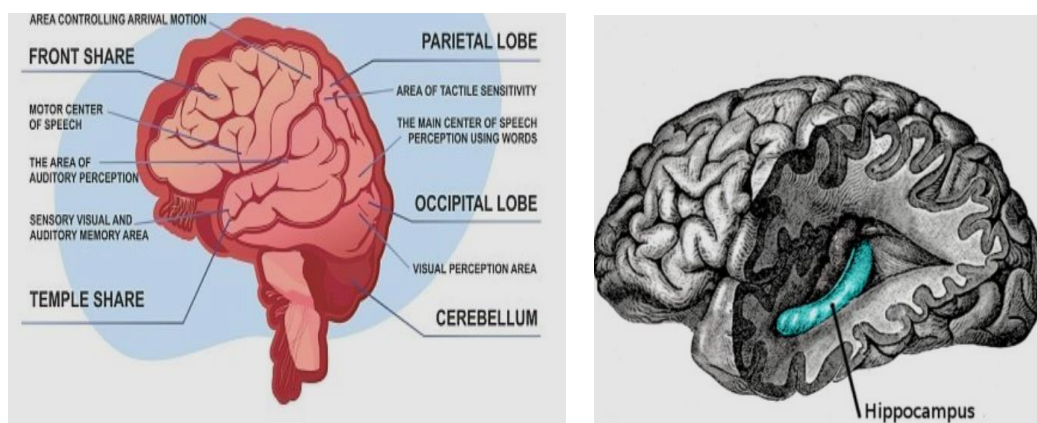
These days, the term has expanded to include not only wounds that threaten the existence of the self, but also everyday experiences that hinder individual self-esteem, such as teasing from childhood friends, mistakes in urinating in the classroom, and events that have ruined public announcements. In fact, DSM-5 understands trauma as a stress-related disorder that can be experienced in everyday life, not a diagnostic category of anxiety disorder that no longer experiences death threats.

The cause of trauma is the memory of fear(the memory of amygdala) learned in the past and present unseparated past that caused trauma due to the functional damage of the hippocampus of the brain, which is recognized as the fact that is happening in the present(the error of the hippocampus), and acts as an error of motor function as the wrong command performance is transmitted to the cortex <Figure 1>.

Today, trauma is widely understood as a variety of psychological and spiritual wounds in large and small forms experienced in everyday life. If this concept of broadness is premised, trauma can happen to anyone, anytime, anywhere, in various contexts of life. The constant wars, natural disasters and talent, terrorism, and social oppression since the fall of mankind have left untouchable scars on many people, even in the most ordinary everyday life. In the United States, about 60% of adults report experiencing traumatic events such as physical assault, sexual assault and neglect within the home during their growth [7][8][9].

And also Korea is no exception. The impact of trauma in everyday life is very devastating. Trauma victims may show distorted cognitive systems such as unrealisation and dissociation, and may show memory loss, fragmentation, and irrational thinking. They are overly sensitive to everyday stimulation, exhibit obsessive and impulsive behavior, and show self-loathing, shame and guilt, depression, and lethargy. They don't fully sympathize with others, and they do aggressive, destructive, or unconventional behaviors [11][12][13].

Figure 1. Trauma and brain.



2.2. Psychosocial understanding of trauma

The theory of trauma, which has played an important role in personality theories, was started by Jean-Martin Charcot, a French neurologist in the late 19th century. He studied hysteria, which features symptoms such as extreme anxiety, fear, amnesia, and emotional excitement, and argued that the cause of hysteria seems to be neurological, but is actually psychological [3][4][7].

Pierre Janet, in his contemporary life, also studied hysteria and saw that the cause was caused by psychological shock, the result of mental trauma. His views were not recognized at the time, but are widely accepted in modern trauma studies today and form the basis. At the same time, Freud saw hysteria as a result of trauma, such as sexual abuse, almost mostly in women in Vienna. The Latin word for hysteria means the uterus, and in the end this symptom was considered a psychological disorder that only appeared in women. Freud withdrew his claim less than a year later. The women he analyzed consistently mentioned sexual abuse, as he was convinced that the upper class men in Vienna would not be able to incestify their daughter. Instead, Freud thought that women had made up their sexual relations with their father through imagination, not real. This became the basis of the theory of the Oedipus complex, which is at the heart of his theory. Herman notes that Freud said that women with hysterical symptoms were not the result of actual trauma but the result of their own problems [11][12][13].

Freud said that Freud “decided to blame the victim instead of the perpetrator.” Herman says Freud created a psychoanalysis in the hysterical theory of rejecting female trauma. The first and second World Wars were the first and second major reasons for trauma research.

During the war, many soldiers had symptoms similar to hysteria, even though there were no physical symptoms. The symptoms, called shell shock, were not caused by mental weakness but were accepted as symptoms that could be caused by anyone who had been subjected to extreme psychological stress. Today's researchers acknowledge that based on Pierre Janet's argument, all forms of mental trauma can cause emotional and physical symptoms to a person, regardless of war, natural disasters, violence, or sexual abuse. If stress symptoms persist, they can reach PTSD. Green said that about 25% of people exposed to extreme stress events showed PTSD through research on trauma and PTSD[3][4][7].

Recently, trauma studies have been developed as complex PTSD. The concept of complex PTSD has not yet been formally recognized in academia, but it has recently been widely used among trauma researchers and has the potential for future development. The disorder, first mentioned by Herman, is also called the Disorders of Extreme Stress(DESNOs), a symptom that appears in victims of persistent and repetitive trauma, rather than a common PTSD that has experienced one trauma, showing complex and extensive symptoms. Recent trauma studies have limited the diagnosis of PTSD as a distortion of various symptoms and personality formed by this repetitive trauma experience, so even in DSM-IV, it is an unnamed disorder, but it classifies victims with more severe pain due to trauma as complex PTSD.

2.3. Preceding studies and and trauma relief

Domestic studies on trauma are being conducted in a vast range. There are various studies on more than 1,500 traumas, including trauma studies by adolescents' school violence, trauma experiences by settlers, trauma experiences related to sexual violence and prostitution, and human trauma in movies. In particular, at present, human society is branded as an infected individual or group in the name of fear and prevention of corona infection. In serious infectious disease situations, the scapegoat of transferring tension and fear to some members of the community can cause dissociation and cultural trauma. The scapegoat violence, which is blamed for the expectation of collective psychological purification, lives in an era of confusion that requires a healthy alternative. Therefore, in this situation, this study aims to examine the implications of human and psychological trauma to us from a historical point of view[14][15][16].

If a person suffers any major accident or disaster, he or she may suffer a serious mental injury even if he or she does not suffer physical injury. This is called PTSD and is commonly called trauma. Smaller than that, victims of bullying or traffic accidents during school days can suffer mental injuries due to natural disasters such as fires, earthquakes, or accidents such as war.

In Korea, there have been many incidents in recent years, such as the Japanese colonial period, the Korean War, the May 25 War, and the May 18 Democratization Movement, and many victims, their families, and surrounding people, such as the Daegu subway fire disaster, the Seowall incident, and the Gyeongju earthquake. In addition, there are a few people who suffer PTSD due to various causes such as bullying in school, sudden traffic accidents, sexual violence, etc. This mental disease, which is a lot of people in society, is a mental disease that is difficult to solve in individuals or families and requires a lot of help from experts. However, since there has been no institution that can study and treat professionally, patients have not been actively treated despite symptoms.

In this situation, the establishment of an institution for research and treatment of trauma has been discussed, but it has been delayed. And finally, on April 5, 2018, the National Trauma Center was officially opened, and as part of its national policy, it managed disaster-related post-traumatic stress disorder. PTSD is reported to be present in any age group regardless of age group. It is reported that up to 75% of the people who have been disaster have been suffering from this disorder, and it is constantly threatening the lives of the victims after the disaster[5][14][15][16].

The main cause is that trauma and the stress caused by the nature of this disease are the necessary conditions for the onset, but that is not enough. Since the clinical aspects may vary depending on the personality tendency, biological vulnerability, and severity of the event or the degree of perception of the event that the victim feels relatively, it is necessary to examine various environmental factors before and after the event. And the main symptoms are invasive symptoms (unwanted but repetitive experiences) of traumatic experiences such as repeated recalls of traumatic events or nightmares, the second is trying to avoid memories, thoughts, and feelings related to traumatic events, and constantly avoiding activities and places that cause recalls of events, or people related to accidents, the third is negative emotional states and mood changes such as fear, anger, guilt, etc., the fourth is sleeping problems, excessive surprise reactions Arousal and responsiveness associated with trauma, such as reckless self-destructive behavior, appear[1][17][18][19].

In addition, they are indifferent to depression, anxiety, difficulty in concentrating on everyday life, loss of interest, and interpersonal relationships, and often accompany irritability, surprise and sleep disorders. In severe cases, symptoms such as dissociation or panic attacks may occur. The timing of symptoms varies depending on the individual, which may start immediately after impact, and may occur after days, weeks, months or years. Corona-19 The situation has undergone many social and economic changes worldwide, and it is called Corona Blue because it is experiencing a phenomenon that people can't trust because of infection.

Posttraumatic stress disorder, commonly referred to as trauma, began to receive social attention in Korea in 2003 due to the Daegu subway arson incident. After the sinking of the lake in 2014, academics as well as social attention are concentrated, and it is an atmosphere that recommends active mental health treatment, not just physical treatment. Due to the various large-scale events and accidents, the term 'posttraumatic stress disorder' has become familiar to the general public, which is not related to psychology, mental health, or medical health.

If your body is stabbed or clubbed, you can get hurt as well as bleeding or flesh tearing and bruises. Just as even a healthy person can die if he is stabbed several times or struck by blunt force, his mental shock can also suffer irreparable suffering according to his degree[18][19][20][21].

In 2018, the National Trauma Center was established and support for post-traumatic stress disorder nationwide has begun, but there is still a long and long way to go. The current disadvantages include the fact that the National Trauma Center is not operated completely independently, and that the medical staff of the National Mental Hospital are also working together, that the number of centers is still insufficient nationwide, and that they are targeting only post-traumatic stress disorder caused by disasters. The above shortcomings should be improved to train experts to expand the number of centers consisting of full-time experts independently, and to carry out a mid- to long-term plan that can be taken care of by those who complain of disability caused by other traumatic events as well as disasters.

Not only the installation of such national facilities but also the recognition of the subjects with mental illnesses in society should be improved, so that the subjects should be able to receive counseling and treatment actively without having anxiety about psychiatric counseling or treatment.

And since many people who live without diagnosis, not only those who are diagnosed with clear symptoms, but also those who live without diagnosis, may have various mental problems, national preventive measures are needed to receive mental and psychological health checkups regularly as well as regular health checkups on the body.

2.4. Phenomenological approach to trauma

Phenomenology, which started in Husserl, is developed by his famous student Heidegger, who tried to grasp the existence of human beings with unique characteristics of life through phenomenology. Phenomenology is a combination of two words, Phainomena and Logos. The phenomenon means "without concealing what is revealed" that is, speaking without concealing it. "Study" means "without concealment," that is, not concealment[1][7][8][22].

Therefore, phenomenology, a compound word of these two words, means "to describe what is revealed by oneself as it is without hiding". Today, phenomenology is used to reveal human understanding in various fields of study beyond the boundary between philosophy and hermeneutics. Until recently, the approach to trauma in the field of pastoral counseling, general counseling and psychotherapy was based on the tradition of logical positivism, so there was a limit to fully reflecting the complex phenomenon of human experience process. Freud used the modern positivistic approach that the most objective discipline is the most true discipline as the basis of his theory. If Heidegger's view is borrowed, human beings are individual and existential beings(Sein). Ignoring this individuality of human beings, it is limited to apply objective principles to all human beings just because they are universal, just like Freud.

In this context, phenomenological approach to trauma is a de-evident paradigm, which allows the victim to understand the victim more generally considering the socio-cultural context intertwined with the complex life and experience of the victim experiencing trauma.

Phenomenological approaches to trauma are not to attempt to analyze and interpret trauma with specific hypotheses, such as psychoanalysis and object relationship therapy hypotheses. Trauma, as the 'fact itself' perseveres to speak to us, reveals the victim's experience and reveals the meaning of the experience to promote understanding of the experience. Therefore, the phenomenological approach to trauma is different from the existing approach to treat everything according to the hypothesis and the experience of trauma in the motto "Let's go back to the fact itself" in the hypothesis. However, phenomenological approaches do not discard the results of research on all existing traumas. However, since the existing approach has been approached as a natural science reduction method, it is a phenomenology scheme rudulgation that prevents the previous preconceptions of natural science and reductionism from affecting the understanding of trauma anymore[1][3][9][10][22][23][24][25][26].

While most existing therapeutic models such as psychoanalysis, behavioral therapy, and family therapy explain all psychological, physical and emotional situations with a fixed hypothesis to the client of trauma, phenomenological approaches help the client make his/her world meaningful. Therefore, phenomenological psychology focuses on discovering the meanings contained in the flow of consciousness while exploring the subjective experience of trauma, which is the circumstances of an individual's life that the positivistic method has neglected in the past[27][28]. Phenomenological treatment explores the meaning of an individual, and rediscovers the meaning of human being. It makes possible. Phenomenology vividly reveals the meaning of human life which was concealed and forgotten through natural scientific recognition[1][3][9][10][25][29][30].

3. Conclusions

Modern society is a pandemic age where nothing is predictable, and trauma is part of society, just as individuals and societies that have experienced violence and trauma are overwhelmed by fear. Or it is undoubtedly true that the pandemic era causes 'group trauma' to many, so increasing the frequency and intensity of human depression and anxiety. Personal trauma is an emotional wound that begins with a shocking event that has happened to one person or a small number of people.

On the other hand, collective trauma is not an individual or a minority but a whole, which is caused by social shock. Trauma is widely understood as various psychological and mental wounds in large and small forms experienced in everyday life. If this concept of light is premised, trauma can happen to anyone, anytime, anywhere, in various contexts of life. After the destruction of mankind, he left untouchables. so to many people due to constant war, natural disasters, talent, terrorism, and social oppression. The key to trauma relief(therapy) is to restore relationships through the recovery of disconnected communication, and needs attention and in-depth support at the national level.

First, trauma should be premised on the concept of light, that is, trauma can occur to anyone in various contexts of life anytime and anywhere. Because many people suffer from constant war, natural disasters and talent, terrorism, and social oppression after the destruction of mankind. Second, the core of trauma relief(therapy) is to restore the relationship through the recovery of disconnected communication. Separating the past from the present needs to be supported by the life here now, and practice looking at the past wounds from a new perspective is needed. In addition, psychological support is provided at the national level so that it can be recovered through healing of wounded self-esteem.

Third, it is necessary to provide in-depth support with interest at the national level. In addition, it is necessary to view the sociocultural context of the victims who experience trauma as a de-evidence paradigm, and to approach the victims from a phenomenological point of view so that they can understand the victims more generally.

This study is valuable in that it suggests the meaning of social human beings and the implications of psychological trauma in pandemic situations. Based on this, it will lead to follow-up studies on program development research that can integrate programs related to trauma treatment into university curriculum from a phenomenological point of view.

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5. Appendix

5.1. Author's contribution

	Initial name	Contribution
Lead Author	YL	<ul style="list-style-type: none">-Set of concepts <input checked="" type="checkbox"/>-Design <input checked="" type="checkbox"/>-Getting results <input checked="" type="checkbox"/>-Analysis <input checked="" type="checkbox"/>-Make a significant contribution to collection <input checked="" type="checkbox"/>-Final approval of the paper <input checked="" type="checkbox"/>-Corresponding <input checked="" type="checkbox"/>-Play a decisive role in modification <input checked="" type="checkbox"/>
Corresponding Author*	JK	<ul style="list-style-type: none">-Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/>-Participants in Drafting and Revising Papers <input checked="" type="checkbox"/>-Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>

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A Study on the Development of the Augmented Reality's Maintenance and Repairs Related Safety Manual according to the Risk Analysis of Power Equipment

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Abstract

Purpose: The complexity and safety of power facilities have increased very rapidly, yet efforts are insignificant in ensuring safety according to risks. Hence, the purpose of is, in order to help prevent safety accidents in advance, risk factors are listed through the risk analysis of power facilities, and to develop an augmented reality safety manual according to the improvement of risk scales to ensure the safety by conducting pre-simulation in the field and taking prompt response at the accident site.

Method: By enumerating the risk factors simultaneously with the causal analysis for the failure together with the impact of the failure mode of the components forming the power generation facility system for which the design failure mode effect analysis(DFMEA) technique is applied, and by developing the augmented reality (AR) based software's for maintenance and repairs based on the details of improvement as per the level of risk (RPN), the methodology for maintenance and repairs is presented due to the expansion of the infectious diseases in the era of contactless.

Results: The development of augmented reality system(software) for maintenance implements the 2D and 3D facility exploded view and work manual, etc., which enable the actual work processes to be performed across various field environments according to emergency situations of power facilities, and the big data based field data, and through acquisition, it would be possible to establish a precision standard maintenance platform. Furthermore, it is expected to have the effect of reducing the costs for accident prevention and maintenance work, and increasing the quality and quantity.

Conclusion: Through this study, the safety of electric power facilities and a preventive method in emergency situations are presented. The software development through augmented reality(AR) through the Design Failure Mode Effect Analysis(DFMEA) can help prevent accidents and implement condition based maintenance plans in an integrated system, and hence, a high efficiency can be expected. It is considered that accuracy, reliability, and safety improvement are required in future papers through the addition of risk points and continuous development of diagnostic algorithm libraries.

Keywords: Augmented Reality(AR), DFMEA, Power Equipment, Maintenance and Repairs, Software

1. Introduction

In this paper, it is very necessary to develop an online preventive diagnosis manual for switch-gear which can improve the stability, reliability and safety of the switchboard operation. With the analog method currently used for the switchgear, it is difficult to keep up with the rapidly developing maintenance technology level and display technology. Hence, while nurturing engineers with a certain level of proficiency requires a long time of training, it is difficult to continuously train engineers as with the present, such as a decrease in the offline training period due

to the gradual population decline and automation according to the fourth industrial revolution[1][2][3].

Figure 1. Switchboard's fire scene.



Furthermore, while the electric power facilities exist across virtually all industrial sites such as power plants, factories, logistics centers, sewage treatment plants, and intelligent buildings, electric safety managers reside only in industrial sites that meet the conditions under the Electric Safety Act. Even when simple tasks are required, there is a problem that the work must be carried out according to the schedule of the electrical safety manager. In particular, in the case of the sites where a machine failure such as a power plant or factory leads to economic loss, serious losses may be obtained even in a simple error situation [4].

2. Body

This paper collects and improves the risk ranking according to DFMEA for the motor control panels commonly used in power plants, factories, distribution centers, sewage treatment plants, intelligent buildings, etc., and it is possible to diagnose and check the soundness of the operation status of the switchboard primarily by measuring it across all times and analyzing the partial discharge and temperature information comprehensively[5].

The system was built by developing the HMI equipped with a data acquisition device which collects and processes sensor signals according to the diagnosis result, a partial discharge and temperature diagnosis algorithm, and a monitoring and diagnostic analysis function.

By applying the augmented reality(AR) based system for the switchboard safety operation manual consisted of the current manual(analog) format, immediate and accurate repair and remote control team support are now made possible.

Furthermore, after commercializing an augmented reality(AR) based system, records of the occurrence of unusual events are collected and used for the future big data construction, and power facilities in the event of a breakdown or accident in electrical equipment such as power plants, factories, logistics centers, sewage treatment plants, and intelligent buildings, which is essential for businesses where downtime has a direct economic impact. When this technology is applied, not only can it be reduced by minimizing economic loss, but also there is a cost reduction effect which may minimize the number of people who must reside in the power facility by supporting the remote control team[6][7].

3. Consideration of the Reliability Engineering

In the currently highly advanced technological society, much effort is made to study and develop methods to ensure the product safety. However, the variables caused by sudden failures of products and systems cannot be predicted, and in particular, if their functions or safety should be lost, they will have a considerable impact upon our lives in society.

In this event, many companies are attempting to articulate the causes. Furthermore, in such a highly advanced technology society where the aspects of such society and the structure of the economy are apparently changing, if it would be possible to improve and guarantee the quality, safety and reliability of various products and systems, study reliability and safety, and apply them appropriately, it is expected that many changes will be apparent in the real life of society as a whole.

In particular, the reliability engineers are expanding reliability engineering to the convergence of new disciplines including statistics, probability theory, reliability theory, virtual simulation, VR, and metaverse in line with the Engineering Classification Table of <Table 1>, and in particular, are setting reliability goals and devising plans for the product development projects across various areas including reliability prediction, Weibull distribution, reliability testing, and accelerated life testing. Furthermore, it is a trend to apply the reliability work for the commercialization or production systems according to the development process [8][9].

Reliability means that the probability is specified to ensure that the stability can be guaranteed without failure for a specified period(t). Hence, it is used for and active across many industries including automobiles, military weapons, aviation, railroads, and automobiles, etc. However, recently, safety and reliability have become more important in terms of the electrical panel for electrical parts in the construction field including intelligent buildings.

Table 1. Reliability engineering according to the engineering classification table.

	Engineering	Contents
Area	System engineering	Designs complex systems and secures reliability
영역	Mechanical engineering	Designs a machine or a system with reliability
영역	Automotive engineering	Applies to automobiles or parts designs given the reliability requirements
영역	Electrical engineering	Designs and tests products as per reliability requirements
영역	Software engineering	Completes performing its intended function during(t) time when the system operates in a given manner
영역	Reliability engineering	Performs throughout the life cycle of a system's development, testing, production and operation

3.1. Reliability evaluation technique

The design failure mode effect analysis(DFMEA) was used to design the reliability and safety of jet aircrafts with a complex operation system consisted of hydraulic or electric devices as they changed from the propeller system to the jet engine aircrafts in the 1950s, and in the early 1960s, the NASA used the brainstorming method to forecast and prevent malfunctions of each part when designing and developing spacecrafts, and since the 1990s, it has been considered, as analytical technique, key activities of quality innovation and reliability management for ISO 9000, TS16949, 6 Sigma, and IATF 16949.

In this text, it is intended to derive the results via the risk analysis for the electrical panel and implement the DFMEA. The DFMEA provides such that the failure mode among the components forming the system blocks is divided into various types, while the block diagram consisted of the components, subsystems, and systems not only prevents the causes and influences on the users in advance with the failure analysis techniques, but also is among the tools used for the product design and the process design phases.

As the DFMEA is an analytical tool, it may be implemented when the DFMEA can be effectively applied and utilized, such as for the quality innovation improvement activities, failure cause and effect analysis, accelerated reliability test's item testing, etc. In particular, the risk priority may be determined by applying the risk analysis table in line with the FMEA's development table of <Table 2>[10][11].

Table 2. FMEA's development table.

Failure modes effects analysis(FMEA)				
Calculation of risk preference number(RPN)				
Failure mode	Severity (1-lowest, 10-highest)	Probability of occurrence (1-lowest, 10-highest)	Probability of detection (1-lowest, 10-highest)	RPN
A	5	7	4	140
B	6	3	5	90
C	4	5	2	40
Since A has highest priority as it highest RPN value				

3.2. Result of the analysis of the switchboard's(motor control panel's) risks

Table 3. Result of the risk analysis.

<input type="checkbox"/>	System	DFMEA		FMEA No.	1
<input type="checkbox"/>	Sub system			Page	1/1
<input checked="" type="checkbox"/>	Component			Prepared by	Kim Dae-Seon
Model year	2022	In charge of design	Jeon In-Ho	Date of initial preparation of FMEA	2022. 1
Model name	Motor control panel MCC-1	Date of scheduled completion	-	Date of recent revision	0
Key team	Development team 1				

Table 4. Result of the risk analysis.

Function		Potential effect of failure	Severity	Special characteristics	Potential cause/mechanism of failure	Rate of incidence	Current design management	Detectability	Risk priority	Recommended actions	Scheduled date of completion of responsibilities and objectives	Result of action				
	Form of potential failure	(result)										Details of action	Severity	Detectability	Rate of incidence	Risk priority
Material	(cause)															
- Magnetic	Loss of automatic bonding function	Loss of current	7	C	Disruption of current flow due to disconnection	6	Refer to the official report	2	84							
1) ON/OFF automatic bonding function																
- S/L switch	Loss of automatic manual function	No automatic and manual control	5	C	Selection is not feasible around the functional coarse area of the operator	4	ON/OFF functional test	7	140	Functional operation training	2022. 2. 15	Development of maintenance manual using AR	5	2	5	50
1) Automatic manual selection function																
- Terminal block	Loss of wire bonding function	Heat generated	7	C	Operator's terminal job failure	4	Visual inspection	1	28							
1) Wire connection																
- Screen	No display	Power generation situation undiscovered	7	C	Determination via the operator's situational judgment according to current flow obstruction and indicator failure	8	Power ON/OFF test	5	280	Complementary operation function through AR	2022. 2	Development of maintenance manual using AR	7	4	3	84
1) Display of development status											25					
- MCCB	Loss of opening and closing function	Loss of current flow	5	C	Disruption of current flow due to short circuit	4	Refer to the official report	1	20							
1) ON/OFF opening and closing function																
- Wire	Current's flow breakage	Loss of current flow	4		Incorrect wire design	1	Refer to the official report	1	4							
1) Current flow																
- CASE	CASE degeneration	Loss of protective function	3		Unfamiliarity with protective function design	3	Visual inspection	2	18							
1) Product protection																

According to <Table 3>, <Table 4> Result of the risk analysis, the risk analysis of the motor control panel demonstrated that the level of risk for the screen development status was highly evaluated, which indicated that the development of a maintenance safety manual through AR is urgently needed.

3.3. Development goals and evaluation methods

Figure 2. Selection of technology applied prototypes.



Most of the companies which are currently developing the XR technology under VR/AR/MR technology and promoting as their main business focus on “technology expansion” rather than “commercialization of technology,” and currently, AI technology is increasing exponentially, yet such relevant technologies have not been applied to commercialization, thereby causing many difficulties and problems in the industrial field[11]. Hence, in this paper, a product to be delivered to the existing site and a prototype to which augmented reality(AR) technology can be applied were selected according to the risk analysis result in <Figure 2> above, which can commercialize the technology[12][13].

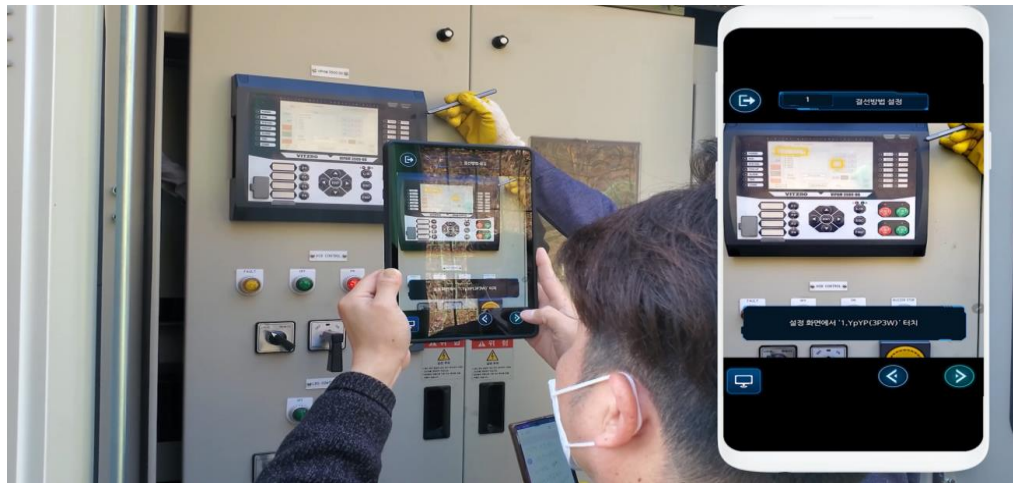
Figure 3. Field photo of the application of the developed product.



<Figure 3> is a field photo of the application of the developed product, and the prototype of the developed product was applied to the photovoltaic power plant power facility site.

The safety manual of the product group selected as the final prototype is currently possessed through the augmented reality(AR) program technique and the technology is applied to commercialize AR technology for maintenance of switchgear facilities, and overall manuals such as operation method and system disassembly understanding are smart AR system application, which was established in phone and smart pad. Furthermore, a maintenance platform which may communicate with each other was established by utilizing remote communication using camera + remote communication 5G(WIFI)[14][15][16].

Figure 4. Final photo of the developed product.



3.4. Data measurement results

Table 5. Results of the data measurement.

Quantitative target items							
Evaluation items (key performance spec)	Unit	Proportion of total items(%)	World class, holding country/holding company (company A/name of country)	Level within the nation (company M)	Target value entered	Result of target value	Level of achievement(%) = Target value/ result value *100
			Level of comparison	Level of comparison			
Power facility recognition speed	ms	33%	None	None	500ms or less	500ms or less	100%
Audio video transmission delay speed	s	33%	None	None	5s or less	5s or less	100%
Power facility handling manual operation speed	ms	33%	None	None	500ms or less	500ms or less	

4. Conclusion

Figure 5. Photo of the final field installation of the developed product.



According to <Table 2> Data measurement result, the demonstration task which may be applied to the developed product was applied in <Figure 5>. In particular, in the case of power facilities directly related to the profits of solar power plants, the results were presented to ensure safety at the same time as a venue to dramatically lower the appearance time of electrical safety managers, which is a loophole in the maintenance of the switchboard facilities which deliver electricity to KEPCO.

Furthermore, as the commercialization of automated equipment is in place, and the commercialization of automated equipment is due to the increase in electric equipment, a methodology is presented which may reduce the insufficient engineer training period and obtain cost and safety at the same time[17][18].

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6. Appendix

6.1. Author's contribution

Initial name		Contribution
Author	CK	-Set of concepts <input checked="" type="checkbox"/>
		-Design <input checked="" type="checkbox"/>
		-Getting results <input checked="" type="checkbox"/>
		-Analysis <input checked="" type="checkbox"/>
		-Make a significant contribution to collection <input checked="" type="checkbox"/>
		-Final approval of the paper <input checked="" type="checkbox"/>
		-Corresponding <input checked="" type="checkbox"/>
		-Play a decisive role in modification <input checked="" type="checkbox"/>
		-Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/>
		-Participants in Drafting and Revising Papers <input checked="" type="checkbox"/>
		-Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>

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A Study on the Prevention of Secondary Accidents Based on the Analysis of High-Speed Train Accidents

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Abstract

Purpose: Railroads are public transportation used by a large number of unspecified passengers, and the vehicle itself is large and very fast, so there is a lower probability of general accidents than road traffic, but once it occurs, it leads to a major accident, causing great human and property damage. In particular, high-speed railways running at 300km/h are obliged to realize the value of absolute safety, but in 2021, the number of high-speed railway accidents increased from 1 to 4 compared to the previous year, causing the reliability of railways to drop sharply. In order to prevent high-speed railway accidents through this, two aspects, primary accident prevention and secondary accident minimization, should be considered at the same time.

Method: The study applied Heinrich's Law(Heinrich's Law), the principle of industrial safety, called the law of 1:29:300, in which dozens of minor accidents and hundreds of signs must appear before a major accident. In particular, it analyzed cases of high-speed railway accidents, which are major accidents among domestic railway accidents, and large-scale derailment accidents by overseas high-speed railway operators. One major accident is caused by hundreds of signs and repetitive and unconscious behaviors that cause the accident. Preemptive preventive measures are needed to prevent further major accidents from occurring on high-speed railways.

Results: The causes of derailment accidents among high-speed train accidents in Korea were railroad workers' insensitivity to railway safety, lack of business cooperation between workers in different occupations, and lack of KORAIL safety management system. Overseas high-speed train accidents were derailment accidents in Germany, China, and France, which were also caused by railroad workers' ignorance and lack of safety management systems. In order for railway safety to become an absolute value, the need for train wireless protection was emphasized not only to preemptively prevent primary accidents but also to minimize secondary accidents.

Conclusion: In this paper, train wireless protection devices were considered to prevent secondary accidents among railway safety fields. The train wireless protection devices warns other train engineers nearby to take emergency measures within a 2-4km radius when the engineer of the train presses the switch of the train protection device in the event of an emergency such as an accident during train operation. Railway accidents must continue to innovate the safety system for interfaces between sub-systems, so if train wireless protection devices are technically upgraded and systematic response algorithms are developed and applied to railway sites, it will be possible to block the "1" major accidents referred to in Heinrich's Law. In the future, empirical research on the contents of the study more requires experimental application considering the railway operation organization and operating environment.

Keywords: Railroad, High-Speed Train, Railroad Accident, Accident Case, Secondary Accident

1. Introduction

In railroad transportation, several systems are intricately connected to each other. Risk factors always exist among such connections, and the railroad operators, etc., are making great

efforts to reduce the risk factors. However, there are only a few perfect measures to reduce the risk factors. This is because, even if perfect countermeasures are developed, new risk factors are created between the countermeasures, thereby resulting in another risk. As such, it is impossible to eliminate all risk factors, and hence, if risk factors are not managed, very serious damages to life and property occurs, requiring the safety management of risk factors[1].

Heinrich's law, also called the 1:29:300 rule, is a statistical law which means that dozens of minor accidents and hundreds of signs related to a major accident must appear before any major accident occurs[2]. When this rule is applied to the railroad, a secondary accident is the one which leads to a collision or a collision with a high-speed train passing after one large railroad accident, that is, the primary high-speed train accident. In this case, it means that dozens of minor accidents, that is, primary high-speed train accidents and hundreds of signs, must appear for some reason before secondary accidents occur. In this case, the hundreds of signs refer to the signs that are routinely taken care of through education, training, and maintenance in the organization, or the signs that have been overlooked without finding a specific cause[3].

The railroad operator offers the trust of absolute safety to the destination in order to provide the railroad passengers with the value of speed, accuracy, and punctuality of travel, and this is the point of contact where 100% of mutual value is exchanged between the high-speed train service provider and the customer, which means zero railroad accidents, and such becomes the core value of safe operation[4][5].

According to Heinrich's Law, a single secondary accident should never occur, yet since an accident always occurs at an unexpected moment, it led to a secondary accident in the 2013 Daegu KTX collision derailment. In order to prevent accidents, it was reminded that even if all the efforts are made to prevent secondary accidents by mobilizing the knowledge and skills possessed by experts, unexpected variables are always latent. The importance of the railroad safety cannot be overemphasized. Hence, if a railroad accident occurs despite active response, it is also very important that the railroad workers have a well-equipped emergency preparedness training system and solidify a safety culture through continuous learning and training so as not to lead to secondary accidents[6][7]. In this paper, based on the causes of high-speed train derailments in Gwangmyeong Station, Daegu Station, and Gangneung Line and in countries operating high-speed railroads abroad, it is intended to propose a plan for preventing major accidents corresponding to "1" of Heinrich's Law 1:29:300.

2. Analysis of Domestic and Foreign High-Speed Train Accidents

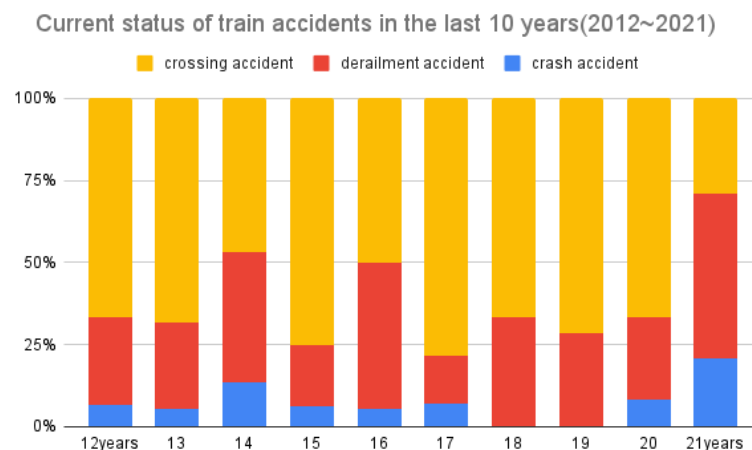
2.1. Domestic high-speed train accidents

Since the high-speed train was launched in 2004, there have been 36 major and small primary accidents such as the KTX train stopping due to a breakdown in the Gimcheon Tunnel in July 2011, and 36 KTX accidents occurred in 2011, 4 accidents in July 2011 alone. During a special audit of KORAIL in 2011, when breakdowns and accidents occurred frequently on railroads including KTX, the Board of Audit and Inspection established a railroad safety committee consisted of about 20 outsiders to conduct inspections and evaluations of safety measures and safety systems[8][9]. As a result, the number of accidents and breakdowns has decreased somewhat, yet the customers still remember the past accidents, and the anxiety about railroad accidents is not completely resolved while they are using high-speed trains[10].

<Figure 1> illustrates the status of train accidents for the past 10 years(2012-2021) compiled in the railroad safety information comprehensive management system of the Korea Transportation Safety Authority in order to identify dozens of minor accidents according to Heinrich's Law(<https://www.railsafety.or.kr>).

Train accidents are largely classified into crossing accidents, derailment accidents, and collision accidents, and over the past 10 years, there have been 13 collisions, 53 derailments, and 100 crossing accidents, for a total of 166. Among which, the number of crossing accidents accounted for the most, and while the number of crossings decreased year by year, the number of crossing accidents did not decrease but increased and decreased, and it is determined that effective safety measures are inadequate [7].

Figure 1. Status of train accidents over the last 10 years(2012-2021).



As a result of analyzing the railroad traffic accidents and railroad safety accidents for the last 5 years of high-speed trains by collecting high-speed train-related accident statistics from the train accident status for 10 years in <Figure 1> through the same management system, it was analyzed as in <Table 1>. It turned out that, among the railroad traffic accidents, there were 1 derailment, 28 general railroad traffic accidents, and 8 railroad safety accidents [11].

Table 1. High-speed rail accident related statistics.

Content and year category	2017	2018	2019	2020	2021	Total
Sum	10	16	6	1	4	37
Railroad traffic accident (derailment)	0	1	0	0	0	1
Railroad traffic accident	7	11	5	1	4	28
Railroad safety accident	3	4	1	0	0	8

Among the data in <Table 1> above, and among the major high-speed train accidents, and among the major high-speed train accidents, the 4 accidents among high-speed train derailment accidents with a possibility of secondary accidents or secondary accidents are summarized, and the Gwangmyeong Station high-speed train accident would be noted the first. The accident occurred due to the negligence of the worker at the construction company, which resulted in the

failure of the contact lock nut, inadequate supervision of cable replacement work, non-compliance with the safety regulations of the signal facility maintainer, and unauthorized direct connection to the route indication circuit, and the change of the signal facility was not accurately notified to the controller, and it was investigated that the controller was also inadequate in responding to the obstacles of the line changer due to inaccurate information [12]. Furthermore, the accident was caused by the railroad workers' insensitivity to railroad safety, their lack of cooperation between workers in different occupations, and inadequate safety management system of KORAIL(Air Rail Accident Investigation Committee(2011).

Second, the Daegu KTX train collision derailment accident in 2013 may be noted [13]. The accident occurred at the moment when the KTX train from Busan to Seoul passed through Daegu Station, the Mugunghwa train bound for Seoul, which had to wait for the KTX train on another track to completely pass through the track, misunderstood the signal and departed, and it ultimately turned out to be an accident which occurred while colliding with a part, and 9 KTX trains and 1 Mugunghwa train derailed thereby [12][13][14].

The problem was that, within a minute of the relevant collision, it was recorded that, the KTX heading for Busan entered from the opposite track, and it was a major accident that derailed and collided with the side of the tilted KTX, thereby leading to a secondary accident that paralyzes both the upper and lower lines of the Gyeongbu Line(Air Railroad Accident Investigation Committee(2013).

The third is the 2018 Gangneung Line KTX derailment accident, and this accident caused the derailment to occur by constructing the track changer cable that changed the direction of the train in the opposite direction, and in the inspection process, it was not confirmed that the display was reversed, and it was investigated that the changes were not accurately reflected in the supervision process. As a result, the track switching device was displayed as normal on the signal control panel, and the KTX passing through this point derailed, injuring 58 passengers and causing property damages of KRW 22.7 billion(Air Railroad Accident Investigation Committee(2018).

The fourth is the SRT derailment accident that occurred in the Honam Maintenance Group in 2020, whose cause was that the SRT captain sped from the speed limit of 60 km/h to 91/km/h during the test drive, hit the car screen sign and deviated from the track. As a result, 3 employees were injured and property damages worth 3.2 billion won were caused(Air Railroad Accident Investigation Committee(2020). <Table 2> briefly illustrates the details above.

Table 2. Summary of high-speed train accidents that occurred in domestic high-speed trains.

Year	Accident details	1st	2nd	Note
2011	Gwangmyeong station KTX-sancheon train derailment accident: the cause of the accident was directly connected to the track indicator circuit of the track changer with a jumper wire.	○		0 death
2013	1st: collision(mugunghwa, KTX), derailment 2nd: side contact of KTX passenger car signal misinterpretation.	○	○	0 death
2018	Gangneung line KTX: accidents caused by various human errors, such as derailment of the junction, misconnection, etc.	○		0 death

2020	Test run SRT high-speed train derailment accident (gwangju depot)	o		0 death
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2.2. Overseas high-speed train accidents

The first was an accident in November 2015 when a TGV 744 high-speed train which was carrying out a test run in the second stage of the LGV Eastern Europe Line near Eckwersheim in northeastern France derailed, killing 11 people and injuring 42 people [15]. This accident was caused by the ignorance of the engineer, and it was the starting point of the accident when the speed limit was exceeded by nearly 100 km during the test drive, where the failure to slow down was the largest cause of accident [15][35].

(https://en.wikipedia.org/wiki/Eckwersheim_derailment)

The second accident is these in which 101 passengers were killed in a derailment accident of high-speed train ICE 884 in Edesse, Hanover, Germany in June 1998. Surprisingly, the cause of this accident was 'poor maintenance' in which one wheel of the railroad vehicle was not properly maintained, and the time, experts said the main reason was the absence of a diagnostic system. The accident left Germany, a technological powerhouse, a most humiliating case, which was considered to have arisen from the ignorance and arrogance of technical knowledge of the German railroad related workers [36].

(https://en.wikipedia.org/wiki/Eschede_derailment)

Third, in July 2011, some devices of the high-speed train on the Hangpu Line high-speed railroad in Wenzhou, Jiangsu Province, southeastern China, broke down, and the high-speed train in operation was discontinued, where the subsequent train collided, derailed, crashed, which turned into a major accident that led to a secondary accident. The accident began when the preceding train was struck by lightning and lost power while it was running, and the subsequent train following it collided with the stopped preceding train every 10 minutes, and both trains derailed 4 passenger cars, two of which were a bridge fell off the bridge. Usually, the train control system would be activated and the following trains could be stopped, but the signal system in the relevant section was also broken due to lightning strikes, and the following trains did not receive a stop signal, the Chinese explained. Such unexpected natural disasters could also lead to secondary accidents, suggesting that large-scale accidents can only be prevented by having a systematic maintenance manual [16][37].

(https://en.wikipedia.org/wiki/Wenzhou_train_collision)

<Table 3> summarizes and illustrates the cases of high-speed train derailment which arose overseas.

Table 3. Summary of high-speed train accidents overseas.

Year	Accident details	1st	2nd	Note
2015 France	Exceeding the speed limit (operation with safety switch off)	o		11 deaths
1998 Germany	Poor maintenance of high-speed rail vehicle wheels	o		101 deaths

2011 China	1st accident: breakdown high-speed train stopped 2nd accident: collision of subsequent trains	○	○	259 deaths
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2.3. A comprehensive analysis of domestic and foreign high-speed train accidents

The causes of accidents due to the above domestic and foreign high-speed train accidents are summarized as railroad workers' insensitivity to railroad safety, lack of business cooperation among workers by occupation, and lack of safety management system of railroad operating institutions. In particular, various factors such as lack of system and mechanical defects are pointed out, but above all, human mistakes stemming from the problems of people who operate them are analyzed as the most important reason[17][18].

In domestic accidents, driving security devices installed to prevent accidents caused by human mistakes did not operate normally, and accidents worsened due to careful driving by high-speed railway drivers, negligence of forward monitoring, and late operation of emergency braking systems. In particular, the Daegu accident led to a secondary accident as the controller not only neglected measures such as displaying a stop signal on the descending signal or not notifying the approaching train to protect the Daegu area immediately after the first collision, but also did not properly take measures such as suspension of operation and non-traditional beams at the central control center[19].

In addition, railroad operation companies have a systematically insufficient system for mobilization of manpower in case of an emergency, and due to the absence of driving-related organizations, the implementation of driving plans, driving systems, education and training plans, and education and training of locomotive crew and train crew members are insufficient, so it is necessary to improve the control system and improve the safety management system.

Because human factors are complex and diverse, it is not easy to assess and control the risks to human factors. Various measures may be prepared to reduce human errors of drivers only when the experience of near accidents and environmental physical improvements of drivers are made together. After an accident, education and training should be systematically carried out, such as active management, mental management, rational improvement of shift work, prevention of stress-causing factors and near accidents, and improvement of healthy sleep quality[20].

Among the cases of overseas high-speed rail accidents, the collision of a follow-up train due to a breakdown of the signal system caused by lightning in China could lead to secondary accidents in natural disasters, suggesting that a more systematic maintenance manual is needed to prepare for natural disasters.

2.4. Analysis of the policies to strengthen the railroad traffic safety in the national railroad network construction plan

Based on the overseas high-speed train accident cases described in 2.2 above, the study on the measures to reduce railroad accidents applicable in Korea was also conducted[21]. An important opportunity for the paradigm of railway safety to change becomes possible in the event of a series of incidents that become a big social issue. For railroad safety, among the contents of the 4th national railroad network construction plan(2021-2030) in Korea, 7 directions were announced to lead the balanced national development and green mobility[22](MOLIT 4th National Railway Network Construction Plan).

Included in these directions were the transition towards the performance-oriented management system based on durability and usability and strengthen railroad safety by preferentially investing in railroad facilities with high breakdown frequency and high damage in the event of an accident or failure through precise analysis of the frequency of railroad accidents and failures

caused by facility causes. <Table 4> is an analysis of the contents of the reinforcement of railroad safety continuously pursued in the national railroad network construction plan from 2006 through 2030.

Table 4. Contents of the plan for strengthening the railroad safety[38].

Division	Railroad safety reinforcement plan
1st national railway network construction plan	<ul style="list-style-type: none"> -Reinforcement of railroad crossing safety management -Screen door installation to prevent accidents near the platform -Maintenance of detailed standards for railway vehicle safety standards
2nd national railway network construction plan	Railroad safety reinforcement plan: included in the following tasks <ul style="list-style-type: none"> -Connecting major bases nationwide with high-speed KTX network -Establishment of express railroad network, green railroad logistics system
3rd national railway network construction plan	Creating safe and convenient facilities <ul style="list-style-type: none"> -Improvement of old facilities and reinforcement of railroad safety -Signal system compatibility, train operation safety reinforcement
4th national railway network construction plan	Creating a safe and convenient user environment <ul style="list-style-type: none"> -Reinforcement of performance-oriented railroad safety -Transition to safety-oriented management system -Detailed analysis of railway accidents and failure frequency -Priority investment in railway facilities with high breakdown frequency

In addition, the Railroad Safety Act, a general legal system for railroad safety, has been enacted and has been in effect since 2005. Pursuant to Article 5 of this Act, the State shall formulate and implement a comprehensive railroad safety plan every five years, and the State, a local government, a railroad operator, etc. shall formulate and implement an annual implementation plan each year pursuant to Article 6. However, despite various railway safety-related systems and stricter regulations, railway accidents and operation failures continue to occur due to poor implementation at railway sites[23]. Therefore, it is necessary to spread the safety culture for safety management centered on accident prevention and establish a system to implement it.

3. Train Wireless Protection Device to Prevent the Secondary Accidents

The railroad operators are trying to provide the best value of safe mobility culture the moment customers purchase a ticket, but the secondary accident in Daegu and the secondary accident of high-speed train in China in 2013 caused a lot of casualties and material damages. In order to prevent further secondary accidents from against occurrence, it was reviewed whether the secondary accident could be prevented with the train radio protection device, which is already being used as an efficient method for the safety system on railroad[24][25].

That is, when an emergency situation such as an accident occurs while the train is running, the train operator warns other train engineers within a radius of 2 to 4 km to take emergency measures when the train operator presses the switch of the train protection device, and this is a system which prevents secondary accidents by automatically stopping the operation of other trains within the vicinity[26]. However, if an accident such as a train derailment, collision, or collision occurs during train operation, the engineer or crew member, who must inform other trains in the vicinity of the situation, may face physical or psychological abnormalities, and hence, there may be situations in which it is difficult to operate the switch of the train protection device by the crew. Furthermore, there may be a problem that the train protection device does not operate due to physical damages to the communication cable, etc. In particular, in the case of the non-operation of the train protection device, since the risk of secondary accidents such as collision by trains running adjacently is very high, it is necessary to secure a safety system for the operation of the train protection device[27].

In the case of the control room, if the high-speed train running in the direction of disembarkation disappears from the status board, or if the condition that the train is running is displayed, that is, the high-speed train which moves with the control room operating software operation algorithm and train number is used, it is considered that 2 types of situations can be detected[28]. By designating a follow-up train and a merchant train based on the 2 points of occurrence of the disembarkation high-speed train, the control room can take actions to slow it down at a speed which can be stopped immediately and, if necessary, take actions to halt it. Furthermore, if action is not taken within the time limit, the control system needs to send the relevant information to the engineer of the train approaching the accident point through a radio or smartphone, etc. If the vehicle does not slow down, it is necessary to have an emergency braking function. If such a measure is possible, it is determined that it will play a sufficient role in preventing secondary accidents by further enhancing the utility value of the train wireless protection device installed on all trains[27][28].

During the 2017 KORAIL national audit, the need for the train wireless protection system was emphasized with the content such that it is necessary to ensure the safety of the people by operating the train wireless protection system properly, and in December 2020, the KSC regulations were amended and are currently used after the railroad technical review committee's deliberation for the train wireless protection device[27]. <Table 5> is an analysis of the possibility of a major accident depending on the operator's consciousness and the presence or absence of a train wireless protection device installed on the locomotive[28][29].

Table 5. Review of the potential for development into major secondary accidents.

Device installment			Engineer's consciousness		Possibility of developing into a major secondary accident
None	Existence				
	Manual	Auto	None	Existent	
○			○		It can happen if you do not take immediate action by a witness or the control room.
○				○	It can be prevented by taking action by a trained engineer.
	○		○		It can happen if you do not take immediate action by a witness or the control room.
	○			○	It can be prevented by taking action by a trained engineer.
		○	○		It can automatically stop the entry of up and down trains.
		○		○	An action by a trained engineer or it can be prevented automatically.

4. Conclusion

In the railroad transportation, when an accident occurs, a very large loss occurs and the ripple effect is large, and hence, it is necessary to continuously innovate the safety system for the interface between subsystems[30]. If the train radio protection system is technically upgraded, the organization's systematic response algorithm can be developed and applied for the railroad field, and it is determined that it will be possible to block the "1" large-scale accident referred to in Heinrich's law.

In this paper, it is intended to achieve zero railroad accidents that which the railroad operators deliver to the customers at the point of contact with them, and it also examined thermal radiation protection devices to prevent secondary accidents in the field of railroad safety[31][32]. In the future, as an empirical study on the research content, it will be necessary

to apply experimentally considering the railroad operating organization and operating environment[31][32].

In order to secure railway safety, I am confident that railway safety will be secured when the government, local governments, railway facility managers, railway operators, and professional institutions fulfill their roles and responsibilities, and each member of each institution is faithful to his or her work with a heavy responsibility.

In the end, it is important to ensure that the CEO and all employees working in the field are not negligent in the given tasks with a united mind.

The occurrence of railroad accidents creates a significant anxiety in the society as a whole. Railroad is an essential means of transportation which promotes public convenience and leads social development[33][34]. For the genuine establishment of railroad safety, sincere efforts of the people concerned for railroad improvement and development, public interest and support, and active participation are required. It is expected that people will be able to enjoy safety, which is a basic human right, by performing the common task of railroad safety towards the secondary accident prevention.

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6. Appendix

6.1. Author's contribution

Initial name		Contribution
Author	EP	·Set of concepts <input checked="" type="checkbox"/>
		·Design <input checked="" type="checkbox"/>
		·Getting results <input checked="" type="checkbox"/>
		·Analysis <input checked="" type="checkbox"/>
		·Make a significant contribution to collection <input checked="" type="checkbox"/>
		·Final approval of the paper <input checked="" type="checkbox"/>
		·Corresponding <input checked="" type="checkbox"/>
		·Play a decisive role in modification <input checked="" type="checkbox"/>
		·Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/>
		·Participants in Drafting and Revising Papers <input checked="" type="checkbox"/>
		·Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>

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A Study on the Teaching Method of the Fire Extinguishment Education Based on the NCS

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Abstract

Purpose: This study aims to examine the development direction of fire extinguishing education based on NCS on the teaching method of fire extinguishing education in the Navy. Fire extinguishment education is composed of basic education from basic remuneration to advanced education. Especially, since the Navy is mainly formed inside the ship composed of sealed compartments, fire extinguishing education is very important because there are such phenomena as Flameover, Backdraft, Flashover, Rollover, etc. except for special cases. And also, this study is focused on the fire extinguishing education for NCS-based education on beginner courses in the navy.

Method: As a research method, the contents is developed focusing on literature review. At the same time, I work as a petty officer for 16 years and also consider the part that I actually experience as a field expert in the navy. Especially, I would like to propose an NCS-based education method that is used in most of the society in order to introduce the current fire extinguishment department in education and training.

Results: In conclusion, the lecture-oriented education is still the most frequently conducted in our military. However, in order to promote the participation of learners through systematic education and training system based on NCS and job-specific education, which can be one of the field and lecture halls, and to apply it to the elementary fire-extinguishing education in the military, it is necessary to develop the NCS-based learning module together with the teaching and learning design and the teaching and learning process plan.

Conclusion: Finally, the NCS learning module is designed to cultivate the ability to solve the job in case of exhibition or emergency. Therefore, it is effective for the students to diagnose the learning by preparing the result table and self-assessment checklist after the training and to perform grouping and individual practice according to the practice guide after the teacher provides the explanation and demonstration of the practice guide at the introduction of the class. In order to utilize the learning module effectively, teachers should thoroughly analyze the NCS to understand the contents and level of job ability required in the field work, and to have practical skills and expertise that can be used for performance evaluation. Especially, the new instructors should thoroughly analyze the contents of NCS related to the practical curriculum and prepare for the following matters in designing the teaching and learning process. The following research is to compare the satisfaction of NCS subject and NCS subject.

Keywords: Fire Extinguishment, Fire Extinguishment Education, Education Training, National Competency Standards, National Competency Standards Education Method

1. Introduction

Recently, the educational environment is changing rapidly, and especially in the government, the establishment of the National Competency Standards(NCS) is to change from theoretical education to practical education to realize a capacity-based society. The labor market has reorganized NCS-based education, training and qualification system to realize a capacity-oriented

society through the establishment of NCS and the National Qualification Framework by creating a success model in which the job competency evaluation system linked to recruitment, promotion and compensation is settled and spread. NCS is gradually being established and activated by the efforts of the government, university and labor market for the introduction of NCS. In this case, this study started with the consideration of what efforts we should make in order to achieve NCS-based education in our military focused on the Navy [1][2][3][4][5].

Navy Education is also no exception. The main task is to the department damage control when the ship is damaged and maintain continuous navigational power to return to the home port. In addition, the part about fire extinguishment is very important in the department of damage control in the Navy

Unlike the Army and the Air Force, the Navy is in a unit, so if a ship is hit by fire, stranding, collision, etc., all the crew members are in heavy danger. Accordingly, our navy should thoroughly train and train the measures for various accidents that may occur in the ship through education and training in advance. In this situation, I have been working in the Navy for 16 years as a senior chief petty officer the Navy's damage control. The education in the military is being carried out in accordance with the 4th Revolution and the development of new future technology, which are currently a big issue. And also, I think it's a lot behind, of course, with the speciality of the military, and there are many restrictions on changing and developing something dramatically within the security framework [1][2][3].

In the past, education in the military was done through unconditional injection method education without needing understanding for high score. However, in these days, we are training with educational skill called action learning based on participation of all learners. And also, Intermediate or advanced courses seem to be very helpful to break creativity and existing framework in new education and training for problem solving as action learning skill.

However, for the students who have no prior knowledge of digestion within a fixed time, the infusion education is required to be done to a certain extent in order to adapt quickly to unfamiliar education, terminology and practice. Also, there is a lack of education and training time to draw the progress of the class and the evaluation results accordingly.

In order to help the current instructors, NCS-based education methods that were learned when acquiring technical development teacher qualifications in advance were very different from those learned and learned in the military, from elementary, middle, and high school [4][5].

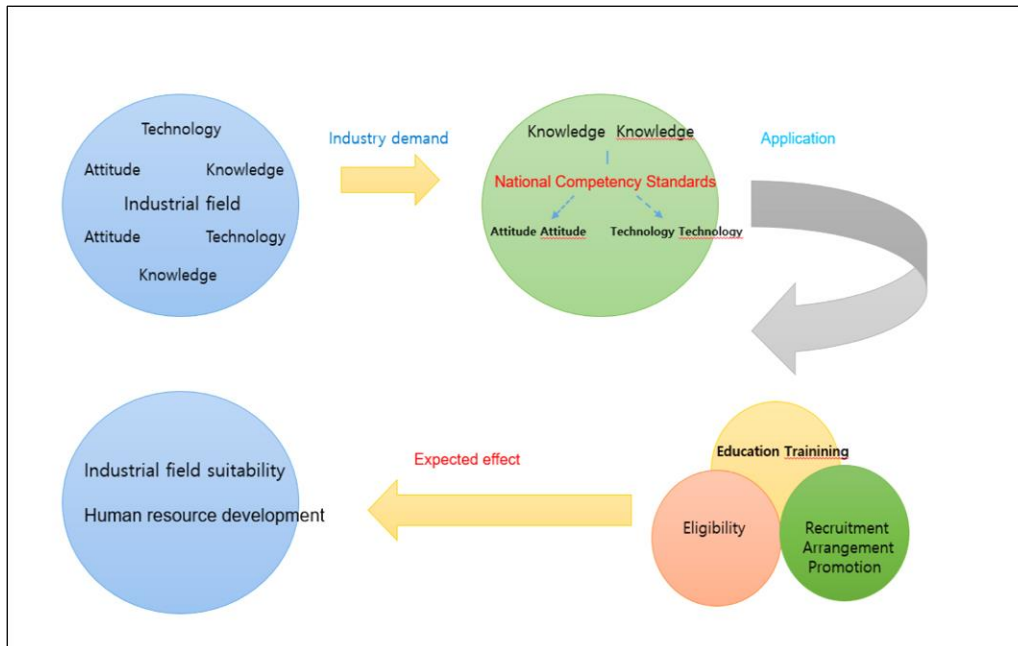
Therefore, this study try to introduce NCS-based education method, which is already used in the present society, to educate and train the fire extinguishment department in the current navy damage control.

2. National Competency Standards

This NCS is a standardization of the state's ability to perform duties in industrial field(knowledge, skill, and attitude). It is a system that supports NCS to train field-oriented talents by utilizing NCS for education and training and qualification [3][4].

As shown in the following <Figure 1>.

Figure 1. NCS system frame.



As of in 2021, 1,039 NCS have been developed, and include jobs that respond to future job changes, such as building cloud platforms, manufacturing hydrogen fuel cells, and installing smart factory systems.

2.1. The advantage in NCS utilization

Job-seekers can clearly know what kind of ability companies want to hire and can improve their job skills accordingly, thereby reducing the burden of building specs.

In the recruitment part, it is possible to develop the recruitment process design and tools (employment announcement/document/writing/interview) that can evaluate the applicant's competence based on NCS job description. And it is possible to hire talent based on job ability (resolve mismatching of companies and applicants) and reduce reeducation costs when joining the company. In NCS utilization, job-oriented education and training system required for each position is provided in the training and education of the employees.

And systematic education and training system can be prepared, and job customized education can promote productivity improvement and worker's participation in learning [4][6][7].

In placement and promotion, NCS in-house career development path can be developed. It can also develop a batch and promotion checklist, and it has the advantage of eliminating the inconsistency between the company's expectations for talent and the competence of workers. In addition, the wage part can convert the annual supply-oriented wage system into a 'job pay' structure by analyzing the job based on NCS. And according to the job competency and ability of the worker, the system that can be paid the proper wage can be rescued.

And also, teachers (educational training institutions, teachers, professors, etc.) can systematically operate the education and training course by designing the curriculum using NCS, and through this, they can train practical talents needed in the industrial field [4][6][7][8].

Finally, the national technical qualifications are improved to job-centered (using NCS), so that people who can actually do the job can get a certificate.

2.2. The understanding of NCS learning modules

If the National Competency Standards(NCS) is a 'job request' in the field, the NCS learning module is a 'teaching and learning material' that is designed to enable NCS's ability units to be learned in education and training. The NCS learning module details the contents related to the theory and practice in order to learn the specific job. In other words, the NCS learning module details the contents related to the theory and practice in order to learn the specific job. It's teaching and learning material.

NCS and NCS learning module are connected to the connection system. The ability unit means that the ability required to perform the task successfully in a specific job is developed as a functional unit capable of training and evaluation. And the ability unit element is the ability to perform within an important range of the ability unit. In addition, the performance criteria are the criteria for performance that individuals must reach to determine whether or not they are achieving their abilities by each ability unit element [4][6][7][8][9].

The composition of NCS learning module consists of learning, learning contents, teaching, learning method and evaluation. First, the learning is presented using the NCS ability unit element name. Learning consists of learning contents, teaching and learning methods, and evaluation. It is based on knowledge, skills, and attitudes of each ability unit of the NCS ability unit.

The contents of the study consisted of learning goals, necessary knowledge, and performance contents. The contents consisted of materials, materials, devices(equipment and tools), and the work activities in the actual industrial field are reflected in the learning contents in various ways [4][6][7][8][9][10].

Teaching and learning methods are the activities of the instructor, teaching strategies, and activities of the learner so that interaction between the instructor, the learner, and the learner can be actively achieved to achieve the learning goal.

The evaluation suggests evaluation criteria, evaluation methods, and feedback methods for evaluation results that can confirm the learning degree of the learning module. So, the preceding studies of NCS are briefly examined as follows.

Previous studies on NCS have already been conducted in many ways. According to the study of Kim Dong-yeon and Kim Jin-soo(2013), despite the government's active promotion to establish the basis of the NCS, companies(55.26%) have been the most active r safety and precautions, order of performance, and performance tip. The learning contents of the learning module are based on the standardized process of the work, research in analyzing the research trends of the national incompetence standards development by subjects that have been conducted so far. The following is the order of two-year(23.68%) and four-year(7.9%) [10][11][12][13].

According to Kim Ki-yong et al.(2014), 74.7% of the surveyed colleges have experience using NCS in the curriculum of 2014, which is a remarkable increase from 36.1% compared to the survey results of 2013. This suggests that NCS is actively introduced in the curriculum in Korea. In addition, more universities are promoting NCS application in the curriculum according to the policy direction of the government's specialization college development project. The early studies of NCS-related university education include research that explored the specialization strategy of the design department of the college based on NCS, NCS-based curriculum for port logistics workers, NCS-based architecture and industry-customized college curriculum, and secretary and curriculum using NCS development techniques(Omanduk et al., 2014) [10][11][12][13].

In addition, Shingu University was actually operated through the reorganization of the curriculum. Among them, the Department of Environmental Landscape has developed and applied a new curriculum since 2010, Baekseok Culture University has operated NCS development curric-

ulum in the field of Culture 82 Sonwonil Contents(Smartphone Contents), Dongui Science University has developed a curriculum reflecting the machine(mold) field, Keimyung Culture University has developed a curriculum reflecting NCS in the textile field in 2011, and is making efforts to realize university education that is in line with human resources with on-site trade volume(Omanduk et al. 2014)[10][11][12][13].

Yoon Woo-young et al.(2015) analyzed the job based on NCS to grasp the level of demand by area, and reorganized the NCS-based curriculum necessary to cultivate the vocational ability connected with the National Qualifications Framework(NQF), to contribute to job creation by satisfying the needs of the industrial field users in the tax and accounting fields of Daegu and Gyeongbuk, thereby improving the employment rate of the department and cultivating the appropriate manpower to contribute to the regional economic development. In the study on the reorganization of NCS-based curriculum in 2016, Son Won-il and others(2016) presented the NCS-based job model that matches the type of manpower training set by considering external environment analysis, internal environment analysis, graduate career, demand forecast for manpower in Daejeon and Chungcheong area, and opinions of job experts in the field[11][12][13][14].

3. The Understanding of Fire Extinguishment in the Navy

Fire extinguishment means to turn off the fire. Our navy, which is a unit of troops, is not only a major obstacle to our mission when a fire occurs due to the nature of the military, but also directly related to our lives. And the fire in society is a little different from the fire in the Navy. And also, the surrounding environment is on the sea, and people couldn't do empty 24 hours a day in the mission.

In addition, fire classifications A, B, C, D, E, and K are all mixed. Finally, not only petty officers in the department of the damage control, who is directly connected to the fire, but also all of the traps should act as firefighters. In other words, not only petty officers who have been trained from basic maintenance to advanced, but also the people who do not have basic knowledge of the fire should help them fire extinguishment when a fire occurs. Some people have received education related to fire extinguishment in the society before being a soldier, but there are more people who don't[15][16][17][18].

Therefore, it is very important to educate the first education and the first education in the education from the digestive repair disease course to the beginner and intermediate level. They are also MZ generation, which is a new term of the Republic of Korea that refers to the Millennial and Z generation. They are familiar with SNS, the Internet, and smartphones, and the MZ generation lives as avatars in a virtual world called Metaverse. Just as the X generation rebelled against the conventions and cultures of the baby boomer generation and showed personality, the Z generation is more individualistic and self-centered than the Millennial generation[1][14][19].

In terms of work values, the tendency to 'leave anytime a better job' and 'want to have more leisure time than work for income' is increasing, and this view is more pronounced than the baby boomer generation. If these friends join the military and receive fire extinguishment education, they will be disappointed if they have forced education as in the past.

It is not easy to create a conservator who can suppress fire in a ship as a soldier in a given environment and time; all the direct divisions of the Navy will do so. However, our conservatives who execute survival training for human life and maintain their fighting power and viability in the ship must somehow know and master the basic abilities and core principles and send them to practice. In the past, when I was educated in early 2000, it was a lecture-oriented education

and a lecture-oriented education focused on essential memorization. It wasn't fun, it was a must-do education, and there were people who didn't work hard, but everyone was an essential one, so they were forced to follow. Since 2010, education has changed to a way in which teachers educate alone and discuss and participate in the education of the infusion type. And in the second half of 2010 and now, individual opinions based on creativity are also important and they are doing the way to solve problems together.

However, it is hard to make the MZ generation effective and follow well in a fixed time. The contents of the textbook should be delivered within a fixed time, and the contents are a little far from the general goal presentation and the field of the military field. The evaluation was a knowledge assessment of the contents of the curriculum and was used as an evaluation result for the performance management of schools and instructors. The instructor was the messenger of the subject and the instructor's ability to convey these contents was important[1][3][13][19].

In addition, the number of people who are unable to concentrate on the development of personal skills of students and the number of students are also. When I talk about the problems and experiences that can happen in practice, the contents of the class are getting distant or lacking in time. As time and results are pursued, progress must go out and essential results must be derived, so it is a reality that it can only serve as a messenger of blind educational knowledge. In other words, most of the instructors who apply the teaching method of the lecture are the instructors.

Of course, there are advantages to lecture education. First, it is economical to systematically deliver the learning contents to many learners in a short time. Second, it is easy to achieve low-level cognitive goals. Third, supplementation, addition, and deletion of the subject contents are easy. Fourth, if teachers have strong linguistic expressiveness, they can stimulate learners as strong. Third, it is difficult to reflect the characteristics of individual learners(ability, knowledge, experience). Fourth, it is difficult to meet the learning needs when the characteristics and abilities of the learners are various. Fifth, it is difficult to expect the creativity of learners[1][2][5][13][14][15].

Our current learning materials account for 90% of the guidelines and teaching plans, and of course, we use to introduce and educate many new technologies of other countries, overseas cases, and external companies. However, in order to achieve the goal in a fixed time and to perform the mission as a soldier in practice, it is a reality that it does not meet all the expectations of the working staff.

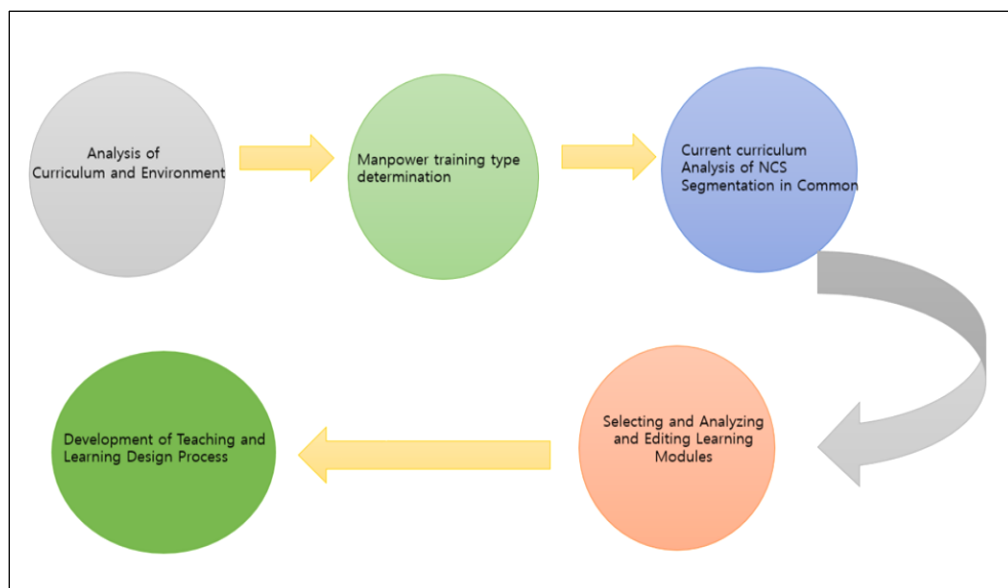
4. The Development Direction of NCS Based Fire Extinguishment Education

I still think that the lecture-oriented education is the most often done in Navy. Therefore, we try to apply it to the beginner(first step) fire extinguishing education in the Navy by promoting the participation of learners through systematic education and training system based on NCS and job customized education[4][12][13][14][15].

NCS is a Korean Employment Classification of Occupations(KECO) type to present the core abilities required for all occupations(11,655) in Korea, and consists of 24 large classifications, 77 middle classifications, 227 small classifications, and 857 sub-classes as of 2015. The subclassification of the classification system refers to the job and NCS is developed in the subclassification unit. The subdivision consists of the basic component of NCS, the ability unit, which consists of the ability unit classification number, ability unit definition, ability unit element(performance standard, knowledge, technology, attitude), application range and work life, evaluation guidelines, and job basic ability[4][12][13][14][15][16][17][19][20][21][22].

In order to establish NCS-based curriculum, we should first review the curriculum and surrounding environment of our technical administration school and select a learning module that suits the training of excellent talents and core personnel. In order to prepare for the application of the learning module, it is necessary to find common points between the current curriculum and NCS subclassification(job)[4][13][14][15][16]. Also, the class should be designed by analyzing the level of ability unit, element, ability unit and ability unit element, and necessary training time. In other words, it is necessary to develop a teaching and learning design and a teaching and learning process plan by finding NCS learning module related to fire extinguishment <Figure 2>.

Figure 2. NCS learning module refined process applied to the navy.



The purpose of the NCS learning module is to cultivate the ability to solve the job by oneself in the event of exhibition or emergency. Therefore, it is recommended that the teacher should provide the explanation and demonstration of the practical guidebook at the introduction of the class, and then make the training or personal practice according to the practical guidebook.

In the past, students were often bored because the teacher prepared all the practice and conducted the classes in the order of theoretical explanation, demonstration practice and student practice. The class using NCS learning module is expected to be able to perform the role of applicants and assistants enough to systematically present the lesson from tool preparation to the actual practice so that students can do it themselves according to the learning module. Therefore, teachers will need patience to wait for students to complete the course in the learning module, and they will need measures to give the task to the students who have completed the training. In the existing class, many students complained of many difficulties in the middle and it was not easy to evaluate both the process and the result. Since the class using NCS learning module has a performance order in the learning module, most of the students can systematically evaluate the confidence and the process and result of learning that they can solve the task with their own strength even if it takes some time. Especially, the practical training guidebook will be able to improve the ability of students to redefine themselves by looking at the practical training result table and to accurately talk about what they did in this class by writing the practical training result table, the job performance ability self-diagnosis table, and the job basic ability self-diagnosis checklist[1][4][13][14][15][16][17][18][20][21][22][23].

In the existing classes, teachers set up tools and equipment and lead to practice after demonstration, so there were many students who did not perform the class process properly, but according to the practical guidebook applying the learning module, the number of students who did not concentrate

on themselves would decrease, and all students actively participated in the study, so that the learning achievement would be improved and the time to ask and answer among students would be increased. In order to utilize the learning module effectively, teachers should thoroughly analyze the NCS to understand the contents and level of job ability required in the field work, and to have practical skills and expertise that can be used for performance evaluation. Especially, the new instructors should thoroughly analyze the contents of NCS related to the practical curriculum and prepare for the following matters in designing the teaching and learning process [1][4][13][14][16][17][18][19][20][21][22][24].

It is necessary to produce auxiliary materials including practical requirements, various regulations, and regulations besides NCS learning module and also, it is the content and level of related ability units(individual learning modules) and ability units(sub-learning units of learning modules) appropriate for our students. And instructors should consider the faithfulness and suitability of the contents of the class while checking whether there is any shortage or not. Our instructors in the Navy will need patience to wait for all learners to complete their training[16][17][18][20][21][22][23][24][25].

5. Conclusions

The naval fire scene can be primarily a warship; the form of the explosion that occurs at this time can vary, such as gas leaks, various cylinders, and explosions of tanks. Because the warship is a sealed structure, it can be difficult to supply smooth oxygen to the origin of the fire, it is necessary to educate NCS based on the theory and practice that can be one from the time of education in the classroom. The fire may simply evolve according to the initial action of the first discoverer, or on the contrary, if the initial action is not taken, the entire ship may be dangerous. If a small fire is not suppressed within at least five minutes, it can spread to a bigger fire.

The NCS learning module is designed to cultivate the ability to solve the job in case of exhibition or emergency. Therefore, it is effective for the students to diagnose the learning by preparing the result table and self-assessment checklist after the training and to perform grouping and individual practice according to the practice guide after the teacher provides the explanation and demonstration of the practice guide at the introduction of the class.

In order to utilize the learning module effectively, teachers should thoroughly analyze the NCS to understand the contents and level of job ability required in the field work, and to have practical skills and expertise that can be used for performance evaluation. Especially, the new instructors should thoroughly analyze the contents of NCS related to the practical curriculum and prepare for the following matters in designing the teaching and learning process..

This study proposes education that can train human resources required in the field through the introduction of NCS in the naval school education field. This study is meaningful in that it is effective education for the students and the educational contents that can be applied to the field at the same time if the expectation effect and operational possibility of NCS in the education field are already sufficient in society and these advantages are combined with our naval fire extinguishment education. The following research is to compare the satisfaction of NCS subject and NCS subject.

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7. Appendix

7.1. Authors contribution

		Initial name	Contribution
Author	SP		-Set of concepts <input checked="" type="checkbox"/>
			-Design <input checked="" type="checkbox"/>
			-Getting results <input checked="" type="checkbox"/>
			-Analysis <input checked="" type="checkbox"/>
			-Make a significant contribution to collection <input checked="" type="checkbox"/>
			-Final approval of the paper <input checked="" type="checkbox"/>
			-Corresponding <input checked="" type="checkbox"/>
			-Play a decisive role in modification <input checked="" type="checkbox"/>
			-Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/>
			-Participants in Drafting and Revising Papers <input checked="" type="checkbox"/>
		-Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>	

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A Study on the Proposal of the Behavioral Principles for the Training of Korea Coast Guard in the Pandemic Era

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Abstract

Purpose: This study proposes the Korea Coast Guard trainee behavior principle based on the value of the Korea Coast Guard in response to the Pandemic era. Through the proposed principle of action, we will provide philosophical standards for value judgment to members of the organization in various dilemma situations that Korea Coast Guard will face in the future. Recently, as a large number of young employees in various fields have been recruited in the Korea Coast Guard organizations, controversy has arisen due to the difference between the existing policies and the expectations of the younger generation. This means that the organization should make more efforts to establish and share the priority of organizational value to its members.

Method: The Korea Coast Guard organizations have unique cultural characteristics that have been formed with unique history. This characteristic of the members is to examine the result of the formation of philosophical value of the Korea Coast Guard organization, along with the value policy of the Korea Coast Guard focusing on the educational regulations applied to the current students by the Korea Coast Guard Education Academy. As a research method of this paper, I would like to examine the behavior style required by members according to the unique characteristics of the Korea Coast Guard organizations in phenomenological aspects. The media press releases were used to maintain objective grounds among various problems caused by the characteristics of the Korea Coast Guard, and the internal voice of the organization was referred to the internal bulletin board of the Korea Coast Guard Agency.

Results: As a conclusion of this study, based on the review of the philosophy and educational goals of the Korea Coast Guard organization. The principle of action is proposed 'Five Promises of Korea Coast Guard Students'. The proposed principle of student behavior is organized so that it can be applied to actual education center life from the perspective of the student. The first regulation of the prize and penalty for the students can be seen as a behavior that is supported and trusted by the people through 'honorable life' that helps others. Second, it emphasizes that marine police will move toward a steady learning and effort as a guardian of the sea, along with the educational goal of 'trying to become an expert in the sea every moment' and prioritizing the expertise and practical skills. Third, the Coast Guard respect the human rights of the people who always keep their promises and do not follow injustice. Fourth, considering the spirit of public service value for the nation and the people that the result suitable for the public interest is more precious, overcoming the individual desire and discerning what is more suitable for the public interest is the value to be cultivated as a public official who serves the people afterward, and above all, it can be wary of the situation that falls into the individualistic tendency, forgetting that he is a 'serviceman of the people'. Fifth, the direction of the challenge spirit shown in the 'expert in the ocean' that 'I am willing to challenge and overcome for a better future' and the future-oriented image that pursues the world's best pursued by educational goals can be confirmed.

Conclusion: As such, this research suggests that the fundamental cause for this dilemmatic situation is on the absence of the values based on the organizational philosophies, and it is necessary for the organization to set up the operational methods based on its philosophical values taking into account the principles of action which are appropriate to the task of KCG(Korea Coast Guard).

Also, this research asserts that the operation based on philosophical grounds contributes to the sequential positivity such as 'psychological stability of the members' and 'creating hard working environments' this will also help its members' learning process and enhance the organization in general. The competence of KCG is the tool that leads to the safety, cleanliness and full of hope for our ocean. KCG has to possess the attitude that is challenging, creative and open that should be built upon its philosophical grounds for the long-term development of the organization. The result will be the achievement of public goods in the ocean and the safety of citizens.

Keywords: Korea Coast Guard, KCG, Core-Value, Value-Based Organization, Action Based

1. Introduction

This The Corona 19 incident we all witnessed in 2020 it was a sign of a huge change to the Pandemic era. The after of Pandemic has brought many changes, from countries to industries, economies and personal life around the world. Especially, the daily life of individuals living in the present age has changed greatly, and non-face-to-face activities such as telecommuting and online classes have increased due to restrictions on contact with people, and the industry has triggered rapid changes such as the emergence of metaverse and virtual reality[1][2][3][4][5]. As the lifestyle changes, individuals living in the Pandemic era have created their own survival strategies and responded to new systems. These survival strategies in the Pandemic era would have been more vital not only for individuals but also for companies and organizations that want to survive fiercely. In the Pandemic era, the Korea Coast Guard officers responded to the spread of corona 19, repeating self-diagnosis and isolation in various places, and access control and prevention were routinely performed in security traps and offices.

As unnecessary contact was limited and online communication increased, the work method changed, and the search and rescue work was assigned to the Corona response personnel, manuals and shades were distributed in preparation for the occurrence of marine emergency patients, and when an infected person occurs in the security trap, cohort isolation was prepared and thoroughly managed so that the mission would not be hindered. Considering the national responsibility for the people, marine police should be maintained to perform their duties in any environment. In order for marine police to perform their duties with the same capacity as usual in the Pandemic era, it is necessary to have consistent organizational value so that they can maintain rationality in crisis situations. People generally change their attitudes and beliefs to maintain their consistency with behavior when their behavior changes(Cooper, Mirabile & Scher, 2005)[6][7][8]and the results of the study show that organizational value establishment can affect the behavior and beliefs of members. In addition, the active intervention of an individual on a matter changes to be active, and the behavior of an individual in the organization has a great influence on the behavior of others, thereby improving the culture of the whole organization[4][5][9][10][11][12][13].

The argument that the company(organization) whose value is established right away can be interpreted as meaning that it will ultimately become a sustainable company(organization) by moving in one direction no matter what external impact comes, is applied to organizations such as marine police. The fact that the value of a group is settled as a culture is the process that the core value that members can share together as members of the organization while performing their duties, and the principle of behavior based on it exist, and in terms of operating the organization, the effort to establish the system to ensure consistency in the performance of the members' duties is accompanied. If you ask if the current public societies have a standard of value judgment, many organizations will argue that there are already various codes of conduct in accordance with the regulations. The Code of Conduct for Public Officials is created in the public societies by Presidential Decree No. 32661, the National Police Agency has a Code of Conduct for Human Rights of Police Officers by Ordinance No. 967, and the Korea Coast Guard

also has a Code of Conduct for Public Officials of the Korea Coast Guard Agency, Ordinance No. 252, and each organization is striving to regulate members' actions by code of code [6][14][15].

However, when we look at the contents, we deal with the prohibition of evil acts mainly on the contents already prohibited by other laws such as abuse of authority of public officials, prohibition of bribery, prohibition of unfair arrest, prohibition of commercial activities, prohibition of solicitation, etc., and the emphasis of the Code of Conduct, such as the prohibition of property such as the Public Service Ethics Act No. 18682, and the obligation to register property, In the end, when a dilemma arises by competing with general values of different directions, not prohibitions, a separate organizational standard that provides judgment standards is needed, and each organization must create and declare and internalize organizational values that fit its identity to achieve organizational goals effectively [16].

Therefore, this study aims to establish the direction of organizational value and to operate the organization based on it, and to suggest that the Korea Coast Guard Education Academy establish the behavior principle based on organizational philosophy and to culturalize it through education to its members. When there is a specific behavior principle based on core values, the organization will strengthen predictable communication based on missions and reduce the problems caused by lack of communication.

In conclusion, this study aims to establish and propose the principle of behavior that the Korea Coast Guard Education Academy will present to the students. The purpose of establishing the principle of behavior of trainees is to provide consistent direction for the value education and student guidance of the Korea Coast Guard Education Academy in accordance with the organizational philosophy of the Korea Coast Guard(Shalom Schwartz. 1977) argues that internalized beliefs and values form personal norms(social psychology, 437p) and that in the case of personal norms, moral rules and the acceptance of any action are within the individual, not outside, and that compensation for the work done according to its inner laws is also associated with personal satisfaction that it acted according to its own rules [17].

As a result, the internalized value of the members affects the organization as well as individual behavior, and is directly related to the satisfactory life of the marine police member. If the common principle of behavior is established as a culture, it will increase the satisfaction of the individual members' lives and help the students to make a correct and clear judgment in various dilemma situations that will become the Korea Coast Guard in the future.

The Korea Coast Guard organizations have unique cultural characteristics that have been formed with unique history. This characteristic of the members is to examine the result of the formation of philosophical value of the Korea Coast Guard organization, along with the value policy of the Korea Coast Guard focusing on the educational regulations applied to the current students by the Korea Coast Guard Education Academy.

As a research method of this paper, I would like to examine the behavior style required by members according to the unique characteristics of marine police organizations in phenomenological aspects. The media press releases were used to maintain objective grounds among various problems caused by the characteristics of marine police, and the internal voice of the organization was referred to the internal bulletin board of the Korea Coast Guard Agency.

This study will be able to describe the behavioral characteristics and culture of marine police organizations and to look at the expectation of the people who look at simultaneous organizations. In addition, the policy of the organization and the related regulations that regulate the students will be examined to examine the direction that the organization has emphasized for a long time in order to regulate the behavior and attitude of the members. The current regulations can be seen as the official culture of marine police, which has been agreed for a long time

through due process. This paper aims to find the philosophical center of the organization and to inductively summarize the behavioral guidelines of marine police trainees.

Despite the efforts to use objective data, the fact that the subjectivity of the researcher is involved as a limit of qualitative research method can be recognized as a limit. However, I would like to clarify that the author, who is a researcher, has been involved in marine police organization for a long time and has been continuously considering policy system that can establish philosophy of marine police organization and develop the future of organization.

2. Verification of the Organization Value of Korea Coast Guard

2.1. The value policy of Korea coast guard

2.1.1. The history of Korea coast guard and the identity of each period

The history of the marine police organization began in 1946 when the Chosun Coast Guard, the predecessor of the Navy, was launched; the organization later became the Navy, and the early marine patrol organization was the Navy. After this, the government realized the necessity of its own maritime security agency and launched the Korea Coast Guard under the Ministry of the Interior in 1953, when it became the only organization to exercise jurisdiction at sea.

In 1955, as part of the efficiency of government functions, marine police became a marine security guard under the Ministry of Commerce, Industry and Energy. At this time, the function of the current general public officials of the Ministry of Maritime Affairs and Fisheries, which has special jurisdiction over fishing, was performed. In 1962, in order to cope with the widespread demand for security at sea, the Korea Coast Guard Establishment Act was enacted and the Maritime Police under the Ministry of Interior became a police officer in the sea to maintain security again. With the enactment of the Police Act in 1991, the Maritime Police Agency is established under the jurisdiction of the Police Commissioner.

After the accident in 2014, it became the maritime security headquarters under the National Security Agency, which was created for the purpose of comprehensive disaster safety response and preparation of a system. At this time, the organization was the main task of the rescue agency to cope with the disaster at sea. After that, Moon Jae-in was launched in 2017, and he is returning to the current marine police and is carrying out the duties of maritime security agencies. In 2019, he enacted the Coast Guard Act, which is an organization law[\[18\]\[19\]\[20\]](#).

As we have seen in the process of changing marine police organization, Korea has been in the process of securing its identity as a security organization that performs its duties in the ocean. In the process, it has reached today through trial and error several times. Through this process, Coast Guard members would have formed unique experiences and perspectives of Coast Guard policemen while adapting to various and special organizational environments such as large-scale disaster response and security maintenance with a small number of personnel and equipment in the vast jurisdictional area.

2.1.2. History of establishing the value of Korea coast guard organization

The value of the organization that the Korea Coast Guard have declared so far is the value of safety, dedication, trust, creation, and honor, which was presented as core values in 2013, since the establishment of the Korea Coast Guard station(60 years of Korea Coast Guard) in 1985 as the "Korea Coast Guard itself(Dawoon)" to become a historic the Korea Coast Guard officer who fulfills his new name in the protection of his country with strong physical strength[\[21\]\[22\]\[23\]](#).

It changed to the vision of 'a happy nation of the country', 'a nation where safety is made a living, a society where safety is made, and a national policy where safety is a priority'. According

to the announcement of the "Korea Coast Guard NEW Vision Strategy System" during the 2017 presidential election of Park Kyung-min, the vision was declared to be six key values of 'the sea that is safer today than tomorrow', emphasizing 'deep change' and 'continuous efforts'.

The vision that Cho Hyun-bae took office and declared in 2018 is 'safe to the sea through communication and empathy' and the core values are 'respect, justice, communication and empathy'. When a dilemma occurs in an organization, it is necessary to review the priorities. The purpose of the core value is to establish important organizational values that are priorities. It is not efficient to judge individual problems by dealing with each issue and can't guarantee rationality. On the other hand, if the problem is defined based on organizational value, it will be possible to predict the results by presenting the principle of right and wrong of individual problems in advance, and it will be a communication method to suppress the controversy about various problems in advance. As we have seen, it is regrettable that the Korea Coast Guard have declared and changed the core value more than several times in a consistent internalization effort, but it seems clear that it is an organization with great passion and interest in establishing organizational value.

Regulation In 2021, the Korea Coast Guard declared the talent prize more concrete than the core value declared, and also are making efforts to establish new organizational value. The original meaning of 'charter' can be interpreted as the authority, goal, and operation principle of the organization and the individual. "The role of expressing the pride of the organization through the norms set to fulfill the promises about any facts, presenting the tasks and goals that the organization ultimately aims for, providing decision-making standards to public officials, realizing policy intentions, and influencing work attitudes and mindset, leading to cooperative efforts to achieve goals." As shown in the following <Table 1>[\[21\]](#)[\[22\]](#)[\[23\]](#).

Table 1. The new charter of the Korea coast guard.

The Korea coast guard policy(2021)		
The humanity award of the new charter		Contents
The new charter	Sea keeper	We will fulfill our responsibilities to preserve the lives and safety of the people and to preserve the marine preservation, the future asset of mankind.
	Practitioner of justice	It makes integrity and fairness a life, complies with principles and norms, and enforces the law correctly.
	Person who serves the people	It provides marine services that the people are satisfied and trust based on communication and consideration..
	The professional of the ocean	We overcome any difficulties with creative attitude and challenging spirit and complete our mission.

In addition, the new charter is largely pursuing four talents, 'the people can have expectations for the performance of the specified contents and strengthen the acceptability of the policy. The guardian of the sea means to preserve the sea of the Republic of Korea as the area of safety and sovereignty of the people in the sea, and the 'realizer of justice' is the role of the police officer and seeks principles, fairness and integrity. The 'servicemen of the people' means to provide marine services that satisfy the people through communication and consideration as public officials who are responsible for the people. The 'professionals of the ocean' shows the willingness to fulfill the mission with creative attitude and challenging spirit to perform successful missions in a special environment of the ocean. The goal of establishing the new charter, which was announced by the Office of the Innovation Administrative and Legal Officers, is to declare the organizational philosophy of "to describe practical contents in connection with Article 2 of the Maritime Police Act, to induce the use of it as a guideline for employees to perform their duties, and to name it as a survival in the spirit of the Maritime Police Agency, which can

be continuously utilized through strengthening internalization education and implementing task-linked policies." Since it became the subject of the officer's office, it seems that the new charter actually set up detailed talent by including or replacing the existing core value. The talent of marine police who was embodied by the new charter can be said to be the result of the examination of the direction of marine police in the field. As shown in the following <Table 2>[22][23][24].

Table 2. A project to create a dignified and wonderful the Korea coast guard.

The Korea coast guard policy(2021)	
The humanity model of Korea coast guard	Contents
A dignified and wonderful the Korea coast guard officer	Improving the identity of coast guard
	Clearing the GAPJIL(Abuse of power)
	Realizing gender equality culture
	Creating a sympathetic human resources culture
	Establishing a healthy audit culture, and preparing for the future

Following the proclamation of the new charter, the Korea Coast Guard also implement a value policy to create an exemplary and honorable Coast Guard culture with the slogan of 'professional and wonderful the Korea Coast Guard'.

Here, I tried to regulate the certain behavior of the members in eight specific ways that the 'Making a dignified and wonderful marine police' project aims at, and here I present eight specific goals. In order, 1st Change of the Afflicted Equity Clearing 2 Organizational Dismissal and Discipline 3 Change of the way of working as public officials and Coast Guard to raise identity 4 Change of the way of working as a Coast Guard 5 Equal culture of gender equality 6 Establishment of personnel culture that everyone sympathizes with 7th Organizational climate 7 Building a healthy organizational culture[22][23][24][25][26].

There is strengthening of education for new employees. The eight tasks presented are the fact that the marine police provided specific cultural guidelines to the Coast Guard members about what goals they should move on to become a 'proud and wonderful' organization member.

2.1.3. Objectives included in the Korea coast guard education regulations

The school regulations of the Korea Coast Guard Education Academy are made by the regulations, and this Rule is intended to prescribe matters necessary for the student education of the Korea Coast Guard Education Academy pursuant to Article 14 of the Coast Guard Officials Education and Training Regulations under the Korea Coast Guard Agency in Article 1.Article 3 stipulates that the education for students should be conducted according to the educational goals according to the four goals as follows following <Table 3>[23][24][25][26][27].

Table 3. Educational objectives of the Korea coast guard education academy.

Article 4 educational goals	
Basis	Contents
Article 4 of the school regulations of the coast guard education academy	First, coast guard who are loyal to the nation and serve the people
	Second, coast guard with expertise and practical skills
	Third, the future-oriented coast guard who pursue the best in the world coast guard who respect human rights and defend justice

In Article 4 of the Coast Guard Education Academy, it is said that it will be applied to all members of the Coast Guard organization, including the trust to enter the education center,

basic and professional courses. Therefore, the institute can establish the principle of behavior by specifying the educational goals set up in the school rules, which can be seen to affect the entire members in the future. This means that the Coast Guard Education Academy has a good direction to lead the organizational culture through education[23][24][25][26][27][28].

Table 4. The Korea coast guard education academy award and penalty provisions.

Basis articles	Included contents
Article 56 award standards table	<ul style="list-style-type: none"> ● Succeedings(accreditation for disaster and safety accident prevention, selection of best student, rewards of various citations) ● Student self-government activities(performance of volunteer activities such as student principal, student director, library) ● Volunteer activities(participation in blood donation, donation of blood donation, volunteer activities after work, etc.) ● Others such as educational development(supporting events, good deeds and misrepresentations, support for preparation for classes and active participation)
Article 57 penalty standards table	<ul style="list-style-type: none"> ● Violation of acts and subordinate statutes(of all kinds of current crimes, drunken driving, sexual assault, bribery, and GAPZIL) ● Sex-related(sex trade, unhealthy physical contact, related photography, pornography, etc.) ● Drinking-related(violation of various behaviors caused by school drinking or drinking) ● School life(time violation, appearance dress, reporting etiquette, facility use, class attitude, violation of safety-related instructions, compliance with regulations such as provision of supply, vacation, maintenance of in-school order related to information and communication network) ● Others(gambling, unauthorized departure, unhealthy collective conduct, security violations, theft of other objects, etc.)

On the other hand, the student life rules stipulated in the Korea Coast Guard Education Academy No. 107 are aimed at stipulating the necessary matters for the smooth life of students who entered the Korea Coast Guard Education Academy. The rules stipulate various prohibitions and operate a penalty system as a student's compliance. The penalty standards prescribed as the prohibitions consist of maintaining dignity, appearance dress, salute, title, language and attitude, compliance with walking, drinking and smoking, how to enter the office, security maintenance, political activities, and compliance with legitimate instructions[23][24][25][26][27][28].

On the contrary, the award store standard table in attached Table 6 of the same rules can be seen as a recommendation of the student's attitude toward life, which can be seen as a representative of the talent that the student needs in accordance with the philosophy pursued by the institute. If the regulations set in Article 57 of the Student Life Rules of the Marine Police Education Center(Penalty Points) are summarized, it is necessary to refrain from acting and conform to order by counting the inconveniences of others as well as illegal activities. In Article 56, it can be understood that the person with exemplary postures is expected to play a role as a leader or volunteer with a goal of actively devoting himself to the community.

3. Analysis of the Organizational Value of the Korea Coast Guard

3.1. Verification of the value included in the policies of the Korea coast guard

The Korea Coast Guard Education Academy organizes a curriculum based on educational goals according to school rules and disciplines students. Therefore, the rules of life of students can be seen as a concrete guideline to fulfill the goals of education.

As a result, the expression of exemplary behaviors that the trainees and new police officers appointed after the education continue to repeat during the education and the effect of compliance with various prohibited acts will be the process of the organizational value being embodied in the education. This is the process of learning the honorability of dedicating and responsible for others in the individual activities of members, as Won Hoon(Core Value), a Coast Guard institute of 'honor', 'courage' and 'dedication' aims.

3.2. Comparison of the value policy and education regulations of the Korea coast guard policies

The 'Making a dignified and wonderful Coast Guard' promoted by the Korea Coast Guard since 2021 is a 'honorable life' that each item of the code of conduct prescribed in the school rules, such as the above, contains the value of the 'grand' of the Korea Coast Guard. The concrete value of action that can be presented in practice can be interpreted including 'competence', 'concern', 'unhidden transparency' of the Korea Coast Guard. The first guardian of the sea in the new charter is to pursue the same goals as the Korea Coast Guard with expertise and practical skills among educational goals, and can link with the mission value responsible for the safety of the people by putting excellent manpower and the best equipment on the spot. The second 'realizer of justice' in the new charter has the same goal as 'marine police who respect human rights and defend justice'. It can be interpreted in connection with detailed values that fulfill 'promise with the people' and 'respond firmly to injustice' with detailed contents linked to practical work.

The third 'serviceman of the people' means 'a Coast Guard officer who serves the people according to the role of the nation'. In the practice, the specifics are linked to 'integrity' that avoids individual pursuit of private interest and 'public interest' that provides services to the people for 'results suitable for public interest', and it can be explained that the marine police do 'sublime mission' in all situations of fighting waves in the sea.

The fourth charter of the new charter emphasizes 'creativity' and 'challenge spirit' in the way that marine police are recognized as the best in the world in the sea, which shows that the goal is the same as 'future-oriented the Coast Guard pursuing the best in the world'. Specifically, 'professionalism' requires a spirit of raising the awareness of the problem and challenging it, and this attitude will reach the goal of the Korea Coast Guard that protects the national interest and the safety of the people. As reviewed, the philosophical value of marine police at the moment of important mission is displayed without fail by the behavior of members, and the behavioral value of various education and training designed according to the educational goal is embodied in the members, which seems to constitute a consistent range of marine police action values in the project of the new charter declared afterwards and the 'making a dignified and wonderful Coast Guard' project.

Therefore, it can be found that the educational goals in school rules and the human resources that the life rules are aiming for are gathered in five directions that the organization should aim when compared to the value policy that the Korea Coast Guard are pursuing as of 2022. This predicts that the goal pursued by marine police education can provide a framework for philosophical value judgment that can be applied to both marine police members as well as students.

3.3. Verifying the value of Korea coast guard through the actions of members

Since the new Korea Coast Guard in education have not yet been put into practice, there is a limited way to contribute directly to the people. Nevertheless, there are cases where the accident, safety, crime prevention, and arrest, which meet the store standards, are achieved in the Rule of Life No. 107, and in this regard, the cases of the students or the police officers appointed after graduation from 2014 when the institute moved to Yeosu and the practical training began are as follows <Table 5>[28][29][30][31][32][33][34][35][36].

Table 5. Trainees reported in media, new Korea coast guard officers.

Exemplary cases reported in media	Media organization (reported date)
Marine police officers rescued fishing boater who crashed breakwater during holiday(Donghae Hae coast guard Chun Sung-pil, Bae Sung-won)	YTN NEWS(2022.8.31.)
The new coast guard officer, Hoon Hoon, who saved a man who was blocked from airways by food (Woo In-hyuk, Mokpo Hae Kyung-seo)	Asia economics(2022.8.3.)
The topic of the current criminal caught by the coast guard trainee (234 Kwon Tae-hoon) Hae-kyung(security officer Kim Hyung-woo of Ulsan Hae-kyung) who rescued people on his way home from work for the Exemplary of fasting	No cut news(2018.3.27.)
"The model of fasting" seafarers who rescued people on their way home from work (scort of Kim Hyung-woo, Ulsan coast guard)	YTN news(2016.09.20.)
The new coast guard officer who received the commissioner's award ... 'I did what I learned' (Park Do-hyung, a police officer a t Gunsanseo)	NEWSIS(2018.03.13.)
'Brain hemorrhage' 50-year-old male rescue marine police trainee 'Midam' (230 Bae Chang-sik)	NEWSIS(2016.09.19.)
Four police officers from Tae-an-seo were rescued by first aid in their 70s with obstruction of airway(four, including police officer Kao Hyun)	Daejeon Daily newspaper(2016.2.4.)
The good deeds of the seafarers who saved passengers between breathing pains (228 Jeong Ji-bin)	Domg A Daily newspaper(2015.07.23.)
Dramatic structure of students with disabilities in passenger cars silted in the water of Yeosu seaport(Choi Eun-jin, Yeosu)	Kegung Hang newspaper (2015.08.19.)

The case of the Korea Coast Guard officers immediately after the appointment of the trainee or the officer is a case in which he is willing to step up at the moment when his role is needed with his expertise through greater challenges and dedication than the expectation of the opponent through the duty of the Korea Coast Guard or the mission. If we look at what the Coast Guard education regulations we have looked at in the past are aimed at, we expect the educational effect that induces the expertise of the Korea Coast Guard who help the students to express their best practices as Korean civil servants. This is one of the philosophies that the Korea Coast Guard education is aiming for. Specifically, it shows the philosophy of active life that helps others who are at risk as honorary Korea Coast Guard members through good behavior even when they are not a mission, beyond the role of public officials in the Constitution, who are responsible for the people[27][28][29][30][31][32][33][34][35].

People who are exposed to the good news of the Korea Coast Guard support the uniform organization in various ways, which returns to the honor of the organization. The attitude of the members who bravely confront this crisis situation is a philosophy of 'honorable life'. The point of orientation in the 'proud and wonderful marine police' aimed at the marine police organization also emphasizes the 'honor' aspect. What is called 'honorable life' should be the dignity of objectively reasonable goodwill and attitude. The necessity of 'professionalism' can be accepted as the demand of 'responsibility' and 'sincereness' for the mission, and as a result, it creates the conditions to demonstrate 'professionalism' and receive 'trust' from the people. The lesson that the Korea Coast Guard can learn in this case can draw up the principle of action that 'I try to develop professionalism every moment for the people in crisis' and should consider the spatial condition of 'sea' considering the mission of the Korea Coast Guard.

The case of six Korea Coast Guard officers who died in the sea since 2016 shows that the recognition of 'honorable life' as a police officer expresses courage and commitment to confront rough waves to save the people in crisis. These cases are at risk by the police officer himself in practice, and it can be seen that the fate of the Korea Coast Guard officer was left to the sea in

the situation of taking it. The public opinion of the people who are exposed to these reports expresses great impression and gratitude for the uniform organization that does noble service for the people for a while. The above cases of death raise the honor of the Republic of Korea as well as the organization, and give safety and pride to the people. In their appearance, they can find the sense of value more precious than themselves, and the expression of aggressive challenging spirit beyond the impossible in harsh marine environment. Also, it can be recognized that the result of social contribution through the service and dedication embodied until the situation of the inability of the Korea Coast Guard's mission characteristics. The lesson from this case is to draw the philosophy of Coast Guard as a principle of action, which is a repetitive action that aims to 'discriminate more valuable value suitable for public interest'.

Next is the value included in the case of the information in addition to the information in the case. One case is the case in which a Coast Guard officer A, who was in charge of the Korea Coast Guard, stopped at the intersection of Yeongdo-gu, Busan on May 5, 2021, and ran away from the intersection of Yeongdo-gu, Busan. As a result of this incident, public opinion about the Korea Coast Guard deteriorated greatly and A was dismissed as a disciplinary action. In this case, the reason for the dismissal of A is that the violation of the duty to maintain the dignity of the Korea Coast Guard officer and the misdemeanor are common reasons for other disciplinary actions, so it doesn't clearly explain what was wrong in the current case[36][37][38][39][40][41].

The reason why the philosophy and the principle of behavior of an organization should be established is that in the case of A, it should be explained in a more concrete way than 'violation of dignity' or 'disgracefulness'. In the 'drinking driving' of A, the blood alcohol level was 0.02%. Nevertheless, it can be assumed that the decision to dismiss the drunk was made by asking for the responsibility of drinking, which resulted in the deterioration of public opinion due to massive unofficialness. In this case, the security trap was mobilized to search for A officer who jumped into the sea, and the result of the joint search by the nearby military unit, the large result of the civilian rescuers, and the fact that the media was reported in large quantities were recognized as a result and led to a serious result of 'dismissal'. However, the judgment of the act due to this situation is a resultant view that is determined considering what happened after the event occurred.

If A was arrested before he jumped into the sea and was not mobilized by security traps, and the results of the discipline should be the same, assuming that he was not reported to the media. Because regardless of the result, there is no change in the act committed by the chief officer A, and the party must be responsible for the act. Organizational philosophy is not the result but the justification of the act. The problem of the resulting logic causes unfairness in which judgments change according to the results of the same act, and if such problems are left unattended, there will be side effects that reduce the results already occurring or make efforts in an unequal direction to prevent media reports. In the end, the organization focuses on unnecessary work to reduce the results, resulting in more problems sequentially.

In another view, the disciplined officer A himself can argue that the motive of his actions is good for the "honor" of the Coast Guard. In order not to discredit the Korea Coast Guard, it is possible to reach the conclusion that the identity of the Korea Coast Guard should not be revealed at that moment and that the identity should be concealed by jumping into the sea. This limits the interpretation of problems by applying the abstract phrase 'honor' to various situations, which explains that the organization did not consistently provide the judgment guidelines of its members only by declaring 'core values'. Therefore, the organization needs to present its organizational value as a concrete principle of behavior, and it should be able to explain what value the party violated in individual matters according to the behavior of the member.

When A pointed out that he jumped into the sea to avoid drunken crackdown in this case, what should be mentioned is that he does not undermine the expectation of the people and the honor of the marine police as a community. Based on this, the philosophy that individuals should have is the 'honest Coast Guard' who lives a 'honorable life', which is consistent with the marine police value policy of pursuing 'professional and wonderful marine police'. Specifically, 'acting to make me clear that I am a marine police officer at any moment' does not create an unjust situation that should be hurriedly removed from the position. Also, responding to police officers' drunkenness is a promise that all citizens should keep, and it is unfair not to fulfill their promises. Police officers are exemplary subjects who should take the lead in social promises.

As a result, the lesson that the Korea Coast Guard can learn from this case is to draw the principle of action that 'always act to reveal that they are marine police officers' and 'to keep promises and not follow injustice' so that members can decide the right direction of action in similar cases. The case of 2 is a report that the Korea Coast Guard agency in June 2021 revealed that it had specialized the executives who were disciplined by drunk driving. The Korea Coast Guard Agency said that there is no problem because the period of promotion restriction due to disciplinary action has passed, but it is criticized that the inside bulletin board of the seaplane will be seen as an unremarkable speciality in the eyes of the people. The issue in this case is the controversy of 'Is it reasonable for a person with a history of drunk driving to make special progress?'

The Korea Coast Guard have been making various policies for the past few years to prevent the four major problems such as drunken driving, and have been disadvantaged to the target person. The Korea Coast Guard have especially strengthened the disadvantages of drunken driving. In terms of personnel policy, they have expanded the number of penalties for many years such as 'restriction of personnel issuance and three years transfer', 'restriction of recommendation of retirement civil servants', 'restriction of special promotion of honorary retirement in the event of heavy disciplinary action due to drunk driving', and 'exclusion of manager' Unpaid, exclusion of performance bonuses for the year, and exclusion from the subjects to move into the government office have shown the will of the origin of drunk driving.

Therefore, the members trusted the consistent direction of the organizational policy that 'drinking driving can't be forgiven in any case' while empathizing and accepting the principle of zero tolerance for drunk driving that the organization is aiming for a long time. In this issue, we should first look at whether we were subjected to reasonable discipline at the time of drunk driving, and look at whether a person who was disciplined by drunk driving can compete for promotion. If the issue of the issue has already been resolved by clear discipline, there is no problem with the organizational system for the discipline of a specific person. And if the party who recovered the qualifications after that was legitimately competing and proved to be a special target as a result of strict evaluation, it would not be wrong. If we look at whether it is appropriate for drunken people to compete in special competitions, we should think from the public's point of view: Any public official should strive for the nation and the people and create results. It is because it is the natural responsibility of public officials who strive for the future of the Republic of Korea.

So, if his efforts have clearly achieved great results throughout the organization even if he has a history of drunk driving, it can be concluded that promoting him is necessary for national interest and national safety. The reason for the controversy in this issue should be clearly stated, however, is that the reason for the controversy among the members in the internal bulletin board of the Korea Coast Guard Agency was fairness among the competitors. The controversy over fairness was due to the policy direction of the marine police, which has been continuously excluded from personnel and welfare for drunk driving. This direction was the opposite of the result of specializing drunk driving power, so it would have seemed to give preference to a specific person. The reason for the controversy in this case is that the organizational philosophy



that has been continuously strengthening the disadvantages of drunken people has been accepted for a long time as part of the marine police identity to its members. Therefore, when deciding on policies, the organization should review the continuity of policy direction in a large framework, and anyone who drafts policies should review the consistency to be maintained after his or her term based on organizational value. As a result, the lesson that the Korea Coast Guard can learn from this case is that policy should have a consistent direction in line with organizational value.

Accordingly, according to the policy signal that the organization has continuously shown, it will be possible to establish and apply organizational philosophy to encourage the efforts for the mission without discrimination and to treat talented people without discrimination, along with the duty of the public officials that 'the promised policy is kept and the unintentional' members do not follow the injustice and 'anyone should challenge and overcome for the better future of the Republic of Korea'.

4. Conclusions and Suggestions

As a conclusion of this study, based on the review of the philosophy and educational goals of the Korea Coast Guard organization like <Figure 1>.

Figure 1. Deriving the activity principles of new Korea coast guard education new trainees.

POLICY	Organizational value		The principle of behavior of new trainee	WON HOON (Core Value)	Educational Academy rules
NEW CHARTER	 	Become a proud and wonderful Coast Guard	I'm always proud to be a Coast Guard act to reveal	Honor trusted Coast Guard	Proud of myself as a Coast Guard officer
		As 'the guardian of the sea' to protect the lives and safety of the people the future asset of mankind fulfill your responsibilities	I'm a sea expert every moment try to be	Courage a strong Coast Guard officer	Coast Guard with expertise and practical skills
		As 'the realiser of justice' living in integrity and justice Compliance with principles and norms enforce the law correctly	I always keep my word do not follow injustice		Coast Guard with honor human rights and defend justice
		As a 'serviceman of the people' based on communication and consideration the people are satisfied and trusting the Coast Guard service is offered	I remember that the outcomes that are appropriate for the public interest are more valuable	Dedication a serving Coast Guard officer	Coast Guard with loyal to the state and serving the people
		As a marine expert with creative attitude and spirit of challenge to overcome any difficulties complete a mission	I am willing to challenge and play for a better future		Coast Guard with future-oriented Seeking the World's Best

The principle of action is proposed 'Five Promises of Korea Coast Guard trainees'. The proposed principle of student behavior is organized so that it can be applied to actual education center life from the perspective of the student. The first regulation of the prize and penalty for the students can be seen as a behavior that is supported and trusted by the people through 'honorable life' that helps others, as shown by the news data about the various good deeds of the students and the officers appointed. Therefore, it is a common value for all members as it shows the sense of duty and honor for the organization called 'Coast Guard with Proudness', which regards honor as important as marine police. Second, it emphasizes that the Korea Coast Guard will move toward a steady learning and effort as a guardian of the sea, along with the

educational goal of 'trying to become an expert in the sea every moment' and prioritizing the expertise and practical skills.

Third, the Korea Coast Guard respect the human rights of the people who always keep their promises and do not follow injustice. They can emphasize the ability to distinguish 'justice' in life by focusing on social and human relations in life and keeping their promises and not using unfair methods. Fourth, considering the spirit of public service value for the nation and the people that the result suitable for the public interest is more precious, overcoming the individual desire and discerning what is more suitable for the public interest is the value to be cultivated as a public official who serves the people afterward, and above all, it can be wary of the situation that falls into the individualistic tendency, forgetting that he is a 'serviceman of the people'. Fifth, the direction of the challenge spirit shown in the 'expert in the ocean' that 'I am willing to challenge and overcome for a better future' and the future-oriented image that pursues the world's best pursued by educational goals can be confirmed.

Just as the many Coast Guard challenges in the rough sea have saved the lives that have been lost so far, the joint goal of the members of 'better our future' will overcome the difficult obstacles that appear in the process of effort. The proposed principles of action for the Korea Coast Guard trainees will be firmly rooted in the Korea Coast Guard culture and policies through repeated education. This proposal is established as the behavior principle of the Korea Coast Guard in response to the Pandemic era, and it can increase the predictability of many generations in various dilemma situations to be happening in the future, make clear by matching the policy and value of the organization, and establish the behavior principle that can be applied to the entire Korea Coast Guard members in the stage of declaring the core value in the large stem of marine police education It is meaningful to propose it.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	EL	<ul style="list-style-type: none"> -Set of concepts <input checked="" type="checkbox"/> -Design <input checked="" type="checkbox"/> -Getting results <input checked="" type="checkbox"/> -Analysis <input checked="" type="checkbox"/> -Make a significant contribution to collection <input checked="" type="checkbox"/> -Final approval of the paper <input checked="" type="checkbox"/>
Corresponding Author*	YL	<ul style="list-style-type: none"> -Corresponding <input checked="" type="checkbox"/> -Play a decisive role in modification <input checked="" type="checkbox"/> -Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/> -Participants in Drafting and Revising Papers <input checked="" type="checkbox"/> -Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>

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The Effect of Nursing Students' Efficacy, Fear, and Crisis Communication Skills on the COVID-19 Infection Prevention Activities Concerning the Importance of New Infectious Disease Response Capability

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Abstract

Purpose: This study is a descriptive research study intended to confirm the effect of COVID-19 related efficacy of infection prevention activity, fear, and crisis communication skills on the importance of newly infectious disease response capability of the nursing students.

Method: The subjects were 266 3rd and 4th year students enrolled in the Department of Nursing at a university located in City I of Province J. The data collection was conducted from June 14 to June 27, 2020, and the data analysis method was the SPSS/WIN 23.0 using frequency, percentage, mean and standard deviation, Independent t-test, One-way ANOVA, Pearson's correlation coefficient, and the multiple regression analysis was performed.

Results: As a result of this study, the importance of newly infectious disease response capability turned out to have a statistically significant positive correlation with the efficacy of infection prevention activity, fear, and crisis communication skills. The importance of newly infectious disease response capability included the efficacy of infection prevention activity($\beta=.365$, $p<.001$), crisis communication skills($\beta=.212$, $p<.001$), and fear($\beta=.130$, $p<.001$).045), while the explanatory power was 30.0%.

Conclusion: This study confirmed that the nursing students' COVID-19 related efficacy of infection prevention activity, fear, and crisis communication skills were the factors influencing the importance of newly infectious disease response capability related to COVID-19. Among which, it is necessary to develop an infection prevention activity support program to strengthen the efficacy of infection prevention activity yielding the largest impact.

Keywords: COVID-19, Efficacy of Infection Prevention Activity, Fear, Crisis Communication Ability, Importance of New Infectious Disease Response Capability

1. Introduction

Since the first confirmed case of COVID-19 in Korea on January 19, 2020[1], the cumulative number of con-firmed cases has been 21,236,355 as of August 13, 2022 [2], and to prevent the spread of COVID-19 infection, many human and material resources have been invested, such as by setting up screening clinics, putting in a lot of medical personnel, and securing negative pressure beds, and medical personnel who have many opportunities to come in contact with con-firmed COVID-19 patients in the medical field are at risk of infection[3]. Furthermore, the nursing students who practice at hospitals for the educational process and have frequent contact with patients have a higher risk of exposure to infection than the general public, and hence, more caution is needed[4].

As such, active participation in the infection prevention activities by the nursing students who are at high risk of exposure to infection is also related to self-efficacy, while self-efficacy refers to an individual's belief in their ability to solve problems in a given situation[5]. They will be confident in their ability to perceive themselves as effective and will put forth sufficient effort to achieve optimal results, which leads to successful performance[6], and it is known that self-efficacy increases when self-efficacy is high[5].

Furthermore, it may be said that it is very important to actively participate in the infection prevention activities because nursing students must comply with preventive measures to prevent the spread of COVID-19 in the field by employing medical institutions and community institutions in the future[7].

Due to the spread of COVID-19, not only social chaos and economic recession, yet also changes in daily life have become inevitable[8]. Since the outbreak of COVID-19, they responded that their lives had changed and their quality of life was worse than before[9]. As a result of examining the change in people's quality of life after COVID-19, 82.8% of respondents responded that their daily life was changed due to COVID-19, and their quality of life was worse than before[9]. In particular, anxiety and fear about COVID-19 infection turned out to be high. Regarding the possibility of infection, the highest response was 'half-and-half' at 55.8%, and the number of subjects who responded 'high' the possibility of infection turned out to be 20.1%[10]. Such results appear to be influenced by the fear of criticism from people around them when they are confirmed with COVID-19, and can also be confirmed through the results of a study in which people responded that the responsibility for the infection rests with the individual and that the infection is the person's fault[11]. The problem is that this phenomenon can create a social stigma due to the fault of the individual who is responsible for the infection[8].

The fear of COVID-19 is the most common emotion experienced when an infectious disease occurs and is a factor that influences other psychological reactions, emotions, considers, and behaviors[12]. The fear of infection is an emotional form that appears irrespective of age and race, and is a recognition of a specific risk[13], and as fear increases, it interferes with rational thinking and makes it impossible to take corrective actions[12]. As such, the changes in life due to COVID-19 and anxiety and fear of infection can negatively affect an individual's quality of life and mental health[14].

Crisis communication refers to a communication process in which information is exchanged between individuals, organizations, and organizations to understand a specific event, predict risk outcomes, and mitigate damage[15], while comfort[16] was pointed out that the organic communication of the disaster management actors was weak as the cause of the difficulties. In the 2000s, Korea experienced the epidemics of infectious diseases such as Severe Acute Respiratory Syndrome(SARS) and the Middle East Respiratory Syndrome(MERS), while the contents of 'Infectious Disease Control and Prevention Act' has been continuously supplemented[17]. In particular, during the outbreak of MERS in 2015, public distrust and confusion were amplified as related information was not disclosed transparently. Thereafter, through efforts such as the establishment of a crisis communication officer's office at the Korea Centers for Disease Control and Prevention(currently the Korea Disease Control and Prevention Agency) in 2016, and the publication of "Public Health Crisis Communication Guidelines" and the "Standard Operating Procedures for Public Health Crisis Communication" in 2017[18], the government, the media, and social media and various mass media have consistently provided the information on disease and epidemiologic information, including patient movement, and encouraged compliance with control measures[19]. Such activities have an impact on raising the public's confidence in coping with diseases[20].

Furthermore, sharing information through communication in such a crisis situation is considered to be an important factor for preparing for and solving newly infectious diseases in the

future, and it will be an important part for nurses who work in the medical field and have to face newly infectious diseases.

The infectious diseases are difficult to deal with, and even with solid prevention and preparation, if an initial response fails, the speed and scope of transmission of infectious diseases far exceed our expectations. Disaster response related to these infectious diseases is not carried out as initially planned, and efforts must be made to recognize the response system because various uncertainties and complexities that arise after the outbreak must be anticipated and dealt with[21]. Hence, the government's disaster response and management capabilities are very important in order to promptly respond to new disasters that are not similar to the existing disasters.

In general, disaster response capacity is defined as all activities for disaster prevention, preparation, response, and recovery[22][23]. Petak[24] classifies the disaster management process based on the time of occurrence or management of a disaster and presents four stages of Prevention, Preparedness, Response, and Recovery, which are considered as essential requirements for disaster response for major actors in the country to have disaster management capabilities[17].

However, currently in Korea, the studies related to novel infectious diseases including COVID-19 primarily focus on the factors influencing preventive behavior[7], anxiety or knowledge about infectious diseases, and performing preventive actions[25]. The studies on health communication and crisis management(Son AR et al, 2020), and the effects of infectious disease government capacity and citizenship on the response performance of infectious diseases[17] are also conducted, yet these contents are comprehensively reviewed for nursing students. Studies that can be considered are scarce.

Accordingly, how do the nursing students who will work as nurses in medical fields in the future evaluate the efficacy of infectious disease prevention activities and the fear of infectious diseases that they feel while experiencing clinical field practice, and how the nursing students evaluate their ability to communicate with infectious diseases related to infectious diseases, and as such, it is considered necessary to learn about and examine how these various factors affect the importance of infectious disease response competency, and based on such study, it is intended to provide the useful basic data for developing effective strategies to enhance the nursing students' ability to respond to emerging infectious diseases and improve their professional competency as the future nurses.

2. Purpose of Research

The purpose of this study is to determine the importance of newly infectious disease response capability by examining the extent of COVID-19 related efficacy of infection prevention activity, fear, crisis communication skills, and importance of newly infectious disease response capability of the nursing students, and analyzing the relationship between them, while the influencing factors are to be investigated. The specific purposes are as follows.

1) Examine the COVID-19 related efficacy of infection prevention activity, fear, crisis communication skills, and importance of newly infectious disease response capability of the nursing students.

2) Examine the importance of COVID-19 related efficacy of infection prevention activity, fear, crisis communication skills, and newly infectious disease response capacity according to the general characteristics of the nursing students.

3) Examine the correlation between the COVID-19 related efficacy of infection prevention activity, fear, and importance of newly infectious disease response capability of the nursing students.

4) Examine the factors influencing the efficacy of infection prevention activity, fear, and importance of newly infectious disease response capability of the nursing students.

3. Research Method

3.1. Research design

This study is a descriptive research study conducted to examine and understand the efficacy of infection prevention activity, fear, and importance of newly infectious disease response capability of the nursing students by analyzing the correlation between them, and the effect of efficacy of infection prevention activity and fear on the importance of newly infectious disease response capability.

3.2. Subjects of the study

The subjects of this study were 3rd and 4th year students enrolled at a university located in City I of Province J, and they were conveniently sampled for those who had experienced clinical practice at a tertiary medical institution. An online survey was conducted through URL to subjects who understood the purpose of this study and gave permission to voluntarily respond to the survey.

To obtain the number of subjects for this study, the G-power 3.1 program was used, and when a significance level of .05, a medium effect size of .15, and a power of .95 were applied, the sample size was calculated to be 178. A dropout rate of about 20% was considered and questionnaires were distributed for 270 students who desired to participate in the study additionally.

3.3. Research tools

3.3.1. Covid-19 efficacy of infection prevention activity

In this study, to measure the efficacy of infection prevention activity of COVID-19, the researchers developed it by referring to the contents of the COVID-19 prevention action presented by the Korea Disease Control and Prevention Agency[3]. Based on the five basic questions, content validity was verified from one infection control specialist and two nursing professors(Content Validity Index, CVI=.87). The CVI for each question is 1-.67, which was developed by collecting opinions of experts and modifying and supplementing them. Construction validity was verified using factor analysis using the main factor analysis and the Varimax rotation method. As a result of the verification, factor analysis was possible with KMO=0.754 and $\chi^2=385.60(p<.001)$, and there were no questions with a commonality of less than .50. Furthermore, as a result of main factor analysis and Varimax rotation method, it was classified as one factor, and the eigenvalue was 1.0 or more, the factor loading was 0.4 or more, and the total variance was 77.04%, thereby confirming the construct validity of this research tool.

The questions used a Likert scale ranging from 1 point of 'not at all' to 5 points of 'strongly agree', and the higher the score, the higher the efficacy of infection prevention activity for COVID-19. The reliability(Cronbach's α) calculated in this study was .831.

3.3.2. Fear for each covid-19 situation

In this study, the researchers developed based on previous studies[8] to measure the situational fear of COVID-19. Based on the 8 basic questions, content validity was verified from one infection control specialist and two nursing professors(Content Validity Index, CVI=.87). The CVI for each question is 1-.67, which was developed by collecting opinions of experts and modifying

and supplementing them. The construct validity was verified using the factor analysis using the main factor analysis and the Varimax rotation method. As a result of the verification, the factor analysis was made possible with $KMO=0.854$ and $X^2=533.272(p<.001)$, and the two questions with a commonality of less than .50(fear of being criticized for canceling a schedule and the fear of additional confirmed cases) were deleted. As a result of performing the main factor analysis and Varimax rotation method through a total of 6 questions, it was classified as one factor. The eigenvalue was 1.0 or more, the factor loading was 0.40 or more, and the total variance was 73.93%, which verified the validity of this study tool.

The questions used a Likert scale ranging from 1 point of 'not at all' to 5 points of 'strongly agree', and the higher the score meant the larger the fear of COVID-19. The reliability(Cronbach's α) calculated in this study was .867.

3.3.3. Crisis communication of the health authorities

In this study, to measure the efficacy of infection prevention activity of COVID-19, the researchers developed it by referring to the contents of the COVID-19 prevention action presented by the Korea Disease Control and Prevention Agency[3]. Based on the five basic questions, content validity was verified from one infection control specialist and two nursing professors(Content Validity Index, $CVI=.87$). The CVI for each question is 1-.67, which was developed by collecting opinions of experts and modifying and supplementing them. The construct validity was verified using the factor analysis using the main factor analysis and the Varimax rotation method. As a result of the verification, the factor analysis was made possible with $KMO=0.818$ and $X^2=929.603(p<.001)$, and there were no questions with a commonality of less than .50. Furthermore, as a result of main factor analysis and Varimax rotation method, three factors were classified, and the eigenvalue of 1.0 or more, factor loading was 0.40 or more, and the total variance was 72.33%, which verified the construct validity of this research tool.

The questions used a Likert scale ranging from 1 point of 'not at all' to 5 points of 'strongly agree', and the higher the score, the higher the crisis communication of the health authorities about COVID-19. The reliability(Cronbach's α) calculated in this study was .852.

3.3.4. Importance of new infectious disease response capability

In this study, to measure the importance of newly infectious disease response capability, it was developed by this researcher based on previous studies[26]. Based on 10 basic questions, content validity was verified from one infection control specialist and two nursing professors(Content Validity Index, $CVI=.87$). The CVI for each question is 1-.67, which was developed by collecting opinions of experts and modifying and supplementing them. Construction validity was verified using the factor analysis by performing the main factor analysis and the Varimax rotation method. As a result of the verification, the factor analysis was made possible with $KMO=0.878$ and $X^2=846.566(p<.001)$, and two questions with a commonality of less than .50(strengthening the sense of community and strengthening the convergence of public opinion) were deleted. As a result of main factor analysis and Varimax rotation method through a total of 8 questions, which were classified into two factors. The eigenvalue was larger than 1.0, the factor loading was larger than 0.40, and the total variance was 67.49%, which verified the validity of this research tool.

The questions used a Likert scale ranging from 1 point of 'not at all important' to 5 points of 'very important', and the higher the score, the higher the importance of newly infectious disease response capability. The reliability(Cronbach's α) calculated in this study was .880.

4. Method of Data Collection

The data collection of this study was conducted from June 14 to June 27, 2020, and an online

questionnaire was distributed through the department representative. Before starting the online questionnaire, the purpose and duration of the study were explained, and the participants were informed that they can participate in line with their voluntary will and that they can discontinue working on the questionnaire at any time. Furthermore, it was explained that the contents of responses to the questionnaire are treated anonymously and are not used for any other purpose than the research purpose. A link to the online questionnaire was distributed to a total of 270 people, of which 268 responded to the questionnaire, yet the responses of 266 people - excluding 2 who responded insincerely - were used as final analytical data.

5. Method of Data Analysis

The collected data were analyzed using the SPSS 23.0 as follows.

- 1) The general characteristics of the subjects were calculated as real numbers and percentages.
- 2) Efficacy of infection prevention activity, fear, crisis communication skills, and importance of newly infectious disease response capability according to general characteristics were analyzed using independent t-test and one-way ANOVA, and post-mortem verification was conducted using Scheffé test for analysis.
- 3) The relationship between the efficacy of infection prevention activity, fear, crisis communication skills, and the importance of newly infectious disease response capacity was analyzed using the Pearson's correlation coefficient.
- 4) The multiple regression analysis was used to determine the effect of the subject's efficacy of infection prevention activity, fear, and crisis communication skills on the importance of newly infectious disease response capability.

6. Results

6.1. General characteristics of the study subjects

The general characteristics of the subjects were 236 women(88.7%) by gender, and 128(48.1%) of the subjects aged 20-24. There were 148(55.6%) grades without clinical practice experience, and 118(44.4%) subjects with clinical practice experience. Regarding their usual health status, 161 people(60.5%) responded 'healthy'. Meanwhile, 164 people(61.7%) had experiences in education related to COVID-19, 135 people(50.8%) were vaccinated against influenza in 2019, and 208 people(78.2%) were willing to be vaccinated in the future.

153 people(57.5%) and 138 people(51.9%) responded that they obtain the information on COVID-19 primarily from the mass media(newspapers and TV) and the Internet(SNS, etc.), each respectively <Table 1>.

Table 1. General characteristics.

Characteristics	Category	n(%)
Gender	Female	236(88.7)
	Male	30(11.3)
Age(years)	<19	70(26.3)
	20-24	128(48.1)
	25-30	34(12.8)
	>31	34(12.8)
Clinical practice experience	Pre-clinic	148(55.6)
	Clinic	118(44.4)

Perceived health status	Very healthy	86(32.3)
	Healthy	161(60.5)
	Unhealthy	16(6.1)
	Very unhealthy	3(1.1)
Education regarding covid-19	Yes	164(61.7)
	No	102(38.3)
2019 influenza vaccination	Yes	135(50.8)
	No	131(49.2)
Influenza vaccination intention	Yes	208(78.2)
	No	58(21.8)
Sources of obtain information*	School (website or bulletin board)	7(2.6)
	Korea centers for disease control and prevention or public health center	50(18.8)
	Media(newspaper, TV)	153(57.5)
	Internet(SNS, etc.)	138(51.9)

Note: N=266.

* Duplicated response.

6.2. Efficacy of infection prevention activity, fear, crisis communication ability, importance of new infectious disease response capabilities according to the general characteristics of the subjects

There were statistically significant differences in terms of the efficacy of infection prevention activity according to the general characteristics of the subjects by gender($t=-2.22$, $p=.036$) and whether they had experiences in education related to COVID-19($t=2.25$, $p=.025$), while fear turned out to have significant differences in terms of gender($t=-2.37$, $p=.024$), age group($t=6.68$, $p=.048$), clinical practice experience($t=-2.07$, $p=.039$), education experience related to COVID-19($t=2.05$, $p=.041$), presence or absence of influenza vaccination($t=2.43$, $p=.016$), and the intention to vaccinate in the future for influenza($t=3.30$, $p=.001$).

Furthermore, crisis communication skills had significant differences in terms of clinical practice experience($t=-2.13$, $p=.034$), health status($F=4.58$, $p=.004$), and education experience related to COVID-19($t=2.29$, $p=.023$), and the presence or absence of influenza vaccination($t=3.15$, $p=.002$), and the importance of newly infectious disease response capabilities had significant differences in terms of the presence or absence of education experience related to COVID-19($t=2.28$, $p=.024$), and the intention to vaccinate for influenza in the future($t=3.04$, $p=.003$) <Table 2>.

Table 2. Efficacy of infection prevention activity, fear, crisis communication skills, and the importance of newly infectious disease response capability according to general characteristics.

Characteristics	Category	Efficacy of infection prevention activity	t/F (p) (Scheffé test)	Fear	t/F (p) (Scheffé test)	Crisis communication skills	t/F (p) (Scheffé test)	Importance of newly infectious disease response capabilities	t/F (p) (Scheffé test)
		Mean±SD		Mean±SD		Mean±SD		Mean±SD	
Gender	Female	4.65±0.43		4.22±0.55		3.97±0.48		4.06±0.41	
	Male	4.37±0.70	-2.22 (.036)	3.87±0.78	-2.37 (.024)	3.87±0.71	-0.68 (.500)	4.56±0.55	-0.57 (.572)
Age(years)	<19	4.62±0.49	0.48 (.700)	4.13±0.59	6.68 (.048)	3.91±0.51	0.59 (.616)	4.59±0.41	0.44 (.728)
	20-24	4.68±0.40		4.33±0.54		3.97±0.56		4.65±0.44	
	25-30	4.66±0.41		4.37±0.51		40.04±0.48		4.63±0.42	

	>31	4.57±0.52		4.10±0.62		3.97±0.51		4.56±0.44	
Clinical practice experience	Preclinic	4.57±0.52	-1.93	4.11±0.60	-2.07	3.89±0.50	-2.13	4.58±0.41	-0.64
	Clinic	4.68±0.42	(.055)	4.26±0.57	(.039)	4.03±0.51	(.034)	4.61±0.44	(.520)
Perceived health status	Very healthy	4.64±0.52		4.28±0.66		4.11±0.57		4.63±0.43	
	Healthy	4.60±0.46	0.38	4.14±0.55	1.41	30.89±0.45	4.58	4.58±0.41	1.06
	Unhealthy	4.66±0.44	(.769)	4.05±0.48	(.240)	3.75±0.52	(.004)	4.45±0.55	(.368)
	Very unhealthy	4.80±0.34		3.95±0.95		3.76±0.16		4.80±0.20	
Education regarding covid-19	Yes	4.67±0.47	2.25	4.23±0.59	2.05	4.01±0.51	2.29	4.64±0.43	2.28
	No	4.54±0.47	(.025)	4.08±0.58	(.041)	3.86±0.49	(.023)	4.52±0.40	(.024)
2019 influenza vaccination	Yes	4.66±0.44	1.39	4.26±0.58	2.43	4.05±0.51	3.15	4.62±0.42	1.98
	No	4.58±0.51	(.163)	4.09±0.58	(.016)	3.85±0.49	(.002)	4.56±0.43	(.232)
Influenza vaccination intention	Yes	4.65±0.45	1.71	4.24±0.57	3.30	3.98±0.49	1.82	4.63±0.39	3.04
	No	4.51±0.55	(.091)	3.94±0.62	(.001)	3.84±0.56	(.073)	4.45±0.50	(.003)

Note: N=266.

Abbreviation: SD, standard deviation.

6.3. Relationship among the efficacy of infection prevention activity, fear, crisis communication ability, and the importance of new infectious disease response capability

The importance of newly infectious disease response capability of the subjects turned out to have a significant correlation with the efficacy of infection prevention activity($r=.500$, $p<.001$), fear($r=.368$, $p<.001$), and crisis communication skills($r=.388$, $p<.001$), which all had a statistically significant difference <Table 3>.

Table 3. Correlation among efficacy of infection prevention activity, fear, crisis communication ability, and the importance of new infectious disease response capability.

Variables	Efficacy of infection prevention activity	Fear	Crisis communication skills	Importance of newly infectious disease response capability
	r(p)	r(p)	r(p)	r(p)
Efficacy of infection prevention activity	1			
Fear	.488(<.001)	1		
Crisis communication skills	.371(<.001)	.351(<.001)	1	
Importance of newly infectious disease response capability	.500(<.001)	.368(<.001)	.388(<.001)	1

Note: N=266.

6.4. Effect of the efficacy of infection prevention activity, fear, crisis communication ability, importance of new infectious disease response capabilities

The multiple regression analysis was used to determine the influencing factors on the importance of newly infectious disease response capability of the nursing students. Before performing the multiple regression analysis, the correlation coefficient values with efficacy of infection prevention activity, fear, and crisis communication skills, which are independent variables of importance of newly infectious disease response capabilities, ranged from .368 to .500 ($p < .001$) to .80, and in the case of tolerance, it was confirmed to be .716 to .825, which was 0.1 or more. Furthermore, the variance inflation factor (VIF) ranged from 1.213 to 1.396, which turned out to be less than the reference value of 10, indicating that there was no multicollinearity of all independent variables. Examining the Durbin-Watson's statistics, which tests the autocorrelation of errors, it is 1.828, thereby confirming that there is no autocorrelation. Next, as a result of analyzing using the Cook's distance statistics for the influence analysis, there were no subjects with a score of 1.0 or higher. As a result of the residual analysis, the linearity of the model, normality of the error term, and homoscedasticity were confirmed, and hence, the regression model turned out to be significant ($F=38.78$, $p<.001$).

As a result of the multiple regression analysis performed, efficacy of infection prevention activity ($\beta=.365$, $p<.001$), fear ($\beta=.130$, $p<.001$), and crisis communication skills ($\beta=.212$, $p<.001$) were the factors significantly influencing the importance of newly infectious disease response capabilities, with a total explanatory power of 30.0%. The factor most influencing the importance of newly infectious disease response capability was the efficacy of infection prevention activity <Table 4>.

Table 4. Influence factors on the importance of newly infectious disease response capabilities (N=266).

Variables	B	SE	β	t(p)	Tolerance	VIF
Constant	2.050	.237		8.64(<.001)		
Efficacy of infection prevention activity	0.325	.054	.365	6.01(<.001)	.716	1.396
Fear	0.083	.043	.130	1.92(.045)	.728	1.373
Crisis communication skills	0.177	.047	.212	3.75(<.001)	.825	1.213
Durbin-Watson's d=1.828, Adj R ² = .300(R ² =.308), F=38.78($p<.001$)						

Note: N=266.

7. Discussion

This study examined the COVID-19 related efficacy of infection prevention activity, fear, and the importance of newly infectious disease response capability of the nursing students, confirmed the correlation between them, and examined the influencing factors on the importance of newly infectious disease response capability, and it is intended to be used as the basic data for the systematic operation of COVID-19-related infection prevention activities and educational programs for the nursing students preparing for their future as medical professionals.

In this study, 161 nursing students (60.5%) responded that the subjective evaluation of their usual health status was 'healthy'. 164 people (61.7%) had experience in education related to COVID-19, 135 people (50.8%) who were vaccinated against influenza in 2019, and 208 people (78.2%) who were willing to vaccinate in the future. It may be considered that the nursing students' awareness of infectious diseases and their understanding of health care for COVID-19 is high due to the nationwide spread and rapid prevalence of COVID-19 infection after 2020, which is believed to be the case with the study of Jeong Y & Park J & Kim H [27]. This suggests

that it is necessary to provide information through infection control education so that the nursing students who are preparing for their future as medical professionals can manage their own health through an accurate understanding of infectious diseases such as COVID-19.

153 people(57.5%) and 138 people(51.9%) responded that they were primarily getting information on COVID-19 from the mass media(newspapers and TV) and the Internet(Social Networking Service; SNS), respectively. It is believed that it is necessary to provide information related to COVID-19 using social media that the students can easily access as well as publicity activities through active broadcasting at the government level about COVID-19.

In the case of the difference in terms of the COVID-19 related efficacy of infection prevention activity according to the general characteristics of the subjects, it turned out that there was a significant difference in the education experience related to COVID-19. This is a similar result to a study[28][29] that demonstrated that self-efficacy was improved after infection control education was implemented using simulation for nurses. It is considered that it is possible to increase the COVID-19 related efficacy of infection prevention activity by providing education on the continuous infection control through the development of a systematic education program.

According to the general characteristics of the subjects, the communication skills for COVID-19 was higher when they had clinical practice experience, COVID-19 related education, influenza vaccination, and plan to vaccinate for influenza in the future. Such results demonstrate that given the COVID-19 situation, the nursing students who are conducting face-to-face or contactless practice in the case of clinical practice have no choice but to respond promptly to information related to COVID-19 from the government and health authorities, and respond sensitively to such information, and hence, it is considered that the government and health authorities regarding disaster and crisis situations determine that they are communicating with the public properly. Furthermore, it is considered that the nursing students who come into contact with subjects with weak immunity are generally well practiced with influenza vaccination, and are responding to and increasing sensitivity to government guidelines for such health management activities. Hence, in the case of the nursing students, clinical practice is conducted in a group of subjects vulnerable to infection, and hence, it is necessary to educate on the prevention of COVID-19-related infectious diseases so that immediate responses to COVID-19-related situations may be achieved through organic communication between hospitals, schools, and students.

As a result of confirming the correlation between the importance of newly infectious disease response capability related to COVID-19 in this study, efficacy of infection prevention activity, fear, and crisis communication skills demonstrated a positive correlation with the importance of infectious disease response capability. Since the studies on the importance of newly infectious disease response capability related to COVID-19 are still inadequate, the previous studies related to preventive behavior were referred to. The results of this study were similar to those of previous studies related to COVID-19[7][25][27][29][30], and the previous studies related to the Middle East Respiratory Syndrome and H1N1 influenza[31][32]. As in the study[33] which claimed that the higher the self-efficacy, the higher the health behavior performance and the higher the possibility of triggering a behavior change according to the individual will, in the study of Kim Y & Song Y, self-efficacy appears to be a complete mediator in the relationship between the organizational culture of infection control and the performance of standardistic guidelines, and the efficacy of infection prevention activity in this study is also considered to be related to the importance of newly infectious disease response capability. Furthermore, the results of the study[33] which claimed that fear had a significant positive correlation with the perception or anxiety of the risk of infection related to COVID-19[33] and the study that demonstrated the largest influence on preventive actions related to COVID-19 in the case of crisis communication skills[27] were similar. This is a situation where the prolonged COVID-19, the explosive increase in confirmed cases, and the spread of re-infection are repeated several times,

and is also an unstable social atmosphere and a state of significant confusion, and in this situation, they trust the fast and accurate response system proposed by the government and standardize it, and hence, it is considered that it is the case because such atmosphere is created. For this reason, the nursing students, who must undergo clinical practice during the curriculum, are actively practicing awareness and activities to prevent infection, demonstrating a correlation with the importance of the nursing students' ability to respond to newly infectious diseases. New infectious diseases, which range from the Severe Acute Respiratory Syndrome(SARS), aviary influenza, Middle East Respiratory Syndrome(MERS), and COVID-19, a respiratory syndrome caused by SARS-CoV-2 infection, face the risk of exposure to the virus on the rise, and the importance of the ability to respond to newly infectious diseases is increasing more than ever before. When comparing the results of this study with the results of previous studies, it was difficult to make an accurate comparison due to the different diseases and the lack of studies on the importance of newly infectious disease response capability related to COVID-19. Hence, as in this study, a continuous follow-up study is recommended on the efficacy of infection prevention activity, anxiety, and crisis communication skills, which has been suggested to be correlated with the importance of COVID-19-related infectious disease response capability.

As a result of the regression analysis performed to confirm the impact on the importance of COVID-19-related infectious disease response capacity, efficacy of infection prevention activity, anxiety, and crisis communication skills turned out to have a significant influence on the importance of COVID-19-related infectious disease response capacity, and among which, the largest impact was caused by the efficacy of infection prevention activity, while the total explanatory power was 30.0%. As in the study which demonstrated that medical students were able to prevent the MERS infection by stopping practice at medical institutions at the time of the outbreak of the MERS and performing infection prevention activities through wearing a mask, washing hands, strengthening personal hygiene, and checking daily body temperature, it will be necessary to develop an active education program to strengthen the implementation of standardistic guidelines[34]. Further-more, it is considered that efforts should be made to improve the importance of newly infectious disease response capability experienced by the nursing students during clinical practice by providing guidelines for the infection prevention activities based on the patient safety management activities prior to the start of their clinical practice.

By applying a systematic and efficient education program for newly infectious diseases to nursing students who will become medical professionals, it is recommended that an education system is needed to strengthen the importance of responding to newly infectious diseases and to utilize them directly or indirectly for the clinical field.

8. Conclusion and Recommendations

8.1. Conclusion & recommendations of the study

In this study, the COVID-19 related efficacy of infection prevention activity, fear, and crisis communication skills of the nursing students were examined as the factors influencing the importance of newly infectious disease response capability, and the total explanatory power was 30.0%. In particular, much effort should be made to enhance the efficacy of infection prevention activity related to COVID-19, which has the largest impact on the importance of newly infectious disease response capability, and accordingly, interventions regarding the development and application of educational programs for the nursing students. This study is meaningful in that it examined the factors influencing the importance of newly infectious disease response capability. However, there are limitations in generalization to the research conducted for the nursing students at a university located in City I. Based on the results of this study, it is recommended that repeated studies are needed based on diverse variables such as COVID-19 related efficacy of

the infection prevention activity, fear, and crisis communication skills to strengthen the nursing students' ability to respond to newly infectious diseases.

9. References

9.1. Journal articles

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10. Appendix

10.1. Author's contribution

	Initial name	Contribution
Lead Author	ML	-Set of concepts <input checked="" type="checkbox"/> -Design <input checked="" type="checkbox"/> -Getting results <input checked="" type="checkbox"/> -Analysis <input checked="" type="checkbox"/> -Make a significant contribution to collection <input checked="" type="checkbox"/>
Corresponding Author*	JL	-Final approval of the paper <input checked="" type="checkbox"/> -Corresponding <input checked="" type="checkbox"/> -Play a decisive role in modification <input checked="" type="checkbox"/> -Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/>
Co-Author	JP	-Participants in Drafting and Revising Papers <input checked="" type="checkbox"/> -Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>

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Exploring the Experiences of Automobile Manufacturing Workers Participating in Rehabilitation Exercise Programs after Industrial Accidents

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Abstract

Purpose: This study was analyzed with a qualitative research method by applying a phenomenological method to examine the experiences and perceptions and attitudes about health care of workers participating in rehabilitation exercises after suffering an industrial accident while working in the K automobile manufacturing industry in Korea.

Method: As for the selection of research participants, a total of 12 participants were selected as the final research participants, including 1 female and 11 male, who could provide a wealth of information on the subject of the study. For data collection and analysis, Colaizzi's six-step analysis method was used to identify the participants' experiences and cognitive changes who participated in the rehabilitation program. Also, the participants' facial expressions and actions were recorded so that they could be used as additional observational data and reflected in the results of further research.

Results: As a result of the study, 5 categories, 13 topic collections, 32 topics, and 97 construct meanings were finally confirmed. Specifically, the importance of strengthening the intrinsic motivation of the participants was emphasized in order to continuously practice health promotion after an industrial accident in the automobile manufacturing industry. In addition, it appears that a method of self-awareness of the necessity of exercise, giving fun of the complex program, and preventing and managing it in daily life is needed.

Conclusion: The contents derived from the results of this study represent the changing perception of workers toward continuous health promotion management and improvement after an industrial accident. Through the research results, it was an opportunity to confirm the changing perception of health care among workers, and it is expected to be actively used in the future by developing rehabilitation exercise programs at the workplace in the automobile industry.

Keywords: Automobile Manufacturing Industry, Workers, Rehabilitation Movement, Industrial Accident, Phenomenology

1. Introduction

Occupational accidents can be defined as injuries or deaths due to accidents at the industrial site, or a worker becomes ill due to physical disability in the course of work. Among workers, those who have suffered an industrial accident due to physical, mental, or psychological damage experience complex experiences of anxiety, disconnection from society, alienation, and family conflict, and undergo life changes[1][2][3]. Therefore, companies recognize the importance of disease prevention and health promotion for workers in improving productivity[4][5].

An industrial accident worker is a person who has been recognized as an industrial accident by applying to an industrial accident insurance institution in a situation in which physical or mental injury or disease occurs due to an occupational accident and requires treatment for

more than 4 days based on the opinion of a doctor[6][7]. In order to be recognized as an industrial accident due to an accident that occurred in the course of performing work at an industrial site, a worker must undergo a complex approval process and unexpected experience. Although companies provide physical and psychological treatment for injured workers in terms of health promotion, industrial accident insurance focuses on quantitative statistical results and business performance without reflecting workers' individual daily change experiences and psychological status want to return[8][9].

According to data released by the Korea Occupational Safety and Health Agency, manufacturing workers are always at risk. According to the Korea Industrial Accident Survey Table, 20,251 of 67,370 industrial accident victims from January 1 to December 31, 2019 were analyzed as manufacturing workers. Overall, the manufacturing industry took up 30.1%, the construction industry 22.5%, and the accommodation and restaurant industry 5.1%. What is serious is that Korea's representative automobile industry is being classified as an industry with a high accident rate due to the complex work environment[10][11]. In spite of the automation of many manufacturing sites in modern society, automobile manufacturing is still performing repetitive assembly work, and musculoskeletal disorders appear as a continuous problem in the process of work[12][13].

There are five major causes of the occurrence of musculoskeletal systems in the automobile manufacturing industry. The first is the repeatability of work that takes 1 minute per vehicle, and the second is caused by an unnatural work posture depending on the direction and location of the object. Third, using excessive force in heavy weight work is the main cause of this, and fourth is considered to be a vibration phenomenon that occurs while using heavy tools. Lastly, in addition to physical causes, various factors influence it[14].

This study was conducted to find out how participants who were judged as industrial accidents in the automobile manufacturing industry of Company K in Korea changed their perception of health care before returning to work through the experience of a rehabilitation program(Muscle Balance Workout of Hee). The research method was explored using the Colaizzi 6-step analysis method among phenomenological methods. Phenomenological research methods require the researcher to see the participant as they really are. It is an inductive study that reveals the essential structure after the researcher controls the preconceived notions and identifies the meaning of the experience[15][16][17]. The results of this study can confirm the changing perception of health management through rehabilitation exercise after an industrial accident and are expected to be used as data for improving the health of workers at workplaces in the future.

2. Research Methods

2.1. Selection of study participants

In this study, participants who participated in the rehabilitation program as industrial accident workers after working in the automobile manufacturing industry of Company K were selected according to the nomadic sampling method. The selection of research participants can reflect the experience according to the research topic well, and sufficient research progress is considered only when the participants who can provide the closest information are selected[18]. Therefore, from among the participants who could actively participate in the rehabilitation program and provide abundant information on the subject of the study, a total of 12 people, 1 female and 11 males, were selected as the final research participants.

Since the phenomenological approach is conducted through in-depth interviews, research ethics is an important process that must be decided first. In this study, the purpose and purpose of the study were sufficiently explained to the study participants for data collection, and they

were informed that the contents of the interview would not be used for any other purpose than the study. It also confirmed that participants had the right to discontinue participation during the course of the study. Finally, a consent form regarding personal information was written and coded with a number, not a name, for personal confidentiality. The general characteristics of the study participants are shown in <Table 1> below.

Table 1. General characteristics of study participants.

Division	Gender	Age	Working part	Injured area
1	Male	57	Materials management	Waist
2	Male	50	Assembly	Waist
3	Male	41	Assembly	Shoulder
4	Male	41	Assembly	Waist
5	Male	33	Assembly	Shoulder
6	Female	50	Assembly	Shoulder
7	Male	45	Assembly	Shoulder, waist
8	Male	51	Engine parts	Shoulder
9	Male	51	Finished vehicle inspection	Neck, waist
10	Male	47	Assembly	Neck, waist
11	Male	41	Surface painting	Knee
12	Male	51	Engine parts	Waist

2.2. Data collection and analysis process

The data collection method in this study was first conducted through preliminary research and in-depth interviews. In the preliminary investigation, literature review was conducted for theoretical extraction, and the in-depth interview was recorded using a smartphone application in which the recording and contents were simultaneously recorded and transcribed. Participants were interviewed twice per person, and the interview took about 30-40 minutes. Interviews were conducted before and after returning to work, and were conducted until the contents of the participants' experiences were saturated. In addition, participants' facial expressions and behaviors were memorized and recorded as additional observational data, which was then reflected in the study results. Data analysis of in-depth interview content was approached by Colaizzi's analysis method. <Table 2> below summarizes the 6-step Colaizzi analysis method.

Table 2. Colaizzi 6-step analysis method.

Division	Analysis method
Step 1	▪The process of grasping the contents of the subject's statements and understanding the implications
Step 2	▪Exclude duplicate content in a separate meaning and derive it as a meaningful statement
Step 3	▪Find meaningful statements and reconstruct them in a general form
Step 4	▪Make the constructed meaning into a subject and describe it as a subject bundle
Step 5	▪Organize and derive classified topic bundles into categories
Step 6	▪Finally describe the confirmed experiences related to the topic

2.3. Composition of participant rehabilitation exercise program

The program used in this study consisted of rhythmic exercise, Pilates using mats and tools, and sports taping. The program participation time consisted of 4 hours per day, and theory and practice were properly combined in the morning and afternoon. This rehabilitation exercise program was named 'Muscle Balance Workout of Hee' and is shown in <Figure 1>, <Figure 2>, and <Figure 3>. Rhythmic exercise practiced repeating the actual movement after explaining the partial movements, and consisted of light movements that arouse interest in the exercise. Pilates using mats and tools included myofascial relaxation massage and stretching, and was conducted to improve flexibility and improve basic physical strength. Sports taping theory and practice were conducted for injury prevention and self-care based on anatomical knowledge.

Figure 1. Rhythmic movement.



Figure 2. Pilates with mats and tools.



Figure 3. Sports taping practice.



3. Research Results

3.1. Categorization of data according to in-depth interviews with participants

As a result of the study on the experiences of automobile manufacturing workers participating in rehabilitation programs after industrial accidents, 5 categories, 13 topic collections, 32 topics, and 97 compositional meanings were finally confirmed. The categorization of participants' experiences is shown in <Table 3> below.

Table 3. Categorization results according to in-depth interview with participants.

Constructed meaning	Topic	Topic bundle	Category
<ul style="list-style-type: none">▪Worried about repetitive abnormal movements▪Anxious because of constant pain	Worry about returning to work	Program participation	Change in participation awareness
<ul style="list-style-type: none">▪Persistent pain requiring rest▪Wanting to rest due to anxiety about movement	Choice for relaxation		
<ul style="list-style-type: none">▪Increased fear of pain▪Fear of getting hurt	Fear of being sick		
<ul style="list-style-type: none">▪Use a variety of muscles▪Complex exercise program	Satisfaction with various programs	Gratitude for participating in the program	
<ul style="list-style-type: none">▪Body has become softer and more active▪Pain is relieved and daily life becomes easier	Thanks for participating in the program		
<ul style="list-style-type: none">▪Movement became easier and I felt refreshed▪Gaining knowledge of body movements	Understanding body movement	Changes in body perception	
<ul style="list-style-type: none">▪Indigestion is relieved▪Numbness in the legs is gone▪Insomnia has improved	Eliminate negative perceptions		
<ul style="list-style-type: none">▪Feeling the limits of hospital treatment▪Stretching feels pain relief	Difficulty of hospital treatment	Recognize the importance of movement	
<ul style="list-style-type: none">▪It is important to warm up before work▪Be aware of movements that are likely to cause injury	The link between movement and occupational accidents		
<ul style="list-style-type: none">▪Rehabilitation exercise makes the body more comfortable▪Fear of movement is gone	Changes in perceptions about rehabilitation		
<ul style="list-style-type: none">▪Negative emotions turn into positive ones▪Peace of mind and body	Relieve negative emotions	Emotional change	
<ul style="list-style-type: none">▪It gave me an opportunity to rethink my health and life▪I became more aware of my body condition	Regret not knowing		
<ul style="list-style-type: none">▪I am able to share my learning with my family▪Make friends by sharing information with colleagues	Improving social relationships		
<ul style="list-style-type: none">▪Improves physical strength and relieves anxiety▪Confidence in returning to work	Relieve anxiety about returning to work		
<ul style="list-style-type: none">▪Time passes quickly because it's fun▪The instructor leads the class enthusiastically	Fun lessons	The importance of leadership roles	Participation satisfaction
<ul style="list-style-type: none">▪It is necessary to systematically receive explanations and receive guidance▪Instructor's guidance makes it easy to adapt	Difficult to proceed without a leader		
<ul style="list-style-type: none">▪Fun and fun training time▪Education time in a bright atmosphere instructor's positive energy	Fun and bright education	Participation according to educational atmosphere	
<ul style="list-style-type: none">▪Participation program▪Program for everyone	Create a positive atmosphere		
<ul style="list-style-type: none">▪Venue is limited due to covid-19▪Classes change frequently due to covid-19	Program restrictions due to covid-19	Discomfort due to covid-19	Environmental improvement request
<ul style="list-style-type: none">▪Health and aquatic rehabilitation classes that were formal education have been canceled	Request for facility improvement	Longing for environmental improvement	
<ul style="list-style-type: none">▪Outdated school facilities▪Need to secure various exercise tools	Request for environmental improvement		

<ul style="list-style-type: none">▪Lack of instructors▪Instructor conducts the program without breaks	demand for leadership			
<ul style="list-style-type: none">▪The need to improve the industrial accident application process▪The approval period for occupational accidents is exhausting and difficult	Complaints about the application process	Grievances in the industrial accident application process		
<ul style="list-style-type: none">▪I feel sorry for my co-workers, but I feel sorry for them▪Psychologically sensitive	Negative emotions in the application process			
<ul style="list-style-type: none">▪Co-workers and family-like atmosphere▪Established relationships with co-workers	Build a friendship relationship	Camaraderie among participants	Participant camaraderie	
<ul style="list-style-type: none">▪Discuss treatment options with co-workers▪Exchange of information on how to deal with industrial accidents	Sharing information			
<ul style="list-style-type: none">▪The state of the body changes depending on the individual's efforts▪Confidence to perform difficult movements comfortably	Awareness of effort	Awareness after participating in the program	Positive coping in daily life	
<ul style="list-style-type: none">▪Only active participation can make a difference▪Recognize the importance of programs for rehabilitation	The need for active participation			
<ul style="list-style-type: none">▪Knowing how to do things on your own▪I am able to prevent myself even on a regular basis	Learning movements that can be applied in daily life	Applications in everyday life		
<ul style="list-style-type: none">▪Continue to exercise even after training is over▪Program application even after returning to the industrial field	Program application after returning to work			

3.2. The essence of the rehabilitation program experience for workers in the automobile manufacturing industry

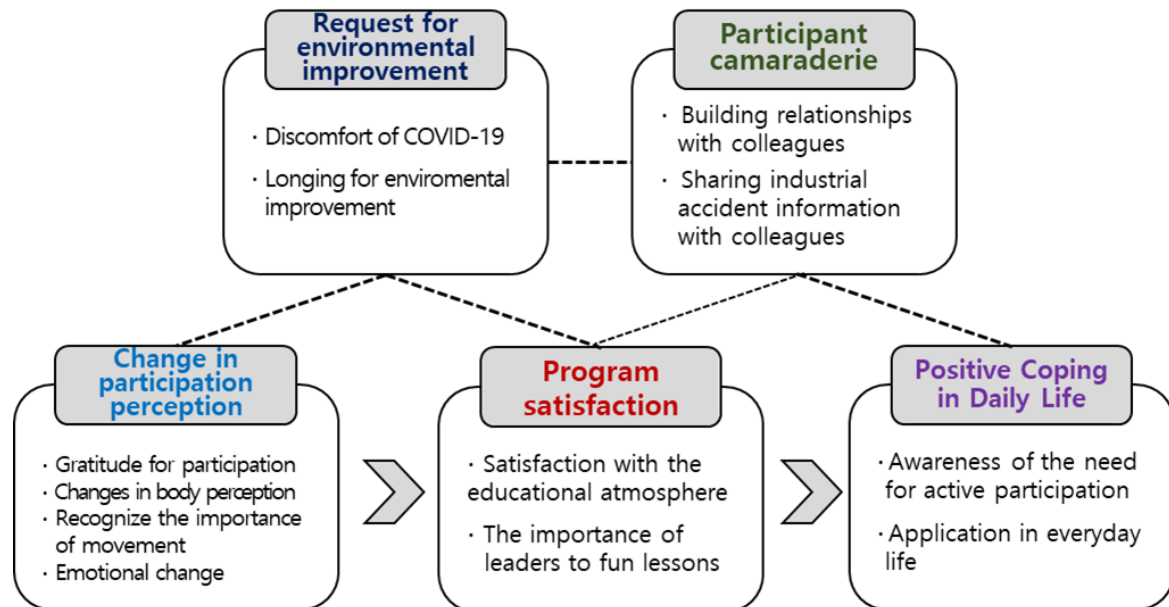
Rehabilitation program training participants in this study had a burden about their unstable physical condition before returning to the field after treatment for industrial accidents was completed. Participants who had a fear of being sick decided to participate selectively in order to rest. After participating in the program, the participants began to have a change in their perception of rehabilitation exercise. By recognizing the importance of movement, the fear of movement disappeared, and positive changes in the body were also experienced. In addition, the participants felt the importance of the role of a leader leading a bright mood change.

However, due to COVID-19, class locations were changed or restricted, and there were cases where they felt uncomfortable about the outdated educational facilities. Fitness training and aquatic rehabilitation classes, which were formal training courses, were postponed, and exercise-related tools and equipment needed to be supplemented. There were times when it seemed pitiful for the instructor to proceed alone without a break, so recruiting a leader seemed urgent. During the occupational accident application process, the participants said they were sorry but sad because they were noticing their colleagues. It was exhausting and difficult due to the long period of approval for industrial accidents, which caused emotional distress and increased sensitivity. However, as colleagues who participated in the rehabilitation program education became close friends, a bond of caring and informing each other began to form. Participants also informed each other about treatment methods and formed a camaraderie by sharing information about the process of handling industrial accidents.

Coping methods in the daily life of the study participants also began to change. The participants experienced that their body could change according to their own efforts, and they also gained the confidence to perform the movements that they thought were difficult with ease.

Participants were able to acquire information on how to rehabilitate themselves on their own and thought that they could be helped in preventing industrial accidents. Participants also learned how to utilize the program after returning to work, enabling them to respond positively in their daily lives. <Figure 4> below presents a situational model of the essential structure of the rehabilitation program experience of workers in the automobile manufacturing industry.

Figure 4. Rehabilitation program experience model for workers in the automobile manufacturing industry.



4. Conclusion and Recommendations

Occupational accidents are not common, but they can happen to anyone. In Korea's Ministry of Employment and Labor, occupational diseases are broadly divided into occupational diseases and work-related diseases in occupational accident analysis statistics[19][20]. The automobile manufacturing industry investigated in this study is divided into transport, inspection, handling of heavy goods, and assembly in the assembly department, body part, painting part, engine part, transmission part, quality control department, and other production departments related to the manufacturing process, so it is difficult for workers to adjust arbitrarily.

Compared to other manufacturing workers, the automobile manufacturing industry is more fragmented and the amount of labor required for work is high[14]. Therefore, this study focused on the automobile manufacturing industry, which is prone to industrial accidents, and conducted a phenomenological study on the experiences of rehabilitation programs by sampling participants who suffered industrial accidents while working at Korean automobile manufacturer K Company. The phenomenology study used in this study is a research methodology that aims to describe the essence of participants by elucidating the meaning and structure of their perceptions and experiences as they are[21][22].

Therefore, in this study, an inductive analysis was performed on the changes experienced after completing the education of the health promotion education program supported by the company as a welfare level after an industrial accident and returning to work. The 'Muscle Balance Workout of Hee' program applied in this study is a program that the researcher has configured in various ways to suit the rehabilitation exercise of automobile manufacturing workers based on aerobic exercise and anaerobic exercise. Through the vivid interview contents of the

participants of this study, it was found that the complex programs such as rhythm exercise, Pilates using mats and tools, and sports taping practice had a positive effect on the participants. Therefore, for rehabilitation, it is necessary to conduct in-depth research by composing a complex program that can help both physical and psychological rehabilitation rather than a single program.

Many studies have been conducted that the physical activity program has a positive effect on the reduction and rehabilitation of musculoskeletal disorders by applying it to workers in terms of prevention and management[23][24][25]. However, there are not many studies that structure the direct experiences of people participating in rehabilitation programs. Similarly, the final components of the five changes in participation perception, participation satisfaction, environmental improvement demand, participant camaraderie, and positive coping in daily life, which were shown as a result of this study, show positive aspects as in previous studies. This study will be meaningful in that it categorizes and structures the experience of participating in the rehabilitation program of industrial accident workers in the automobile manufacturing industry.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	HK	-Set of concepts <input checked="" type="checkbox"/> -Design <input checked="" type="checkbox"/> -Getting results <input checked="" type="checkbox"/> -Analysis <input checked="" type="checkbox"/> -Make a significant contribution to collection <input checked="" type="checkbox"/>
Corresponding Author*	JL	-Final approval of the paper <input checked="" type="checkbox"/> -Corresponding <input checked="" type="checkbox"/> -Play a decisive role in modification <input checked="" type="checkbox"/> -Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/>
Co-Author	HW	-Participants in Drafting and Revising Papers <input checked="" type="checkbox"/> -Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>

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