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Vol. 8

1. Human Life of Korean University Students

/ Sunggu Jo

2. Analyzing the Effects of Smartphone Addiction, Parental Attachment, Peer Attachment on Impulsivity in School-Disengaged Adolescents

/ Gutaek Bae, Youngik Kim, Mihee Choi

3. Water Supply Reliability Analysis of Multi-Purpose Dams in Preparation for Water Disasters

/ Kibum Park

4. Human Rights Concerns on Fukushima Radioactive Wastewater Dumping Plan in Kishida Era

/ Jina Choi

5. A Study on the Strategy for Responding to Large-Scale Complex Disasters

/ Dongkwan Lee

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Human Life of Korean University Students

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Abstract

Purpose: The Korean wave phenomenon is closely related to university students in Korea, and university students are greatly influenced by the Korean Wave phenomenon and experience and develop positive changes and opportunities through it. The Korean Wave phenomenon is contributing to university students introducing and promoting Korean wave contents abroad, contributing to Korean language education and cultural exchange, and becoming Korea's representative soft power factor through cultural event planning and international leadership. Through these roles, university students can gain opportunities to promote Korean culture and values to the world and form an international network, which has created a need for research on the lives of Korean university students.

Method: In this study, 150 Korean university students were surveyed by convenience sampling method. A valid questionnaire was analyzed for 136 people, and the data were analyzed using the SPSS 23.0 program. Frequency analysis, t-test, and One Way ANOVA were used as analysis methods. According to the purpose of the analysis, differences in stress by gender, difference in organizational commitment by presence or absence of friends of the opposite sex, differences in empowerment by religious type, and differences in organizational commitment by friends of the opposite sex and dwelling type were explored.

Results: First, as a result of examining the difference in stress according to gender in Korean university students, males answered Q7(I feel the need to reduce part of my role in my team) and Q8(I feel my role is too much in my team). It was found that women experience higher levels of stress than women. Second, as a result of verifying differences in empowerment according to religious types of Korean university students, in Q8(I decide the goal of my training by myself), the result was that Christian believers experienced higher empowerment than other religions(non-religious). And as a result of examining the difference in organizational commitment according to the presence or absence of friends of the opposite sex among Korean university students, those who have friends of the opposite sex were Q1(I feel a strong sense of belonging to the team I am currently training for), Q2(I think the current team is worth putting my heart and soul into), and Q3(I look forward to life in the team more positively in the future).

Conclusion: First, Korean university students showed different role burdens and stress levels according to gender. Second, Christians tended to feel greater self-determination and control through religious values and belief systems. Third, those who have friends of the opposite sex tend to feel a strong sense of belonging and passion within the organization. Fourth, students living in university dormitory dormitories showed higher organizational commitment than students who commute to school. The university dormitory provides an environment that encourages the formation of relationships with classmates and communication with the outside world.

Keywords: Korean Wave Culture, Korean University Students, Stress, Organizational Commitment, Empowerment

1. Introduction

1.1. Need for the study

The global Korean wave phenomenon has a strong connection to university students in South Korea. The Korean Wave refers to the phenomenon of Korean popular culture, especially music, dramas, and movies, becoming very popular abroad. The Korean Wave is an international phenomenon that began to have a significant impact on the world from the late 1990s to the 2000s[1].

In the midst of this, Korean university students have had a significant impact on the Korean wave phenomenon. As Korean wave cultural content has become very popular abroad, the number of students studying Korean abroad and interested in Korean culture has increased [2][3][4], and Korean universities are running Korean language education programs for foreign students. It expanded, and Korean wave-related studies and research fields were also developed [5][6][7].

This Korean wave phenomenon has brought great pride and change in perception to Korean university students as well. The global success of Korean wave contents has instilled pride as creators of Korean culture and popular culture, and has influenced Korean university students to form their identities overseas as Korean wave stars representing Korea or fans of cultural contents [8]. In addition, the Korean Wave phenomenon has had a positive impact on Korean university students' international exchanges and study abroad [9][10]. experience and an opportunity to form an international network [11].

As such, the Korean Wave phenomenon has a significant impact on Korean university students and Korean popular culture, and Korean university students experience and develop positive changes and opportunities through it.

However, this study needs to be international because it has a lot of interest in young people around the world, and like this study, an article analyzing the stress, empowerment, and organizational commitment according to gender, religious type, opposite-sex friend, and housing type of Korean college students I hoped that it would be published in English and could provide information to more researchers internationally, and I thought that the value would increase, so I published this study.

1.2. Korea's soft power

In an interview with the Spanish media 'El Pais', it is worth noting that BTS' leader RM mentioned Korean history and culture of effort in response to a question mixed with criticism of Korean culture. RM, the leader of BTS, said that Korea was a country that suffered from invasion and division by neighboring countries, and that the country was left in ruins 70 years ago due to the war that started with the invasion of communism. However, he said, the reason why Korea has been able to attract the world's attention now is thanks to the people's relentless efforts. He also commented on some Western European perspectives, countering the view that denies Korea's culture of hard work. Regarding the pressure on the fandom, RM mentioned that a strong fandom helped him achieve his goals. In addition, all men in Korea are obliged to serve 2 years in the military, and they usually take a leave of absence after completing their first year at university, spend 2 years in the military, and then return to the second year of university. He replied that he was showing his will to grow and develop through military life. This interview touched many people, and the news spread and inspired the pride of Korean university students [12]. Most Korean university students sympathized with BTS leader RM's remarks, and it can be seen that the role of Korean university students is at the center of the soft power of the Korean wave.

As such, the social role of university students in Korea is as follows.

First, Korean university students can play a role in introducing and promoting music, dramas, and movies abroad[13]. By sharing Korean wave-related information and introducing it to foreigners through social media, blogs, online communities, etc., you can contribute to promoting Korean culture and art to the world.

Second, Korean university students play a role of helping students who want to learn Korean abroad[14]. By operating a Korean language exchange program within the university or providing support for Korean language education for international students, we can promote the spread of the Korean language and understanding of Korean culture worldwide.

Third, Korean university students are creating opportunities to promote the diversity and charm of Korean culture by promoting exchanges with international students and participating in planning cultural events[15]. We plan multinational student gatherings, cultural festivals, and performances to provide opportunities for foreigners to experience the cultural values and charms of Korea.

Fourth, Korean university students are contributing to becoming Korea's representative soft power by growing into talented people with international perspectives and leadership. Through overseas exchange programs, overseas training, and international conferences, various experiences and knowledge are accumulated, and through activities in the international community, they are advancing as leaders representing Korea's opinions and values[16].

Lastly, as the Korean Wave phenomenon increases Korea's soft power, Korean university students can make the most of its influence and contribute to promoting Korean culture and values to the world[17]. The expansion of soft power has a positive impact in various aspects, such as improving national image, creating economic profits, and promoting international exchange, so the role of university students is very important.

Therefore, this study exploratively examined stress, empowerment, and organizational commitment through gender, religious type, opposite-sex friends, and dwelling type among Korean university students, who are making significant contributions to Korea's soft power through the Korean Wave, to shed light exploratory on the human lives of Korean university students.

1.3. Korean university students

1.3.1. Relationship between gender, religious type, friends of the opposite sex, and dwelling type of Korean university students

First, the gender of Korean university students can affect their personal experiences, behaviors, and university life[18]. Gender may show differences in social roles, relationships, and personalities in general. Therefore, there may be differences in university students' relationships with friends of the opposite sex and dwelling type depending on gender, and it may vary depending on individual personality and inclination, cultural factors, etc.

Second, the religion of Korean university students can have a great impact on personal values, beliefs, and moral guidelines. Religious type can affect an individual's behavior, way of thinking, and interpersonal relationships, which can also affect friends of the opposite sex and dwelling type[19]. Depending on religious beliefs, the criteria for choosing a friend of the opposite sex or the type of residence may vary. In addition, university students belonging to religious communities participate in religious activities and events.

Third, Korean university students believe that opposite-sex friends can play an important role in university life, and are formed according to individual inclinations, likes, and interests. Gender, religion, and cultural factors can affect opposite-sex friendships, but individual The person's personality, interests, and interactions also play an important role[20].

Fourth, the dwelling type of Korean university students can be diverse, such as school dormitories, living outside, and living at home. Dwelling type can affect a university student's independence, autonomy, and sense of belonging. Dwelling type can also affect an individual's gender, religion, and exchanges with friends of the opposite sex, and can also affect school life satisfaction and university experience[21].

1.3.2. The relationship between stress, empowerment, and organizational commitment in Korean university students

First, Korean university students are experiencing stress due to various factors such as academic, personal relationships, and economic pressure. Academic burdens, exam assignments, period pressures, and changes in university life can act as stressors. Such stress has physical, emotional, and cognitive effects on university students, and also affects academic achievement, emotional well-being, and interpersonal relationships[22].

Second, Korean university students have a level of empowerment as they pursue self-directed activities with authority and responsibility for their studies and university life. Empowerment has a positive effect on university students' self-esteem, self-efficacy, and participation[23].

Third, Korean university students' organizational commitment is when individuals accept the organization's goals and values and experience an emotional and cognitive connection to the organization. They participate in university communities, clubs, research groups, etc. is promoting. Organizational commitment has a positive effect on university students' academic achievement, interpersonal relationships, and self-realization[24].

Fourth, stress in Korean university students can affect empowerment and organizational commitment[25]. High stress can lower university students' empowerment and organizational commitment, and conversely, higher levels of empowerment and organizational commitment can alleviate university students' stress levels. This can help university students improve their ability to regulate and control their academics and university life.

2. Research Method

2.1. Subject of research

In this study, the population of university students majoring in sports in the Daegu-Gyeongbuk region of Korea was sampled, and 150 people were surveyed by convenience sampling, and a survey was conducted using the self-administration method. Among the collected 150 questionnaires, 136 questionnaires were used as a valid sample, excluding data in which responses were insincere or parts of the survey contents were omitted.

Table 1. General characteristics of study subjects.

	Division	N(%)
Gender	Male	100(73.5)
	Female	36(26.5)
Religious type	Christian	23(16.9)
	Catholic	6(4.4)
	Buddhism	13(9.6)
	Others(non-religious)	94(69.1)
Opposite sex friend	Exist	59(43.4)
	Non-existence	77(56.6)
Dwelling type	1 person life	100(73.5)
	Life with family	36(26.5)

2.2. Research questions

Data processing in this study is to collect distributed questionnaires, exclude data that are judged to be incomplete or unreliable from the research subject, input data that can be analyzed individually into a computer, and then research hypotheses using the SPSS 23.0 Program, a statistical package program. Statistical verification was conducted as follows according to the purpose of data analysis and data analysis.

First, frequency analysis was conducted to identify general characteristics using the SPSS/PC+23.0 program.

Second, a t-test was conducted to explore differences in stress according to gender, differences in organizational commitment according to having friends of the opposite sex, and differences in organizational commitment according to dwelling type.

Third, One Way ANOVA was conducted to explore differences in empowerment according to religious types and the post hoc used the Tukey method.

3. Research Results

3.1. Stress and gender

Table 2. Stress measuring tool.

	Question	Cronbach's α
1	My team's training time is too much.	.631
2	I get conflicting demands from two or three people about my training.	
3	I am in charge of a job that needs to be done differently depending on the situation.	
4	I have a clearly established mission and goal for training.	
5	I am clearly aware of my role.	
6	I know what my responsibilities are for my role.	
7	I feel the need to reduce some of my roles on our team.	
8	I feel that my role in our team is too much.	

Table 3. Differences in stress by gender.

Question	Division	N	M	SD	t-value	Sig
Q1	Male	100	2.9400	1.05237	.835	.828
	Female	36	2.7778	.83190		
Q2	Male	100	3.0500	.91425	.639	.109
	Female	36	2.9444	.62994		
Q3	Male	100	3.1400	.94302	.940	.147
	Female	36	2.9722	.84468		
Q4	Male	100	3.6500	.82112	.248	.940
	Female	36	3.6111	.76636		
Q5	Male	100	3.8600	.76568	1.165	.815
	Female	36	3.6944	.62425		
Q6	Male	100	3.9500	.74366	1.645	.670
	Female	36	3.7222	.61464		

Q7	Male	100	3.1200	1.06629	1.629	.042*
	Female	36	2.8056	.74907		
Q8	Male	100	2.5300	1.13222	1.082	.039*
	Female	36	2.3056	.85589		

Note: *p<.05, **p<.01, ***p<.001.

<Table 3> shows the results of the verification of stress differences according to gender. Males showed higher scores than females in Q7 and Q8.

3.2. Empowerment and religion

Table 4. Empowerment measuring tool.

Question		Cronbach's α
1	I can exert a significant influence on the achievement of our team's goals.	.855
2	I can influence what happens on my team.	
3	I am confident that my team will successfully achieve its goals.	
4	I can successfully achieve even difficult training.	
5	I can control a lot of what happens on my team.	
6	I have the ability to decide for myself how to practice martial arts.	
7	I have a great deal of independence in conducting my training.	
8	The goals of my training are determined by myself.	

Table 5. Differences in empowerment by religious type.

Question	Type	N	M	SD	F	Sig	Post hot
Q1	Christian	23	3.9565	.76742	1.620	.188	
	Catholic	6	3.8333	.75277			
	Buddhism	13	3.6923	.85485			
	Others (non-religion)	94	3.5638	.79729			
Q2	Christian	23	3.9130	.73318	.849	.470	
	Catholic	6	3.8333	.75277			
	Buddhism	13	3.6154	.76795			
	Others (non-religion)	94	3.6489	.77192			
Q3	Christian	23	3.8696	.81488	.170	.917	
	Catholic	6	3.8333	.40825			
	Buddhism	13	3.6923	.63043			
	Others (non-religion)	94	3.7660	.82208			
Q4	Christian	23	3.9565	1.02151	.459	.712	
	Catholic	6	3.8333	.75277			
	Buddhism	13	3.6154	.76795			
	Others (non-religion)	94	3.7872	.84079			

Q5	Christian	23	3.6957	1.18455	.694	.557	
	Catholic	6	3.6667	.51640			
	Buddhism	13	3.5385	.77625			
	Others (non-religion)	94	3.4043	.91955			
Q6	Christian	23	4.1304	.86887	.986	.402	
	Catholic	6	3.8333	.75277			
	Buddhism	13	4.1538	.68874			
	Others (non-religion)	94	3.8404	.93099			
Q7	Christian	23	4.0000	.73855	2.410	.070	
	Catholic	6	3.8333	.75277			
	Buddhism	13	3.6923	.63043			
	Others (non-religion)	94	3.4681	.95829			
Q8	Christian	23	4.5217	.59311	3.707	.013*	A>D
	Catholic	6	4.0000	.63246			
	Buddhism	13	4.2308	.59914			
	Others (non-religion)	94	3.8936	.92129			

Note : A: Christian, B: Catholic, C: Buddhism, D: Others(non-religion).

<Table 5> shows the result of verifying differences in empowerment according to religious types. In Q8, Christianity was higher than others(non-religion).

3.3. Organizational commitment, friends of the opposite sex, and dwelling type

Table 6. Organizational commitment measurement tool.

Question		Cronbach's α
1	I feel a strong sense of belonging to the team I am currently training for.	.747
2	I think the current team is worth putting all your heart and soul into.	
3	I am looking forward to a more positive life in the team now.	
4	I like to talk about my team with people outside the team.	
5	I think of my team's problems as my own and try to solve them.	
6	Even if I move to another team, I don't think it will be very different from the level of satisfaction with the current team.	
7	I feel like part of our team.	
8	I never thought about quitting our team.	

Table 7. Differences in organizational commitment according to having friends of the opposite sex.

Question	Division	N	M	SD	t-value	Sig
Q1	Exist	59	3.9831	.68207	1.842	.006**
	Non-existence	77	3.7403	.81761		

Q2	Exist	59	4.0000	.71919	.979	.045*
	Non-existence	77	3.8701	.80050		
Q3	Exist	59	3.9322	.73963	1.492	.003**
	Non-existence	77	3.7143	.91561		
Q4	Exist	59	3.7797	.81087	.949	.152
	Non-existence	77	3.6364	.91636		
Q5	Exist	59	3.8305	.74631	.091	.996
	Non-existence	77	3.8182	.80667		
Q6	Exist	59	2.9661	1.14419	-2.344	.903
	Non-existence	77	3.4156	1.08033		
Q7	Exist	59	4.0678	.73963	.022	.202
	Non-existence	77	4.0649	.73157		
Q8	Exist	59	3.4407	1.03842	.378	.079
	Non-existence	77	3.3636	1.27640		

Note: *p<.05, **p<.01, ***p<.001.

<Table 7> shows the result of verifying differences in organizational commitment according to the presence or absence of friends of the opposite sex. In Q1, Q2, and Q3, having friends of the opposite sex was higher than not having friends.

Table 8. Differences in organizational commitment by dwelling type.

Question	Division	N	M	SD	t-value	Sig
Q1	University dormitory(living on your own)	100	3.7800	.79874	-1.669	0.016*
	Commuting to school	36	4.0278	.65405		
Q2	University dormitory(living on your own)	100	3.8400	.78779	-2.225	0.194
	Commuting to school	36	4.1667	.65465		
Q3	University dormitory(living on your own)	100	3.7500	.89188	-1.353	0.006**
	Commuting to school	36	3.9722	.69636		
Q4	University dormitory(living on your own)	100	3.6000	.88763	-2.228	0.036*
	Commuting to school	36	3.9722	.77408		
Q5	University dormitory(living on your own)	100	3.7900	.80773	-0.836	0.073
	Commuting to school	36	3.9167	.69179		
Q6	University dormitory(living on your own)	100	3.3400	1.10298	2.085	0.961
	Commuting to school	36	2.8889	1.14087		
Q7	University dormitory(living on your own)	100	4.0000	.75210	-1.770	0.548
	Commuting to school	36	4.2500	.64918		
Q8	University dormitory(living on your own)	100	3.2700	1.16216	-2.128	0.643
	Commuting to school	36	3.7500	1.15573		

<Table 8> shows the result of verifying differences in organizational commitment according to dwelling type. In Q1, Q3, and Q4, university dormitory was higher than commuting.

4. Result

First, it is the result of the verification of the stress difference according to the gender of Korean university students. In Q7(I feel the need to reduce part of my role in my team) and Q8(I feel my role in my team is too much), males scored higher than females.

Second, it is the result of verifying the difference in empowerment according to the religious type of Korean university students. In Q8(the goal of my training is determined by myself), Christianity was higher than others(non-religious).

Third, it is the result of verifying the difference in organizational commitment according to the presence or absence of friends of the opposite sex in Korean University students. Q1(I feel a strong sense of belonging to the team I am currently training for), Q2(I feel that the current team is worth giving my heart and soul to), and Q3(I look forward to life in the current team more positively in the future). Having friends was higher than not having friends.

Fourth, it is the result of verifying the difference in organizational commitment according to the dwelling type of Korean university students. Q1(I feel a strong sense of belonging to the team I am currently training for), Q3(I look forward to more positive life in the team now), Q4(I like to talk about my team with people outside the team), university dormitory was higher than commuting.

5. Conclusions and Suggestions

5.1. Conclusion

First, in the results of stress differences according to gender in Korean university students, there were differences in the role burden and amount of roles between male and female students. It can be seen that Korean university students may feel different levels of stress in their roles depending on their gender. Still, in Korean society, women are still expected to do household chores and housework[26], which in some cases causes female students to struggle with the balance between their studies and family life. On the other hand, boys may be under social pressure for their careers and work.

Based on these results, Korean university students should consider the role division and balance according to gender. University students need to find ways to manage the strain and stress of their roles, balancing them with appropriate support. University life is a challenging time to balance academic and social demands, so regardless of gender, the ability to reconcile one's own needs with the needs of the organization is important.

Second, the results of the verification of differences in empowerment according to religious types of Korean university students show that Christians feel more self-determination and control. There are many Christian believers among Korean university students. Christianity has a religious value and belief system, which can provide greater spiritual support and bonding to individuals. Religious beliefs can motivate individuals to set goals and achieve them, which can have a positive impact on empowerment.

Third, the results of the verification of the difference in organizational commitment according to the presence or absence of friends of the opposite sex among Korean university students show that those who have friends of the opposite sex feel a stronger sense of belonging within the organization and more strongly feel the passion and value for the team. Korean university students have many relationships with their peers at school, and relationships with friends of the opposite sex can provide social support and help build social connections within an organization. Relationships with members of the opposite sex can promote trust and cooperation

among team members and strengthen communication and collaboration within the team. This can help increase organizational commitment within the organization.

Fourth, as a result of verifying the difference in organizational commitment according to the dwelling type of Korean university students, students living in university dormitories showed higher organizational commitment than students who commute to school. This suggests that the living environment in university dormitories is a factor that can further promote a sense of belonging and positive expectations within the organization. University residence halls can provide an environment that fosters close connections with classmates and encourages interaction with people on and off the team. This could explain why students who live in university residence halls are more actively involved in team activities and feel a stronger connection and sense of belonging within the organization.

University dormitories provide a learning environment for the achievement of academic goals, while at the same time promoting interaction and social relationships among students [27]. This environment provides opportunities for students to share their experiences and grow through cooperation, which is one of the factors that promote organizational commitment. Additionally, university residence halls provide a space to promote communication and interaction with people outside of the team, which can help students talk about their team and form a social network.

These results suggest that university dormitories can play an important role in improving students' organizational immersion. University dormitories foster students' sense of belonging and positive expectations, which can act as factors that can promote students' academic achievement and personal growth. Therefore, university residence halls must play an important role in providing benefits and programs that support students to have a better organizational experience and help them balance academic and social demands.

5.2. Suggestion

University students in Korea are called the MZ generation and have the following characteristics:

First, the MZ generation has a high interest in social problems and issues. They have a strong interest in social values such as fairness, human rights, the environment, and diversity, and often play a role in expressing their voices and bringing about social change.

Second, the MZ generation has a high understanding of various values and cultures because they have been exposed to internationalization and global culture. They respect diversity, view it positively, and communicate with others with an open mind.

Third, the MZ generation grew up in an environment where digital technology and the Internet were common, so they have a high understanding of digital and handle digital devices easily. Social media, smartphones, and the Internet are used naturally, and information accessibility and communication methods are different from previous generations.

Fourth, because the MZ generation can easily access a variety of information and materials, they have many opportunities to receive various inspirations and come up with creative ideas. Accordingly, we value individual disposition and individuality, and tend to respect individual tastes and interests.

Flexible work view and entrepreneurship challenge with subtitles: As the MZ generation has a flexible concept of work, they tend to seek economic opportunities directly through entrepreneurship or freelance, rather than relying only on traditional workplaces. They are characterized by their desire for new challenges and their pursuit of professional success through creative ideas. Therefore, the MZ generation has characteristics and values that are different from those of the previous generation, and this affects various areas such as society, economy, and culture.

Given that the lives of university students in Korea can serve as a lens through which the spread of Korean Wave culture can be glimpsed, this study was published in English to deliver valuable information to opinion leaders around the world who are interested in Hallyu culture.

Northeast Asia, where this researcher lives, was one of the poorest countries in the world with North Korea's surprise invasion of the south 70 years ago. However, thanks to the will of young people in Korea and the help of liberal democratic forces, it now has economic and military power that ranks in the top 10 in the world. However, even now, tensions are rising in Northeast Asia due to the hegemony battle between the US and China, and I believe that a cultural approach for soft influence and integration is needed, not an economic or military conflict anymore. It is hoped that the derivative power of many follow-up studies related to the culture of Northeast Asia will start from this study.

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7. Appendix

7.1. Author's contribution

	Initial name	Contribution
Author	SJ	<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"/>-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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Analyzing the Effects of Smartphone Addiction, Parental Attachment, Peer Attachment on Impulsivity in School-Disengaged Adolescents

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Abstract

Purpose: This study examined the effects of smartphone addiction, parental attachment, and peer attachment on impulsivity among dropout adolescents, using 318 adolescents who participated in the fifth year of the Panel Survey of School Disengaged Adolescents.

Method: To investigate the impact of smartphone addiction on impulsivity among school dropouts, we conducted inter-variable correlation analysis, three-step mediated regression analysis, and Sobel test.

Results: First, the correlations between impulsivity, smartphone addiction, parental attachment, and peer attachment of dropout adolescents were analyzed, and the results showed that parental attachment and peer attachment were negatively related to impulsivity and smartphone addiction were positively related to impulsivity. Second, the mediating effects of parental attachment and peer attachment on the effects of smartphone addiction on impulsivity of dropout adolescents were analyzed, and the results showed that both parental attachment and peer attachment had mediating effects on reducing impulsivity of dropout adolescents.

Conclusion: This study is significant in that it confirms the influence of parental attachment and peer attachment on smartphone addiction and impulsivity among dropout adolescents. Therefore, based on the findings of this study, various educational interventions are needed to reduce the impulsivity of dropout adolescents through various pathways of adolescent impulsivity, and at the same time, programs that promote healthy parent-child relationships and peer relationships should be actively implemented as a preventive measure.

Keywords: Smartphone Addiction, Parental Attachment, Peer Attachment, Impulsivity, School-Disengaged Adolescents

1. Introduction

Adolescence is a transitional developmental stage between childhood and adulthood in which adolescents experience many frustrations and conflicts psychologically and rebel against the authority and interference of the older generation environmentally, so they face various problematic situations compared to other periods. Impulsivity, one of the typical behavioral traits of this period, refers to the tendency to act on impulse rather than rational thought [1] and to fail to control oneself, such as the inability to control anger [2]. High levels of impulsivity in adolescence are likely to lead to delinquency and deviant behavior in vulnerable environments [1], and the interaction between impulsivity and environmental vulnerability can be a powerful factor in maintaining antisocial behavior in adolescents [3]. In particular, it has been reported that dropouts are more environmentally vulnerable than their peers, leading to increased impulsivity [1][2]. Impulsivity has also been reported to be a factor in triggering cyberbullying and various delinquent behaviors [4][5].

According to the '2022 Basic Statistics on Education' survey released by the Ministry of Education, the total number of adolescents who dropped out of school in elementary, middle, and

high schools nationwide was 42,755, representing 0.8% of the total enrollment of 5,323,075 students[6]. Recently, the dropout rate of Korean youth by education level was 0.8% in 2019, 0.5% in 2020, and 0.5% in 2021 for middle school students, and 1.7% in 2019, 1.1% in 2020, and 1.5% in 2021 for high school students[7]. In other words, about 50,000 school-age children leave school every year, and the number of dropout youth is estimated to be about 370,000[8]. While the reasons for dropping out of school are varied, including personal reasons and school maladjustment, the rate of psychological dropouts has been increasing in recent years, indicating that many dropouts are experiencing psychological difficulties[9][10]. After dropping out of school, dropouts experience psychological challenges such as prejudice, disregard, discrimination, stigma, stereotyping, and conflict with parents[10][11][12]. They also experience increased stress such as frustration with their situation, anxiety about the future, and lack of freedom in their lives[9][11], which can lead to poor interpersonal relationships and increased problem behaviors[13][14][15].

In particular, negative interpersonal relationships, problematic behaviors, and psychological insecurities experienced by dropouts have been consistently reported as important factors that negatively affect self-esteem[16][17] and lead to psychological instability, resulting in a loss of control over one's situation and impulsivity to act hastily and impulsively[18][19]. In other words, the negative evaluations experienced by dropout adolescents reduce their ability to regulate and control their own behavior, leading to difficulties in controlling negative emotions such as anger and the tendency to improvise and act impulsively to escape reality. Furthermore, impulsivity leads to negative psychological traits in adolescence[20], and difficulties in controlling emotions lead to an inability to control impulses, leading to aggressive problem behavior[21]. Impulsivity is an important predictor of smartphone addiction in adolescents, and studies have consistently reported that impulsivity plays an important role in pushing adolescents toward smart addiction[22][23]; specifically, higher levels of impulsivity are associated with higher levels of smartphone preoccupation and compulsive use, and more severe smartphone addiction leading to impaired daily functioning[24][25].

In addition, due to anxiety and stress, dropout adolescents spend more time on their smartphones than their peers[26] and are more immersed in their smartphones, making them vulnerable to addiction[10][27]. In particular, the correlation between time spent on smartphones and smartphone addiction is high, and smartphone addiction is highly correlated with delinquency and problem behavior[28][29][30][31], raising the seriousness of smartphone addiction and the need for intervention methods. In addition, disconnected youth are less educated, controlled, and supervised in their smartphone use, which increases their risk of addiction[32]. In particular, disconnected youth have a range of psychological maladjustments and emotional challenges, including depression, anxiety, and feelings of alienation and low self-esteem, in addition to common developmental challenges experienced by most of their peers[33][34][35]. These emotional difficulties can manifest as smartphone addiction and impulsivity[24][25]. Therefore, there is an urgent need for research on the psychological and emotional effects of smartphone addiction among school dropouts.

Parental and peer factors are generally considered to be the most important influences on the psychology and emotions of adolescents.

Parents are the closest environment that influences adolescent growth and development and are more influential and important than many other factors that affect adolescent development. Parents choose to model attitudes and behaviors that they believe are ideal for their children's healthy social-emotional development[36] and convey meaningful values and norms to their children through positive interactions with them. Consequently, parental overprotective parenting[37][38], excessive control[25], and closed and dysfunctional parent-child communication[39] contribute to adolescent smartphone addiction. Conversely, affectionate and regular parenting contributes to secure parental attachment and positive emotional regulation in adolescents[40]. Furthermore, secure parental attachment and a good parent-child emotional re-

lationship make children emotionally stable [41] and positively affect their socioemotional development, such as emotional intelligence, such as empathy and emotional regulation, as well as their ability to express their emotions [42]. In other words, secure parental attachment is an important positive influence on adolescents' psychoemotional development [43]. Therefore, this study aims to examine the influence of parental attachment on psychoemotional factors such as smartphone addiction and impulsivity among school dropouts.

Adolescence is a time when social relationships expand compared to childhood, and it is highly influenced by peer attachment, which emphasizes the importance of support, understanding, recognition, and intimacy through peer relationships. Peers are people who are similar in age and developmental level and interact with them in daily life, and compared to adults, adolescents rate peers who spend a lot of time with them and share thoughts, feelings, experiences, and problems as important attachment partners [44]. The peer attachments they form influence their ability to adapt to the external environment and maintain a positive psychological state [45]. On the other hand, low peer attachment in adolescence, or difficulty in forming peer relationships, can lead to negative psychological states such as loneliness, which can lead to internet addiction [46]. This suggests that peer attachment performs various functions in the psychological and emotional aspects of adolescents through interpersonal relationships [47]. In addition, Internet addiction and smartphone use have been linked to impulsivity in many studies [48][49][50][51], so it is speculated that the psychological and emotional aspects of peer attachment may mediate the relationship between smartphone use and impulsivity. In particular, it is important to note that most of the most important peer relationships in adolescent interpersonal life typically take place in the context of school, and since dropouts are often excluded from these spaces, they may fail to form peer attachments that consist of intimacy and communication, which means that they may experience a decrease in life satisfaction due to loneliness and fear. Furthermore, as dropouts are more likely to be addicted to smartphones than their peers, which is highly correlated with loyalty, it is necessary to examine the attachment relationships between parents and peers in the dropout's immediate environment.

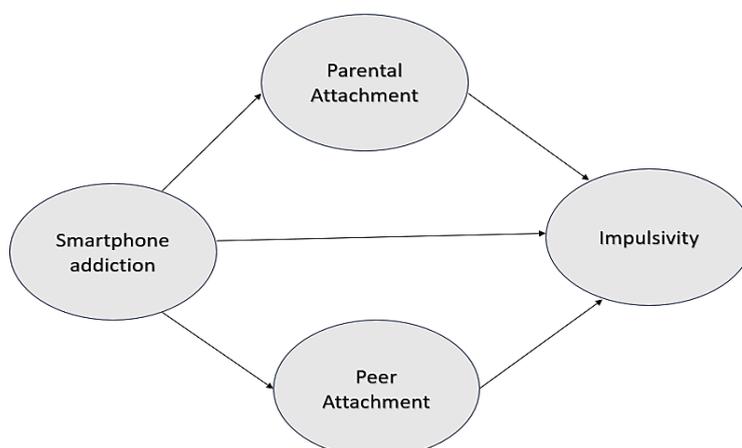
Therefore, this study aims to examine impulsivity, one of the psychoemotional characteristics of dropout adolescents, by focusing on the factors of smartphone addiction, parental attachment, and peer attachment. In addition, we will examine the influence of parental and peer attachment in the relationship between smartphone addiction and impulsivity.

According to the purpose of this study, the following research questions were set, and the research model is shown in <Figure 1>.

First, do smartphone addiction, parental attachment, and peer attachment affect impulsivity in dropout adolescents?

Second, do parental attachment and peer attachment mediate the relationship between smartphone addiction and impulsivity among dropout adolescents?

Figure 1. Continuous multiple regression model.



2. Subjects and Methods

2.1. Subjects

The data of the panel survey on dropout youth utilized in this study were collected by the National Youth Policy Institute(NYPI) to collect detailed information on the developmental and environmental characteristics of dropout youth and followed up for five years from 2013[52]. To obtain the sample of dropout youth, the NYPI obtained a list of dropout youth from schools and related institutions(e.g., GED schools, alternative education institutions, youth counseling and welfare centers, vocational training institutions, etc.) across the country in 2013, and then adjusted the list to avoid over-sampling from certain institutions, resulting in an initial sample of 776 youth[52]. The survey was conducted in a face-to-face interview by a professional researcher who asked the targeted youth questions and recorded their responses in a questionnaire. This study analyzed the data from the fifth year of the survey, excluding missing data and outliers, and finally analyzed 318 participants[53]. The variables analyzed in this study are shown in <Table 1>.

Table 1. General characteristics of the research subjects.

Variable	Classification	N(%)	Variable	Classification	N(%)
Sex	Male	167(52.5)	Household economic level	① Very ugly	10(3.1)
	Female	151(47.4)		②	41(12.8)
Withdrawal and reinstatement status	Out of regular secondary school (including non-high school/unaccredited alternative school, GED passers, and non-completers)	145(45.5)		③	71(22.3)
	Attending a full-time secondary school (including breaks/vacations)	9(2.8)		④ Moderate	134(42.1)
	Graduated from regular high school (excluding GED)	19(5.9)		⑤	45(14.1)
	Attended college (including breaks/vacations)	118(37.1)		⑥	17(5.3)
	Graduated from college	16(5)	Health	Not healthy at all	13(4)
	Dropped out of college	11(3.4)		Unhealthy	66(20.7)
Current housing type	Living with your parents	226(71)		Healthy	195(61.3)
	Renting	55(17.2)		Very healthy	44(13.8)
	Subletting	9(2.8)	No response	4(1.2)	
	School dormitory	6(1.8)	Whether you live with your parents	Living with parents	223(70.1)
	Company dormitory	2(0.6)	Living independently of parents	47(14.7)	
	Home of a relative or other acquaintance(senior, friend)	14(4.4)	Temporarily living apart from parents	44(13.8)	
	Other	6(1.8)			

Note: N=318.

2.2. Research instruments

2.2.1. Smartphone addiction

To measure smartphone addiction, we used the 15-item Youth Smartphone Addiction Test of the Korea Information Society Agency [54], which was shortened to 8 items suitable for dropout youth by the researchers of the Panel Survey on Dropout Youth. The scale consists of items such as "I enjoy using my smartphone more than being with my family and friends," "I would find it hard to cope if I couldn't use my smartphone," and "I have tried to reduce the amount of time I spend on my smartphone, but I have been unsuccessful." Each item is scored from 1 to 4 on a 4-point Likert scale ranging from 1, "Not at all," to 4, "Very much so. In this study, higher scores indicate higher smartphone addiction. In this study, the reliability of the instrument, Cronbach's α , was .76.

2.2.2. Impulsivity

To measure impulsivity, we utilized a questionnaire from the Dropout Youth Panel Survey. This instrument is an adaptation of Arneklev et al.'s [55] self-control scale. There are five items, including "I put the cart before the horse," "I quickly give up when things get difficult and complicated," and "I enjoy risky and exhilarating activities," with response categories ranging from 1, "Not at all," to 4, "Very much so," on a 4-point Likert scale ranging from 5 to 20, with higher scores indicating higher levels of impulsivity. In this study, the instrument had a Cronbach's α reliability of .79.

2.2.3. Parental attachment

To measure parental attachment, we utilized items from the Panel Survey of Dropout Youth. This instrument is part of the scale used by Choi et al.'s [56] in their study on support measures to promote mental health of children and adolescents, and consists of 8 questions, including 5 questions on parental emotional support and 3 questions on economic support. In this study, the 5-item parental emotional support scale, excluding economic support, was used to measure the level of emotional parental attachment among dropout adolescents. The response items include "My parents know and understand me," "They treat me warmly," and "They listen to my problems," and the response categories range from 5 to 20 on a 4-point Likert scale from 1, "Not at all true," to 4, "Very true." Parental attachment is associated with higher scores. Higher scores on parental attachment indicate higher levels of parental emotional attachment. The reliability of the instrument in this study, Cronbach's α , was .92.

2.2.4. Peer attachment

To measure peer attachment, we utilized a scale adapted from Lee et al.'s scale [57], which was selected and adapted by the researchers of the Panel Study of Dropout Youth. The scale consists of three items, "My friends understand me well," "I can talk to my friends when I want to confide in them," and "I trust my friends," and each item is scored from 3 to 12 on a 4-point Likert scale ranging from 1, not at all true, to 4, very true. In this study, higher scores indicate higher peer attachment. The Cronbach's α reliability of the instrument in this study was .85.

2.3. Analysis method

This study used SPSS/Win 24.0 program, and frequency and percentage were calculated after frequency analysis to find out the general characteristics of the research subjects; mean, standard deviation, and Pearson's correlation coefficient were used to find out the relationship between smartphone addiction, parental attachment, peer attachment, and impulsivity; and parallel multiple mediator model analysis was conducted to find out the relative influence of the variables. To examine the effect of smartphone addiction on the impulsivity of school-disengaged adolescents through the mediation of parental attachment and peer attachment, we conducted a three-step mediated regression analysis and Sobel test as proposed by Baron and Kenny [58].

3. Results

3.1. Descriptive statistics of research variables

The mean and standard deviation were calculated to determine the level of impulsivity, smartphone addiction, parental attachment, and peer attachment perceived by dropout adolescents, and the results are shown in the following <Table 2>. The mean of smartphone addiction was 13.43(SD=3.78), the mean of parental attachment was 8.89(SD=2.70), the mean of peer attachment was 14.78(SD=2.97), and the mean of impulsivity was 9.32(SD=1.69).

Table 2. Descriptive statistics of key variables.

Variable	Min	Max	<i>M</i>	<i>SD</i>
Smartphone addiction	8	26	13.43	3.78
Parental attachment	5	18	8.89	2.70
Peer attachment	5	20	14.78	2.97
Impulsivity	3	12	9.32	1.69

Note: N=318.

3.2. Correlation of research variables

Before analyzing the correlation between impulsivity, smartphone addiction, parental attachment, and peer attachment of dropout adolescents, skewness and kurtosis were calculated to verify the normality of each variable. As a result, the absolute value of skewness of all variables ranged from .05 to .65, which is less than 3, and the absolute value of kurtosis ranged from .07 to 1.91, which is less than 10, fulfilling the assumption of normality [59].

The correlation results between impulsivity, smartphone addiction, parental attachment, and peer attachment among dropout adolescents are shown in <Table 3>. Based on the dependent variable, impulsivity, parental attachment($r=-.27$, $p<.01$) and peer attachment($r=-.32$, $p<.01$) were negatively correlated. In contrast, smartphone addiction($r=.23$, $p<.01$) was positively correlated. Additionally, smartphone addiction was negatively correlated with parental attachment($r=-.21$, $p<.01$) and peer attachment($r=-.14$, $p<.05$), and positively correlated with parental and peer attachment($r=.37$, $p<.01$).

Table 3. Correlations between impulsivity, smartphone addiction, parental attachment, and peer attachment.

Variable	Smartphone addiction	Impulsivity	Parental attachment	Peer attachment
Smartphone addiction	1			
Impulsivity	.23**	1		
Parental attachment	-.21**	-.27**	1	
Peer attachment	-.14*	-.32**	.37**	1
Skewness	.65	.05	-.55	-.56
Kurtosis	.07	-.57	1.37	1.91

Note: * $p<.05$, ** $p<.01$, *** $p<.001$.

3.3. Mediating effects of parental attachment and peer attachment on the relationship between impulsivity and smartphone addiction

To examine the relative influence of the variables on the impulsivity of dropout adolescents, a parallel multiple mediator model regression analysis was conducted with smartphone addic-

tion, parental attachment, and peer attachment as independent variables and grit as the dependent variable. Before conducting the regression analysis, the Durbin-Watson value(1.87~2.05) was checked to confirm the independence of the residuals, and the VIF value(1.05~1.19) was checked to confirm multicollinearity, and it was found that there was no abnormality[59].

The relative explanatory power of the variables affecting the impulsivity of dropout adolescents is shown in <Table 4>. First, smartphone addiction, parental attachment, and peer attachment were found to have an explanatory power of 15.4% for impulsivity(F=18.99, p<.001). These results suggest that excessive smartphone dependence and parental and peer attachment can be explained as variables affecting impulsivity among school dropouts.

To determine the mediating effects of parental attachment and peer attachment on the effects of smartphone addiction on impulsivity, a three-stage mediated regression analysis was conducted. In the first stage, the independent variable, smartphone addiction, had a significant negative effect on the mediating variables, parental attachment(B=-.17, p<.001) and peer attachment(B=-.06, p<.001). In step 2, the independent variable, smartphone addiction, had a significant positive effect on the dependent variable, impulsivity(B=.16, p<.001). Finally, in the third step, both independent variables and mediators were entered to determine their effects on impulsivity, and the mediators, parental attachment(B=-.14, p<.01) and peer attachment(B=-.38, p<.001), were found to have a significant negative effect. In addition, the independent variable, smartphone addiction, had a significant positive effect on impulsivity(B=.12, p<.01), suggesting that smartphone addiction partially mediates parental attachment and peer attachment to influence impulsivity in dropout adolescents.

Table 4. Mediating effects of parental and peer attachment on the relationship between smartphone addiction and impulsivity.

Model summary	Model 1 (subordinate: parental attachment)		Model 2 (subordinate: peer attachment)		Model 3 (subordinate: impulsivity)		Model 4 (subordinate: impulsivity)	
	B	SE	B	SE	B	SE	B	SE
Constant	16.99	.60***	10.17	.35***	6.69	.55***	12.89	1.14***
Smartphone addiction	-.17	.04***	-.06	.03*	.16	.04***	.12	.04**
Parental attachment							-.14	.05**
Peer attachment							-.38	.09***
R-sq	.044		.020		.052		.154	
F-value	14.53***		6.52*		17.45***		18.99***	

Note: *p<.05, **p<.01, ***p<.001.

The results of the Sobel test for the indirect effects in the paths of smartphone addiction → parental attachment → impulsivity and smartphone addiction → peer attachment → impulsivity are shown in Table 5. In the path of smartphone addiction → parental attachment → impulsivity, the indirect effect size was .62 and the Z value was 2.83(p<.01), indicating a mediating effect. In the path of smartphone addiction → peer attachment → impulsivity, the indirect effect size was .01 and the Z value was 1.85(p<.05), indicating a mediating effect.

Table 5. Results of the indirect effect analysis.

Mediating effect path	Indirect effect	Z(t)-value
Smartphone addiction → parental attachment → impulsivity	0.62	2.83**
Smartphone addiction → peer attachment → impulsivity	0.01	1.85*

Note: *p<.05, **p<.01.

4. Discussion and Suggestions

This study focused on smartphone addiction among the variables that affect the impulsivity of dropout adolescents. For this purpose, parental emotional attachment as a family variable and peer attachment as a social variable were set as mediating variables, and the mediating effects of these variables were analyzed in the relationship between smartphone addiction and impulsivity. The main findings of this study are summarized and discussed as follows.

First, we analyzed the correlations between impulsivity, smartphone addiction, parental attachment, and peer attachment among dropout adolescents and found that parental attachment and peer attachment were negatively related to impulsivity, while smartphone addiction was positively related to impulsivity. In other words, the better the emotional attachment between parents and peers, the less impulsive the dropout adolescents were, while the stronger the smartphone addiction, the more impulsive they were. In addition, smartphone addiction was negatively related to parental attachment and peer attachment. Taken together, these results suggest that smartphones increase impulsivity in dropout adolescents, while positive parental and peer relationships reduce smartphone addiction and impulsivity. These findings are partially consistent with previous studies showing that Internet and smartphone addiction are positively related to impulsivity[48][49][50][51], that peer attachment is negatively related to smartphone addiction[60][61][62][63], and that parental attachment and peer attachment negatively affect negative psychological outcomes such as impulsivity[64].

These findings suggest that smartphone addiction, parental attachment, and peer attachment are important factors influencing psychosocial outcomes such as impulsivity among dropout adolescents. This means that the stronger the tendency to smartphone addiction, the more impulsivity, and the more social stigma and depression they may experience compared to their peers[65][66], which may lead to delinquency, problematic behavior, and impaired daily functioning. This suggests the importance of positive parental and peer relationships in reducing smartphone addiction and impulsivity among these disconnected youth.

In other words, in order to understand negative psychological behaviors such as impulsivity, it is important to know what kind of emotional bonds they have with their parents and peers. During adolescence, the more stable and positive parental attachment, which includes parents' emotional understanding of their children, counseling, and financial support, is associated with children's positive emotional development[67]. Positive peer attachment, which is the development of a sense of community through good communication and increased trust with peers, is also associated with emotional stability[68].

Parents act as a safe haven for adolescents, and parental attachment is a very important factor for psychological and emotional stability. Due to the characteristics of school dropouts, they are prone to smartphone addiction, depression, anxiety, and other negative emotions, and have difficulty establishing positive peer relationships, so it is important for parents to show interest in their children and form a positive attachment relationship. This suggests that parental support and a stable parent-child relationship can reduce negative emotions such as depression in adolescents, help them form a positive self-concept, and enable them to cope positively with negative problems and stressful situations. In addition, as smartphone addiction affects impulsivity and adolescents who drop out of school have weak coping skills against self-stigma to internalize negative evaluations of their surroundings[69], it is necessary to introduce social education programs that can help adolescents mitigate impulsivity through self-control and management support programs and reduce the level of smartphone addiction.

Second, we analyzed the mediating effects of parental attachment and peer attachment in the relationship between smartphone addiction and impulsivity among dropout adolescents,

and found that both parental attachment and peer attachment have a mediating effect on reducing impulsivity among dropout adolescents. In other words, the higher the smartphone addiction, the higher the impulsivity, but in this process, parental and peer attachment can reduce the impulsivity of adolescents.

Our findings are consistent with research showing that higher parental and peer attachment is associated with lower smartphone addiction [64] and studies reporting high correlations between impulsivity and smartphone addiction [24][48]. Our findings are similar to those of a study that examined the longitudinal interrelationships of parental and peer attachment, informal stigma, and delinquency with smartphone addiction and impulsivity in adolescents [27] and the mediating effects of social stigma and impulsivity on the relationship between parental abuse and smartphone addiction [28]. These findings suggest that dropout adolescents with deficits in parental attachment may experience greater perceived social stigma, which may increase their propensity for smartphone addiction and impulsivity, leading to a variety of problematic behaviors. In particular, social stigma can lead to increased anxiety, depression, and attachment anxiety. Attachment anxiety in adolescence leads to impulsivity, which makes them more prone to smartphone addiction and is a major factor in problematic behavior [70]. However, as Hirshci and Gottfredson [71] argue, healthy psychological and emotional attachments derived from relationships with parents and peers can reduce problem behavior and impulsivity, and are an important factor in curbing smartphone addiction and negative psychological problems in adolescents [72].

Despite the fact that adolescence is a developmental stage characterized by a broader range of interpersonal relationships and less time spent interacting with parents than before, parents still play an important role in the lives of adolescents [2]. This suggests that effective and quick approaches to impulsivity and smartphone addiction among school dropouts are largely dependent on fostering parent-child attachment. Being out of school during adolescence, when social relationships are formed through peers, can lead to a variety of problems in adolescent development. Neglected attention at home and a disrupted attachment relationship with parents increase the psychosocial difficulties experienced by dropouts [73]. Despite the current recognition of the importance of attachment through the parent-child relationship for the psychological and emotional health of dropout youth, parental involvement is not as high as it should be due to practical difficulties. However, the results of this study suggest that parental factors are effective against problematic behaviors such as smartphone addiction and impulsivity, and intervention measures through parental education should be prepared.

In addition, peer attachment has been shown to be a factor in reducing smartphone addiction and impulsivity among disconnected youth. In this study, peer attachment was found to be a factor influencing adolescents' inappropriate smartphone use and addiction. These findings are similar to previous studies [74][75] that found that smartphone addiction among school dropouts was related to peer attachment and alienation. These results suggest that during adolescence, when peer relationships are important, the need to constantly connect with peers to validate one's existence and the fear of alienation and exclusion from peer relationships may lead to excessive smartphone use and addiction. Adolescence is a time when the importance of peer attachment is emphasized, and adolescents feel more alienated than in other developmental periods, and this can be seen as a dysfunctional defense mechanism that tries to solve the alienation of peer relationships through excessive smartphone use and social media activities. Because they are more likely to be socially stigmatized, depressed, and alienated than their peers, they are at a higher risk for smartphone addiction, which means they are more likely to develop impulsivity, which can lead to problematic behaviors. Therefore, in-depth and systematic research on restoring healthy peer relationships among school dropouts is needed.

Parents are still a source of security and attachment to parents is still important for disen-

gaged adolescents[68], but with the rapid physical and physiological development of adolescence, the need for independence from parents increases and attachment behaviors and interactions with parents naturally decrease[76]. In addition, during this period, adolescents feel self-esteem and confidence when they receive recognition from their peers, so their attachment to peers increases[77]. This means that when adolescents are experiencing a lot of conflicts and confusion due to their physical and emotional development and decreasing interaction with their parents, the role of peers who spend a lot of time with them and have common interests and emotional connections plays an important role in their emotional and psychological stability. Therefore, it may be more effective to increase both parental and peer attachment in order to help adolescents overcome problematic behaviors such as smartphone addiction and impulsivity.

This study hypothesized that smartphone addiction would affect impulsivity among school dropouts, and tested the mediating effects of parental attachment and peer attachment. The results showed that smartphone addiction increased impulsivity, and parental attachment and peer attachment decreased impulsivity. Impulsivity is closely related to all problem behaviors related to adolescents, including smartphone addiction, gaming addiction, pornography addiction, drinking, smoking, and running away from home[78]. In addition, people with high impulsivity are rebellious, quick to anger, less friendly and responsible toward others, and lack self-control, which makes them unacceptable to others and unable to establish harmonious relationships[79]. These characteristics can be further manifested through the virtual world of smartphones, leading to self-aggrandizement, academic disruption, poor concentration, rebelliousness, short-temperedness, and aggression toward others. In addition, the portability and immediacy of smartphones make them more attractive to adolescents with high impulsivity and self-centeredness, which increases their desire to use smartphones, which in turn leads to smartphone addiction and various problematic behaviors, forming a vicious circle. Therefore, it is necessary to consider educational programs to restore relationships with parents and peers to reduce smartphone use among disconnected adolescents, as well as educational measures to curb the impulsivity of adolescents with high levels of impulsivity and inappropriate smartphone use.

The implications and limitations of this study include the following.

First, this study is significant in that it confirms the influence of parental attachment and peer attachment on smartphone addiction and impulsivity among dropout adolescents. Therefore, based on the results of this study, various educational interventions are needed to reduce the impulsivity of adolescents through various pathways of adolescent impulsivity, and at the same time, it is necessary to actively implement programs that promote healthy parent-child relationships and peer relationships as a preventive measure.

Second, prior to prevention and education on excessive smartphone use and addiction among out-of-school youth, national implications for appropriate smartphone use should be made. In other words, it is necessary to organize a group of experts through various social complementary facilities, such as out-of-school youth support centers, to present appropriate smartphone usage guidelines, and to try a multifaceted approach for various publicity.

Finally, a limitation of this study is that the psycho-emotional characteristics and predictors were identified only from the responses of adolescents who dropped out of school. In future studies, comparative studies with adolescents from various environments, such as adolescents from multicultural families or single-parent families, would provide a more sophisticated understanding of desirable psycho-emotional characteristics and parental and peer dynamics.

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6. Appendix

6.1. Author's contribution

	Initial name	Contribution
Lead Author	GB	-Set of concepts <input checked="" type="checkbox"/> -Design <input checked="" type="checkbox"/> -Getting results <input checked="" type="checkbox"/> -Analysis <input checked="" type="checkbox"/>
Corresponding Author*	YK	-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"/>
Co-Author	MC	-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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Water Supply Reliability Analysis of Multi-Purpose Dams in Preparation for Water Disasters

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Abstract

Purpose: In this study, in order to find a way to minimize water supply shortage, reliability analysis of water supply was conducted by operating the Andong and the Imha Dam. The purpose is to find a way to minimize water shortage by the allocation distribution model from the reliability analysis results.

Method: In this study, in order to analyze the water supply reliability of Andong and Imha Dam, using the Allocation rule presented by Park et al(2007), based on the planned water supply of Andong and Imha Dam for a total of 360 months from 1993 to 2022, analyzed. From the analysis results, the reliability of stable water supply was evaluated.

Results: In the case of supplying the planned water supply of Andong and Imha Dam, the analysis result of Rule(B), which considers the ratio of the storage and inflow of the dam in the reservoir operation analysis result, showed that the shortage of Andong Dam occurred the most at 23 months, Regarding the number of shortages of control points, Rule(A), which considers only the storage capacity of the dam, was found to be short at 39 months, which is the largest number of shortages. As for the frequency standard reliability, Rule(B) showed the highest reliability of 90%, but in the case of quantitative reliability, the reliability was similar in all cases.

Conclusion: In the water supply reliability, the reliability of stable water supply by supplying only the planned water supply amount is 94%, 93%, and 90% in Rule(B) of the allocation distribution model. 5% at the Andong dam, 7% at the Imha dam, and 10% at the control point. When water supply is evaluated with frequency reliability, it is judged that countermeasures for the shortfall are necessary. Next, in the case of quantitative reliability, when only the planned water supply was supplied, it was analyzed to be 95%, 94%, and 95% in all methods, so that the quantitative reliability was higher than the frequency reliability.

Keywords: Water Disaster, Water Supply, Allocation Rule, Parallel Reservoir, Reliability

1. Introduction

Recently, large-scale social disasters such as corona and natural disasters such as typhoons, torrential rains, droughts, and earthquakes are constantly occurring. Research has been conducted to prepare for disasters such as Covid-19. There has been a study on manuals for floods and earthquakes in flight facilities[1], and a study on economic investment in preparation for natural disasters has also been conducted[2]. Research has also been conducted on ways to help policy decision-making by evaluating factors for resilience in the event of disaster damage[3].

The stable securing of water resources and the stable use of water are becoming more important issues in the present, when it is increasingly difficult to predict precipitation due to climate change. In particular, the demand of local governments to stably supply clean water due to the development of industry and the improvement of living standards is becoming an issue

as well as regional conflicts and social problems. Conflict due to the imbalance of water resources continues even within the Korean territory. Reliability evaluation is mainly used as a method of evaluating the water supply capacity of dams, and many previous studies have used reliability indicators as a method of evaluating the stability of water supply. has been proven(Cha, et al., 2002, Cha and Park, 2004, Park, 2005, Park, et al, 2007, Lee et al, 2012, Lee and Yi, 2014, Lee et al, 2022[4][5][6][7][8][9][10]).

The analysis of water supply capacity in existing reservoirs determines the water use capacity so that sufficient water can be supplied by reflecting the water demand in the downstream area to determine the water use capacity at the time of constructing the reservoir. However, when water supply decreases or increases due to changes in water supply conditions in the downstream area, a new interpretation of the water supply capacity is required.

A number of domestic precedent studies related to water supply capacity and reliability analysis of reservoirs have been conducted, and they are steadily progressing due to changes in precipitation due to climate change and changes in water supply in the downstream area. Cha et al(2002), Cha and Park(2004), Park(2005), Park et al.(2007), Lee et al.(2012) quantitatively[4][5][6][7][8], By analyzing the frequency reliability through various analysis periods, problems were presented in the water supply capacity analysis based on the existing annual frequency standard, and water supply capacity analysis was presented based on various reliability standards.

Lee and Kim(2002) have studied an operation plan that can operate a reservoir in the flood season using a variable limit water level and supply water through an ensemble prediction technique. Kang and Park(2005) set the reservoir water level and water supply amount that can be additionally supplied through the optimal operation of the reservoir in the Seomjin River[11][12].

Kim et al.(2008) reviewed the cases that can be supplied and the amount of flow that can be supplied at the same time in each reservoir in the Han River basin in order to prevent the problem of deteriorating water quality due to water shortage during the dry season, and found that when supplied at the same time, the result increases by more than 50%. Presented[13].

Lee and Yi(2012) reviewed a plan to utilize the storage capacity of a multi-purpose dam as an emergency water source in preparation for water shortage[14]. As a result, it was analyzed that Imha, Daecheong, Hapcheon, and Namgang dams were vulnerable to drought. Lee and Yi(2012) used the average water supply shortage rate and the maximum water supply shortage rate as water shortage indicators among indicators to evaluate water supply capacity. The possibility of supplying emergency water for multi-purpose dams has been evaluated[8].

Lee(2014) evaluated the water supply capacity of multi-purpose dams in the Han River, Nakdong River, and Geum River system in terms of sustainability and vulnerability, and analyzed that dams in the Nakdong River basin were vulnerable to water supply[15]. Ahn et al.(2016) evaluated water supply by utilizing the emergency capacity of dams in preparation for water shortage due to reduced inflow due to climate change[16]. Jang and Kim(2016) suggested the need to manage the total supply by linking dams and weirs to supplement the additional supply capacity of the Nakdong River[17].

Yu et al(2017) conducted a bivariate drought frequency analysis on multi-purpose dams to evaluate the safety of water supply during the drought period and analyzed the water supply capacity by season. Therefore, it was confirmed that the water supply was sufficient, and it was analyzed that the drought for a duration of 3 months could be supplied with only the inflow, but it could withstand the drought with a frequency of 5 to 10 years, except for Andong and Seomjin River Dam[18].

Choi et al(2020) applied the shortage supply method to reservoir operation for stable water supply in the Han River water system reservoir system and evaluated period reliability, quantitative reliability, recovery, and vulnerability[19]. As a result, the period reliability increased by more than 30% and the quantitative Reliability increased by 4%. Sung et al.(2022) analyzed the analysis period in various periods of days, semis, nets, months, and years to evaluate the stability of water supply of dams, evaluated reliability, and evaluated recovery, vulnerability, water resource utilization, Sub-indicators such as non-inflow and non-supply were presented, and an integrated sub-indicator was developed and presented by classification[20].

In this study, in order to minimize water shortage, the reliability of the linked operation plan of Andong and Imha Dam was evaluated using an allocation distribution model.

2. Method

In this study, to evaluate the water supply capacity of the Andong and the Imha dam, the water supply schedule of the Andong and the Imha dam for a total of 360 months from 1993 to 2022 was evaluated to evaluate the quantitative reliability and frequency criterion reliability. The water supply analysis method of the parallel reservoir was analyzed using the Allocation rule presented by Park et al(2007)[7].

Revell(1999) proposed the theory for water supply analysis of parallel reservoirs applied to this study, but for domestic application, Park et al(2007) applied a model modified to suit the domestic reservoir conditions[7]. In the case of a reservoir system composed of parallel systems such as Andong and Imha Dam, in order to minimize the water supply in the downstream area, the plan to supply each planned water supply, the capacity of the reservoir, the inflow according to the basin area, and the size of the planned water supply should be considered. It is efficient to apply an allocation model that compensates for each other's shortcomings.

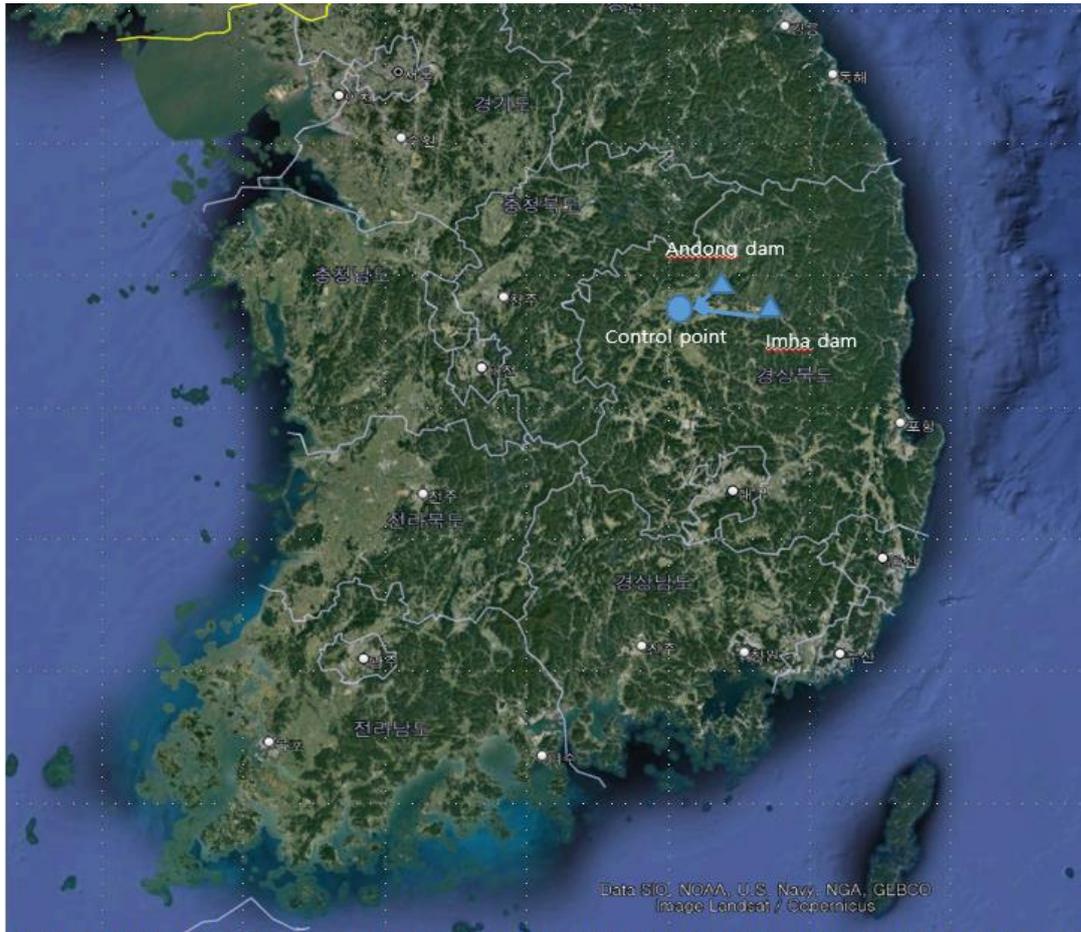
Rule(A) is a method of calculating the allocation distribution coefficient considering only the storage volume of each dam, and Rule(B) is a method of distribution considering the storage volume and inflow of the dam. Finally, Rule(C) is a method of dividing the sum of the dam's storage volume and inflow volume by the total storage capacity to determine the allocation distribution coefficient and apply it to the water supply volume.

The condition for the analysis was to multiply the water distribution coefficient calculated in each month t by the water supply volume of Andong and Imha Dam. The flood season, July-September, was set to supply the entire amount of planned water supply, and the initial condition was the full water level condition, the lower limit condition was the storage capacity based on the low water level, and the upper limit condition was the storage capacity at the full water level.

Table 1. Classification of disaster occurrence period.

Characteristics	Units	Andong dam	Imha dam
Dam crest level	EL. m	166.0	168.0
Flood water level	EL. m	163.9	165.8
Normal high water level	EL. m	161.7	164.7
Low water level	EL. m	130.0	137.0
Water supply	MCM	926	592
Water supply storage	MCM	1,224	548

Figure 1. Study area.



Note: <https://earth.google.com/>(2023).

In addition, the water supply conditions were set to be discharged above the full water level, and the discharge amount was always set to be greater than 0. The difference between the sum of the storage amount and the inflow amount in month t and the sum of the lower limit storage amount of the Andong Dam and the planned supply amount was greater than 0, and the storage condition of the river dam was more than 0. If it is the same as the condition of the planned discharge is supplied, and if it is less than 0, the sum of the inflow of the Andong and Imha dam is multiplied by the allocation distribution coefficient to supply.

Frequency-based reliability is an evaluation of the number of shortages over the total analysis period, and quantitative-based reliability is an evaluation of the reliability of the ratio of shortages over the analysis period. In addition, in order to supplement the reliability evaluation of water supply shortage, the evaluation index for the period to return to the normal state after the occurrence of water supply shortage is the degree of restoration. Finally, when a shortage occurs, the index for evaluating the size of the shortage is the vulnerability index. In this study, the capacity evaluation of water supply in connection with Andong and Imha Dam was analyzed by month, and frequency-based reliability, quantitative-based reliability, restoration, and fragility were reviewed. <Table 3> applies the existing planned water supply(m^3/s) of Andong and Imha Dam.

3. Results

In order to analyze the water supply capacity of Andong and Imha Dam, inflow data for the last 30 years were used, and the analysis period was from 1993 to 2022. Reliability evaluation results in the case of supplying are shown.

In the case of supplying only the planned water supply of Andong and Imha Dam, in the analysis result of Rule(B), which considers the ratio of the storage volume and inflow of the Andong and Imha Dam, the shortage of Andong Dam occurred the most at 23 months. As for the number of insufficiency of the control point, Rule(A), which considers only the amount of storage in the dam, was found to be insufficiency for 39 months, which is the most insufficiency. As for the frequency standard reliability, Rule(B) showed the highest reliability of 90%, but in the case of quantitative reliability, the reliability was similar in all cases.

However, in the case of restoration to a normal state when a water shortage occurs, Rule(C) was found to be restored to normal the fastest based on the control point, and in the case of a vulnerability indicating the size of the shortage when a shortage occurs Rule(C) appeared the lowest, and it was found to have the least effect when there was a shortage of water supply.

In the case of restoration, it was analyzed as 0.39 to 0.50 according to Rule(C). In the case of fragility, the case of Rule(C) was the lowest at 0.53 to 3.59, and when the planned water supply was supplied, it was analyzed at 0.09 to 2.18. In the analysis result of the average shortage during the shortage period, Rule(C) showed that all were small, and when the planned water supply was supplied, it was analyzed as $1.55 \cdot 10^6 \text{ m}^3$, $9.75 \cdot 10^6 \text{ m}^3$, and $20.70 \cdot 10^6 \text{ m}^3$.

Table 2. Comparison of water supply analysis.

Characteristics		Rule A	Rule B	Rule C
Water supply deficits No.	Andong	22	23	22
	Imha	25	25	27
	Control point	39	37	30
Water supply deficits amounts (10^6 m^3)	Andong	1,337.82	1,374.05	1,378.25
	Imha	842.52	876.40	828.92
	Control point	2,180.34	2,250.44	2,207.16
Average storage ($10^6 \text{ m}^3/\text{month}$)	Andong	703.11	710.34	705.93
	Imha	308.11	312.34	305.76

Table 3. Comparison of reliability index.

Characteristics		Rule A	Rule B	Rule C
Frequency (%)	Andong	94	94	94
	Imha	93	93	93
	Control point	89	90	89
Quantity (%)	Andong	95	95	95
	Imha	94	94	94
	Control point	95	95	95

Resiliency	Andong	0.43	0.48	0.50
	Imha	0.42	0.40	0.37
	Control point	0.40	0.43	0.39
Vulnerability	Andong	1.21	1.11	0.09
	Imha	0.58	0.37	0.71
	Control point	5.93	5.52	2.11
Average water supply in deficits (10 ⁶ m ³)	Andong	19.79	17.39	1.55
	Imha	8.37	5.33	9.75
	Control point	54.75	53.75	20.70

4. Conclusions

In this study, operation of the Andong and the Imha Dam parallel reservoir was analyzed using the allocation distribution model and the water supply reliability analysis using the existing dam inflow data for a total of 360 months from 1993 to 2022, and the following conclusions.

First, in the reliability of water supply, the reliability of stable water supply by supplying only the planned water supply amount was 94%, 93%, and 90% in Rule(B) of the allocation distribution model, so the reliability of the water supply frequency standard was low, indicating water shortage. The probability is 5% for Andong dam, 7% for Imha dam, and 10% for control point, so when water supply is evaluated with frequency-based reliability, it is judged that countermeasures for the shortage are necessary.

Next, in the case of quantitative reliability, when only the planned water supply was supplied, it was analyzed to be 95%, 94%, and 95% in all methods, so that the quantitative reliability was higher than the frequency standard reliability.

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6. Appendix

6.1. Author's contribution

	Initial name	Contribution
Author	KP	<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"/> -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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Human Rights Concerns on Fukushima Radioactive Wastewater Dumping Plan in Kishida Era

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Abstract

Purpose: The Kishida administration's proposed Fukushima radioactive wastewater dumping plan is very controversial both domestically and internationally. This paper examines the risks and consequences of the plan with a special focus on human rights concerns. It argues that, as the Kishida administration commences the decommissioning of the Fukushima Daiichi Nuclear Power Station, it should only consider approaches that are consistent with a human-centric policy that is supportive of human rights.

Method: This paper employs politics of responsibility theory to examine the Kishida administration's proposed Fukushima radioactive wastewater dumping plan. In light of the current body of research on the decommissioning of the Fukushima Daiichi Nuclear Power Station by international scholars, scientists, and experts, it argues that the Kishida administration's implementation of the proposed radioactive wastewater dumping plan represents a failure to govern with an eye to the politics of responsibility.

Results: This paper finds that application of the Fukushima radioactive wastewater dumping plan under the Kishida administration will induce immense political, economic, social, and environmental consequences for Japanese citizens as well as citizens in neighboring countries and beyond. The Kishida administration is presently failing to pursue policies that reinforce a human-centric policy that would be more supportive of human rights.

Conclusion: The Kishida administration must suspend the current plan to dump Fukushima's radioactive wastewater into the Pacific Ocean and consider alternative methods that will not result in the radioactive pollution of the ocean. As it proceeds with the decommissioning of the Fukushima Daiichi Nuclear Power Station, it should focus on principles of governance emphasizing the politics of responsibility and take steps to abide by relevant international legal standards and human rights norms.

Keywords: Kishida Administration, Fukushima Radioactive Wastewater Dumping Plan, Human Right to Health, The Politics of Responsibility, Protecting The Environment

1. Introduction

The Fukushima nuclear disaster of March 11, 2011 was comparable to the 1986 Chernobyl nuclear disaster in the former Soviet Union[1]. Almost twelve years have passed since the Fukushima nuclear disaster, yet the human rights of the disaster-affected inhabitants of Fukushima are still under attack. The Kishida administration's plan to dump over 1 million metric tons of tritium contaminated wastewater into the Pacific Ocean over the next 30 or more years is facing strong domestic and international opposition[2][3]. The Kishida administration's plan will fail to protect the human right to health of the disaster-affected citizens in Fukushima who are suffering from pre-existing conditions. It is likely to have negative consequences for the health of the remaining Japanese citizenry as well as the citizens of other states in the region. There have been several researches undertaken on scientific analysis of the issue of concern by

the international scholars. However, There has not been far less or perhaps none of researches undertaken on human rights impact through the lens of politics of responsibilities. This paper therefore examines how the Kishida administration's radioactive wastewater dumping plan poses risks, threats, and consequences for the human rights of citizens globally. It argues that the Kishida administration should pursue a more human-centric policy that reinforces human rights by recognizing and employing the politics of responsibility.

2. The Politics of Responsibility in Protecting Environment and Human Rights

The non-traditional security issues ranging from COVID-19 to climate change are imminent, existential threats to both national security and the international community[4][5][6][7][8][9][10]. Dr. Sikkink reflects on forward-looking responsibility theory along with promulgation of new rights such as the right to a clean environment[11]. He concluded that the application of a forward-looking approach to norm change in addressing urgent problems such as climate change would pressure recalcitrant parties to change their behavior regarding an externality generated by their economic activities, both individually and collectively. That in fact poses an existential threat to both the national and international communities. Dr. Sikkink further argues that “to address environmental crises, it is necessary to emphasize not only our rights to a clean environment, but also the obligations of states, corporations, institutions, and individuals to protect the environment...[11].”

The Kishida administration has not yet provided adequate treatment for the disaster-affected citizens of Fukushima[12] while aggressively pushing the Fukushima radioactive wastewater dumping plan regardless of domestic and international opposition. Indeed, the Kishida administration's radioactive wastewater dumping plan comprises a backward-looking politics of responsibility. It is the same, already controversial and undemocratic policy embraced by the previous Abe administration[13]. In proceeding with this plan, the Kishida administration ignores unresolved human rights issues concerning disaster-affected citizens in Fukushima, disregards the promise made in 2015 to the Japanese fishing community not to proceed with the dumping plan without first obtaining the consent of the fishing community[14], fails to consider the neighboring countries' requests for full compliance with Article 2 of the London Protocol[15] and UNCLOS Article 207[16]. The Kishida administration should consider the immediate suspension of the current plan to dump Fukushima wastewater into the Pacific Ocean and consider alternative methods to prevent radioactive pollution and protect the global citizenry. Further, the Kishida administration should invest in further efforts to govern in accordance with the politics of responsibility, abide by existing international legal standards and promote international human rights norms.

3. Kishida's Failure to Promote Responsible Government Policy

The Kishida administration recently increased defense spending[17] to support Ukraine. This decision was applauded by many. However, the current Japanese administration's domestic policy choices have been less laudable. The most recent polls indicate that the major cause of Kishida's dropping approval rating resulted from his wastewater dumping plan[18]. It is unclear why the current administration is pressing forward with the radioactive wastewater dumping plan where it is opposed by the majority of Japanese citizens as well as global citizens while failing to meet the needs of the disaster-affected citizens of Fukushima.

The Kishida administration has failed to build trust between itself and ordinary Japanese citizens[19]. The Japanese fishing community in particular, whose economic activities heavily depend upon the ocean, has long opposed the government's plan to dump radioactive wastewater

into the ocean[2][20][21][22]. Indeed, the Abe administration promised in 2015 not to proceed with the dumping plan without first obtaining the consent of the fishing community[14]. The government later broke its promise when it announced, “the government may listen but it does not mean it will take into account what it hears...[23],” and “We will consult with local people, rather than getting the consent from them, to take action...[23].” Then, in June, 2023, a Japanese government official reversed course, again stating that the government would respect the 2015 agreement that it would not proceed with the dumping plan without first obtaining the consent from fishing community[14]. In early August, 2023, the Kishida administration announced that they were considering proceeding with the wastewater dumping plan as soon as the end of this month[24]. Meanwhile, regardless of the IAEA’s report of July, 2023 which said the dumping plan would be scientifically safe, some scientist may disagree with the report, the Japanese fishing community again voiced its opposition to the Kishida administration’s dumping plan at a series of meetings conducted by the government officials with its representatives[25].

Since early 2020, resolutions have been passed opposing the radioactive wastewater dumping plan by 41 local councils and 59 local authorities[23]. After the IAEA’s report came out in July, 2023, Miyagi city council passed another resolution expressing concerns about the government’s irresponsible radioactive wastewater dumping plan and requesting the Kishida administration to consider alternative solutions to the problem[26]. The Kishida administration’s behavior towards ordinary Japanese citizens, most especially the Japanese fishing community, are clear indications that the current administration is failing to promote responsible government policy as well as democratic governance.

The human right to health of disaster-affected citizens in Fukushima has been continuously violated by the current administration. In 2019, the Committee on the Rights of the Child (CRC) expressed concern that the Abe administration had failed to meet its human rights obligations to the disaster-affected children in Fukushima[27]. Its most recent report indicates that disaster-affected children in Fukushima are struggling to protect themselves both from the health effects of radiation and the associated social stigmatization[12]. Lee’s recent study further indicates that disaster-affected women, including migrant women in Fukushima, are facing discrimination as well[12].

The most recent data indicates that disaster-related deaths have reached over 2,300 while many others are suffering from chronic illness resulting from the Fukushima disaster[12]. It is also troubling that compensation payments from the Japanese government have been paid to only a limited number of disaster-affected citizens in Fukushima, the sources of payments are largely unknown, and the compensation process has not been transparent[12]. Over 76,000 hired decontamination workers; homeless people, unregistered individuals, even asylum seekers have been exploited by the TEPCO and Japanese government[1]. Mimura’s recent study indicates that the problems related to decontamination workers have been unresolved[12].

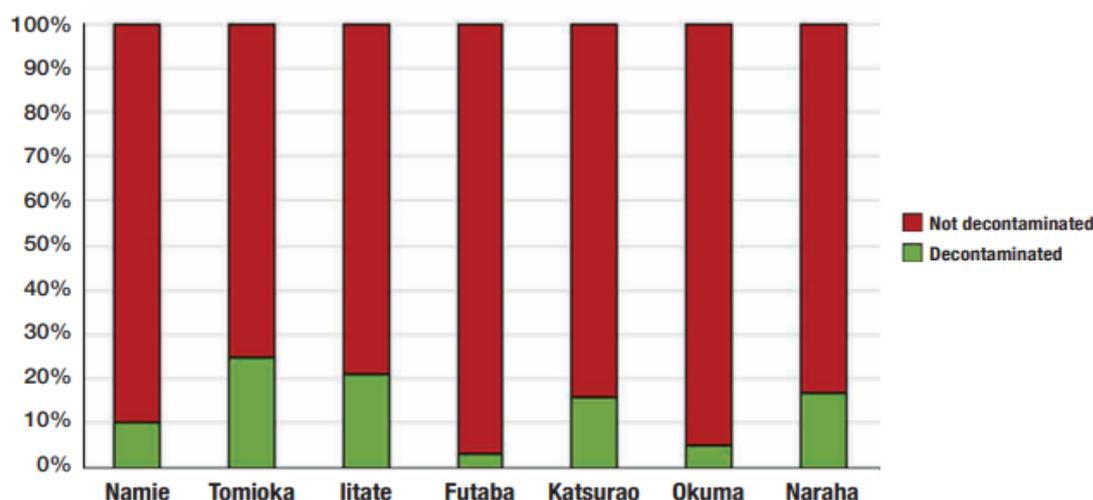
Their citizen’s human right to health remains under attack by the Japanese government’s decision to relocate evacuees contaminated areas of Fukushima[1]. As <Figure 1>, <Figure 2> indicated below, the percentages of not decontaminated areas are far too higher than the percentages of decontaminated areas in Fukushima[28]. The Kishida administration’s wastewater dumping plan has further negatively affected citizens of Fukushima. For instance, Ishikawa town said, “victims who have been severely damaged by the nuclear accident should not be overwhelmed by the release of contaminated water into the ocean. This will fundamentally overturn the efforts and future prospects of producers who have worked to ensure the safety of agricultural, livestock and marine products produced in Fukushima prefecture and overcome the damage caused by rumors” [29].

Figure 1. Seven districts wholly inside the Fukushima prefecture special decontamination area-decontaminated and not contaminated as of September 2017.

Districts	Total area - (hectares)	Decontaminated – as of 30/09/2017 (hectares)	Not Decontaminated (hectares)	Percentage Decontaminated	Percentage Not Decontaminated	Evacuation Order Lifted
Namie	22,314	2,140	20,174	10	90	March 31 2017 ¹⁹
Tomioka	6,839	1,710	5,129	25	75	April 1 2017 ²⁰
Iitate	23,013	4,830	18,183	21	79	March 31 2017 ²¹
Futaba	5,142	133	5,009	3	97	Partial lifting 3 March 2020
Katsurao	8,437	1,355	7,082	16	84	June 12 2016 ²²
Okuma	7,871	401	7,470	5	95	Partial lifting 5 March 2020
Naraha	10,364	1,740	8,624	17	83	September 5 2015
Total	83,980	12,309	71,671	15	85	

Note: Fukushima daiichi 2011-2021: The decontamination myth and a decade of human rights violations. greenpeace(2021).

Figure 2. Percentage of land in SDA municipalities decontaminated and not decontaminated.



Note: Fukushima daiichi 2011-2021: The decontamination myth and a decade of human rights violations. greenpeace(2021).

The Kishida administration is failing to get support from neighboring countries. According to the survey, about 85 percent of South Korean citizens strongly oppose the Kishida administration's radioactive wastewater dumping plan[30]. Of that 85 percent, up to 70 percent South Korea stated that they would stop consuming marine products when wastewater begins to be discharged by Japan[30]. This will not merely hurt the Japanese fishing industry. It will also likely lead to significant damage to the South Korean fishing industry[31]. In 2020 London Convention/London Protocol(LC/LP) meetings, South Korea claimed that Japan's radioactive wastewater dumping plan was not in compliance with its obligations under Article 2 of the London Protocol[15].

During its 2020 meeting, China[32], Chile, Mexico, and Vanuatu, all of whom are associated with the Pacific Island Forum(PIF), have also opposed Japan's dumping plan[15]. The PIF, inclusive of 18 Pacific states, has been a major opponent to the radioactive waste dumping plan, has thus requested that the Japanese government suspend the plan, and has demanded Japan's compliance with its obligations under Article 2 of the London Protocol[15].

Nonetheless, the Kishida administration's response in 2022 was troubling as they objected to their neighboring countries' proposals to seek legal advice but committed to conducting an

environmental impact assessment before any wastewater would be discharged [15]. As previously stated, the Kishida administration recently announced they would be ready to dump radioactive wastewater by the end of August, 2023; however, they have not performed the environmental impact assessment.

The owner of the Fukushima Daiichi Nuclear Power Plant, Tokyo Electric Power Company (TEPCO), seems to be in charge of all technical matters concerning the radioactive wastewater dumping plan. It has, however, long been criticized by international scientists and experts for providing incorrect data. In late 2022, the National Association of Marine Laboratories stated, “The supporting data provided by the TEPCO and the Japanese government are insufficient and, in some cases, incorrect, with flaws in sampling protocols, statistical design, sample analysis, and assumptions, which in turn lead to flaws in the conclusion of safety and prevent a more thorough evaluation of better alternative approaches to disposal. A full range of approaches to addressing the problem of safely containing, storing, and disposing of the radioactive waste have not been adequately explored, and alternatives to ocean dumping should be examined in greater detail and with extensive scientific rigor” [33]. Dr. Dalnoki-Veress expressed special concern for the lack of data concerning transboundary, transgenerational issues [34].

In June, 2023, the PIF experts once again suggested to the Japanese government to use the wastewater in making concrete as an alternative to dumping it into the ocean. However, the Kishida administration rejected the proposal for technical and legal reasons [35]. Here, the Kishida administration insisted that the reason why the wastewater could not be used to make concrete was that the tritium in the wastewater could violate their domestic law. Their concern with the rule of domestic law was ironic where they completely ignored the fact that tritium enriched radioactive wastewater dumping plan could violate the United Nations Convention on the Law of the Sea (UNCLOS). The Kishida administration is in fact seeking to proceed with the radioactive wastewater dumping plan because it is the “cheapest option” available [16] without consideration of alternative measures when there are available land for additional storage tanks for decades or longer [28].

According to the latest IAEA’s report in 2023, “Comprehensive Report on the Safety Review of the ALPS-Treated Water at the Fukushima Daiichi Nuclear Power Station,” tritium has not been removed from Fukushima radioactive wastewater [36]. Long-term exposure to tritium may pose dangerous health risks to humans and cause serious biological consequences [16][37][38][39][40][41][42][43][44][45][46][47]. Tritium exposure could cause cancer, hereditary and generational effects, and even death [16][37][38][39][40][41][42][43][44][45][46][47]. Furthermore, Dr. Buessler argued there should be more to be researched to understand the potential health risks of many other radioactive elements contaminated besides tritium in the Fukushima radioactive wastewater tanks [48]. The most recent analysis by Dr. Mousseau asserts that tritium can adversely affect the reproductive system [46][49]. The Kishida administration’s Fukushima wastewater dumping plan violates UNCLOS Article 207 as it constitutes pollution and poses potential harmful consequences to living resources and marine life as well as human health and marine activities [16][50][51].

4. Conclusion

The Kishida administration is failing to promote responsible government policy as its Fukushima radioactive wastewater dumping plan hinders marine activities of the domestic and international fishing community and undermines the human right to health of the disaster-affected citizens in Fukushima. Moreover, the plan is strongly opposed by neighboring countries which would, in turn, undermine regional peace and security. It raises safety concerns due to TEPCO’s apparent technical incompetence. It is not the government’s sole alternative. Other

measures could prevent the pollution of the Pacific marine environment, pollution which will likely pose harm to marine life and human health. Finally, the Fukushima radioactive wastewater dumping plan violates Japan's obligations under Article 2 of the London Protocol as well as Article 207 of UNCLOS. In sum, the Kishida administration needs to immediately suspend the current plan to dump the Fukushima radioactive wastewater into the Pacific and consider alternative methods available that would both dispose of the wastewater and not result in transoceanic pollution. The Kishida administration should undertake further efforts to govern in a manner consistent with the politics of responsibility, abide by international legal standards and international human rights norms.

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6. Appendix

6.1. Author’s contribution

	Initial name	Contribution
Author	JC	<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"/> -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 Strategy for Responding to Large-Scale Complex Disasters

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Abstract

Purpose: A large-scale complex disaster refers to a disaster that develops on a huge scale outside the predictable range as natural disasters and social disasters occur serially or simultaneously. The local community must take into account the diversity of residents' situations and organize an evacuation cooperation system in advance in order to respond to such large-scale, complex disasters. The purpose of this paper is to present a direction for improving community response to disasters through a review of large-scale complex disasters.

Method: This study examines the large-scale flood damage evacuation plan in the 5th district of Koto, Tokyo, Japan, which established an evacuation plan led by the local community after the Great East Japan Earthquake. Evacuation was divided into vertical evacuation, evacuating within the community, and wide area evacuation, evacuating outside the community.

Results: The main features of these evacuation plans were that they encouraged local residents to make independent judgements, to implement the plans, and to proactively request and prepare for administrative support for the parts that were insufficient.

Conclusion: First of all, for efficient evacuation from large-scale-complex disasters, various stakeholders need to be recognized and systematically organize, and cooperation with relevant and upper-level administrative agencies is needed to solve problems that are beyond the capacity of local governments. It is also necessary for residents to recognize their own role in disaster response along with the proper implementation of disaster prevention administration, and for the administration to support factors that residents cannot do as much as possible, as the basic structure of the crisis.

Keywords: Large-Scale Complex Disasters, Community-Driven, Correspondence of Administration, Disaster Response, Evacuation Plan

1. Introduction

Recent natural disasters are increasing in scale and their form is also changing to the form of complex disasters. One of the surest measures to protect human life from such disasters is evacuation. In particular, evacuation in large cities can be effective only when the actors of various communities come together quickly after a disaster [1][2][3][4]. The purpose of this study is to review and consider community evacuation plans in response to large-scale complex disasters. In Korea, national action guidelines are prepared and disseminated at the government level. These are designed to ensure a rapid response in the event of a disaster. It divides natural disasters into 18 categories, such as typhoons, heavy rain and heavy snow. It also organizes what the public should do in the event of a disaster. Explanation of evacuation tips is the main content of the National Action Guidelines, which is a general guideline according to the disaster situation. However, it lacks a lot to be a general solution for disaster evacuation that can be used in all regions of Korea.

Different regions have different disaster safety conditions and needs. This means that even if people live in the same region, the evacuation methods (shelters, routes, etc.) may differ depending on the characteristics of the population and the place of residence. In the case of local governments in Korea, according to the guidelines of the Ministry of Public Administration and Security [5], evacuation plans for residents (areas of concern for human casualties, etc.) are prepared. However, most of them are standardized evacuation plans that require more consideration of regional characteristics and have problems such as lack of actualization. This suggests that Korea's Residential Evacuation Plan is still in its infancy, and needs to evolve and improve.

On the basis of experience and lessons learnt from major and minor disasters, Japan is in the process of developing empirical evacuation plans from a community-level perspective. Structural measures against disasters have been greatly advanced by the 1961 Basic Law on Disaster Prevention, enacted after Typhoon Lee Se-wan in 1959, and casualties have been greatly reduced. However, casualties from natural disasters still occur. For this reason, "zero" disaster reduction projects have been implemented throughout Japan and have been continuously carried out for a long time [6].

For evacuation plans in Korea, which are standardized and do not reflect regional characteristics well, the main purpose of this study is to seek improvement plans. As a case study, the wide-area evacuation plan of the 5 wards of Koto in Tokyo, Japan, was analyzed. This plan comprehensively improved the problems identified after the Great East Japan Earthquake in 2011.

Therefore, effective measures for the minimization of casualties through evacuation are under review. Based on the premise of community-integrated and subjective evacuation, countermeasures and policies were summarized for the 5 districts of Koto [7]. There are several previous studies on evacuation in Korea. However, most of them are engineering studies. There are various preceding studies on evacuating in Korea, but most of them are engineering studies. This paper is significant in that studies analyzing empirical cases where community-led evacuation plans have been established are inadequate.

2. Direction of Community-Led Evacuation Plan

Local government evacuation plans in Korea are prepared according to the guidelines of the Ministry of Public Administration and Security. These evacuation plans tend to be somewhat uniform across the country, so there are various reasons for the lack of updating. From a macro perspective, however, it should be noted that disaster response is considered to be driven by administrative initiatives. The following is a look at the responsibilities of the state as expressed in Korea's Framework Act on Disaster and Safety Management (hereafter referred to as the Disaster and Safety Act).

"Article 4 (Responsibilities of the State, etc.) The State and local governments have the responsibility to protect the lives, bodies, and property of the people from disasters and other accidents, and to prevent disasters and other accidents and reduce damage. We must make efforts and establish and implement plans to promptly respond to and restore damages."

The responsibilities of the people as set out in the Act are as follows.

"Article 5 (Responsibilities of the People) Citizens shall cooperate as much as possible when the state and local governments perform disaster and safety management tasks, and disasters or other various accidents occur from buildings and facilities owned or used by them. We should try not to do that."

In summary, the Disaster and Safety Act stipulates that disaster response is the responsibility of the state and that the public will cooperate with it. This can be seen as a structure in which

the people are directly and indirectly dependent on the administration in responding to disasters on a large scale.

Evacuation is one of the most effective ways of protecting people during a disaster. It can only be implemented effectively if the administration and the local community, which is the basis of people's lives, work together [8][9][10]. When the evacuation plan is applied to a community where an administration-dependent disaster response structure is formed, residents will realize that evacuation will be carried out after receiving disaster information from the administration. In other words, evacuation can be perceived as a passive concept by the recommendation and order of the administration [11]. In order to break away from the administration-dependent concept and establish a community-led evacuation plan, the following three aspects should be organically considered [12].

First, to recognize disasters according to local conditions, evacuation plans should be prepared by improving disaster management. At present, most evacuation plans in Korea deal with administratively led measures [13][14]. As we have seen, if an evacuation plan is made on the basis of the structure of the state's responsibility and the people's responsibility as stipulated in the Disaster Management Act, it is impossible to escape the passive appearance of residents evacuating after the disaster information is sent by the administration. Such an evacuation plan cannot adequately respond to local disasters or disasters according to local conditions. Therefore, it is necessary to prepare an evacuation plan that recognizes the incompleteness of the disaster management system, in addition to emphasizing the state's responsibility for disaster management.

Secondly, the diversity of situations of residents after evacuation should be taken into account. The evacuation orders stipulated in the Disaster Safety Act are as follows.

"Article 40(Evacuation Order) In case a disaster occurs or is likely to occur, the head of a Si/Gun/Gu and the head of regional control, if necessary, to prevent harm to human life or body, You may order people to evacuate or evacuate ships or vehicles. In this case, you can designate an evacuation site in advance."

According to the Disaster Safety Act, the head of a local government can order an evacuation and designate a shelter. However, when a disaster occurs, issuing uniform disaster information for a specific area cannot guarantee the safety of residents. For example, in a place where flooding is progressing rapidly due to localized heavy rainfall, it may be safer to evacuate to the roof of a building you own or to a nearby tall building than to follow an evacuation order. In other words, the evacuation actions to be taken by individuals may differ depending on the geographical characteristics of the dwelling and the circumstances and conditions in which they are located.

Third, a cooperative system for evacuation must be established in advance. In Korea, the concept of large-scale evacuation has not yet been actively introduced, and the agreement system for cooperation between local governments can be considered inadequate. In the future, it is necessary to organize the evacuation cooperation system by spatially classifying it not only within the region but also between regions. In inter-regional cooperation, if a large-scale complex disaster is expected to affect several local governments, large-scale evacuation is required. If such evacuation is not prepared in advance by agreement between local governments, a disaster may cause secondary damage.

3. Case Analysis: Large-Scale Flood Evacuation Plan for Koto District 5, Tokyo, Japan

3.1. Evacuation planning trends in Japan

In Japan, following the enactment of the Framework Law for Disaster Prevention and Mitigation, the number of casualties due to disasters decreased significantly, but in the 2000s, voices of self-reflection began to emerge that the disaster policy promoted for more than 50 years had reached its limits[15].

In 2004, Japan's Ministry of Land, Infrastructure, Transport and Tourism announced the "Emergency Action Plan for Flood Damage Countermeasures" in response to frequent flood damage caused by typhoons and torrential rains. In 2005, the Flood Damage Prevention Act was amended to make it virtually mandatory to prepare a flood hazard map for small and medium-sized rivers as well as large rivers. And in the same year, guidelines for the application of "evacuation preparation information" were announced, taking into account the vulnerable in disasters. In 2006, a review meeting was held to improve disaster prevention information from the perspective of local residents, and terms and contents related to flood prevention information were reviewed and published as a report. In 2007, the Ministry of Land, Infrastructure, Transport and Tourism reviewed the disaster prevention information system based on the above report. After the Great East Japan Earthquake in 2011, evacuation was reviewed based on the problems revealed[6]. As a result, it can be seen that Japan's evacuation plan is relatively faithfully implemented in terms of prompt evacuation of residents, provision of information to facilitate evacuation, and consideration for the vulnerable in a disaster.

3.2. Overview of the large-scale flood evacuation plan in the 5 wards of Koto

Koto Ward 5 is located in the eastern lowlands of Tokyo, Japan, and has a population of approximately 2.58 million as of 2019. Large rivers such as the Sumida, Ara and Edo Rivers and their tributaries, as well as small and medium-sized rivers, border the district. In addition, the city's location at zero meters above sea level makes natural drainage difficult. If the drainage system does not work as desired, there is a risk of persistent flooding. In addition, it can be said that this is an area with a very high risk of flood damage, as extensive flood damage can be expected if the sea and river banks of the port of Tokyo collapse during high tide.

In the event of a combination of these various flood risks, it is predicted that a significant number of the five wards of Koto will be flooded beyond the standard capacity set by the structural measures[6]. In the 5 wards of Koto, efficient evacuation plans for residents in these complex disaster situations have been prepared through a systematic process.

First, in October 2015, the 'Large-scale Flood Damage Countermeasures Council' was established in the 5th Ward of Koto to review evacuation measures in response to large-scale complex disasters and to set the direction. In August 2016, the discussions of the above council were summarized as the 'Large-scale Flood Damage Countermeasures Policy in the 5 wards of Koto', through which the goal of no casualties in the event of large-scale flood damage was clarified. In order to promote the above policy, the "Koto 5 Ward Wide-area Evacuation Promotion Council" was established, and matters that could be done within the region for wide-area evacuation and entities that should cooperate with related organizations were designated in advance.

As a result, the "Council of Five Districts in Koto Ward for the Large-scale Flood Hazard Map" was established for risk awareness and the "Large-scale Flood Disaster Plan for the 5 Districts of Koto" for implementation[6].

3.3. Public administration's perception of incompleteness in disaster response

In Koto 5 wards, an independent risk communication process is gradually being implemented to raise residents' awareness of the risk of large-scale flooding in the area and to publicize and disseminate the importance of large-scale evacuation. The content includes 'Awareness of the risk of major flood damage in the region', 'Administrative efforts and limitations' and 'Independent efforts by residents'[6].

The process of recognizing the risk of large-scale flood damage in the region first suggests that the risk of flood damage has increased due to climate change. The content is to examine what risks have occurred through the history of flood damage in the 5 districts of Goto, and to raise awareness of large-scale evacuation as social vulnerability has increased due to current population and infrastructure growth. To this end, face-to-face communication such as lectures and workshops, cyberspace such as SNS and websites, and publicity through terrestrial broadcasting will be used to spread awareness of flood risk more widely. In particular, school disaster preparedness education on widespread evacuation is being used to ensure that this awareness continues to be embedded in the region.

In the process of "Administrative Efforts and Limitations", about 2.5 million people can be isolated in buildings if residents in the 5th district of Koto undergo vertical evacuation. It is pointed out that it will take more than 2 weeks to rescue the residents, even if all the disaster management personnel are mobilized. Therefore, although the administration recommends large-scale evacuation, residents are informed that problems such as heavy traffic congestion and evacuation information that does not take the situation into account may occur. In other words, in order to implement effective early wide-area evacuation, it is necessary to make residents aware that they need to work together to solve the problem.

In this way, the 5 districts of Koto are systematically raising awareness of the need for large-scale evacuation and emphasizing the 'independent efforts of residents' for this purpose.

3.4. Consideration of the diversity of residents' situations following evacuation

Not all residents can evacuate in an orderly manner after an evacuation warning is issued, and their one-sided reliance on evacuation warnings may also be problematic[15][16][17]. In other words, since the living environment and situation of residents are different, and the method of evacuation depends on the passage of time after a disaster occurs, diversity in evacuation needs to be considered.

To solve these problems, the 5 wards of Goto are taking their own initiative. In accordance with the decision criteria based on the joint review of the Koto 5 District Evacuation Council, local residents are encouraged to voluntarily evacuate the large area and are embodied in connection with related organizations[6].

In addition, the 5th District of Goto divided the concept of evacuation into wide-area evacuation and vertical evacuation. Although wide-area evacuation is recommended, vertical evacuation is implemented as a temporary measure, as not all residents can comply with it. For residents who cannot stay on high floors or in tall buildings, shelters have been designated in the highlands of the region, and material use plans for long-term stays(sheltering) have been reviewed. We are working with volunteer fire brigades and community associations to help residents stock up on emergency supplies and evacuate vulnerable people efficiently in the event of a disaster.

3.5. Pre-organization of a cooperative system for evacuation

In order to systematically evacuate, taking into account the above-mentioned recognition of the incompleteness of the administration and the diversity of resident situations, it is necessary to establish a cooperation system in advance. In the 5 districts of Koto, the cooperation system was spatially divided into intra-regional cooperation and inter-regional cooperation, and was implemented as follows[6]. First, for intra-regional cooperation, emergency shelters were secured in cooperation with private companies that have evacuation rooms, managers of multi-family dwellings such as apartments, and local residents. An agreement on the storage and management of goods was also concluded in preparation for the two-week lifeline interruption set by the Goto District 5 Wide-area Evacuation Promotion Council. The Regional Cooperation concluded evacuation agreements with local governments further away than the shelters specified in the existing agreement for the expansion of wide-

area shelters. To this end, the 5 districts of Koto proactively negotiated with the central government and metropolitan governments to adjust the coverage of regional shelters. In order to prevent traffic congestion and support the transportation of evacuees in the event of an evacuation of the metropolitan area, the central government and the metropolitan government concerned were requested to improve related systems, and this was reviewed in cooperation with related organizations.

In Koto 5 wards, the existing evacuation-related council and in Koto 5 wards, the existing evacuation-related council and the existing matters and measures necessary for wide-area evacuation will be continued, and the "Koto 5-ward wide-area Evacuation Promotion Council" was formed to specify the necessary items.

This is the process of requesting support from the central government, metropolitan governments and related organizations in situations where the Goto 5 wards are unable to specify the role and activities for evacuation or where an agreement is required. In other words, it is very important that the Goto 5 wards take ownership of the evacuation and work together in advance.

4. Conclusion

In this study, the community-led evacuation strategy is to recognize the incompleteness of disaster management, consider the diversity of residents' situations after evacuation, and faithfully build a cooperative system for evacuation in advance. Looking at the characteristics of the wide-area evacuation plan in Koto-ku, Tokyo, Japan from this point of view, it is worth noting that a systematic plan has been prepared step by step to prepare for potential flood risks in the future.

To summarize the cases of the wide-area evacuation plan in the 5th district of Koto, the 5th district of Koto considered residents in various situations for evacuation and conducted its own risk communication to share problems within the region. In addition, cooperation with relevant and higher-level administrative agencies was sought to solve problems that could not be solved with the capacity of the local administration[18]. In other words, for an efficient evacuation, the multi-stakeholder problems were identified and action plans for solutions were systematically organized. The wide-area evacuation plan of Koto 5-ku, Tokyo, Japan, which reflects these characteristics, suggests the following to us.

First, Evacuation plans should be prepared by improving disaster administration to recognize disasters according to local conditions. Disaster management policies are undoubtedly a major responsibility of national and local governments. Structural measures that require huge budgets cannot be solved at the private level, and given the nature of publicity, it is the responsibility of the administration to take the lead[19][20][21]. However, this responsibility alone cannot fully protect residents[22].

Second, In addition to the implementation of the disaster prevention administration, the inhabitants should be able to make independent evacuation plans to do so. The level of understanding of regional characteristics and situations is inevitably higher for residents than for other subjects. However, there are cases where the concerns of these residents are not well reflected. It is necessary to find a way to stimulate ongoing interest. First of all, everyone should recognize that administrative evacuation has its limits. Administrative disaster information may be uniform. It is the responsibility of the inhabitants to react appropriately to a disaster situation. There are cases where residents do not respond immediately to the lack of disaster information from the government in situations where the risks are sufficiently predictable, such as a typhoon, earthquake and tsunami. This is a representative example of residents not seeking independent action.

Third, A disaster information system needs to be established well in advance so that a co-operation system for evacuation plans can be established in advance. Even with adequate disaster information and systems in place, it is possible that appropriate responses may not be made if local people are not made aware. In the case of wide-area evacuation, there is a possibility of large-scale traffic congestion due to the increased use of vehicles [23]. There are vulnerable people who may find it difficult to evacuate to a large area and there are residents who may find it difficult to use transport to get to the large area shelter. Evacuation shelters may not be sufficient for the number of evacuees, and maintenance within evacuation shelters may not be well maintained. Even if evacuation arrangements are made for each zone, there is a possibility of duplication. It is therefore necessary to consider these various problems comprehensively and carefully in advance through a cooperative system [24]. Obviously, it is important to carefully prepare an agreement in advance for efficient cooperation between actors after a disaster, and to learn and repeat training on an ongoing basis [25].

Future evacuation plans should start by rethinking the relationship between the administration and residents. In disaster response, it is desirable for residents to recognize their own role and for the administration to provide maximum support for factors that residents cannot do, as the basic structure of disasters.

From this point of view, the large-scale complex disaster evacuation plan is a process of finding a reasonable solution between the administration and the residents. From the point of view of the community-led evacuation strategy, it means for us that the 5 wards of Goto have clearly defined goals and roles and have faithfully structured the promotion system, in addition to what the 5 wards of Goto can do for efficient implementation and must receive support from related and higher-level organizations. It is expected that Japan's wide-area evacuation plan will have implications for future research on similar disaster evacuation plans in Korea.

The limitation of this study is that it is useful to improve the understanding of Japan's Goto District 5 wide-area evacuation plan, but it is cautious to make a conclusive prediction about Korea's disaster management system from it. A comparative analysis study on the same area is needed. For example, there is a case in Korea where a large reservoir burst and was flooded. So it will be possible to compare and analyze how the preparation is after that.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Author	DL	<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"/>-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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