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Development and Effects of the Self-Determination Improvement Program for Patients with Schizophrenia in CRISIS

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Abstract

Purpose: The purpose of this study were to develop a self-determination improvement program for patients with schizophrenia and to confirm their effects on autonomy, competence, relationship, and self-care agency.

Method: The study was in a pre-test, post-test for a nonequivalent control group design. The participants were 47 inpatients who were diagnosed with schizophrenia(experimental group:24; control group:23). The self-determination improvement program was provided in 8 session over 4 weeks. Data was collected from September to October 2020. Data were analyzed using SPSS/WIN 25.0 program with Chi-square test, Fisher's exact test, and the independent t-test.

Results: After participating self-determination improvement program, the experimental group showed a significant increased in autonomy($t=4.24$, $p<.001$), competence($t=5.33$, $p<.001$), relationship($t=7.90$, $p<.001$) and self-care agency($t=2.49$, $p=.016$) compared to the control group.

Conclusion: The findings of this study it was confirmed that the self-determination improvement program for patients with schizophrenia improves basic psychological needs(autonomy, competence, relationship) and self-care agency. This suggests that it is useful as an intervention program for the recovery of patients with schizophrenia in clinical practice.

[Keywords] Autonomy, Competence, Relationship, Schizophrenia, Self-Care

1. Introduction

1.1. Necessity of the research

Schizophrenia is a representative mental disorder that causes dysfunction in various areas such as cognition, perception, emotion and behavior, and impairment in reality judgment ability[1][2]. Unfortunately, most of schizophrenia begins in early adulthood, causes lack of daily life skills, interpersonal problems, and social dysfunction, and often becomes chronic after acute and stable periods[3]. In the past, treatment of schizophrenia was mainly based on accommodation in hospitals or facilities, or biological treatment according to medical models, but recently, the treatment goal was to reinforce the self-care agency of patients with schizophrenia to maintain an independent life in the community have[4][5].

Self-care agency is the ability to perform daily life by interacting with the environment in order to maintain a healthy life and function of an individual[6]. This is the competency necessary for an individual to lead an independent life, and includes strengthening problem solving ability, interpersonal relationship ability, and self-care ability[7]. Because schizophrenia is difficult to maintain daily life due to repeated recurrence, the demand for self-care is high, but it is difficult to properly perform self-care, which often leads to self-care deficiency[8]. Therefore, it is important for the treatment of schizophrenia to help maintain

a stable daily life by strengthening the self-care agency by providing psychological drug treatment and various psychosocial rehabilitation programs. In previous researches [7][8], it was confirmed that the higher the self-care agency of schizophrenia patient, the increased self-care activity and mental health status improved. In addition, it was confirmed that the autonomy, competence and relationship perceived by individuals are important in the relationship between the support of health professionals perceived by schizophrenia patients and self-care agency [9]. In particular, self-determination theory (SDT), one of the motivational theories for predicting or explaining human behavior, argues that intrinsic motivation is important for individuals to initiate positive behavior or maintain adaptive healthy behavior [10]. For example, in SDT, an individual's behavior is determined by intrinsic motives arising from within and extrinsic motives arising from external rewards or demands. When an individual's intrinsic motivation is reinforced, self-determination improves and leads to positive behavior, but when extrinsic motivation is given, self-determination is reduced, leading to non-adaptive behavior without maintaining adaptive behavior [11][12]. From the SDT point of view, it was considered that the improvement of basic psychological needs such as autonomy, competence and relationship as an internal characteristic of an individual is helpful for effective health behavior [13][14]. Autonomy is recognizing that you are the regulator of behavior [15]. Competence is experienced when the actions performed using the individual's abilities while interacting with the environment are positively perceived [15]. Relationship is about feeling satisfaction while forming positive social relationships with other people [13]. In studies based on SDT, patients with high autonomy also increased their self-perceived competence and continued adaptive health behavior [9]. Relationships also played an important role in reinforcing intrinsic motivation by forming meaningful relationships with others, so that adaptive behavior could be maintained [10][13]. Therefore, if SDT based self-determination improvement program is applied to schizophrenia patients, autonomy, competence, and relationship will be improved, and self-determinism will be enhanced, thereby reinforcing self-care ability. In this study, the self-determination improvement program for schizophrenia patients was constructed and applied, and its effects on autonomy, competence, relationship, and self-care agency were identified. This could be used as an intervention for patient with schizophrenia in clinical practice.

1.2. The purpose and hypotheses

Hypothesis 1. The experimental group that participated in the self-determination improvement program will have more autonomy than the control group that did not participate.

Hypothesis 2. The experimental group that participated in the self-determination improvement program will have more competence than the control group that did not participate.

Hypothesis 3. The experimental group that participated in the self-determination improvement program will have more relationship than the control group that did not participate.

Hypothesis 4. The experimental group that participated in the self-determination improvement program will have more self-care agency than the control group that did not participate.

2. Experimental Methods

2.1. Research design and subjects

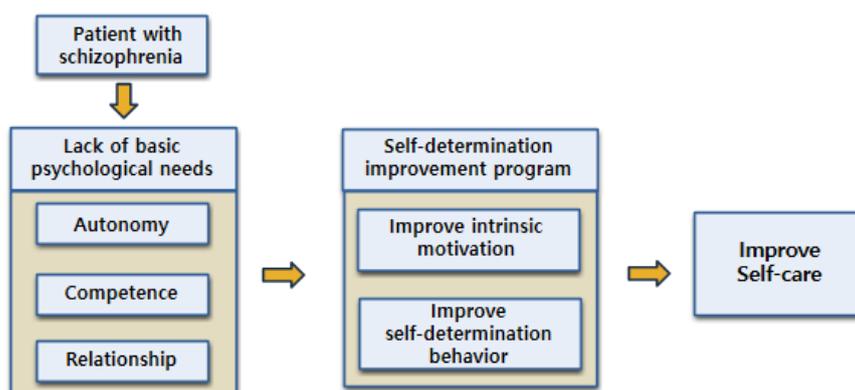
This study is a quasi-experimental research of nonequivalent control group pre-test and post-test design. Participants of this study were inpatients of a mental hospital located in K Province, Korea who were diagnosed with schizophrenia by a specialist of mental health medicine at that hospital in accordance with the diagnostic and statistical manual of mental disorders, DSM-5. Another qualifications for the subjects were 1) Those aged 19 to 65 years

old, 2)Those who do not have substance addiction or organic mental disorder, 3)Those who understand the purpose of the program and agree in writing to participate in the research, 4)Those who communicate smoothly and can answer questionnaires and 5)Having no experience of participation in any other cognitive behavior program within 3 months before the beginning of this study. The number of subjects was assigned to 21 groups for each group required for two-sample independent t-test in a one-sided test with effect size = .80, significance level = .05, power = .80, using the G * Power 3.1.9 program. However, later, this study modified the number of the participants by taking into consideration the rate of dropout, that is, about 15% due to the possibilities of discharge from hospital, worsening of psychotic symptoms, or abandonment during the program period. To measure the intervention effect of the program, a preliminary investigation of the experimental group was conducted at the beginning of the first session of this program, and the control group was also conducted on the same day. In addition, after a program consisting of 8 sessions for 4 weeks, twice a week, a follow-up investigation was conducted using the same method. The data collection period was from September to October 2020. In this study, the final participant in the experimental group consisted of 24 patients excluding 1 discharged during the program period, and the control group consisted of 23 patients excluding 2 discharged from the hospital.

2.2. Self-determination improvement program

In this study, based on the self-determination improvement program of Hoffman and Field [16], it was developed in consideration of the characteristics of schizophrenia. From the SDT point of view, the most important thing to change an individual's behavior is the degree of basic psychological needs[10][13]. The conceptual framework of this study was established under the assumption that self-care can be improved by ultimately attempting self-deterministic behavior if the basic psychological needs of autonomy, competence, and relationship improve in schizophrenia patients. Conceptual frameworks of that program are shown below <Figure 1>.

Figure 1. Conceptual framework of this study.



In order to confirm the applicability of the final developed program to patients with schizophrenia, the content validity was confirmed by 1 psychiatrist and 2 psychiatric nurses. The program consisted of a total of 8 sessions, and the duration of each session was 60 minutes. The main topics for each session are understanding one's given environment, identifying one's own values, managing mental health, developing personal abilities, communicating with family, developing interpersonal skills, understanding the importance of communication, and improving daily life skills. The detailed contents of the program are as follows <Table 1>.

Table 1. The self-determination improvement program.

Themes	Theory	Purpose	Contents of program
(Session 1) Look around me	Autonomy	Understanding the purpose and needs of the program	<ul style="list-style-type: none"> ☐ · Program introduction ☐ · Making a motivation and connection ☐ · Conducting a pre-test
(Session 2) Identifying one's own values	Autonomy competence	You can set goals for yourself	<ul style="list-style-type: none"> ☐ · Watching videos about 'Challenge that never stops' ☐ · My life that I want
(Session 3) Managing mental health	Autonomy competence	You can manage the crisis situation of schizophrenia by yourself	<ul style="list-style-type: none"> ☐ · Diagnosis & progress of schizophrenia ☐ · Managing schizophrenia's crisis situation
(Session 4) Developing personal abilities	Autonomy competence	You can check your good points and recognize them positively	<ul style="list-style-type: none"> ☐ · Checking out my good points and needs ☐ · Setting long and short-term goals
(Session 5) Communicating with family	Relationship	You can communicate effectively with your family	<ul style="list-style-type: none"> ☐ · Family to me what does it mean? ☐ · Practice effective communication with your family
(Session 6) Developing interpersonal skills	Competence relationship	You can expect the outcome from the planned action	<ul style="list-style-type: none"> ☐ · Identifying obstacles to my recovery ☐ · Social contact daily plan
(Session 7) Understanding the importance of communication	Competence relationship	You can communicate effectively with others	<ul style="list-style-type: none"> ☐ · Determine the type of communication ☐ · What is self-assertive communication? ☐ · Practice effective communication
(Session 8) Improving daily life skills	Autonomy competence	You can make your own decisions and take responsibility in your daily life.	<ul style="list-style-type: none"> ☐ · The importance of intrinsic motivation ☐ · Setting up your own daily plan ☐ · Program evaluation ☐ · Conducting a post-test

2.3. Instrumentation

1. Autonomy

The autonomy scale was used within the Korean basic psychological needs scale developed by Lee & Kim[10]. This tool is a self-report test composed of a 5-point Likert scale of 6 questions, and the higher the score, the higher the autonomy. According to research by Lee & Kim[10], the inter-item consistency of this scale is Cronbach's $\alpha=.70$. The reliability in this study is Cronbach's $\alpha =.71$

2. Competence

The competence scale was used within the Korean basic psychological needs scale developed by Lee & Kim[10]. This tool is a self-report test composed of a 5-point Likert scale of 6 questions, and the higher the score, the higher the competence. According to research by Lee & Kim[10], the inter-item consistency of this scale is Cronbach's $\alpha=.75$. The reliability in this study is Cronbach's $\alpha=.76$

3. Relationship

The relationship scale was used within the Korean basic psychological needs scale developed by Lee & Kim[10]. This tool is a self-report test composed of a 5-point Likert scale of 6

questions, and the higher the score, the higher the relationship. According to research by Lee & Kim[10], the inter-item consistency of this scale is Cronbach's $\alpha=.79$. The reliability in this study is Cronbach's $\alpha=.74$

4. Self-care agency

The self-care agency scale was used mental health related self-care agency scale developed by West & Isenberg[17]. This tool is a self-report test composed of a 5-point Likert scale of 32 questions, and the higher the score, the higher the self-care agency. According to research by West & Isenberg[17], the inter-item consistency of this scale is Cronbach's $\alpha=.88$. The reliability in this study is Cronbach's $\alpha=.85$

2.4. Data analysis

The collected data were processed using the SPSS/WIN 25.0 Program.

1. The general characteristics of participants were identified and determined in terms of frequency, percentage point, mean value and standard deviation value. Homogeneity between the experimental and the control groups in relation to those dependent variables was examined and analyzed using the Chi-square test and the Fisher's exact test.

2. As part of the preliminary survey, the Shapiro-Wilk test was made to verify the normality of dependent variables. This move found that those variables are all normal in distribution($W=.920 \sim .983$, $p=.053 \sim .718$), which in turn were analyzed using the independent t-test. Homogeneity between the experimental and the control groups in relation to those dependent variables was analyzed using the independent t-test. And then, homogeneity between the experimental and the control groups in relation to those dependent variables was examined and analyzed using the independent t-test.

3. The effects of experimental treatment with the self determination improvement program were determined and analyzed using the independent t-test.

3. Results

3.1. General characteristics and homogeneity test

As far as the general characteristics of participants are concerned, 54.2% of the experimental group and 73.9% of the control group were all male. And 66.7% of the experimental group and 78.3% of the control group were all aged 40 or over. In terms of marital status, 87.5% of the experimental group and 78.3% of the control group were all unmarried. The experimental group, additionally, 62.5% were high school graduates or lower and 37.5%, junior college graduates or higher. While, 78.3% of the control group were high school graduates or lower and 21.7% of the same group were junior college graduates or higher. 62.5% of the experimental group and 73.9% of the control group were all religious believers. Based on all of these characteristics, this study made the homogeneity test to find that the experimental and the control groups were homogeneous with no significant difference <Table 2>.

Table 2. The general characteristics and homogeneity of the two groups.

Characteristics	Categories	Exp.(N=24) n(%)	Cont.(N=23) n(%)	χ^2	<i>p</i>
Gender	Men	13(54.2)	17(73.9)	1.98	.159
	Women	11(45.8)	6(26.1)		

Age(year)	<40	8(33.3)	5(21.7)	0.79	.374
	≥40	16(66.7)	18(78.3)		
Marital status	Married	3(12.5)	5(21.7)	0.71	.461 [†]
	Single	21(87.5)	18(78.3)		
Education level	≤High school	15(62.5)	18(78.3)	1.40	.238
	≥College	9(37.5)	5(21.7)		
Religion	Have	15(62.5)	17(73.9)	0.70	.401
	Have not	9(37.5)	6(26.1)		

Note: Exp.=Experimental group; Cont.=Control group; [†]Fisher's exact test.

3.2. Homogeneity test on autonomy, competence, relationship and self-care agency

As part of the pre-test, this study tested homogeneity between the experimental and the control groups. As a result, it was found that the two groups were similar to each other with no significant difference between them in autonomy($t=-1.443$, $p=.156$), competence($t=-.543$, $p=.590$), relationship($t=.820$, $p=.416$) and self-care agency($t=.398$, $p=.692$) <Table 3>.

Table 3. Homogeneity of dependent variables in pretest.

Variables	Exp.(N=24) M±SD	Cont.(N=23) M±SD	t	p
Autonomy	15.63±1.79	16.39±1.85	-1.443	.156
Competence	15.83±3.20	16.26±2.05	-.543	.590
Relationship	17.96±2.61	17.39±2.08	.820	.416
Self-care agency	94.92±10.23	93.78±9.23	.398	.692

Note: Exp.=Experimental group; Cont.=Control group.

3.3. The effects of the self-determination improvement program

This study applied the self determination improvement program to its participants. As a result, the research found that the same program brought significant differences between the experimental and the control groups in terms of autonomy($t=4.24$, $p<.001$), competence($t=5.33$, $p<.001$), relationship($t=7.90$, $p<.001$) and self-care agency($t=2.49$, $p=.016$) <Table 4>.

Table 4. The comparison of autonomy, competence, relationship and self-care agency between the pretest and posttest.

Variables	Group	Pre test	Post test	t	p
		M±SD	M±SD		
Autonomy	Exp.(N=24)	15.63±1.79	19.04±1.88	4.24	<.001

	Cont.(N=23)	16.39±1.85	16.61±2.06		
	Exp.(N=24)	15.83±3.20	19.00±2.65		
Competence				5.33	<.001
	Cont.(N=23)	16.26±2.05	15.00±2.49		
	Exp.(N=24)	17.96±2.61	20.33±2.35		
Relationship				7.90	<.001
	Cont.(N=23)	17.39±2.08	15.43±1.85		
	Exp.(N=24)	94.92±10.23	101.00±9.43		
Self-care agency				2.49	.016
	Cont.(N=23)	93.78±9.23	94.30±8.97		

Note: Exp.=Experimental group; Cont.=Control group.

4. Discussion

As a result of this study, it was confirmed that the subjects who participated in the self-determination improvement program significantly increased their basic psychological needs (autonomy, competence, and relationship) than those who did not participate. It was also found to have a significant effect on self-care agency. From the perspective of self-determination theory, this program can be interpreted as a positive change while reinforcing intrinsic motivation by satisfying the desire for autonomy to decide on one's own actions based on one's interests and values [18]. In addition, in the intervention of this program, the subject's intrinsic motivation responded positively to induce self-confidence and recognition of competence. In order to satisfy the needs of the relationship, they supported the formation of meaningful relationships with others who participated in the program or with their own family members. The process of these programs improved the self-care agency of patients with schizophrenia. Those who participated in the program expressed that they felt confident that I could do it too, and that it was an opportunity to think first from the perspective of their families and people around them. In previous research [9], autonomy, competence, and relationship of patients with schizophrenia showed a positive correlation with self-care agency. This means that as the basic psychological needs of schizophrenic patients are satisfied, it can have a positive effect on health behavior [19][20]. The self-determination improvement program is significant in that it can be applied as an intervention for recovery by improving the basic psychological needs (autonomy, competence, and relationship) of patients with schizophrenia and improving self-care agency from a clinical practice point of view.

The limitations in this study are as follows. First, because there was a limit to recruitment of study subjects, inpatients with schizophrenia were conveniently sampled. In future studies, it is necessary to confirm the effectiveness of the program through randomization. In addition, in this study, the effect of the program was confirmed only by pre-intervention tests and post-intervention tests, so that the continuous effect of the intervention was not confirmed, so it is necessary to verify the effectiveness of the intervention in the long term in future studies.

5. Summary and Conclusion

This study was attempted to develop a self-determination improvement program and confirm this in order to reinforce the capacity necessary for self-care of patient with schizo-

phrenia based on SDT, a motivational theory for predicting and explaining human behavior. The study found that the self-determination improvement program is positively effective in satisfies the basic psychological needs (autonomy, competence, and relationship) of patients with schizophrenia and improves self-care agency. This confirmed that the self-determination improvement program can be an effective intervention method to help improve intrinsic motivation and strengthen self-care agency by satisfying the basic psychological needs of patients with schizophrenia. In the future, based on this study, it is hoped that a self-determination improvement program that can help recovery of schizophrenia patients in various clinical practice will be developed and applied.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Lead Author	IK	<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"/>
Corresponding Author*	JL	<ul style="list-style-type: none"> -Play a decisive role in modification <input checked="" type="checkbox"/> -Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/> -Participants in Drafting and Revising Papers <input checked="" type="checkbox"/> -Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>

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The Trump Administration's NEGOTIATION STRATEGY Towards the North Korean Nuclear Crisis: South Korea's Response

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Abstract

Purpose: The purpose of this paper is to review denuclearization talks between the US and DPRK and map out policy alternatives for South Korea by analyzing Trump's strategy toward the DPRK. The denuclearization of North Korea remains an important issue for the security of Northeast Asia and has been the subject of a variety of negotiation strategies. Despite the failure of previous negotiations to achieve the objective of denuclearization, they still hold important lessons for ongoing efforts.

Method: This paper analyzes the negotiations between North Korea and the United States(US) through the lens of Fisher and Ury's model of principled negotiations. It offers the possibility for dealing with some of the most intractable and potentially destructive conflicts, such as that surrounding a nuclear deal with the DPRK. In particular, Fisher and Ury's negotiation model can be a suitable analysis framework for denuclearization talks between the US and DPRK because it raises the prospect of a win-win situation for all the entities.

Results: First, for the rational solution of the negotiation, the South Korean government has to differentiate issues from actors. Second, we need to focus on benefits or interests rather than positions. The positions taken in the negotiations must reflect the central interest or purpose, that of denuclearization, rather than political interests, which may be just a modified populism. Third, we need to focus on the benefits of a denuclearization settlement between the US and North Korea. If the denuclearization negotiations between the US and North Korea are concluded and the DPRK agrees to complete denuclearization, economic cooperation between the two Koreas will be accelerated and it will be a win-win situation for both parties. Fourth, in the process of denuclearization talks, South Korea has to keep consistency based on objective criteria. South Korean government has to obtain the consent of all actors by mapping out a roadmap for the denuclearization of the Korean Peninsula.

Conclusion: As the negotiation process for the denuclearization of the Korean Peninsula may take a long time and may not be smooth due to conflicting interest(or at least, in Fisher and Ury's terminology, positions), it is important that as a first step, the three parties can agree on a definition of denuclearization and its constituent elements. As part of this process, South Korea should be able to present a credible denuclearization roadmap that can construct a consensus between North Korea and the US.

[Keywords] Denuclearization, Negotiation Models, North Korea, South Korea's Role, Trump Administration

1. Introduction

North Korea's nuclear program is one of the longest-standing and most difficult problems faced by South Korea and the United States(US). The security contours on the Korean Peninsula are more uncertain than at any time since the Hanoi summit talks between the US and the Democratic People's Republic of Korea(DPRK). With the accumulated frustrations of North Korea's leader, Kim Jong-un, who returned home empty-handed from his second summit meeting with US President Donald

Trump in February 2019. Furthermore, as a responsive measure to the airborne leaflet campaign of North Korean defectors, the DPRK has blown up the liaison office which was created as a sign of goodwill toward President Moon Jae-in of South Korea who had brokered meetings between the US and North Korea.

The US administration has declared that it is going to strengthen military capability to realize peace through strength. Currently, the major threats to US national security include the DPRK, China, Iran, Russia and, transnational security issues. The contemporary geostrategic operating environment, with US-China rivalry gaining momentum, means that North Korea is becoming all the more valuable as a buffer state.

As a negotiation theory, Roger Fisher and William Ury's methodology introduces soft, hard, and principled negotiation models <Table 1>. It offers the possibility for dealing with some of the most intractable and potentially destructive conflicts, such as that surrounding a nuclear deal with the DPRK[1]. In particular, Fisher and Ury's negotiation model can be a suitable analysis framework for denuclearization talks between the US and DPRK because it raises the prospect of a win-win situation for all the entities. The soft position strategy regards the 'other' as a friend, and therefore the negotiating party is likely to yield or succumb to the entity. By contrast, the hard position strategy regards the entity as an enemy. Thereby, it accomplishes the negotiation purposes through threats or ultimatums. Meanwhile, the principled model enhances interest for all parties and overcomes the limitations of both the soft and hard position models[2]. The principled negotiation model regards the other entity as a rational and joint problem-solver rather than a friend or enemy. The cause of failure in the denuclearization negotiation between the US and the DPRK is that both parties have adopted the hard position model.

Table 1. Roger fisher and william ury's negotiation model.

	Soft	Hard	Principled
Recognition of the other	Friends, trust	Adversaries, mistrust	Focus on problem-solving by enhancing interest for both parties
Negotiation purpose and aims	To agree, concede generously	Final victory, reluctant concession	Mapping out policy options for mutual interest.
Relations	Concession for good relations	Demand concession	Separating the people from the problem.
Attitude towards the other	Soft. consideration for the other	Hard, stick to my position	Stressing objective criteria
Bargaining	Retraction of ultimatum,	Threats & ultimatums	

The purpose of this chapter is to review denuclearization talks between the US and DPRK and map out policy alternatives for South Korea by analyzing Trump's strategy toward the DPRK. To this end, the next section evaluates the shortcomings of the US negotiation strategy abide by the Roger Fisher and William Ury's negotiation methodology. Part III reviews South Korea's responsible role in a satisfactory negotiation. Part IV suggests policy recommendations for achieving verifiable denuclearization on the Korean Peninsula. The conclusion proposes policy alternatives for South Korea amid strategic changes between the US and DPRK.

2. Analysis of US Negotiation Strategy

Persuading the DPRK Regime to give up its cherished nuclear weapons is difficult and by no means an endeavor with a certain outcome. South Korean observers and policy advisors are divided between leftists who think that North Korea will give up its nuclear weapons if outside conditions are satisfactory and rightists who think that the DPRK regime will not give up its nuclear weapons[3]. It is uncertain whether China and Russia will participate actively in the denuclearization of the DPRK. Of grave concern is that China and Russia would rather diminish US influence on the Korean Peninsula than contribute to complete denuclearization of the DPRK. In terms of the DPRK regime, its identity as a nuclear weapon state is closely connected with the legitimacy of Kim Jong-un. The only way North Korea could win a war against the US imperialist is by possessing nuclear weapons[4]. As a result, through possession of such military resources, Kim Jong-un can garner support from his people[5]. Thereby, he can manage regime security. North Korea's nuclear weapons are not just an instrument of domestic security, they are also a means to achieve its strategic goals beyond the Korean Peninsula.

US intelligence estimates have pointed out that the DPRK has enough fissile material for up to 60 nuclear warheads. The US tries to maintain a favorable geostrategic position by imposing costs on the DPRK for possessing nuclear weapons by separating North Korea from the international community with economic sanctions. President Trump's negotiation strategy is also based on realism which stresses power. The US tries to eliminate the threat posed by North Korea's ICBMs to America and its allies. However, Kim Jong Un appears willing to engage in limited opening and threat reduction in exchange for economic benefits; while at the same time he is keen to retain the DPRK's status as a nuclear weapon state[5].

The initial stage of negotiation, President Trump has used a "madman strategy" to bring back the DPRK regime to the negotiation table. He has pressured the DPRK regime by saying that it will face fire and fury. He has offered economic assistance and sanction relief if the DPRK accepts complete denuclearization. After Trump's "Fire and Fury" remark, the Korean People's Army's Strategic Force threatened to fire an array of long-range missiles at the surrounding waters of the U.S territory of Guam. The DPRK's scope and depth of bolstering its nuclear deterrent will be properly coordinated by the US hostile policy toward the DPRK. Negotiation between the US president and a North Korean Chairman may carry substantial risks[6]. Mr. Trump's madman's strategy induced the regime to the negotiation table, but there is still no tangible outcome over denuclearization despite several summit talks between the two sides[7].

At his inauguration, President Trump regarded the DPRK as a target for destruction and ridiculed Kim Jong Un as a little Rocketman, in a like manner to President George Bush including the DPRK in the axis of evil in 2002. The Obama administration's relatively benign policy towards the DPRK had been met with long-range missile and nuclear test while Pyongyang continued to enjoy economic support and compensation. "Strategic patience" towards the DPRK meant that in practice North Korea would no longer be rewarded for bad behavior, but instead would be ignored. With good reason, therefore, the first element of US policy is distrust. Second, in terms of the official US position in negotiations(not to be confused with interests), the stated aim has always been to achieve CVID. To this end, the US has pressured the DPRK regime with economic sanctions and military threats. However, the US has also, often taken a flexible attitude in dealing with the DPRK. For example, the Leap Day Deal stipulates the freezing of the DPRK's nuclear activity, rather than absolute CVID.

Third, in terms of relations, the US has continued to engage the DPRK in a diplomatic relationship focusing on denuclearization talks, even while facing extreme provocation from the other. For example, the Clinton administration reached a missile agreement with the DPRK in 1999 through sustained diplomatic effort, despite North Korea's continuous provocation of a nuclear test and the test-firing of missiles. In the wake of the DPRK's second nuclear test, the Bush administration kept on negotiating with North Korea despite of bad relations with the DPRK regime. In 2009, when Obama was inaugurated as President, he tried to end the DPRK's nuclear program with negotiation. Four months later, the DPRK proved its advanced nuclear capability, but Obama persevered with efforts to reach an agreement through dialogue. Fourth, in terms of negotiating attitude, the US remains firm towards the DPRK on its CVID stance. To this end, the US took a hard-line policy of sanc-

tions on the DPRK regime to force acceptance of CVID[8]. The US negotiation practice is interspersing dialogue with sanctions. The US is open to dialogue, but it imposes sanctions on provocation. Before the Stockholm working-level talks, the US executed test-firing of an LGM-30 Minuteman to coerce the DPRK.

As the DPRK's missile and nuclear capability strengthened, however, President Trump focused on his interests in negotiations with the DPRK, corresponding to his transactional leadership, rather than taking a hard, positional stance related to CVID. Fifth, the US puts pressure on the DPRK to draw concessions through military threats and ultimatums. The US policy of pressure is executed through unilateral executive orders, as well as through the United Nations (UN) and other international organizations. From Bush to the Obama administration, the US has adopted a carrot-and-stick policy in turn to induce the DPRK to scrap its nuclear weapons program. Carrot policy implies increasing humanitarian assistance by relieving economic sanctions. Meanwhile, stick policy implies putting military options on the table and strengthening economic sanctions.

Before the working-level talks in Stockholm, the US treasury department put three North Korean hacking groups on the sanction lists; the Lazarus Group, BlueNorOff, and AndArial. This was because they were executing cyber-attacks on foreign governments and financial institutes to assist Pyongyang's fund-raising for its weapons and missile programs[9]. Trump showed a degree of conciliation in guaranteeing the DPRK regime security before the third submit talks, but he also maintained sanctions on North Korea, reflecting the carrot-and-stick approach.

Creative US solutions in the walking level talks in Sweden included that if the DPRK regime scraps all its nuclear programs, the US might allow the export of coal and textiles. Thus, if the DPRK met the US demand, the US was willing to relieve economic sanctions and allow humanitarian economic assistance[10]. Also, the US raised the possibility of signing the end-of-war declaration. However, the deal was undermined by a lack of trust between the US and North Korea. After the submit talk, North Korea pointed to the absence of reciprocal measures from the US, corresponding to the DPRK's series of denuclearization activities. They suggested that the US did not adhere to promise regarding stopping US-South Korea military drills, signing a peace agreement, and relieving sanctions. The US suggested 4th submit talks between the two countries but the DPRK would not accept it if there were no US reciprocal measures. North Korea's official newspaper, Rodong Sinmun stressed that "If we concede to an imperialist's demand with fear, we may perish".

Trump have elevated personal outreach with Kim Jong Un to a level far beyond that of their predecessors. In not sticking rigidly to a denuclearization first position, Trump has tried to show a conciliatory attitude by firing his security advisor John Bolton who was advocating a "Libyan Model" of regime transition. From the outset of denuclearization talks between the US and North Korea, Kim's public denuclearization promises have been conditional and vague. Therefore, President Trump has shown his willingness to accept the DPRK's denuclearization way of step by step if the DPRK regime agrees with the end state of complete denuclearization.

However, North Korea demanded more concessions from the US and succeeded in test-firing large -diameter multiple rocket launchers with a range of more than 370km. On November 1, 2019, the US then returned the DPRK regime to the list of the "state sponsor of terrorism." Once labeled a "state sponsor of terrorism," North Korea loses all access to support from the World Bank.

The US' definition of denuclearization involves the scrapping of the DPRK's nuclear arsenal and program, which is radically different from the DPRK's understanding which involves the removal of the US nuclear umbrella including conventional forces on the Peninsula. President Trump's primary concern is to be seen as a successful statesman through the progress of denuclearization of the DPRK at the same time as revitalizing the domestic economy. Trump wanted to show the world that, unlike previous US presidents, he could strike an unparalleled nuclear deal with Kim Jong Un.

President Trump is appealing to his voters by upholding his handling of denuclearization talks with the DPRK by expressing intimacy with Kim Jong Un who halted nuclear testing and test-firing of IC-BMs[11]. The two sides have to show real flexibility in their actions, not merely in their words. The DPRK has to take more tangible steps for denuclearization beyond the symbolic dismantling of an old test site, and the US must consider partial relaxation of sanctions in response.

3. A Responsible Role for South Korea

The US and South Korea hold different views on how best to approach the denuclearization of the DPRK, although both sides agree on the end state of complete denuclearization. South Korea foreign minister Kang Kyoung-wha has suggested that the US needs to delay in wrapping up disablement and documenting ways to verify the North's declaration to induce denuclearization. In response, the US has flatly rejected Kang's idea saying that final fully verifiable denuclearization (FFVD) is the ultimate goal of the US[12]. The South Korean government further shows the tendency to prefer conciliatory approaches in negotiations[13].

After the three leader's meeting at Panmunjom, the DPRK regime tried to implement direct negotiations with the US by excluding South Korea. South Korea has to put a priority on denuclearization rather than economic cooperation with the DPRK. The US must not send a signal to the DPRK regime that the US may tolerate the DPRK's possession of nuclear weapons if it defuses any threat to the US mainland. South Korea and the US have to maintain their stance that the denuclearization of the DPRK is the only option. If they relieve economic sanctions on the DPRK, they may miss the chance for the denuclearization of North Korea, which, following the sixth and most powerful nuclear test, which created a magnitude-6.3 tremor, has become ever-more imperative. Imperfect denuclearization may pave the way for Pyongyang to possess nuclear weapons indefinitely. This may hand the DPRK regime the strategic initiative on the Korean Peninsula, which, in turn, may lead to South Korea and Japan developing nuclear weapons.

This section suggests a negotiation strategy for South Korea with 4 principles which are based on Fisher and Ury's theory of negotiation. First, for the rational solution of the negotiation, the South Korean government has to differentiate issues from actors. Second, we need to focus on benefits or interests rather than positions. The positions taken in the negotiations must reflect the central interest or purpose, that of denuclearization, rather than political interests, which may be just a modified populism. Third, we need to focus on the benefits of a denuclearization settlement between the US and North Korea. If the denuclearization negotiations between the US and North Korea are concluded and the DPRK agrees to complete denuclearization, economic cooperation between the two Koreas will be accelerated and it will be a win-win situation for both parties. Once the Yongbyon nuclear facilities are verifiably dismantled, and Mount Geumgang tourism and Kaesong Industrial Complex operations are resumed, the rest of North Korea's nuclear facilities will be gradually abolished, and sanctions relieved through negotiations between the US and North Korea.

Fourth, in the process of denuclearization talks, South Korea has to keep consistency based on objective criteria. Sanctions may be lifted if North Korea sincerely reciprocates South Korea's principled requests <Table 3>.

Table 3. Concept of engagement and coerce adopted by US president[14].

	Trust and wait	Doubt and verify
Engage	Trust and engage dovish engagement The Clinton administration (1992-2000)	Engage and verify conditional engagement The George H.W. Bush administration (1988-1992)
Coerce	Coerce and wait strategic patience The Obama administration (2009-2017)	Coerce and verify comprehensive coercion The George W. Bush administration (2000-2008); The Donald Trump administration(2017-2020)

A principle-centered deal with the DPRK would include specific steps to eliminate its arsenal of nuclear weapons, verify against cheating and guarantee North Korea's security. The underlying security interests are clear from the avowed positional declarations and actions coming out of Pyongyang. In 2017, North Korea achieved the breakthrough of developing an ICBM that could strike the US main-

land, to deter what it saw as a US security threat[15]. In May 2020, Kim Jong Un stressed that he would further bolster his country’s nuclear deterrence capabilities in response to the US’ nuclear threat. Thus, the only way that North Korea’s nuclear weapons, uranium enrichment capabilities, and ballistic missile capabilities can successfully be addressed is through the principle-centered negotiation model of Roger Fisher and William Ury, rather than the more coercive approaches which will only contribute to the “security dilemma.”

4. Policy Recommendations

The Author would like to propose a three-phase roadmap for denuclearization on the Korean Peninsula <Table 4>.

Phase I: The DPRK should agree with a final stage of denuclearization before implementing phase by phase denuclearization. The three nations of South Korea, North Korea, and the US, need to gather a consensus on the definition of denuclearization of the Korean Peninsula.

Phase II: The US and South Korea have to compensate the DPRK for the sequential scrapping of its nuclear program. Exemptions from UN sanctions should have snapback provisions in case Pyongyang is caught cheating.

Phase III. Complete exemption from economic sanctions and the extension of a security guarantee towards the DPRK in return for the actual dismantlement of nuclear weapons and facilities.

Table 4. Three-phase roadmap for denuclearization of Korean peninsula[16].

Concerned parties objectives and goals of different stages		North Korea	International community
Three-phase roadmap for verifiable denuclearization of Korean Peninsula	1 st Phase: Defining denuclearization of the Korean Peninsula among South Korea, the US, and North Korea	<ul style="list-style-type: none"> - The DPRK should agree with a final stage of denuclearization before implementing phase by phase denuclearization - Suspension of the DPRK’s tests of nuclear weapons and ICBMs. - Discontinuance of and freeze on all nuclear facilities 	<ul style="list-style-type: none"> - Suspension of South Korea-US military drills. - Banning of the US strategic military asset near the Korean Peninsula
	2 nd Phase: Sequential dismantlement of the DPRK’s nuclear weapons and facilities	<ul style="list-style-type: none"> - Scrapping of the DPRK’s nuclear program on a sequential basis. - IAEA inspections of nuclear facilities - DPRK’s agreement to IAEA inspection of its past activities. 	<ul style="list-style-type: none"> - Partial sanction lift corresponding to the DPRK’s scrap of its nuclear programs. - Snapback provisions in case Pyongyang is caught cheating.
	3 rd Phase: Complete lifting of economic sanctions and extension of security guarantees	<ul style="list-style-type: none"> - DPRK’s actual dismantlement of its nuclear weapons and facilities 	<ul style="list-style-type: none"> - Complete for lifting of sanctions and extension of security guarantees to the DPRK. - Normalization of diplomatic relations between US-DPRK, Japan-DPRK[17] - Joint Korean peninsula denuclearization agreement registered with UN Secretariat

5. Conclusion

The denuclearization of North Korea is a vital issue for the security of Northeast Asia and has been the subject of several rounds of international negotiations held in an attempt to solve this problem. It will take a significant amount of time and risk to denuclearize the DPRK through the process of verification methods[18][19][20].

This chapter has analyzed the negotiations between North Korea and the US by applying Fisher and Ury's negotiation model theory. The findings are that the most important thing is to get political consensus among the three parties of South Korea, North Korea, and the US on the final stage of

denuclearization. Based on Fisher and Uray's negotiation model theory, the chapter has introduced a negotiation strategy to carry out denuclearization of the DPRK based on principled negotiations. North Korea is trying to discuss the issue directly with the United States, excluding South Korea in the process of denuclearization negotiations

South Korea should lead the establishment of a partnership between mini-multilateral cooperation systems that can complement the South Korea-US alliance which is the core of Korea's alliance strategy in the 21st century. This includes regional middle power countries such as Australia, Indonesia, and India. The ROK-US alliance is a valuable value alliance that has maintained the survival and prosperity of South Korea for the past 70 years, but it cannot be eternal. Thus, the ROK must strengthen its capability along with efforts to build trust and to strengthen the South Korea-US alliance[21]. The negotiation process for the denuclearization of the Korean Peninsula may take a long time and may not be smooth due to the actors' conflicting interests. Therefore, South Korea, North Korea, and the US have to come up with a specific and definitive meaning of the denuclearization of the Korean Peninsula and agree upon it. In the process, South Korea should be able to present a credible denuclearization roadmap that can draw up a consensus between North Korea and the United States.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Author	SL	<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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The Enlightenment to CHINA from the Investment and Operation of the South Korean PENSION INSURANCE FUND

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Abstract

Purpose: The pension insurance fund serves as the lifeline for a majority of Chinese people due to its close connection with people's personal interests.

Method: The increasing severity of becoming an aging society, compounded with the requirement of preserving and increasing the value of the basic pension insurance fund, has made the investment and management of the pension insurance fund especially important.

Results: With more than 30 years of experience running a pension insurance fund, South Korea(ROK) has implemented a set of standardized investment policies for pension insurance investment, together with an actuarial mechanism, boasting relatively high transparency in terms of information disclosure. This study analyzes the actual effectiveness of investment policies and operation efficiency of the ROK pension insurance fund. Subsequently a summation and assessment of the fundamental features and experiences in its operation and investment are provided.

Conclusion: This paper then produces insights and advice on reforming and optimizing the investment and operation of the Chinese pension insurance fund, in hopes that these suggestions can play a positive role in supporting the sustainable, healthy development of the pension insurance fund in China.

[Keywords] Pension Insurance Investment, ROK's Pension Insurance System, Chinese Pension Insurance Fund, Operation of the Pension Insurance Fund, Investment Model

1. Introduction

The institution of pension insurance is regarded as a social safety network that ensures an individual's quality of life in the future. The ROK's pension insurance system has been in operation for over three decades. According to the ROK's Statistics Korea, pension insurance was extended to 22.21 million people at the end of 2019, thus boosting its coverage rate to over 70%^[1]. Moreover, in comparison to other countries, the ROK established its pension system rather late and has steadily become engulfed in the trials of having an accelerated aging society and a declining birth rate. These factors have coalesced, resulting in mounting pressure on the operation of the pension insurance fund. Therefore, the Korean government determined to explore countermeasures to stabilize the pension insurance fund. For the purpose of higher efficiency in operation and management of this fund, the National Pension Service was established as an independent organ in September 1987. According to the Law on Pension Insurance, the target of running the pension insurance fund is to pursue long-term yields. Such an objective raises requirements on the profitability, stability, public interest, mobility and independent operation of the insurance fund. Additionally, its asset operation must be transparent and efficient. Every five years, the relevant authority produces a Medium to Long-term Alloca-

tion Plan that clarifies the targets and strategies involved in asset allocation, prevention benchmarks, various mechanisms and specially engaged associated agencies that are at play in the medium to long run. The periodic review has greatly boosted the efficiency of investment management. By the end of 2019, the accumulated scale of capital in the pension insurance fund reached \$6.2 billion and the operation yields in 2019 were \$6.2 billion with a return rate of 11.33%^[2]. When considering the operational scale of pension insurance funds found in other countries, the ROK ranks behind Japan(GPIF, US\$ 1.37 trillion)¹ and Norway(GPFG, US\$ 982 billion)².

As the size of the pension insurance fund in the ROK has continued to expand, the government has placed greater focus on investment management because the reserve fund is relevant not only to financial sustainability and benefits accessed by participants, but also to the generational fair share of burden. This reserve fund can even indirectly impact overall national economic development^[3].

The Chinese pension insurance system has entered a critical stage yet is still plagued by an unsolved issue, namely financial sustainability. An inadequate ability to preserve and increase value as well as guard against risks presents a substantial challenge^[4]. There has been continued attention paid to overcoming major challenges, such as how to build up a highly efficient investment and management system and how to preserve and increase fund value. This paper likewise delves into the process and results of the ROK pension insurance fund, particularly in terms of its investment and operation^[5]. Furthermore, this study analyzes characteristics of investment and management policies and distills the relevant lessons to be considered from its methods of investment and operation. Finally, targeted policy recommendations for the investment and operation of the Chinese pension insurance fund are provided.

2. Brief on the ROK Pension Insurance Fund

In 1986, the ROK government introduced the Law on Annuity and officially implemented its annuity scheme in 1988. The model underpinning the ROK pension insurance scheme is based on benefits with fund payment risks undertaken by the government from the retirement to death of a participant, who could access the pension income annually. As for the balance of the pension insurance fund, the fund income is derived from premium contributions collected from participants, along with returns on investment; expenditures are composed of payments dispersed to pension collectors and management fees. In 2019, the total fund revenues reached 121.3 trillion Korean won, including 47.8 trillion won for premium revenues(39.3%) and 73.4 trillion won for returns on investments and operations(64.7%). With regards to expenditures, the total amount in 2019 was 23.4 trillion Korean won, including 22.7 trillion Korean won for payments to collectors and an additional 600 billion Korean won for management fees. By 2019, the accumulated pension insurance fund was 97.9 trillion Korean won <Table 1>.

Table 1. Statistics on the size of revenues and expenditure of the ROK pension insurance fund 2010-2019(Unit: 100 billion Korean won, %)^[1].

Scale \ Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total income	351	393	438	484	531	582	646	830	385	1213
Growth rate(%)	10.8	10.7	10.3	9.5	8.9	8.8	9.9	22.2	- 115.6	68.3

¹ Source of data: www.gpif.go.jp/.

² Source of data: <https://www.nbim.no/>.

Revenue from premium	243	270	301	332	366	364	390	417	443	478
Return on investment	108	122	136	151	164	217	245	411	58	734
Total expenditure	60	70	83	96	110	151	176	197	213	234
Growth rate(%)	15.0	14.3	15.7	13.5	12.7	27.2	14.2	10.7	7.5	9.0
Distribution	56	66	78	91	105	151	170	190	207	227
Management fee	3	4	4	5	5	5	5	6	6	6
Accumulated scale annually	291	322	355	388	421	431	470	640	178	979

3. Overview of Investment Policies for the ROK Pension Insurance Fund

3.1. Management model for the ROK pension insurance fund

The law stipulates that the ROK pension insurance fund should be managed in a centralized way that is directly under the government's control. It is in this way that the government establishes social insurance agencies responsible for managing and executing social insurance affairs in a unified and centralized manner. The Ministry of Health and Welfare oversees the operation of the pension insurance scheme and the formation of relevant policies. Apart from that, it also acts as the decision-maker overseeing numerous aspects: the pension insurance scheme's arrangement, standards for charging premiums, benchmarks for pension collection and distribution, plans related to fund operation, and unified management of the pension insurance fund and information. In addition, the Ministry of Health and Welfare supervises relevant work across different localities.

The National Pension Service(NPS) is overseen by the minister of Health and Welfare as a special legal entity that is tasked with comprehensively conducting business related to pension insurance. That business not only covers accepting and executing fund management, the preservation and increase of value, collection of pension insurance premiums, the fixing of pension remuneration and distribution, and the managing policy holders, but also includes evaluating policies, operating funds, and analyzing financial trends for said funds.

To ensure transparency and high efficiency in running assets in the pension insurance fund, Provision 105 in the Law on Pension Insurance lays out plans on annuity operation, which serves as a basis for the Ministry of Health and Welfare to determine detailed plans about fund operation annually. This also allows the ministry to produce an investment policy statement. NPS accepts the entrusted business of fund asset operation from the Ministry of Health and Welfare. Therefore, as a trustee, it allocates assets, manages risk, conducts business operations and assesses results according to criteria highlighted by the investment policies.

3.2. Investment policies for the pension insurance fund

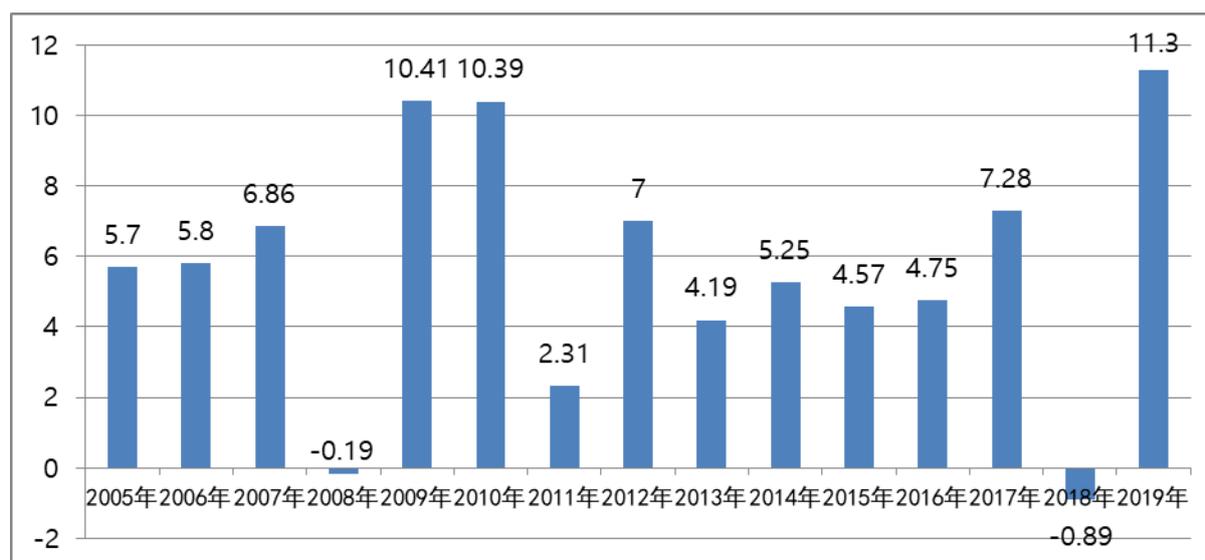
In terms of investment policies for the pension insurance fund, the Law on Annuity in the ROK calls for the adoption of an investment model that combines direct investment and entrusted investment for increased financial sustainability. In advantageous areas, direct investment is preferred, whereas entrusted investment prevails in areas without advantages or products at a higher management cost[6]. A Medium to Long-term(Five years) Asset Allocation Plan is produced every five years, with the latest plan running from 2020 to 2024. In this most recent iteration of the plan, the Fund Operation Committee under the NPS aims to achieve financial sustainability for the pension system and improve the rate of return on investments on a continual basis. Viewing the matter of economic growth rates, price increases and other relevant factors as a unified whole, the committee has made stocks, entrusted investment and

alternative investment as major targets for NPS investment. As for the investment scale, there has been a continual increase in the ratios of stock investment and entrusted investment, while the proportion of bond investment conversely has diminished over time. Securities in detailed asset allocation plans are comprised of stock(over 30%), bonds(around 60%), and alternative investment(above 10%), among which overseas investment accounts for more than 30%.

4. Characteristics for the Investment and Operation of the ROK Pension Insurance Fund

Since 1988, the ROK pension insurance fund has introduced marked-based investments and operations. Considering that the basic feature of a national pension scheme is that it should cover all citizens, the government further emphasizes the importance of the preservation and increase of its value. NPS statistics detailing the pension insurance fund’s performance reveal that from 2005 to 2019, the average annual rate of return on investment reached 5.65% as shown in <Figure 1>. Since the rate of return for fund investment is higher than the inflation rate, excess earnings have been accrued.

Figure 1. Rate of return on investment for the pension insurance fund in the ROK 2005-2019(%)^[1].



4.1. Adopting an investment model combining direct investment and entrusted investment

To raise the rate of return on investment, the ROK pension insurance fund has adopted an investment model combining direct investment and entrusted investment. At the same time, the proportion of entrusted investment has been expanded in terms of fundamental investment orientation, investment types and operation scope. To better ensure the system’s fairness, rationality and transparency, the ROK has continuously improved upon and supplemented the selection, cultivation and management of entrusted companies.

There are three stages involved in the operation process for entrusted investments. First, investment strategies and plans must be formulated. The Fund Operation Committee sets the basic direction for operating entrusted investments annually, which also details the types of entrusted assets and investment proportion. Based on the initial plans formed by the committee, an additional annual investment and operation plan are also produced. Second, entrusted companies to execute the fund investment and operation plan are selected. The fund operator

selects and manages entrusted companies according to asset types. Furthermore, the operator reviews proposals, conducts on-site visits and conducts interviews to determine which company will be responsible for implementing fund investments and the operation plan. Follow-up performance evaluations are conducted with the entrusted companies every six months, which will determine decisions on investment follow-up or withdrawal. Third, post-event management is introduced. Post-event management is performed on entrusted companies to assess their regular business reports. An evaluation is made by external professional agencies that will make use of information from internal electronic systems. Moreover, the department that runs these funds will often check operation results as well as a company's compliance with investment plans. If an entrusted company violates the investment plan, it must submit an explanation and provide relevant information in regular evaluations that include operation results and compliance with the contract, which is checked every six months. Assessments are determined with help from this information and serves as a reference for decisions on whether increase or withdraw allocated capital shares.

In the case of domestic stock investments in the ROK, direct investment tends to focus on an index investment strategy, whereas an entrusted investment tilts towards a proactive investment strategy[7]. Since direct investment is conducted internally within the NPS, it lacks liquidity and suffers from long investment cycles. Despite the potential for higher yields associated with a proactive investment strategy, the only choice for internal investment is an index investment[8]. Market efficiency is quite low because internal investment has no special investment methods or techniques[9]. As the business performance evaluation is dependent on the operator's internal direct investment to some extent, fund investment must follow an index investment strategy. On the other hand, entrusted investment is conducted by specially entrusted companies that deploy external investment experts who have diversified knowledge and investment strategies for asset operation[10]. The advantage of proactive investment is its high liquidity, which is due to the expanded investment ratio of medium-and-small stocks. In addition, its investment yield exceeds direct investment. Thus, it plays a crucial role in promoting the overall development of the financial market. From the perspective of stock types in an entrusted investment, such an investment tends to continuously expand the proportion of growth enterprise market, investment with social responsibilities, SME stocks and long-term investment, while gradually reducing investment in shares of large enterprises; The intention here is to improve stability in its portfolio of securities and assets by breaking out of its own restricted domestic capital market and diversifying international investments[11]. In the first half of 2019, the domestic stock investment was 120.3 trillion Korean won, accounting for 17.3% of the total investment in the financial sector, an increase of 11.4 trillion Korean won compared to 2018. As for the ratio of direct investment to entrusted investment, direct investment in stocks stands at 65.6 trillion Korean won(54.5%) and entrusted investment in stocks is 54.7 trillion Korean won(45.5%) as shown in <Table 2>.

Table 2. Statistics on investment of the ROK pension insurance fund[1].

Scale and yield		2016			2017			2018			First half of 2019		
		Size	Ratio (%)	Yield (%)	Size	Ratio (%)	Yield (%)	Size	Ratio (%)	Yield (%)	Size	Ratio (%)	Yield (%)
Total investment size		5582	100	4.76	6216	100	7.28	6382	100	-0.89	6996	100	7.15
Domestic bonds (100 billion Korean won)	Total	2793	50.0	1.83	2893	46.6	0.51	3109	48.7	4.82	3482	50	2.93
	Direct	2453	44.0	1.80	2545	41.0	0.49	2730	42.7	4.81	2775	39.8	2.92
	Entrusted	339	6.1	2.04	348	5.6	0.63	379	5.9	4.88	404	5.8	3.01

Foreign bonds (100 billion Korean won)	Total	232	4.2	3.66	232	3.7	3.37	265	4.2	1.51	303	4.4	9.71
	Direct	101	1.8	3.41	104	1.7	3.24	108	1.7	1.49	124	1.8	9.87
	Entrusted	130	2.3	3.89	127	2.1	3.48	157	2.5	1.51	178	2.6	9.60
Domestic stocks (100 billion Korean won)	Total	1024	18.3	5.64	1315	21.2	26.31	1089	17.1	-16.90	1203	17.3	6.97
	Direct	548	9.8	9.99	712	11.5	28.38	588	9.2	-16.73	656	9.4	7.97
	Entrusted	476	8.5	1.02	602	9.7	23.91	500	7.8	-17.08	547	7.9	5.80
Foreign stocks (100 billion Korean won)	Total	856	15.3	6.89	1082	17.4	24.89	1128	17.7	-9.52	1453	20.9	20.27
	Direct	281	5.0	7.72	370	6.0	2.87	404	6.3	-7.98	529	7.6	21.28
	Entrusted	574	10.3	6.48	711	11.4	25.89	724	11.3	-10.34	924	13.3	19.7
Alternative (100 billion Korean won)		636	11.4	9.99	668	10.8	4.53	766	12.0	11.8	803	11.5	4.2
Short-term capital (100 billion Korean won)		34	0.6	2.02	17	0.3	0.35	21	0.3	2.43	14	0.2	1.05

4.2. Gradually increasing the proportion of foreign investment

Starting from 2005, the ROK has been investing in foreign bonds, with American treasury bonds being its primary target. The intention here is to improve stability in its portfolio of securities and assets by breaking out of its own restricted domestic capital market and diversifying international investments[12]. Initially, the ROK mainly considered two factors in overseas investment: 1. The number one target is the U.S. because, compared to other countries, the U.S. boasts a developed and stable financial market where stable yields are guaranteed. 2. The top asset for overseas investment is bonds, which are prioritized due to their status of being a relatively safe asset for investment when knowledge about outbound investments was insufficient. Thus, bond investment became a necessary choice. After 2-3 years of outbound investment (mainly in U.S. bonds), the ROK gradually reduced the proportion of investment in the U.S. treasury bonds but increased its share of debenture bonds such as corporate bonds. At the same time, it expanded investment into bonds related to other currencies including the euro, yen and yuan. In June 2019, U.S. bonds took the largest proportion in the ROK outbound investment in bonds, amounting to 41.9%, followed by Europe(30.9%) and Japan(17.1%). In addition, investment in foreign stocks remains in its initial stage and the mixture gives the highest proportion to the U.S. stocks(57.5%), followed by Europe, Japan and other Asian countries. According to the Medium-term Assets Allocation Plan(2020-2024) formed in 2019, investment will be further diversified in the next five years. And it is estimated that in a certain period into the future, diversification will be realized in outbound investment whose scope will be gradually expanded to cover emerging countries so that outbound investment could take over 33% in the pension insurance fund[13].

4.3. Tapping into advantages of alternative investment to diversify investment methods

In contrast to conventional investment in stocks and bonds, alternative investment is characterized by being both high risk and high yield. Presently, alternative investment is mainly targeted at real-estate development, major construction, risk investment, restructuring corporate investment, private equity and resource development[14]. Capital tied to alternative in-

vestment primarily comes from yields on long-term investment, making it well suited to fund investments with abundant liquidity such as a pension insurance fund[15]. Different from conventional investment in stocks and bonds, alternative investment has the potential to generate super yields. In recent years, the weight of alternative investment attracting capital from the pension insurance fund in the ROK has seen a steady increase. Moreover, in the first half of 2019, the scale of alternative investment was 80.3 trillion Korean won, an increase of 3.7 trillion Korean won against 2018, and the rate of return reached 4.24%. The proportion of foreign alternative investment(70%) outstripped that of domestic alternative investment(30%).

4.4. Actively applying the actuarial mechanism

Every five years, the ROK government checks the financial status of the pension insurance fund and predicts pension payment levels for the following years so as to identify problems in a timely manner and improve the pension insurance system accordingly[16]. In addition, to mitigate the burden of future pension payments and seek long-term financial stability, the ROK government will gradually reduce the payment rate of the pension insurance fund and delay fund exhaustion by improving the regime. Since the first actuarial report was released in 2003, three additional actuarial reports have been made public; those from 2008, 2013 and 2018. The reports have a measurement cycle of 70 years and calculates revenue, expenditure and exhaustion of the pension insurance fund based on institutional parameters and presumptions about the macro-economy. The 2018 actuarial report shows that in the next 20 years, the ROK pension insurance fund could enjoy revenues exceeding expenditures. However, the accelerating aging society might topple the balance in 2030 when expenditures will exceed revenues. In addition, the accumulated balance of the pension insurance fund is predicted to run dry by 2057.

Based on calculated results, long-term financial stability for the pension insurance fund could be fully analyzed as a way to support governmental reform and adjustment of the pension insurance system[17].

5. Recommendations on Optimizing the Investment and Operation of the Chinese Pension Insurance Fund

As an important component of the Chinese social security system, the pension insurance scheme has played a crucial role serving as the safety valve in social and economic development. In 2019, the total revenues for the Chinese basic pension insurance fund reached 5.7026 trillion yuan and the total expenditures were 5.2342 trillion yuan. By the end of 2019, the accumulated balance for the basic pension insurance fund was registered at 6.2873 trillion yuan[18]. Recently, the Chinese pension insurance fund has enjoyed surplus revenues against expenditures, with a continuously enlarging accumulated balance. In addition, China is reforming and improving the investment and operation system for its pension insurance fund. This paper makes several proposals concerning the investment, operation and management of the Chinese pension insurance fund with lessons drawn from characteristics of the ROK pension insurance fund.

5.1. Adoption of an efficient management mechanism for entrusted investment is conducive to raising the rate of return for the pension insurance fund

The primary principles upheld by the Chinese pension insurance fund are safety and security, out of which two lines of management flow; one for revenues and the other for expenditures. Special funds are dedicated to specifically designed purposes and used as employee pension insurance. A reserved balance equivalent to two-month's pay should be all channeled into purchasing bonds or deposited in special accounts. Investment in other financial vehicles or enterprises is prohibited[19]. However, due to capital market development, an aging society

and the expanding fund scale, it is better to diversify a portion of the pension insurance fund by transferring to investment management companies with access qualifications[20]. This constitutes an effective solution to the problems facing the Chinese pension insurance. The ROK's experience with their pension insurance fund proves that it is necessary for funds in personal accounts to be transferred to fund companies or special investment agencies in order to realize a more fruitful investment and operation results. By applying a strict approval scheme and qualification affirmation mechanism to select the trustee, investment with higher risks is entrusted to specialized managers. Whereas, assets with lower risks, such as bonds, might be directly invested by the social security and insurance agencies. This type of capital allocation system will better disperse investment risks and bring in a higher rate of return.

5.2. Engagement in the capital market is a rational choice for the investment of the pension insurance fund

The ROK pension insurance fund has been engaged in the capital market through a combination of entrusted investment and direct investment, which plays a decisive role in pushing up the rate of return on investment[21]. Moreover, market-based investment is beneficial to optimizing the investment portfolio and raising the investment return rate. Investment in the ROK is so dispersed that it is not bound by the bond market or stock market but extends into domestic and overseas markets. Learning from the ROK experience, the formulation of investment policies for the pension insurance fund in China is expected to move beyond deposits or treasury bonds and enhance its operation width and depth in the capital market. In the bond market, municipal bonds issued by local governments should be purchasable, and in the stock market investment in blue chip stocks in the Shanghai Stock Exchange and Shenzhen Stock Exchange might be tested. This could be followed by investment in the Shanghai-Hong Kong Stock Connect Project and the Shenzhen-Hong Kong Stock Connect Project and eventually the foreign capital market.

In addition to this, China should establish and improve the regulatory mechanism for fund investment in order to strengthen supervision and improve management of social insurance agencies, investment managers and other fund operators. Chinese laws are intended to make explicit clarification on relevant regulations and rules to ensure investment regulations are authoritative and effective[22]. Furthermore, it is necessary to establish a specialized institution to fend off investment risks and take charge of risk-prevention so that risks can be identified promptly and asset loss induced by investment risks be reduced. The final point is to make the regime of information disclosure stricter for the investment and operation of funds as this makes public monitoring over the operation of the pension insurance fund more efficient.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Author	SL	<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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The Effect of Integrated Art Play Utilizing SAFETY-Related Picture Books on the Understanding of Stories of Children with Disabilities

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Abstract

Purpose: The integrated art play using safety-related picture books is as the effect of structure comprehension and inference comprehension on the safety-related story structure of disabled children is verified, it provides basic data on safety education using safety-related picture books in the future.

Method: The activities were conducted five times a week and a total of 70 times over 14 weeks, and safety-related picture book activities done until week 1 to 7 were presented repeatedly in 8 to 14 weeks. The inspection tool was used by Mikyung Park, which consists of questions from 1 to 10 for story structure comprehension, and questions from 11 to 14 for story inference comprehension. It was scored 2 for voluntary answers, 1 for clue-provided answers, and 0 for non-response, a total of 21 points can be obtained in story structure comprehension, and 16 points in story inference comprehension.

Results: The analysis results showed that all children in the study scored higher in the post-test examination compared to the pre-examination, but in the story reference comprehension, there were children with the same score in the pre-examination and post-mortem examination. In other words, integrated art plays using safety-related picture books were found to be more effective in promoting story structure comprehension than in story reference comprehension for disabled infants.

Conclusion: According to the research results, reading safety-related picture books and then playing integrated art can be seen as helping infants with disabilities improve their knowledge related to safety or problem-solving skills. It also suggests that integrated art play activities, including art, music, and dramatic elements, are suitable ways to help infants with disabilities learn how to solve problems and participate in voluntary activities, and to understand the need for safety and the overall content of the picture book.

[Keywords] *Integrated Art Play, Infants with Disabilities, Story Structure Comprehension, Story Inference Comprehension, Safety-Related Picture Books*

1. Introduction

The nation's economic growth has brought about significant changes in people's lives and at the same time, exposed them to various risks of accidents. Safety accidents are closely related to daily life, and it is impossible to predict when, where, and who, and what form, it will occur. In particular, children with disabilities, who refer to special education subjects, are highly likely to have accidents because they are curious about objects or environments around them due to their developmental characteristics and have difficulties in physical function, athletic ability and self-regulation[1]. According to the Special Education Act on Disabled Persons, etc[2], special education subjects are defined as those who have special educational needs or need education considering their characteristics. This means that compared to ordinary children, they show differences in level of development or achievement ability in physical, communica-

tion, sociality, basic living habits, and cognitive characteristics. To prevent safety accidents for ordinary infants, including children with disabilities, teachers should provide safety education considering the age of the infant and various teaching methods[3]. Furthermore, the lack of adequate safety education at home and the absence of systematic safety education at educational and childcare institutions make it difficult to respond quickly to safety accidents[4]. In response, teachers need to eliminate risk factors around children with disabilities to ensure stability, and continuous safety education at home and institutions so that they can recognize environments or situations where accidents can happen and to develop knowledge and understanding to cope by themselves with not only safety accidents but also to avoid natural disasters and violent crimes. Due to the nature of children with disabilities, their attention is shorter and the ability to perform memory recall is less than that of ordinary infants, so it is necessary to build knowledge and attitudes desirable through repetitive and active hands-on methods based on experience in everyday life rather than simple knowledge transfer[5]. Therefore, by systematically organizing safety education that meets the developmental level and repeatedly executing it with time, story comprehension education that can be acquired[6] through direct and indirect experiences in daily life should be conducted. In this regard, the application of integrated art play, an activity linked to other areas, is effective so that children with disabilities can understand safety-related situations and stories by utilizing familiar safety-related picture books so that they can improve their ability to solve problems according to the situation.

The integrated art play is the 1st stage, safety-related picture book activities(listening to safety-related picture books, brainstorming safety-related experiences, sharing safety-related experiences), 2nd stage, integrated activities(musical, operational, dramatic, artistic), and 3rd stage, expressing and evaluating safety-related situations. This is active for 3 stages, so it is not a one-time or short-term safety education, but will be able to internalize safety concepts while experiencing situations related to safety repeatedly and express safety behaviors when disabled infants encounter safety-related problem situations in real life. Prior research on safety education utilizing integrated art play was conducted as utilizing picture books as school violence prevention education[7], musical drama activities utilizing multicultural picture books[8], integrated safety education[9], and the effect of increase in comprehension of story related to sex on prevention of sexual violence[5]. However, safety education for children with disabilities is currently insufficient. These prior research results can be seen to not only enhance knowledge in certain areas such as sex education, multiculturalism, sexual violence, and school violence, but also emphasize that safety education should be taught to children with disabilities in a specific area directly related to real life increasing the ability to respond in situations. In addition, safety education for children with disabilities should start with: understanding safety-related story structures and inferential thinking about the top 7 standards of school safety[10]. This is because if safety-related stories or situations are simply memorized and used as a learning assessment, it is difficult to solve safety problems and form a life attitude to become a responsible member. Looking at the results of the study on integrated art play for children with disabilities, Jin-ah Park studied about improving the self-expression of children with language development retardation through integrated art therapy[11]. Art activities including fairy tales, art, theater, and play were conducted over a total of 35 sessions, and as a result, scores increased in infant language expression tests, and tests through animal familyization had a positive impact on the increase of self-esteem and creativity. Kyung-hee Yang implemented an integrated art education program for disabled children and presented activities that incorporated literature, music, and theater in 3 stages[12]. In the process of applying integrated art education, children with disabilities have increased their interest in people or the environment and showed various expressions through a wide range of experiences. As such, various forms of research are being conducted in developing and applying integrated art plays that incorporate areas.

In addition, providing children with disabilities with quality picture books alone can provide

safety-related stories, which can improve their understanding of safety-related stories. This is because children with disabilities can recall safety-related content contained in pictures and writings, identify cause-and-effect relationships, and classify information and draw implicated information, acting as a multidimensional concept requiring a variety of cognitive processes[13]. Picture books are the most easily accessible material at home or kindergarten, and can be a useful tool for safety education for children with disabilities, and can lead to potential self-change, helping children with disabilities to potentially distinguish situations even in situations that they do not have the help of parents or teachers[14]. In addition, if linked to integrated activities, the understanding of safety-related stories, safety knowledge, and safety problem solving skills of children with disabilities will be doubled and internalized. Prior research on improving story comprehension using picture books showed effective results as a result of executing discussion activities using fairy tales[15], development and effectiveness of infant picture book reading programs based on their understanding[16], and integrated safety education utilizing fairy tales[17]. However, there is a lack of research on the effects of utilizing picture books on knowledge, technology, and attitude formation on certain areas such as safety for children with disabilities.

Therefore, this study aims to see which effect there is on the safety-related story structure understanding and inference understanding while children with disabilities participate in integrated art play utilizing safety-related picture books containing various safety-related contents. To this end, the following research questions are set out in this study.

Research question 1. What is the effect of integrated art play utilizing safety-related picture books on the safety-related story structure comprehension of children with disabilities?

Research question 2. What is the effect of integrated art play utilizing safety-related picture books on the safety-related story inference comprehension of children with disabilities?

2. Method

2.1. Subjects

10 children in the class of age 3 of the 5 daycare centers specializing in disabilities in P-si, Gyeongsangbuk-do, were selected as research subjects as they are children falling under the following two criteria (child J participated together in the program but was excluded from the study due to severe cognitive impairment).

2.1.1. Selection standard for research subjects

First, children with disabilities who need the help of professional institutions due to difficulties in living with ordinary infants due to differences in specific developmental areas (verbal delay, physical delay, etc) with peers at the age of 3 to 4.

Second, infants with disabilities were selected who were issued a medical certificate through a hospital examination or a welfare card for the disabled according to the state-proposed procedures for registration of the disabled. People eligible for the program and developmental characteristics shall be as shown in <Table 1>.

Table 1. The age and diagnosis of the subject.

Child's name	Birth date	Diagnosis	Developmental characteristics
A	15. 03. 05	Delay in language development	Can use familiar words to describe own experiences related to fairy tales, and even though they have difficulties in saying the exact name of the characters in the fairy tale, they can talk about the names in categories such as 'Ajumma' and 'Rabbit'. Sometimes, the words used by the infant themselves were used (playground-Chitoto etc), and the pronunciation was deteriorated, making it difficult for teachers to understand.

B	15. 04. 30	Delay in language development	Can listen to fairy tales told by teachers, and choose the wrong card when choosing a character card. Have Difficulty in answering their thoughts to teacher's questions voluntarily.
C	14. 12. 22	Delay in language development	Can sit down nicely and listen to fairy tales and speak their own experiences or thoughts in complete sentences. Sometimes they say "I don't know" while playing around even if they know the correct answers to the teacher's questions.
D	14. 10. 02	Delay in language development	Can sit down nicely and listen to fairy tales and when a teacher asks questions about the familiar objects(rabbits, breads) etc from the fairy tales, they can recognize and speak through visual clues, and have difficulties in voluntarily saying their thoughts.
E	15. 08. 20	Delay in language development	Interested in fairy tales and shows high accuracy in questions where the answer is set such as "Yes or No" rather than telling their own experience
F	15. 03. 16	Delay in language development	There were a lot of time where the infant read fairy tales voluntarily because they had high interest in fairy tales. There were difficulties in organizing and telling their thoughts or experiences, but when remembering the character's name or when recalling the situation after just looking at the scene, they often memorized and expressed the lines.
G	15. 09. 08	Delay in language development	Active in all activities and the pronunciation were very deteriorated. They do tell their experiences in sentences, however there are many situations where teachers don't understand. It was efficient to identify the level of awareness of infants when presenting complementary alternative communication data such as picture data.
H	15. 12. 02	Delay in language development	Difficult to sit nicely and listen to fairy tales, and after listening to fairy tales, they can reminisce about them using visual clues and complementary alternative communication.
I	14. 08. 11	Delay in language development	Difficult to sit down and listen to more than half of the picture books with teachers as they are a children who cannot express their language voluntarily.
J	14. 07. 10	Brain lesions	Due to difficulties in keeping their body fixed, the teacher needed help them even to stare at the picture book accurately, and now only babbling sounds are possible.

2.1.2. Selection of arbitration goal acts by infants

This study selected 3 specific intervention target behaviors for each diagnosis group(children) that can be improved through the program, as the ultimate goal is to improve the understanding of safety-related stories of children with disabilities. The diagnosis-specific groups were divided into levels 1(child B, child H, child I) and 2(child A, child G, child F, child C, child D, child E). The criteria for distinguishing were divided into 2 levels, if not 1, depending on whether they know how to communicate, answering the teacher's questions.

2.1.3. Continuous inspection of program

During the 14 weeks of the program, 3 observers observed and recorded the behavior of each infant in the observation room. In each session, observations were mutually confirmed at the evaluation meeting between researchers, homeroom teachers and observers based on observers' observations, and the interest and suitability of infant changes and activities were continuously checked. Based on the results of the inspection, a formative activity design method was applied to reflect the changes and demands of infants in each session as much as possible in the details and interventions of the next session.

2.2. Research tool

The safety-related story comprehension test tool used in this study was used by Mi-kyung Park[18] and consists of two sub-questions on story structure and inference comprehension. Understanding safety-related story structures consists of questions from 1-10 including elements of story structures such as backgrounds, topics, plot episodes, and solutions with a question of the facts within stories, causality, and clarity of information on the surface of the

story after listening to safety-related picture books. Story inference comprehension consists of 11-14 questions that can interpret the emotions and behaviors of the characters in the story and link them to the infant's own experience, and 0 to 21 points in structural understanding (story sequence 7 can get up to 3 points), and 0 to 16 points in inference comprehension can be obtained. Inference comprehension questions include extended questions about why they think so, and if answered voluntarily, they earn 2 points, and if answered after the teacher provides related clues, it is 1 point. Any other non-response or unrelated answer shall be considered 0 points. In the case of extended questions, level 1 infants, which show difficulties to perform, are presented with a level 1 question by making a low-level inference question. In addition, due to the nature of the infants under the study, the researchers judged that they would give points even if they answered "yes" or showed gesture of positivity such as nodding, and even if they answered no or expressed negatively with gestures. To exclude the effects of pre-inspection, the pre-inspection used picture books related to safety in the personal safety area: 8 pictures Don't follow strangers, post-inspection used picture books related to safety in the disaster safety area: 8 scenes of Leeseul's first errand, and no response or unrelated answers weren't given points as they were given as 0 points.

The selection of safety-related picture books were done after discussing with the researchers that focused on the presented 22 duplicates and the suitability of development, 1 professor of early childhood education, 2 teachers with more than 10 years of early childhood education experience, 2 doctors of early childhood education, and the head of a daycare center for the disabled with a doctorate in special early childhood education, 7 picture books related to safety in each area that can be familiar to infants (No safety in life David, Get out of the way for the ducklings of traffic safety, Sad Randolin of violence and personal safety, Help with drug and cyber addiction! The Little Prince's trip to Seoul, There's a disaster safety fire, Occupational safety tomboy driver Chichi, What should I do when I get hurt? first aid), 1 pre-inspection book (The first errand of Lee Seul-yi for disaster safety), 1 post-inspection book (Don't follow strangers in violence and personal safety) were finally selected.

3. Research Procedure

Prior to this experiment, the preliminary research was conducted on three 3 year old infants (male and female) at the C daycare center in K-si, Gyeongsangbuk-do that have delay in language development who did not participate in the experiment, to examine the suitability for integrated art play inspection tools utilizing safety-related picture books and the time required. In the same way as this study, preliminary and follow-up tests were conducted to measure and evaluate safety-related story comprehension inspection tools through scoring according to the responses of infants.

3.1. Primary preliminary research

Between August 26 and September 9, 2019, 3 children aged 3 from a daycare center specializing in disability who are not a subject to research, were given integrated art play utilizing safety-related picture books, Living safety areas: No David, Violence and personal safety areas: Sad Randolin, 5 times in 2 weeks with 1 picture book related to safety, a total of 10 was conducted. As in this study, pre- and post-inspection was conducted, and as a result, all 3 infants showed no significant difference. Therefore, questions about pre- and post-inspection were more easily modified and supplemented, and a second preliminary study was planned after preparing by adding a picture card and an emotion card that an infant can answer the content.

3.2. Secondary preliminary research

As the results of the first preliminary study showed no significant difference, between September 16 and October 1, 2019, integrated art plays were performed for a total of 10 times in

two weeks using picture books related to traffic safety and occupational safety to exclude the practice effect of the primary activity. Working in the first preliminary study prior to the start of the second preliminary study: No David, when the sad Randolin's safety-related picture book was presented, infants did not remember at all. This can be seen as the practice effect of the first examination not being shown.

In addition, in the first preliminary study, when the integrated art play was conducted in a large group with three infants, the teacher suggested activities tailored to individual characteristics when doing free choice activity as low concentration of infants or ability to perform task showed.

3.3. Inspector training

Before conducting this study, in order to establish consistent testing standards for inspectors, conducted inspector training on 2 teachers who graduated 3-year and 4-year infant education on October 4, 2019, including researchers, with more than 5 years of general infant education and 6 years of field experience and the inspector consisted of a total of 3 people, including this researcher. In this process, problems and supplementary matters were corrected, and the inspector was asked to explain the inspection details and the process of conducting the inspection, and record all the contents and briefly write down the characteristics of infants on the inspection sheet.

In order to obtain the inter-inspector consistency for the inspection tool, the story comprehension test tool to be used in the actual inspection was repeatedly practiced until it matched the test method and measurement criteria presented by the researcher. This is to be familiar with the understanding of the inspection tools and with the reference description of the items and their evaluation. Furthermore, specific situations were presented to teachers to help them understand clearly, and infant attitudes were assessed according to the measure. Consistent criteria were established after discussion with inspectors on the cases derived from the inspector training process.

3.4. Pre-inspection

The inspection tool of the pre-inspection was used by Mi-kyung Park[18] and was conducted for a week from October 7 to 14, 2019, a week before the integrated art play was implemented. The venue was a quiet and separate space from the activity room and it was conducted in an interview method in a 1:1 situation with infants and teachers.

3.5. Implementation of program

Integrated art play utilizing safety-related picture books was conducted 5 times a week for 14 weeks from October 21, 2019 to January 24, 2020, a total of 70 times(1 time, about 20 minutes). For the first 7 weeks, one book per week picture book activities related to safety in each area was carried out, followed by repeated activities from week 8 to week 14 once again from week 1 to week 7. With one picture book, 5 sessions were active and it took about 20 to 30 minutes for each session. Activities were conducted in the classroom, and integrated art plays were conducted for all infants, but based on the second preliminary study, all infants were presented to participate in the activities naturally during the free choice activities. For example, session 2: in the activity of making props for picture book content integrated art play, interesting materials such as decorative materials and popping paints that infants usually like were presented on the table and were taught how to use them if there were infants who showed interest. About 3 to 5 props in the picture book were presented so that the infant could choose the props he/she wanted to make, and when the teacher suggested the big design, the infant made the props using the decorative materials he/she wanted on the design. Infants who were not interested in any activities were first presented by the teacher and made them together. Due to the nature of infants with disabilities, there is a difference in the number of tasks being done and teaching methods should be provided considering individual levels. In

other words, it was difficult to run as a large group with 10 infants in integrated art play activities, so all infants were required to participate in the activities in the natural play of their daily lives. The target children conducted activities related to the safety areas of the 7 top standards for school safety, and researchers conducted total of 70 times (1 time, about 20 minutes) in 14 weeks. 7 areas were performed once a week for 7 weeks, and then were repeated for 7 weeks again. This emphasizes repetitive learning in early childhood education, especially for children with disabilities due to the need to present repeatedly because they lack long-term memory and verbal expression. In addition, active materials were attached to the walls of the classroom and picture books were placed in the language area after the picture book activity, allowing children to access them at any time during the day. Songs made together were recorded and played frequently during free selection activities, and only music was presented when they showed that they were familiar with the lyrics.

Integrated art games utilizing safety-related picture books were held before large and small group activities after eating breakfast snacks during the day at daycare centers. This is to select when they don't have hurt feelings or reduced concentration due to other activities, so that infants can be immersed in the best. Specific details are as follows.

3.5.1. 1st session - listening to and talking about safety-related picture books

In the first session, listen to picture books and activities of brainstorming to find safety-related elements in the contents of picture books, and recalling the characters are carried out. The activity of listening to picture books was repeatedly presented by the teacher, and related picture books were always kept on the bookshelf. Some infants, who were usually interested in picture books, voluntarily read picture books. It was difficult for infants to recognize or voluntarily answer teacher's questions, so the teacher prepared 2 more pictures unrelated to the character's picture in the fairy tale and provided clues to choose the character's picture in the fairy tale. Children of Level 1 were engaged in activities to find the same picture by comparing it to pictures of fairy tales. Level 2 children gradually eliminated the teacher's questions about the characters and voluntarily carried out name-telling activities without any clues.

3.5.2. 2nd session, 3rd Session - integrated art play

In the 2nd session, integrated art plays were conducted to solve safety problems, sharing similar situations or experiences that occur around infants through safety-related factors derived from the 1st session and how to solve problems in those situations. The procedures for integrated art play are as the following.

3.5.2.1. Writing lyrics and singing songs

In song writing, the teacher suggested the big framework so that words related to the content of fairy tales could be included, and the key words that infants wanted could be presented in it. The song was selected and performed by selecting songs that infants are familiar with, such as using songs that infants are interested in that week, or linking new songs of the month. The song made during the free choice play was recorded and played continuously, and infants were seen singing along.

3.5.2.2. Movement and physical activity

When selecting a movement that fits the lyrics of the song, the movement was decided by limiting only the key words that were selected with the infants, and for the phrases with key words, the movements were repeatedly carried out. As the number of programs provided increased, the movements suggested by the infants increased. For infants who find it difficult to imitate the movements, physical activities that fit the subject were presented as well as motion activities.

3.5.2.3. Preparation of props and decorate stage background

Various art expression techniques were used to decorate props and stage backgrounds. There were difficulties for the infants to voluntarily choose the props in the picture book, so the teacher presented the overall design, and in the middle of the activity, additional props related to the characters or situations that infants were interested in were additionally made and were presented so that materials could be selected from a large frame.

3.5.3. 4th session - role play

They set up hypothetical situations with the infants and presented safety-related problem situations in a role-playing manner. Role-playing organized the environment to freely participate in play within the free choice activities. For example, during activities such as violence and personal safety integrated art, build a house with blocks, and then the teacher asks the infants: Do you want to go see a pretty rabbit in my house, and the infants shouted: I don't want to. No! and were seen running away.

3.5.4. 5th session - evaluation and re-confirmation

They presented a hypothetical situation related to safety and reconfirmed the activities from the 1st to 4th sessions within the play. The environment was organized so that they could know and take specific action tips in safety-related situations presented by the teachers, and evaluated whether safety-related knowledge was acquired to record advanced behavior or unusual matters of the infants. As the number of sessions increased, the frequency of children's voluntary participation and the accuracy of identifying and answering the teachers' intentions increased. Also: The range of words used, such as recall and electromagnetic waves, increased, and children B and H, who were initially not interested in the activities, had a positive cognitive effect, suggesting actions corresponding to the words presented by the teacher and continued on saying the back part of the word once the teacher called out the front part.

3.6. Post-inspection

The post-inspection was conducted using the inspection tool used in the pre-inspection, and 9 infants in the experimental group were conducted in the same way of the pre-inspection from January 21 to 23, 2020 to verify the effectiveness of this program.

3.7. Data analysis

In this study, t-verification of the pre and post inspection of the story structure comprehension and story inference comprehension was conducted to find out the impact of integrated art play utilizing safety-related picture books on the story comprehension of children with disabilities. Data processing used the SPSS/for Window 20.0 program and analyzed the collected data as the following.

First, a graph comparing the two results is presented to find out the difference between the prior and the post results of the subject's story structure comprehension and the story inference comprehension.

Second, to identify the areas that showed the most differences in each child due to program application and to analyze clear changes, the description about the process of developmental change of the areas related to story comprehension and the development after the test results are written below the graph.

4. Results

4.1. Effect of integrated art play utilizing safety-related picture books on the safety-related story structure comprehension of children with disabilities

The results of the study to find out the impact of integrated art play utilizing safety-related

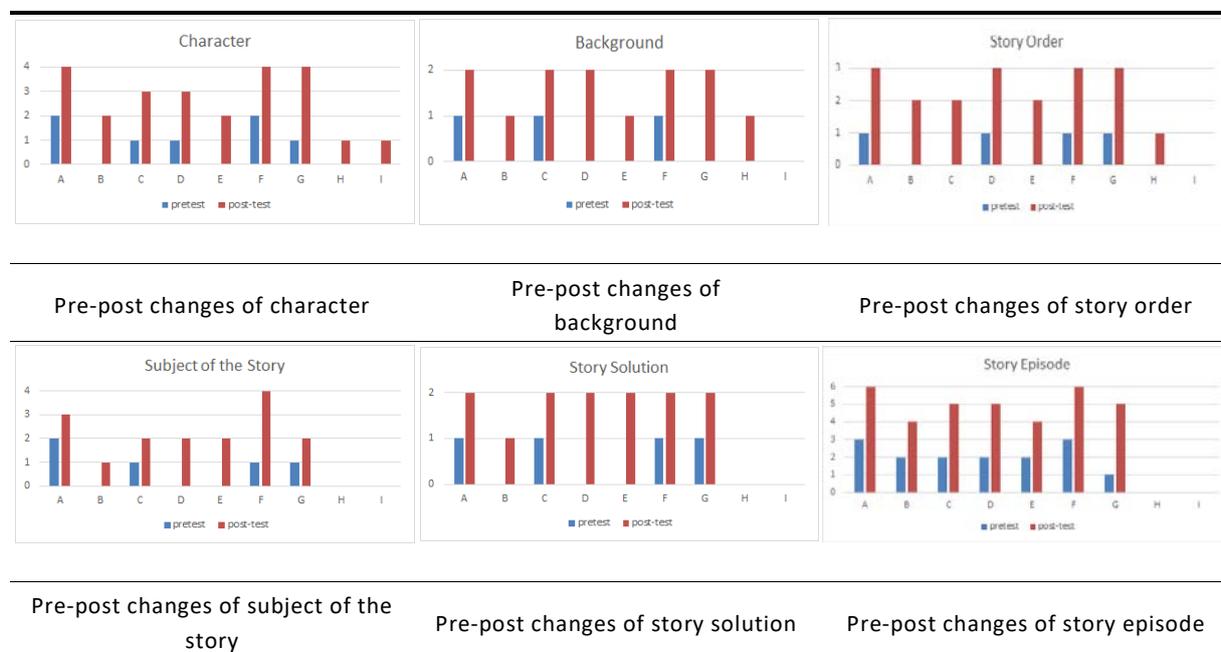
picture books on the safety-related story structure comprehension of children with disabilities are as shown in <Table 2>, <Table 3>.

Table 2. Pre and post test results on story structure comprehension.

	Pre story structure comprehension	Post story structure comprehension
M	1.20	4.30
SD	1.48	3.13
Case	10	10
t		-4.98
sig		.001

Note: *p<.05.

Table 3. Pre-post changes of story structure comprehension.



In the character field, all infants showed high results in the post-inspection. In particular, there was a high rate of increase in question number 1, where the character was chosen as a photo or given the exact name of the character. Pre-inspection showed that infants who were able to speak out gave comprehensive (ma'am, person, etc.) answers to the characters, but post-inspection showed that they answered using the character's exact name.

Category 3 background, which is understanding the overall background after listening to the contents of the safety-related picture book, was scored at the post-inspection by all children except child I. During the pre-examination, all children were provided with picture clues and gave correct answers, but in the post-examination, children who could utter were able to answer questions related to the background of safety-related picture books without any clues.

Child F showed the highest difference in the topic of the story, which corresponds to the questions number 4 and number 5, which have to answer by recalling certain contents and topics by remembering the story of the safety-related picture book. Compared to setting a low standard for the answer to the question, child F was able to give high-level answers, and the attitude and concentration of listening to safety-related picture books during the post-

inspection showed noticeable improvement. There was no significant difference in scores between child H and child I, but compared to the preliminary examination, which they had difficulties in sitting and listening to more than half of the safety-related picture books, the post-inspection showed them sitting and staring at the safety-related picture books until the end.

In the 6th question of the story solution, which requires to understand and answer the character's problem-solving method, children D and E showed the highest score in the post-inspection compared to the pre-inspection that did not score. They answered with simple words related to the character's problem-solving method, and remembered and followed the actions taken when the teacher presented a picture book related to safety. That is, children D and E can see that their immersion in the safety-related picture books has increased enough to remember the teacher's specific behaviors related to the safety-related picture books.

The sequence of stories in which the 4 important events of the story are remembered and the picture cards are listed in the correct order was the most participated by infants. The question in the order of the story are the only one assigned with 3 points, and it was shown as the question that the highest number of children received the highest score in the post-inspection. Most children were confused with the picture of number 2 and number 3 corresponding to the middle part, although the contents of the beginning and end were accurately arranged. Children A and F were able to arrange all 4 picture cards correctly.

The story episode category include questions 8, 9, and 10, and can earn a total of 6 points. All children, except children H and I, scored higher on the post-inspection. In particular, most infants were able to give the correct answer when asked how the character felt in the problem presented by the teacher. In the post-inspection question 10, child A, who is able to speak, said: Iseul is good, and child F: I felt so happy, and it was observed that the composition of the sentence was improved by using the noun.

4.2. Effect of integrated art play utilizing safety-related picture books on the safety-related story inference comprehension of children with disabilities

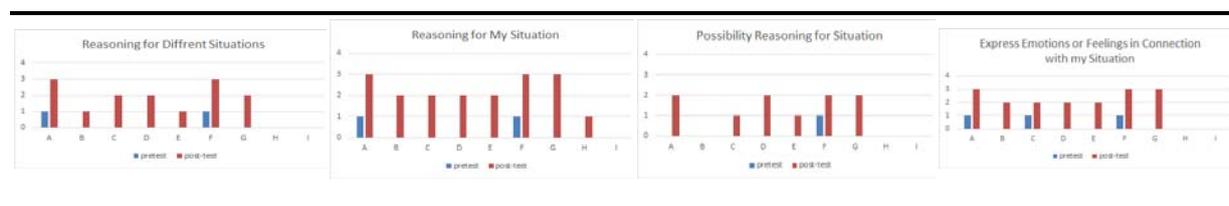
Table 4. Pre and post test results on story inference comprehension.

	Pre story inference comprehension	Post story inference comprehension
M	.30	2.30
SD	.48	2.11
Case	10	10
t		-3.59
sig		.006

Note: * $p < .05$.

The results of the study to find out the impact of integrated art play utilizing safety-related picture books on the safety-related story inference comprehension of children with disabilities are as shown in <Table 4>, <Table 5>.

Table 5. Pre-post changes of story inference comprehension.



Reasoning for different situation	Reasoning for my situation	Possibility reasoning of a situation	Express emotions of feelings in conjunction with my situation
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As the integrated art play session increased, child G often said their thoughts such as, when there is something sad or angry in the picture book, tears come to their eyes, and while listening to the picture book: Don't do it or in the fun part: It's so funny. etc. It is understood that the overall area of the story has increased by expressing one's intention in language in the process of identifying the character with oneself. -Teacher A-

In question 11, all children except children H and I were able to express their thoughts or choose the picture cards associated, but in extended questions related to question 11, most children found it difficult to answer. In the pre-inspection, child A did not answer the teacher's question, and child F answered: "I don't know", but in the post-inspection, they presented an answer related to the question and earned 1 point by child A answering: "No milk", child F: "I'm still sad." As it was the item that showed the most changes in story inference comprehension, most infants were able to understand the reasoning that put themselves in the character's situation. In particular, child G showed a high change in the story inference comprehension, and if the opinions of the prosecutor are summed up, it is assessed because child G's participation in integrated art play activities was the highest.

The possibility inference categories for situations requiring relatively higher accidents compared to other categories showed the lowest score gain rate with two points at the highest score in the post-inspection, but showed a high increase compared to the pre- and post-inspection scores. All children, except child F, did not earn points in the pre-inspection, but all children except children B, H, and I scored in the post-inspection. Although infant scores were generally low in story inference comprehension, all children except children H and I scored in this category related to emotion and feeling expression. Also in the pre-inspection, children C, D, and E who presented limited emotions such as "yes" or "no", expressed emotions frequently used in integrated art play activities in language, such as "I'm annoyed" looking at the same frown face, "I am happy", etc. In other words, positive changes in the number of words and their expressive power have emerged.

5. Conclusion

In this study, we wanted to find out the effect of integrated art play utilizing safety-related picture books on the understanding of stories of infants with disabilities. After applying integrated art play activities utilizing safety-related picture books, children under study scored higher on post-inspection than on pre-inspection in at least 1 category. This means that integrated art play utilizing safety-related picture books is effective in improving the understanding of safety-related stories for infants with disabilities. These results are in line with the study results of Young-ui Kim and Young-sil Kim[19] that after listening to fairy tales, the overall level of understanding of the story increased through integrated activities such as language, art, and drama. In addition, Hye-won Ryu[20] partially matches with the findings that the activity of expressing one's thoughts or opinions on fairy tales through language and pictures, and rephrasing one's changed thoughts and opinions through safety-related activities, is effective for infants' story understanding. As such, integrated art play utilizing safety-related picture books has a positive effect on not only general infants but also on the understanding of stories of disabled infants. If the results of the study are discussed in accordance with the research questions, it is as follows.

First, as a result of analyzing the effect of integrated art play utilizing safety-related picture books on the story structure comprehension of children with disabilities, all children in the

study scored higher in post-inspections than in pre-inspections. Looking at what has been shown in the research process, it can be seen that as the session increases, the task performance rate of the infants increases in activities such as finding the same picture or listing the order of picture book contents correctly. This can be found in the sense that teachers' needs are clearly identified in their structural understanding and that high success experiences are provided through simple cognitive processes.

Second, there was a child who had the same score of pre-inspection and post-inspection in the story inference comprehension utilizing safety-related picture books. In the case of story inference comprehension, it is necessary to go through a relatively complicated process of introducing and reconstructing one's experience beyond the simple cognitive process, so pre- and post-inspections do not show significant differences depending on the level of development of each child. This means that when a story comprehension inspection is conducted for infants with disabilities, it is necessary to present a few additional low-level categories suitable for individual development levels.

In conclusion, integrated art play utilizing safety-related picture books showed that it was more effective in improving story structure comprehension than in story inference comprehension for children with disabilities. The reason why story inference comprehension was difficult to achieve high scores is that unlike story structure comprehension, which can be scored by simply recalling the contents of picture books, it requires a relatively complex cognitive structure that reflects one's thoughts or feelings. It also suggests that integrated art play activities, including art, music, and dramatic elements that has always been interested, are suitable ways to help infants participate in activities voluntarily, recognize the need for safety, understand the overall content of picture books, and learn problem-solving.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Author	HL	-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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Is Laughter Therapy Useful in a Health CRISIS?: Meta-Analysis of Laughter Therapy

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Abstract

Purpose: This study was to identify the trends of laughter therapy and to analyze the effect size of laughter therapy

Method: KISS, KMDB, KERIS and the National Assembly Library was searched for relevant journals by using the following key words 'laughter treatment', 'laughter intervention' and 'laughter therapy'. 48 journals were included in this study. Data were analyzed using CMA ver. 2.0 and effect size was calculated by 'the standardized mean difference

Results: The major findings of this study were as follows. 1)The overall effect size of laughter therapy was 0.668. 2)The sub-group effect size were social(0.863), psycho-somatic(0.836), emotional(0.775), psychological(0.679), physiological(0.464), physical(0.653) by each. 3)As the laughter therapy program, the effect size of only laughing therapy was larger than parallel therapy and the effect size of 4 step program was larger than 3 step program. More program in a week was larger effect size of laughter therapy.

Conclusion: It might be useful for this study to review systematic research on laughter therapy in Korean journals. Laughter therapy was also effective therapy for people and develop program based on knowledge from laughter therapy research.

[Keywords] Effect Size, Laughter Intervention, Laughter Therapy, Laughter Treatment, Meta-Analysis

1. Introduction

1.1. Background

Health is the most important part of human. In maintaining health, as well as medicine, complementary and alternative traditional therapies play an critical role[1]. Complementary and alternative therapies have proven their effectiveness in many different levels and in various ways[2][3][4][5][6].

Laughter means the shape and sound that expresses the happiness potential in the human mind on face[7][8]. In addition, humans express joy through laughter, which is the physiological phenomena of the body[9]. Ancient Greek Philosopher Aristoteles said that humans are the only existences that can express various types of laughter. Only humans can laugh, and laughter can be said to be the best human nature. In other words, laughter is a natural expression of human emotion. When humans are happy or feeling enjoyable, laughter expresses emotion. Laughter not only acts as a natural emotion expression but also as a buffer for personal relations, so the smiling appearance makes a good impression on other people and socially accelerates personal relations. Also, people laugh because they are happy and joyful, but laughter strengthens the positive emotions of humans, helping to improve physical, psychological, and social functions. Even nonspontaneous affected laughter has similar effects to real laughter, which is helpful for physical and psychological health[1].

Laughter therapy is an activity that improves the well-being and health of the subject using fun experiences or expressions in daily life. It is a type of communication that causes smiles, laughter, and joyful emotions and enables interaction(AATH; American Association for Therapeutic Humor). Laughter therapy was defined as the use of laughter for therapeutic purposes to improve the healing and reaction ability of the subject in the physical, cognitive, emotional, and spiritual aspects[10]. Laughter therapy for therapeutic purposes is a fundamental disease. It is said to be meaningful as autotherapy medical science or complementary and alternative medicine that cannot replace the treatment of surgery, medicine, chemotherapy, and radiation therapy[4]. Therefore, the purpose of laughter therapy includes prevention of a disease, smooth interpersonal relationship, escape from toxic symptoms, health promotion, and increase in the quality of life[11]. In other words, laughter therapy is a behavioral and psychological treatment through laughter that is continuously and comprehensively administered to all people who need laughter so that they can experience a state of happy emotion[12]. Because laughter therapy nurtures immunity and resistance from natural healing, it strengthens the body while preventing diseases and improving health. It is involved in all organs of the body, such as the nervous system, endocrine system, immune system, respirator, circulatory system, etc. by maximizing the remaining body functions to self-medicate diseases[13].

For laughter therapy, Robinson(1978)[14] first used the term laughter nursing to suggest laughter therapy as a nursing intervention[3], and laughter therapy was used as one of the complementary therapies in domestic and international clinical nursing settings. Laughter therapy does not require any special preparation, does not require cost, and can be used at any time and any place than other intervention methods. In addition, since it does not require advanced skills or education and has the advantage that it can be used through only a little training, it is widely used as a nursing intervention plan through laughter[14].

However, as a result of exploring previous researches related to laughter therapy, there were different results have been found despite of applying the same measurement variable, And there was also difficulty in identifying the effect of laughter therapy objectively because the study subjects were different and they were not the same in the number, duration, time, and program of intervention. Since research results conducted in different environments cannot be generalized, therefore, the necessity of meta-analysis has been felt to draw a systemic conclusion by integrating each research.

Meta-analysis is an analysis that collects and analyzes multiple research results again. It is a method of statistically analyzing individual studies by gathering together individual studies for the purpose of synthesizing accumulated research results in a specific field or subject[10][15]. As evidence-based medical science and nursing with scientific evidence has established itself

as a recent trend during intervention, studies that apply laughter therapy to clinical settings have been conducted, and its effectiveness has been continuously proven. Therefore, at the present time, through meta-analysis, a comprehensive analysis of studies related to laughter therapy and various variables related to the effect of laughter therapy were comprehensively compared and analyzed to provide evidence as a therapeutic intervention.

Therefore, this research confirms the size of the overall effect of laughter therapy and the size of the effect by program characteristics through meta-analysis, a method of statistically synthesizing existing study literatures on a subject. In addition, in the clinical nursing setting, an attempt was made to present the evidence of laughter therapy as a nursing intervention applied to patients and to provide guidelines for laughter activities and laughter program composition.

1.2. Purpose

This study attempted to confirm the effect of laughter therapy through meta-analysis, and the specific purpose is written as follows.

Identify the status of laughter therapy research.

Check the magnitude of the overall effect of laughter therapy.

Check the size of the effect of each area of laughter therapy.

Check the magnitude of the effect by the characteristics of the laughter therapy program.

2. Method

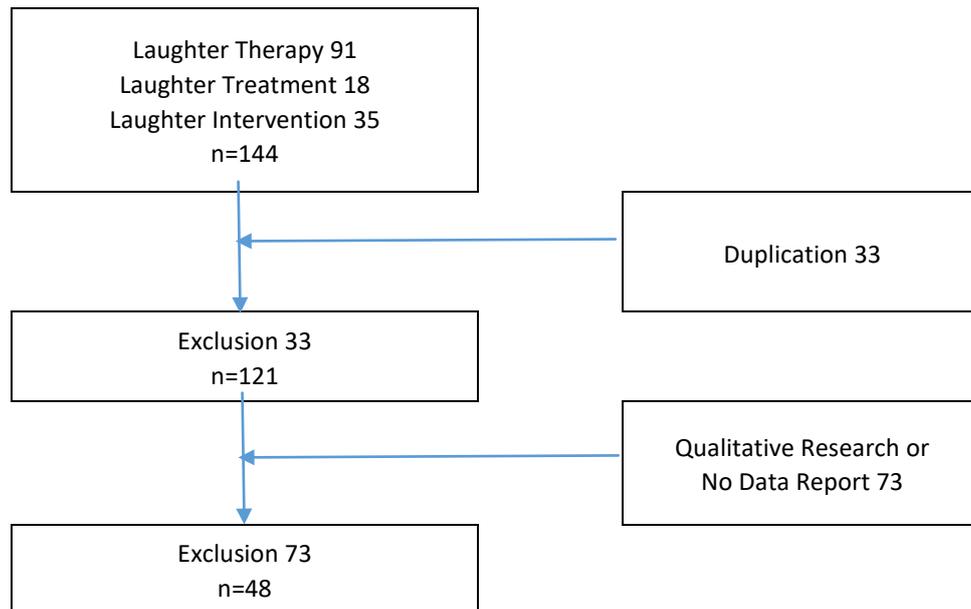
2.1. Research design

This study is a meta-analysis research using a database to confirm the effect size of laughter therapy in published papers on laughter therapy.

2.2. Data collection

Dissertation and scholarly journal paper were searched using the search engine of Korean Studies Information Service System, RISS, KMDB, and National E-Library System to collect domestic study results that analyzed the effect of laughter therapy. Based on published papers until 2017, subject terms were 'laughter therapy', 'laughter treatment', and 'laughter intervention'. As a result, 'laughter therapy' 91, 'laughter treatment' 18, and 'laughter intervention' 35 were searched, and 121 laughter scholarly journal papers excluding duplicates were primarily collected. Among the searched papers, studies that were not quantitative research or did not report data for effect size calculation were excluded from the analysis. Finally, article 48 that suggested the effect of laughter therapy were selected as the subject of analysis <Figure 1>.

Figure 1. Data collection.



2.3. Data coding

In this study, the characteristics of the laughter therapy program, the number of program operations, and effect variables were considered as major variables and coded. Also, the coding procedure is as follows. First, the coding paper was developed under the agreement of the researchers. Second, two researchers who steadily carried out the laughter therapy program and carried out the research steadily conducted the coding, and in case of disagreement in this process, it was resolved through consultation. In addition, in the case of disagreement between the two people, the related problem was resolved by reflecting the opinion to a third party, a specialist in laughter therapy. At this time, there were no cases of disagreement even after all three people had discussed it. For Example, in a study that measured blood pressure and pulse for stress measurement, when there was a conflict between the opinion of 'mentally' coding blood pressure and pulse and the opinion of 'physiologically' coding, discussion with an actual upper-level laughter expert and coding into a 'physiological' category.

2.4. Effect size calculation

Effect size is statistics representing the quantitative research results reported in the results of individual studies and is presented by standardizing different research results [16]. First, the effect size of individual research results is calculated, and then the total effect size is calculated. After that, sub-group analysis is performed on the nomadic variables for each characteristic of the study, and meta-regression analysis is performed when the characteristics of the study are continuous variables. The commonly used effect sizes are standardized mean difference, correlation coefficient, and odds ratio. In this study, the before and after effect size calculation of the experimental group and control group is different from the method of calculating the general effect size (d). Also, before and after effect sizes were divided by the standard deviation of the prior average by dividing the difference between the prior average (X_{trt} , X_{crt}) and the posterior average (Y_{crt} , Y_{trt}) of each of the experimental group and control group, which are treatment groups.

The formula for calculating the before and after effect sizes of the experimental group and control group is as follows.

$$g^{trt} = \frac{Y_{trt} - X_{trt}}{S_x}, \quad g^{ctrl} = \frac{Y_{ctrl} - X_{ctrl}}{S_x}$$

Y^{trt} means the posterior average value of the experimental group, X^{trt} means the prior average value of the experimental group, Y^{ctrl} means the posterior average of the control group and the prior average value of the X^{ctrl} control group. S_x represents the standard deviation of the pretest mean values for the experimental group and control group. Here, the effect size is measured by the following formula $\Delta = g^{trt} - g^{ctrl}$ by the difference between the before and after average values of the experimental group and the control group, and the variance of the measured effect size is derived by the following formula.

$$Var(g^{trt}) = \frac{4(1-r^{trt}) + (g^{trt})^2}{2n^{trt}}, \quad Var(g^{ctrl}) = \frac{4(1-r^{ctrl}) + (g^{ctrl})^2}{2n^{ctrl}}$$

r is the correlation coefficient between before and after test scores in the experimental group and the control group. The standard error of the measured effect size can be calculated as the square root of the variance.

$$SE_d = \sqrt{V_d}$$

Hedge and Olkin(1985)'s method were used to assign weights according to the size of the number of cases in the study[17]. The reason for the weighting is that the results of studies with a large number of cases are considered to have more accurately estimated the effect size, and thus have more influence in calculating the total effect size. To calculate the total effect size, a homogeneity analysis is first performed. The zero hypothesis of the homogeneity test is that the effect sizes of individual studies were extracted from the same population. So, if the zero hypothesis is not rejected, it is determined that the effect sizes are estimated from the same population, and a fixed-effects model is used. If the homogeneity test is statistically significant and rejects the zero hypothesis, a random effects model that considers random errors other than sampling errors is used. In the random-effects model, it is assumed that the effect sizes are extracted from different populations, and in general, when a random-effects model needs to be used, the effect size tends to be overestimated by using the fixed-effects model[18]. In this study, the CMA 2.0(Comprehensive Meta-Analysis 2.0) program was used to calculate the standardized mean difference change effect size.

2.5. Publication bias

In the case of studies published in meta-analysis studies, the effect size tends to be overestimated compared to non-published studies, so we analyzed whether there is a publication bias. In this study, publication bias was first verified through a funnel plot. As a result, it is possible to predict that there is no publication bias. In the case of verifying publication bias by the trim & fill method, if there are studies to be corrected, the effect size is recalculated by adding the studies in the analysis[19]. As a result of verifying the publication bias by the method of Duvall and Tweedie(2000)[19], since the correction value and the observed value were analyzed identically, it is possible to predict that there is no publication bias in this study.

3. Results

3.1. Trends of laughter therapy

3.1.1. Laughter therapy research by publication year

Since the first publication of laughter treatment papers in 2006, it has steadily increased,

and since the establishment of the Korean Laughter Clinical Association centered on medical professionals in 2006-2009, it has increased steadily, with 20 articles in 2010-2013, and 20 articles in 2014-2017. Laughter treatment increased.

3.1.2. Laughter therapy research by field

Research on the application of laughter therapy consisted of 32 nursing articles, 6 social welfare studies, 4 pedagogical/psychological counseling articles, 3 art therapy articles, and 3 other article. The overwhelming majority of journals in nursing were published.

3.1.3. Laughter therapy research by subject

The subjects of laughter treatment were 16 for the elderly, 11 for adults, 10 for women, 8 for children, and 3 other articles. There were many papers applied to the elderly.

3.2. Effect Size of laughter therapy

3.2.1. Overall effect size of laughter therapy

In this study, the 'standardized mean difference' effect size was calculated for the study of effectiveness. As a result, the total effect size of the random-effects model was 0.668, and the 95% confidence interval was 0.587-0.749 <Table 1>.

According to the criteria suggested by Cohen(1988)[18], in the standardized mean difference effect size, the small effect size was 0.3 or less, the medium effect size was 0.5, and the high-level effect size was 0.8 or more. As a result of verifying the effectiveness of 48 studies, it was analyzed that there is an effect, and the effect size was confirmed to be at the level of moderate to the severity of the random-effects model. This effect size was statistically significant.

Table 1. Total effect size of laughter therapy.

K*	Effect size	Standard error	95% CI		p-value
			Lower limit	Upper limit	
48	0.668	0.041	0.587	0.749	<.001

Note: *K: number of effect size

3.2.2. Effect Size of laughter therapy by sub-group

Sub-group analysis was performed when the variable representing the main research characteristics included in the previous studies was a categorical variable to find out what variable causes the difference in the laughter therapy effect in the existing individual studies. As a result of comparing the effect areas of laughter therapy largely, as shown in <Table 2>, the effect size was very high in the social area(0.863) and somatization area(0.836). Also, the emotional area(0.775), the mental area(0.679), the physical area(0.653), the integrated area (0.614), the cognitive area(0.535), the physiological area(0.513), and the behavioral area(0.507) showed the largest effect size in the order. In all areas, the effect size was more than 0.5, showing a medium effect size.

Table 2. Effect size of laughter therapy by sub-group.

Sub-Group	K*	Effect Size	Standard Error	95% CI		p-value
				Lower limit	Upper limit	
Social	15	0.863	0.142	0.585	1.141	<.001

Somatic	17	0.836	0.122	0.596	1.075	<.001
Emotional	67	0.775	0.059	0.660	0.890	<.001
Psychiatric	61	0.679	0.065	0.551	0.806	<.001
Physical	36	0.653	0.078	0.500	0.806	<.001
Integrative	6	0.614	0.204	0.215	1.014	0.003
Cognitive	11	0.535	0.137	0.266	0.805	<.001
Physiological	23	0.513	0.104	0.310	0.716	<.001
Behavioral	28	0.507	0.086	0.339	0.675	<.001

Note: *K: number of effect size.

3.2.3. Effect size of laughter therapy by program type

When comparing the effect size of laughter therapy by program characteristics, it was found that the 4-stage composition program(0.810) was more effective than the 3-stage composition program(0.765). In addition, the case where laughter therapy was the main method(0.711) in the laughter therapy program showed a larger effect size than that of the laughter supplementary therapy(0.542) <Table 3>.

Table 3. Effect size of laughter therapy by program type.

Program	K*	Effect size	Standard error	95% CI		p-value
				Lower limit	Upper limit	
3 steps	181	0.765	0.040	0.688	0.843	<.001
4 steps	23	0.810	0.110	0.595	1.025	<.001
Main	210	0.711	0.034	0.645	0.778	<.001
Adjuvant	54	0.542	0.064	0.417	0.667	<.001

Note: *K: number of effect size.

3.3. Meta-regression analysis result

Meta-regression analysis was conducted to determine the increase or decrease in the number of operation times and the size of the operation time effect of the laughter therapy program. The results are shown in <Table 4>. As shown in <Table 4>, the longer the number of program operations per week, the greater the effect of laughter therapy. However, as the total number of times, operating hours per session, and total time increased, the effect of laughter therapy did not increase, but the regression coefficient value was not statistically significant. It was confirmed that the larger the number of operations per week, the larger the effect size and the longer the treatment time, the lower the effect size of laughter therapy. It was analyzed that the effect size was large when the treatment time per treatment was performed within 75 minutes, and it was analyzed that it was effective to conduct it within 450 minutes based on the total time.

Table 4. Relations between laughter therapy program and continuous variables.

Program		Point effect	Standard error	z-value	p-value
Number	Slope	0.039	0.018	2.211	<.05

(a week)	Intercept	0.543	0.032	16.855	<.05
Number (total)	Slope	-0.004	0.003	-1.123	>.05
	Intercept	0.642	0.035	18.483	<.05
A time	Slope	-0.001	0.003	-1.967	<.05
	Intercept	0.657	0.026	25.017	<.05
Total time	Slope	-0.001	0.000	-3.051	<.05
	Intercept	0.671	0.023	28.836	<.05

4. Discussion

The following will be discussed based on the results of this study conducted to confirm the overall effect size of laughter therapy.

In the effect size of each area, Kang(2017)'s study[20] showed the highest effect size in the emotional area in the order of emotional, mental, social, and somatization, but in this study, in the order of social, somatization, emotional, mental, and physical areas. This is believed to be due to the increased number of studies on laughter therapy in recent years compared to past studies and verification of detailed effects in various areas. The effect of laughter therapy was found to be greater than the actual physical, physiological, and behavioral effects on social, emotional, and mental areas such as communication, pain, anxiety, depression, and mood. Laughter therapy is a cognitive and mental function in an emotional state. It is in the context of Robinson(1978)[14], who suggested that it is a way to relax by changing the tension[1], and laughter said that sound communication influences interpersonal relationships and helps improve social function. It is consistent with the research results(Song, 2007)[9]. In addition, as Lee et al(2020)[11] said that pleasure is expressed as a physical laughter, laughter is considered to have a great effect on the emotional area because it is emotionally based on pleasure. In this study, the effect size for each area of laughter therapy was 0.5 or more in all areas, showing an effect size of more than severity. This is different from the study of Kang(2017)[20], which reported an effect size of less than 0.4 in physiological, physical, and behavioral areas. This is believed to be due to the fact that this study included a number of studies that measured effects in various areas, and also suggests a limitation of the study that may have included errors in the publication to report positive results of laughter therapy.

In this study, in the characteristics of the laughter therapy program, the size of the effect was higher as the main method and the four-stage configuration. When constructing a laughter therapy program, laughter therapy is the main method, and the purpose of the program is clarified. It suggests that it should be applied. In addition, the longer the number of laughter therapy programs per week, the greater the effect of laughter therapy, but the longer the total number, single treatment time, and total treatment time, the less effective the laughter therapy was. This is because the application of a continuous program at the beginning increases the effect of laughter therapy. As the one-time treatment time and the total treatment time increase, extending the operation time of the laughter therapy program or simply increasing the total number of operations does not increase the effect size of laughter therapy[16]. Therefore, in this study, it is suggested that the program should not exceed 75 minutes per session and 450 minutes in total.

5. Conclusion & Suggestion

As discussed in the above, the oral care protocol in this Research had beneficial effects on

This study attempted to present basic data of laughter therapy in evidence-based intervention to subjects in the clinical field by confirming the overall effect size of laughter therapy, effect size by area, and effect size by characteristics of laughter therapy program.

The subjects of this study were firstly collected articles searched with laughter therapy, laughter intervention, and laughter therapy as the subject words through an academic search engine, and 48 articles that could be meta-analyzed were confirmed and analyzed. As a result of the study, the overall effect size of laughter was large at 0.668, and the effect size of laughter therapy for each area was the greatest in social, somatization, and emotional areas. In addition, in the case of laughter therapy as a major corporation, in the case of laughter therapy program characteristics, the effect size of the four-stage composition was large, and the greater the number of operations per week, the greater the effect size of laughter therapy. It was also confirmed that one treatment time should not exceed 75 minutes and a total treatment time of 450 minutes.

Therefore, laughter therapy is one of the complementary therapies with great effect, and the evidence that laughter therapy can be applied was confirmed. Based on this, future implications are as follows.

First, although the evidence for laughter therapy was confirmed, it is necessary to continuously accumulate evidence, and to compare the effect size with other complementary and alternative therapies.

Second, there is a need for discussion and research to subdivide the composition of laughter therapy programs by disease and subject characteristics, and to standardize and establish grounds for its operation.

Third, it is necessary to confirm the effect size of each technique among the characteristics of laughter therapy programs, and to develop a program that considers the subject and prepare a basis.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Lead Author	WB	-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*	JK	-Make a significant contribution to collection <input checked="" type="checkbox"/> -Final approval of the paper <input checked="" type="checkbox"/> -Corresponding <input checked="" type="checkbox"/>
Co-Author	KK	-Play a decisive role in modification <input checked="" type="checkbox"/>
	YL	-Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/>
	HL	
	JP	
	RY	-Participants in Drafting and Revising Papers <input checked="" type="checkbox"/>
	KL	-Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>
	SK	
	KL	

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University Students' Learning Behavior, Online Learning Satisfaction, University Satisfaction, and Emotional Difficulties according to ADHD Tendencies and Gender in Covid-19 CRISIS

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Abstract

Purpose: The purpose of this study was to examine the learning and emotional difficulties that students with ADHD tendencies experienced at a local university where its' learning environment has changed dramatically due to the crisis of COVID-19. The differences in learning behaviors, online learning satisfaction, and university satisfaction according to university students' ADHD tendencies, gender, and the level of emotional difficulties such as depression and anger were investigated. The effects of the coexistence of ADHD tendencies and emotional difficulties on those differences were also examined.

Method: A total of 1,032 students in the K university at Daegu participated in this study. The learning behaviors, online learning satisfaction, university satisfaction, and the level of emotional difficulties including depression and anger were surveyed. The collected data were analyzed, first, using t-test in order to examine the differences according to ADHD tendencies, gender, and the level of emotional difficulties. Next, the participants were divided into four groups according to their ADHD tendencies/depression level and ADHD tendencies/anger level, and then t-test and ANOVA were conducted. Finally, two-way ANOVA was implemented to investigate whether the differences among those four groups differed by gender.

Results: First, university students with ADHD tendencies tended to be more passive and neglected in their learning than those without ADHD tendencies. And, their online learning satisfaction and university satisfaction were also significantly lower than those of students without ADHD tendencies. Second, while female students were more active in learning and their level of online learning satisfaction and university satisfaction were higher than those of male students, they also showed higher levels of emotional difficulties such as depression and anger than male students. Third, the learning behavior, online learning satisfaction, and university satisfaction of the students, who had the coexistence of ADHD tendencies and emotional difficulties such as depression or anger, were significantly lower than those of students who had not, regardless of their gender.

Conclusion: This study shows that there are differences in learning behavior, online learning satisfaction, university satisfaction, and emotional difficulties of university students according to their ADHD tendencies and gender. As COVID-19 shows no signs of subsidence, universities in Korea are more likely to offer online classes in 2021 again. At the same time, the problem of depression and anger among university students is likely to become even more serious due to prolonged COVID-19. This study indicates that university students' ADHD tendencies, gender, and emotional difficulties need to be considered in order to effectively implement online learning in Korean universities in the COVID-19 crisis.

[Keywords] ADHD, Learning Behavior, Online Learning, Satisfaction, Emotional Difficulties

1. Introduction

COVID-19, which was first reported at the end of 2019 and spread to the world in 2020, has created a new social rule called social distance, the restriction of meetings and face-to-face contacts[1][2][3]. Universities where a large number of professors, students, and faculty members gather together to take classes, study, and work are required more desperately to comply with this rule, because if this rule is not followed, the number of COVID-19 infections has rapidly increased, mainly in universities. According to the New York Times, a survey of more than 1,900 universities in the United States showed that more than 397,000 cases of infection and at least 90 deaths within the university's area in 2020 were reported[4]. Similarly, the Guardian reported that in the UK and Wales regions, the rate of COVID-19 infection in areas with universities is more than seven times higher than in neighboring areas that do not[5]. As a result, most universities have changed the form of classes from face-to-face to non-face-to-face, online classes[6].

The Ministry of Education in Korea also announced the 'Academic Management and Support Plan for Education' to switch offline classes to online ones[7]. According to Article 22 of the Higher Education Act of Korea, the number of online courses at the university does not exceed 20% of the total number of course credits. The Ministry of Education deregulated the limit on the number of online classes so that universities could temporarily change offline classes to online ones. Due to the Ministry of Education's management and the rapid spread of COVID-19, full scale online classes were held at almost all universities in 2020. Full-scale online classes at almost all universities in Korea is unprecedented. An educational experiment of online instruction and learning was begun in Korean universities.

However, the problem was that this full scale change to online classes was unprepared and urgently administered without considering the learning characteristics of university students. There might be students who were vulnerable to unprepared online classes, representatively, those with attention deficit hyperactivity disorder(ADHD) tendencies. ADHD is an emotional behavior disorder with inattention, hyperactivity, and impulsivity as core symptoms[8]. University students with ADHD tendencies often exhibit those symptoms in childhood and continue until adulthood. They are likely to experience more emotional and social difficulties than those without ADHD tendencies. They are found to receive low social supports and more conflicts with others including family members and friends due to their impulsive behaviors and improper emotional expressions[9]. In addition, they are more likely to experience emotional difficulties such as depression, anxiety, and anger, and their self-esteem was significantly low[10]. Also, they tend to have more academic difficulties that they typically use inefficient strategies in learning and, their academic achievement is significantly low[11]. Their academic difficulties are likely to become more serious in online learning. Becker and his colleague surveyed 238 adolescents aged 15 to 17 with and without ADHD about their difficulties of online learning during the COVID-19 pandemic[12]. According to the results of the study, students with ADHD perceived that online learning was more difficult than offline learning, and their parents also responded that their child's learning management was more difficult in online learning situations.

Other university students, most likely to suffer from unprepared online classes, were those experiencing emotional difficulties such as depression and anger. As the COVID-19 situation prolongs, many people have been experiencing emotional difficulties such as depression, anxiety, and anger. Park and his colleagues surveyed the psychological impacts of COVID-19 in 1,000 people randomly selected based on the gender, age, and geographic distribution of the entire Korean population in May 2020[13]. According to the results of the study, 27.3% of respondents reported experiencing mild or higher traumatic pain, and 34.2% of participants reported mild or higher depressive symptoms. These emotional difficulties showed different severities according to gender and age group. In particular, females showed significantly higher levels of traumatic pain, depression, and anxiety compared to males, and respondents in their twenties had significantly higher levels of depression, anxiety, and suicide risk compared to other age groups. These emotional difficulties are highly likely to have negative impacts on

university students' learning and their school life. Son and his colleague, and Kecojevic and his colleague analyzed the impacts of COVID-19 on university students' emotions and learning[14][15]. According to the results, university students experienced severe depression, anxiety, and stress. Also, they suffered from many difficulties in daily life such as lack of sleep, and as a result, they were unable to properly concentrate on their learning and school works.

This study was conducted for university students at Daegu in 2020. Daegu, the target area for the study, is the metropolitan city where COVID-19 most seriously occurred in the first half of 2020. As result, emotional difficulties such as depression and anger prevailed throughout the entire city. According to the results of a nationwide study conducted by Gyeonggi Research Institute in April, the level of anxiety/depression caused by COVID-19 was the highest in Daegu at 65.3%[16]. Based on this awareness of the problem, this study aimed to examine the learning and emotional difficulties which students with ADHD tendencies experienced at a local university where its' learning environment has changed dramatically due to the pandemic of COVID-19. In addition, the gender differences of those difficulties were analyzed. The specific research questions were as follows.

First, are there differences in university students' learning behavior, online learning satisfaction, university satisfaction, and/or emotional difficulties including depression and anger according to their ADHD tendencies, gender, and emotional difficulties?

Second, are there differences in university students' learning behavior, online learning satisfaction, and university satisfaction according to their coexistence of ADHD tendencies and emotional difficulties.

Third, do the differences in learning behavior, online learning satisfaction, and school satisfaction, which university students with the coexistence of ADHD tendencies and emotional difficulties exhibit, differ by gender?

2. Methods

2.1. Participants

A total of 1,016 students from K university located in the Daegu metropolitan city participated in this study. K University is a large, four-year university with more than 20,000 enrolled students and ranked in the top 10 nationwide in terms of enrolled students. After loading the questionnaire developed by the researchers on the online survey service of Korea Social Science Data Center, a link to participate in the online survey was sent as a text message to K University students. The survey was conducted from June 9 to July 22, 2020, over about six weeks. A total of 1,032 university students responded to the survey, and the data of 1,016 students were analyzed excluding 16 students who did not consent to the use of personal information. The demographics of participants are shown in <Table 1>.

Table 1. Demographics of participant.

Group	Variable	Gender		total
		Male (%)	Female (%)	
Year	1 st	331 (69.4%)	357 (66.2%)	688 (67.7%)
	2 nd	65 (13.6%)	94 (17.4%)	159 (15.6%)
	3 rd	39 (8.2%)	50 (9.3%)	89 (8.7%)
	4 th	42 (8.8%)	38 (7.1%)	80 (7.8%)

Major	Humanities and social science	197 (41.3%)	284 (52.7%)	481 (47.3%)
	Natural science or engineering	239 (50.1%)	114 (21.2%)	353 (34.7%)
	Arts and sports	35 (7.3%)	81 (15.0%)	116 (11.4%)
	Medical and nursing	6 (1.3%)	60 (11.1%)	66 (6.5%)
ADHD	Non-ADHD tendencies	374 (78.4%)	429 (79.6%)	803 (79%)
	ADHD tendencies	103 (21.6%)	110 (20.4%)	213 (20.9%)
Depression	Low level	258 (54.1%)	273 (50.6%)	531 (52.2%)
	High level	219 (45.9%)	266 (49.4%)	485 (47.7%)
Anger	Low level	246 (51.6%)	250 (46.4%)	496 (48.8%)
	High level	231 (48.4%)	289 (53.6%)	520 (51.1%)

2.2. Measurement

2.2.1. ADHD tendencies

In this study, the adult attention deficit/hyperactivity disorder self-report scale (ASRS v1.1) developed by Kessler and his colleague was used to measure the ADHD tendencies of university students [17]. This scale was composed of a total of 6 statements and designed to self-evaluate each statement using a 5-point Likert scale (1 point-not at all, 5 points-very frequently). In the statements 1-3 a score of 3 or more, and in the statements 4-6, a score of 4 or more was evaluated as having an ADHD tendency. When being evaluated as having an ADHD tendency in 4 or more of the 6 statements, the participants were qualified as having ADHD tendencies overall.

2.2.2. Learning behaviors

To measure the learning behavior of university students, the part of the questionnaire for measuring learner behavior developed by Cha was used [18]. This scale was configured to self-evaluate using a 5-point scale with 10 statements, and the higher the total score, the more active and efficient the learning behavior. The internal reliability of the learning behavior scale analyzed using Cronbach's α was found to be .901.

2.2.3. Online learning satisfaction

To measure university students' level of online learning satisfaction, the part of the questionnaire for measuring learning satisfaction developed by Cho was used [19]. This scale was configured to self-evaluate using a 5-point scale with 7 statements, and the higher the total score, the higher the level of online learning satisfaction. The internal reliability of the online learning satisfaction scale analyzed using Cronbach's α was found to be .901.

2.2.4. University satisfaction

To measure university students' level of university satisfaction, the part of the questionnaire developed by Kang for measuring university student satisfaction was revised to suit the current university situation and employed [20]. This scale was configured to self-evaluate using a 5-point scale with 7 statements, and the higher the total score, the higher the level of uni-

versity satisfaction. The internal reliability of the university satisfaction scale analyzed using Cronbach's α was found to be .901.

2.2.5. Depression

In order to measure the level of depression of university students, the part of depression in the Korean psychological examination test developed by Kim and his colleague was employed[21]. This scale was composed to self-evaluate using a 5-point scale with 12 statements, and the higher the total score, the higher the level of depression. The internal reliability of the depression scale analyzed using Cronbach's α was found to be .949.

2.2.6. Anger

To measure university students' level of anger, the part of anger scale developed by Steele and his colleague was revised to suit the current university situation and employed[22]. This scale was composed to self-evaluate using a 5-point scale with 10 statements, and the higher the total score, the higher the level of anger. The internal reliability of anger scale analyzed using Cronbach's α was found to be .949.

2.3. Data analysis

The analysis process of the research data was as follows. First, descriptive statistics were conducted to examine the ADHD tendencies, learning behavior, online learning satisfaction, university satisfaction, and emotional difficulties including depression and anger of the participants. Second, t-tests were conducted to find out whether there were differences in learning behavior, online learning satisfaction, university satisfaction, and emotional difficulties including depression and anger according to the ADHD tendency and gender. Third, the participants were divided into four groups according to ADHD tendency/depression level or ADHD tendency/anger level, and then t-tests and ANOVA were conducted to investigate the differences between each group. Finally, two-way ANOVA was conducted to examine whether the differences between groups divided into ADHD tendency/depression level or ADHD tendency/anger level differs by gender. The SPSS 18.0 program was used for data analysis.

3. Results

3.1. Differences in learning behavior, online learning satisfaction, university satisfaction, and emotional difficulties according to ADHD tendencies and gender

In order to examine whether there were differences in learning behavior, online learning satisfaction, university satisfaction and emotional difficulties including depression and anger according to the ADHD tendencies of university students, t-tests were implemented. As the results are shown in table 2, the learning behavior($t=7.415$, $p<.001$), online learning satisfaction($t=3.271$, $p<.001$), and university satisfaction($t=3.744$, $p<.001$), of students with ADHD tendencies were found to be significantly lower than those of students without ADHD tendencies. In addition, the levels of depression($t=-9.812$, $p<.001$), and anger($t=8.339$, $p<.001$), of students with ADHD tendencies were significantly higher than those of students without ADHD tendencies.

Table 2. Comparison of students with and without ADHD tendencies.

Variable	Group	M	SD	MSD	t
Learning behavior	Non-ADHD tendency	34.689	6.790	0.240	7.415***
	ADHD tendency	30.761	7.182	0.492	

Online learning satisfaction	Non-ADHD tendency	24.279	5.723	0.202	3.271***
	ADHD tendency	22.808	6.251	0.428	
University satisfaction	Non-ADHD tendency	36.839	6.407	0.226	3.744***
	ADHD tendency	34.962	6.862	0.470	
Depression	Non-ADHD tendency	26.644	10.296	0.363	-9.812***
	ADHD tendency	34.592	11.281	0.773	
Anger	Non-ADHD tendency	18.189	7.344	0.259	-8.339***
	ADHD tendency	23.221	9.439	0.647	

Note: *** $p < .001$.

In order to examine whether there were differences in learning behavior, online learning satisfaction, university satisfaction, and emotional difficulties including depression and anger according to the gender of university students, t-tests were implemented. As the results are shown in table 3, female students' learning behavior ($t = -2.391$, $p < .05$), online learning satisfaction ($t = -4.921$, $p < .001$), and university satisfaction ($t = -2.161$, $p < .05$) were found to be significantly higher than male students. In addition, female students' levels of depression ($t = -2.056$, $p < .05$) and anger ($t = -2.732$, $p < .01$) were significantly higher than male students.

Table 3. Comparison of male and female students.

Variable	Group	M	SD	MSD	t
Learning behavior	Male	33.304	7.648	0.350	-2.391*
	Female	34.362	6.450	0.278	
Online learning satisfaction	Male	23.019	6.299	0.288	-4.921***
	Female	24.813	5.317	0.229	
University satisfaction	Male	35.975	6.571	0.301	-2.161*
	Female	36.863	6.503	0.280	
Depression	Male	27.558	10.985	0.503	-2.056*
	Female	28.976	10.965	0.472	
Anger	Male	18.509	7.735	0.354	-2.732**
	Female	19.894	8.343	0.359	

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

3.2. Differences in learning behavior, online learning satisfaction, and university satisfaction according to the level of depression and anger

In order to examine whether there were differences in learning behavior, online learning satisfaction, and university satisfaction according to their level of depression, the participants were divided into two groups based on their level of depression and t-tests were implemented.

As the results are shown in table 4, the learning behavior($t=7.871$, $p<.001$), online learning satisfaction($t=6.645$, $p<.001$), and university satisfaction($t=9.271$, $p<.001$) of the students with high depression level were found to be significantly lower than those with low depression level.

Table 4. Comparison of students with low and high depression level.

Variable	Group	M	SD	MSD	t
Learning behavior	Low depression	35.482	7.001	0.304	7.871***
	High depression	32.095	6.684	0.303	
Online learning satisfaction	Low depression	25.115	5.930	0.257	6.645***
	High depression	22.718	5.532	0.251	
University satisfaction	Low depression	38.194	6.290	0.273	9.271***
	High depression	34.532	6.288	0.286	

Note: *** $p<.001$.

In order to examine whether there were differences in learning behavior, online learning satisfaction, and university satisfaction according to their level of anger, the participants were divided into two groups based on their level of anger and t-tests were implemented. As the results are shown in table 5, the learning behavior($t=7.001$, $p<.001$), online learning satisfaction($t=4.667$, $p<.001$), and university satisfaction($t=9.054$, $p<.001$) of the students with high anger level were found to be significantly lower than those with low anger level.

Table 5. Comparison of students with low and high anger level.

Variable	Group	M	SD	MSD	t
Learning behavior	Low anger	35.415	6.974	0.313	7.001***
	High anger	32.387	6.815	0.299	
Online learning satisfaction	Low anger	24.843	5.954	0.267	4.667***
	High anger	23.139	5.660	0.248	
University satisfaction	Low anger	38.278	6.478	0.291	9.054***
	High anger	34.698	6.126	0.269	

Note: *** $p<.001$.

3.3. Differences in learning behavior, online learning satisfaction, and university satisfaction according to the coexistence of ADHD tendencies/depression and ADHD tendencies/anger

In order to examine whether there were differences in learning behavior, online learning satisfaction, and university satisfaction according to their coexistence of ADHD tendencies and depression, the participants were divided into four groups based on their ADHD tendencies and the level of depression shown in table 6, and ANOVA was implemented. As shown in table 7, there were significant differences in learning behaviors, $F(3, 1012)=33.031$, $p<.001$, online learning satisfaction, $F(3, 1012)=15.827$, $p<.001$, and university satisfaction, $F(3, 1012)=29.790$,

$p < .001$, among groups. According to the results of subsequent pairwise comparisons between four groups, the learning behavior of AH+HD group students were found to be significantly lower than those of NA+LD and NA+HD group of students. In addition, AH+HD group students' online learning satisfaction and university satisfaction were significantly lower than NA+LD and/or AH+LD group students.

Table 6. Four groups of students based on the coexistence of ADHD tendencies and depression level.

Variable	Group	N	M	SD
Learning behavior	Non ADHD(NA) + low depression(LD)	466	35.886	6.954
	Non ADHD(NA) + high depression(HD)	338	33.041	6.188
	ADHD(AH) + low depression(LD)	64	32.531	6.735
	ADHD(AH) + high depression(HD)	148	29.959	7.263
Online learning satisfaction	Non ADHD(NA) + low depression(LD)	466	25.268	5.787
	Non ADHD(NA) + high depression(HD)	338	22.947	5.379
	ADHD(AH) + low depression(LD)	64	23.844	6.731
	ADHD(AH) + high depression(HD)	148	22.277	5.930
University satisfaction	Non ADHD(NA) + low depression(LD)	466	38.251	6.221
	Non ADHD(NA) + high depression(HD)	338	34.902	6.149
	ADHD(AH) + low depression(LD)	64	37.750	6.848
	ADHD(AH) + high depression(HD)	148	33.723	6.536

Table 7. Comparisons of students based on the coexistence of ADHD tendencies and depression level.

		SS	df	MS	F	Contrast (Tukey HSD)
Learning behavior	Between groups	4504.440	3	1501.480	33.031	4>1, 2*** 2>1*** 3>1***
	In groups	46002.086	1012	45.457		
	Total	50506.527	1015			
Online learning satisfaction	Between groups	1564.523	3	521.508	15.827	4>1*** 2>1***
	In groups	33346.591	1012	32.951		
	Total	34911.114	1015			
University satisfaction	Between groups	3529.978	3	1176.659	29.790	4>1, 3*** 2>1, 3***
	In groups	39973.044	1012	39.499		
	Total	43503.023	1015			

Note: *** $p < .001$.

In order to examine whether there were differences in learning behavior, online learning satisfaction and university satisfaction according to their coexistence of ADHD tendencies and anger, the participants were divided into four groups based on their ADHD tendencies and the level of anger shown in table 8, and ANOVA was implemented. As shown in table 9, there were significant differences in learning behaviors, $F(3, 1012)=30.483$, $p < .001$, online learning satisfaction, $F(3, 1012)9.532$, $p < .001$, and university satisfaction, $F(3, 1012)=29.160$, $p < .001$, among

groups. According to the results of subsequent pairwise comparisons between four groups, the learning behavior of AH+HA group students were found to be significantly lower than those of NA+LA and NA+HA group of students. Besides, AH+HA group students' online learning satisfaction and university satisfaction were significantly lower than NA+LA and/or AH+LA group students.

Table 8. Four groups of students based on the coexistence of ADHD tendencies and anger level.

Variable	Group	N	M	SD
Learning behavior	Non ADHD(NA) + low anger(LA)	429	35.904	6.880
	Non ADHD(NA) + high anger(HA)	374	33.294	6.416
	ADHD(AH) + low anger(LA)	67	32.284	6.806
	ADHD(AH) + high anger(HA)	146	30.062	7.264
Online learning satisfaction	Non ADHD(NA) + low anger(LA)	429	25.047	5.807
	Non ADHD(NA) + high anger(HA)	374	23.398	5.502
	ADHD(AH) + low anger(LA)	67	23.537	6.725
	ADHD(AH) + high anger(HA)	146	22.473	6.015
University satisfaction	Non ADHD(NA) + low anger(LA)	429	38.443	6.409
	Non ADHD(NA) + high anger(HA)	374	35.000	5.899
	ADHD(AH) + low anger(LA)	67	37.224	6.864
	ADHD(AH) + high anger(HA)	146	33.925	6.630

Table 9. Comparisons of students based on the coexistence of ADHD tendencies and anger level.

		SS	df	MS	F	Contrast (Tukey HSD)
Learning behavior	Between groups	4185.741	3	1395.247	30.483	4>1, 2*** 2>1*** 3>1***
	In groups	46320.786	1012	45.772		
	Total	50506.527	1015			
Online learning satisfaction	Between groups	959.360	3	319.787	9.532	4>1*** 2>1***
	In groups	33951.754	1012	33.549		
	Total	34911.114	1015			
University satisfaction	Between groups	3461.359	3	1153.786	29.160	4>1, 3*** 2>1, 3***
	In groups	40041.664	1012	39.567		
	Total	43503.023	1015			

Note: ***p<.001.

3.4. Gender differences in learning behavior, online learning satisfaction, and university satisfaction based on the coexistence of ADHD tendencies/depression or ADHD tendencies/anger

As there were differences in learning behavior, online learning satisfaction, and university satisfaction according to their coexistence of ADHD tendencies and depression, two-way

ANOVA was implemented in order to examine whether or not those differences differ by gender. As shown in table 10, 11, 12, gender difference was not found.

Table 10. Two-way ANOVA: learning behavior by ADHD tendencies/depression and gender.

Dependent variable	Source	SS	df	M	F
Learning behavior	ADHD/depression	4502.705	3	1500.902	33.212***
	Gender	89.469	1	89.469	1.980
	ADHD/depression*gender	130.704	3	43.568	.964
	Error	45553.751	1008	45.192	

Note: *** $p < .001$.

Table 11. Two-way ANOVA: online learning satisfaction by ADHD tendencies/depression and gender.

Dependent variable	Source	SS	df	M	F
Online learning satisfaction	ADHD/depression	1651.162	3	550.387	17.106***
	Gender	549.825	1	549.825	17.088***
	ADHD/depression*gender	27.505	3	9.168	.285
	Error	32432.673	1008	32.175	

Note: *** $p < .001$.

Table 12. Two-way ANOVA: university satisfaction by ADHD tendencies/depression and gender.

Dependent variable	Source	SS	df	M	F
University satisfaction	ADHD/depression	3610.167	3	1203.389	30.581***
	Gender	180.688	1	180.688	4.592*
	ADHD/depression*gender	57.567	3	19.189	.488
	Error	39665.250	1008	39.350	

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

As there were differences in learning behavior, online learning satisfaction, and university satisfaction according to their coexistence of ADHD tendencies and anger, two-way ANOVA was implemented in order to examine whether or not those differences differ by gender. As shown in table 13, 14, 15, gender difference was not found.

Table 13. Two-way ANOVA: learning behavior by ADHD tendencies/anger and gender.

Dependent variable	Source	SS	df	M	F
Learning behavior	ADHD/anger	4273.503	3	1424.501	31.360***
	Gender	104.882	1	104.882	2.309
	ADHD/anger*gender	197.837	3	65.946	1.452
	Error	45787.462	1008	45.424	

Note: *** $p < .001$.

Table 14. Two-way ANOVA: online learning satisfaction by ADHD tendencies/anger and gender.

Dependent variable	Source	SS	df	M	F
Online learning satisfaction	ADHD/anger	1037.748	3	345.916	10.561***
	Gender	672.407	1	672.407	20.530***

	ADHD/anger * gender	58.608	3	19.536	.596
	Error	33014.667	1008	32.753	

Note: ***p<.001.

Table 15. Two-way ANOVA: university satisfaction by ADHD tendencies/anger and gender.

Dependent variable	Source	SS	df	M	F
University satisfaction	ADHD/anger	3583.531	3	1194.510	30.379***
	Gender	250.868	1	250.868	6.380*
	ADHD/anger * gender	125.503	3	41.834	1.064
	Error	39635.293	1008	39.321	

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

4. Discussion

According to the results, first, it was found that university students with ADHD tendencies were more passive and neglected in their learning, and their online learning satisfaction and university satisfaction were also significantly lower than those of students without ADHD tendencies. These results are consistent with previous research studies showing that university students with ADHD tendencies tended to have more difficulties in learning[23], showed more problems with adapting to school life[24], and had lower satisfaction with university[25]. The reason why university students with ADHD tendencies exhibited these problems could be explained by their low self-regulation abilities[26]. As mentioned earlier, In Korea, online learning was administered at almost all universities in 2020 due to the spread of COVID-19. Typically, offline classes are implemented based on direct interactions between instructors and students, and thus students only need to focus on the content being taught by instructors. However, in online classes, instructors and students interact through the mediation of computers and the Internet, and during online learning, students easily encounter various distracting stimuli such as advertisements and entertainment news interfering with their concentration on learning. Thus, in online classes, effective learning cannot be achieved unless two tasks including the computer manipulation and the concentration of the learning content with avoiding distracting stimuli are performed. University students with ADHD tendencies were more likely to show difficulties in multitasking and avoiding distracting stimuli compared to other students without ADHD tendencies due to lack of self-regulation ability[27]. And, those difficulties were likely to have negative impacts on the satisfaction of online learning and university.

The results also indicated that university students with ADHD tendencies were found to have higher levels of emotional difficulties such as depression and anger compared to students without ADHD tendencies. These results are consistent with previous studies showing that the emotional difficulties of university students with ADHD tendencies were greater than those of students without ADHD tendencies[28][29][30]. The following two reasonable explanations are possible about why university students with ADHD tendencies experienced greater emotional difficulties. First of all, students with ADHD tendencies were likely to experience more stress in university life than those without ADHD tendencies. As mentioned above, students with ADHD tendencies are likely to experience more difficulties in academic tasks and social relationships due to the symptoms of attention deficit and impulsiveness, and accordingly, they experience more stress academically and socially. Particularly, because ADHD tendencies is a neurological problem that cannot be treated by itself, those academic and social stress are not temporary but repetitive and persistent. And those repetitive and persistent stress were likely to trigger emotional difficulties such as depression and anger. Next, emo-

tional difficulties could be amplified by inadequate management of students with ADHD tendencies. According to previous studies, the stress coping ability of students with ADHD tendencies was poorer than that of students without ADHD tendencies, and also they tended to use more inefficient stress coping strategies[31][32]. This means that even if students with ADHD tendencies experience a similar level of stress as those of students without ADHD tendencies, they cannot adequately cope with them and their stress may be amplified. There was a possibility that the amplified stress could lead to emotional difficulties such as depression and anger.

Second, according to the results, it was found that learning behavior, online learning satisfaction, university satisfaction, and emotional difficulties such as depression and anger vary according to gender. To begin with, female students were more active in learning, and their level of online learning and university satisfaction were higher than those of male students. These results are consistent with previous studies indicating that the learning behaviors of university students would be different according to their gender, and particularly female students were likely to be more conscientious and thorough in learning than male students[33][34]. There exist a few reasonable explanations for why female students showed better attitudes and efforts in learning than male students. First, there was a possibility of gender differences in learning due to sociocultural differences. In Korea, there has been a distinct difference in socially expected behaviors demanded of men and women. It has been emphasized that men are in charge of external activities such as production activities, and women are in charge of internal activities such as child-rearing and housekeepers. Accordingly, social activities are indeed more permissive and open to men than to women in Korea. Due to these socio-cultural characteristics, male students had a side that allowed more social relationships or activities other than learning in university, and this might lead to a reduction in time and efforts devoted to learning. Second, differences in learning styles between male and female students could lead to these results. Several previous studies examining the gender differences of learning styles reported that female students preferred relatively sequential tasks and tended to be calmer and steadier in learning, whereas male students showed interest in various tasks simultaneously and showed more active and progressive characteristics in learning[33][35][36]. The learning in universities, which required continuous and sincere efforts of students, would be more consistent with the learning style of female students. Furthermore, in the case of online learning, more steady self-directed learning might be required than in offline classes, so it was possible that female students would perform more sincere learning than male students.

Next, according to the analysis results, it was found that the level of emotional difficulties such as depression and anger also differed in gender, and female students showed more emotional difficulties than male students. According to several previous studies that analyzed the emotional differences between male and female students, female students tended to show more emotional difficulties than male students under similar stress situations, and emotional difficulties of female students had a greater impact on school work and daily life than those of male students[37][38][39]. The results of this study are consistent with these previous studies. This gender difference in emotional difficulties experienced by university students can be explained in the difference in brain function between men and women. According to Schulte-Rüther and his colleague's research, which analyzed the differences in brain responses between men and women in dealing with tasks related to oneself or others, it was found that the brain regions activated when dealing with the same task differ between men and women[40]. More specifically, in the case of women, the right frontal lobe, which is the brain area responsible for emotional information, was more activated than in men. There was a possibility that female students responded more emotionally to continuous stressful situations caused by the prolonged spread of COVID-19 than male students, and these responses produced more emotional difficulties such as depression and anger.

Third, the results indicated that emotional difficulties such as depression and anxiety were found to have negative impacts on university students' learning behavior, online learning satisfaction, and university satisfaction. These results are consistent with the results of previous studies that analyzed the relationships between university students' emotional difficulties and their learning including learning behaviors, learning engagement, and academic achievement[41][42][43][44]. How the emotional difficulties of university students negatively affected their learning can be reasonably explained through previous studies analyzing the relationships between emotional difficulties and learning motivation. Learning motivation refers to the fundamental driving force that initiates learning behavior, sets the correct learning direction, and maintains learning until the goal is achieved[45]. Sufficient learning motivation is an essential element for starting and maintaining desirable learning behaviors. A series of studies related to learning motivation indicates that learning motivation was highly influenced by the emotional state of students, and depression and anger were major variables that could lower learning motivation[46][47]. Considering these previous research studies, it can be assumed that the university students' increased depression and anger, known as Corona Blue or Corona Red, lowered their motivation for learning and changed their learning behaviors passively and negatively. Furthermore, those negative and passive learning behaviors could lead to their lower online learning satisfaction and university satisfaction.

Fourth, the results showed that the learning behavior, online learning satisfaction, and university satisfaction of the students, who had the coexistence of ADHD tendencies and emotional difficulties including depression or anger, were significantly lower than those of students who had not the coexistence, regardless of their gender. These results are in line with the results of previous studies showing that students with the coexistence of ADHD and depression tended to experience more cognitive, behavioral, and social difficulties than those without coexistence[48][49]. The following explanation is possible as to the reason why the coexistence of ADHD tendencies and emotional difficulties caused more serious problems than otherwise. According to recent research results, the most common cause of ADHD or ADHD tendencies is heredity[50]. This means that ADHD tendencies are likely to occur before emotional difficulties including depression or anger, which are acquired later. In fact, several previous studies showed that students with ADHD tendencies showed remarkable difficulties in family life, school tasks, and interpersonal relationships, and these difficulties often led to emotional difficulties such as depression and anger[50]. Therefore, the coexistence of ADHD tendencies and emotional difficulties meant that ADHD tendencies already played a dysfunctional role in various aspects of university students' life for a certain period of time, and led to emotional difficulties such as depression and anger.

The limitations of this study and suggestions for subsequent research are as follows. First, the application of the research results may be limited, because the survey data of this study were collected from one large university in Daegu. Students from universities in the capital area or from middle and small universities may show different responses or produce statistically insignificant results. Therefore, it is necessary to recruit participants from more diverse regions and size of universities in subsequent studies. Second, the data of this study were collected by a self-report survey. Thus, there was a possibility that the actual situation was exaggerated or underestimated in the participant's subjective perception. Particularly, in terms of learning behaviors, the participants' wishes could be reflected. Therefore, in the follow-up study, it is necessary to analyze the learning behaviors of university students using more accurate and direct methods such as behavioral observation records. This study showed that there were differences in learning behaviors, online learning satisfaction, university satisfaction, and emotional difficulties of university students according to their ADHD tendencies and gender. As COVID-19, which started in 2020, shows no signs of subsidence internationally[51], universities in Korea are more likely to offer online classes in 2021 again. At the same time, the emotional difficulties of depression and anger among university students are likely to become even more serious due to prolonged COVID-19. This study indicates that university students'

ADHD tendencies, gender, and emotional difficulties need to be considered in order to effectively implement online learning in Korean universities in the COVID-19 situation.

5. References

5.1. Journal articles

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	JC	-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*	JC	-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 SO	-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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