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Selection of URBANIZATION Indicator Species Through Naturalized Plant Distribution Analysis

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Abstract

Purpose: As the number of foreign plants adapted to the urban environment increased, urban plants that could grow and adapt to the city appeared. These plants invade the existing ecosystem and provide direct and indirect risk factors to plants and humans, such as vegetation disturbance in nature and cities and pollen allergy. This study is expected to be used as a standard for urbanization indicators by selecting indicator species through distribution analysis of naturalized plants.

Method: This study was analyzed based on flora survey data for 12 years from 2006 to 2017, the 3rd to 4th National Natural Environment Survey period, including 1200 places (776 map index system numbers). For distribution analysis of naturalized plants, matrix analysis was applied. The researchers analyzed the number of species by frequency of appearance in 162 cities and counties and the number of species by frequency of appearance in 1200 places. In addition, this study classified the distribution grades by the matrix analysis and tried to select the urbanization indicator species by conducting the first and second stages of evaluation.

Results: As a result of the second stage evaluation, 34 species were selected. There were 28 species with grades 2 to 3 in the distribution grade. There were 6 species with a naturalization rate of 15% or more and an appearance rate of 40% or more. Species with an urbanization index of 15% or more and an appearance rate of 40% or more were analyzed as 15 species. As a result of synthesizing the evaluation items, researchers selected 6 species as urbanization indicator species.

Conclusion: The urbanization indicator species had a low distribution grade, and they had a high frequency of appearance in 17 administrative districts. Researchers selected species of high appearance rates in areas with high naturalization rates and species of high appearance rates in regions with high urbanization indexes. As a result, 6 species were selected, including *Juncea*, *Supina*, *Coccinea*, *Great ragweed*, *Common groundsel*, and *Asper*.

[Keywords] Urbanization Indicator Species, Exotic Plants, Naturalized Plants, Naturalization Rate, Urbanization Index

1. Introduction

As urbanization progressed rapidly, the characteristics of a new urban environment appeared. An example is an increase in the number of exotic plants adapted to the urban environment due to the rise in the introduction of exotic plants in cities and increased human activities and international exchanges. Urbanization and the characteristics of the urban environment constituted anti-natural and artificial ecosystems, and urban plants that can grow by adapting to the city have emerged[1].

Among the urban plants introduced intentionally or unintentionally by humans, some alien plants were naturalized and played an essential role as pioneer plants in a poor urban environment[2][3].

However, they invaded the existing ecosystem and provided direct and indirect risk factors to plants and humans, such as pollen allergy, disturbance of vegetation in nature and cities. In addition, these plants are changing ecosystem functions and leading to a decline in the typical natural landscape available for human use. These results lead to damage and destruction of natural ecosystems, reducing biodiversity[1][4].

Ryu YJ(2002) argued that the cause of the decrease in biodiversity lay in the destruction of habitats due to artificial development and ecosystem damage. Kim DE(2018), Yoon IJ(2013), and Jung SY(2014) analyzed that the cause was the introduction of alien organisms[5][6]. Lee HC(2002) reported that habitat change and destruction, an increase in the rate of intentionally or accidentally introduced alien species invasion, and excessive development were the causes of biodiversity decline[7][8][9]. Cho HS and Cho KH(2015) mentioned that naturalized plants are one of the most important factors that threaten biodiversity[10][11][12]. In addition, they evaluated that naturalized plants negatively affect the ecosystem and cause socio-economic losses such as disease transmission and crop yield reduction[13][14].

The research on naturalized plants, which started in the 1960s, has been steadily increasing since the 2000s, and the direction and scope of the study are gradually expanding. In particular, naturalized plants are being studied intensively in the study of vascular plants[15][16][17][18]. Studies are being actively conducted to analyze the characteristics of naturalized flora in a specific region and the ecological environment of specific naturalized plants[1][19][20][21].

Therefore, this study selected urbanization indicator species through distribution analysis of naturalized plants. Researchers conducted this study, expecting that the indicator species will be used as the standard for urbanization indicators.

1.1. Preceding research

Researches on naturalized plants have been steadily increasing since the 1960s, and the direction and scope of research are gradually expanding. In general, studies related to the distribution of naturalized plants deal with research on the distribution status by region, year, and site type. Most studies on the distribution of naturalized plants by region deal with small-scale regions limited to one area[1][22][23][24]. However, Park SH et al.(2002) and Jung SY(2014) analyzed the total and the average number of species of naturalized plants in South Korea as a whole. In a study on the distribution of naturalized plants by year, Lee HJ(2018) visited 80 places in Gyeongsangbuk-do for 8 years from 2010 to 2017 and identified naturalized plants. Then, she reported after analyzing the identified naturalized plants by year[1][25][26]. Kim BW(2008), Oh CH et al.(2010), Jung SY(2014), and Lee HJ(2018) analyzed the habitat types by classifying them in consideration of the habitat environment of naturalized plants[1][27][28][29].

2. Methods

2.1. Gathering data

This study was analyzed based on the flora survey data for 12 years from 2006 to 2017, the 3rd ~ 4th National Natural Environment Survey. When viewed from the side of the map index system, there were 776 map numbers(1200 places).

In analyzing 1200 places by year, there were the most locations with 148 places(12.3%) in 2017. Next there were 142 places(11.8%) in 2014, 120 places(10.0%) in 2008, 120 places(10.0%) in 2010, 117 places(9.8%) in 2009, 113 places(9.4%) in 2011, 110 places(9.2%) in 2007, 105

places(8.8%) in 2012, 100 places(8.3%) in 2013, 85 places(7.1%) in 2006, 30 places(2.5%) in 2016, and 10 places(0.8%) in 2015.

776 map numbers nationwide(1200 places)

The 3rd-4th National Natural Environment Survey

- Survey Period: 2006-2017(12 years)

- The 3rd National Natural Environment Survey(2006~2013): 871 places

- The 4th National Natural Environment Survey(2014-2017): 329 places

2.2. Data analysis

In this study, a matrix analysis was performed to analyze the distribution of naturalized plants. Matrix analysis means visualizing data by intersecting two lists of rows and columns [16][30]. It is a data analysis method that can check the correlation between data by using a matrix consisting of the intersection of two or more significant dimensions [31][32].

After analyzing the number of species by frequency of appearance for 162 cities and counties and the number of species by frequency of appearance for 1200 places, the researchers placed them in rows and columns respectively and surveyed by displaying the object to be analyzed in the corresponding attribute. The evaluation standards for distribution grades are as shown in <Table 1>.

Table 1. The evaluation standards for distribution grades.

Division	Grade	Evaluation standard
Frequency of appearance in city and county	5	Frequency of appearance in 162 cities and counties: 101 times or more
	4	Frequency of appearance in 162 cities and counties: 76-100 times
	3	Frequency of appearance in 162 cities and counties: 51-75 times
	2	Frequency of appearance in 162 cities and counties: 26-50 times
	1	Frequency of appearance in 162 cities and counties: 0-25 times
	r	Frequency of appearance in 162 cities and counties: 0 times
Frequency of appearance in survey place	5	Frequency of appearance in 1200 places: 401 times or more
	4	Frequency of appearance in 1200 places: 201-400 times
	3	Frequency of appearance in 1200 places: 101-200 times
	2	Frequency of appearance in 1200 places: 51-100 times
	1	Frequency of appearance in 1200 places: 1-50 times
	r	Frequency of appearance in 1200 places: 0 times

<Table 2> shows the distribution grade matrix analysis of the appearance frequency of cities and counties and the appearance frequency of survey places.

Distribution grade evaluation = $f(x_1, x_2)$

X1 : Frequency of appearance in cities and counties (162 places)

X2 : Frequency of appearance in survey places (1200 places)

Table 2. Distribution grade matrix.

Frequency of appearance in city and county	r	3	2	2	1	1	r
	1	3	3	2	2	1	1
	2	4	3	3	2	2	1
	3	4	4	3	3	2	2
	4	5	4	4	3	3	2
	5	5	5	4	4	3	3
	x1	x2	5	4	3	2	1

↑

→ Frequency of appearance in survey place

3. Results & Discussion

3.1. Species number analysis by frequency of appearance for 1200 places and 162 cities and counties

The species with an appearance rate of 50% or more in 1200 places are 6 species, such as Daisy fleabane, Evening primrose, Common dandelion, Horse-weed, Virginian poke, and Black locust.

For the 162 cities and counties, the species with an appearance rate of 86.4% or higher were 6 species, such as Daisy fleabane, Black locust, Evening primrose, White clover, Common dandelion, and Horse-weed. <Table 3> shows the number of species by frequency of appearance for 1200 places.

Table 3. Number of species by frequency of appearance for 1200 places.

Frequency of appearance(times)	Appearance rate(%)	Number of species
601 or more	51 or more	6
401-600	33.4-50.0	6
201-400	16.8-33.3	14
151-200	12.6-16.7	8
101-150	8.4-12.5	15
51-100	4.3-8.3	25
31-50	2.6-4.2	21
11-30	0.9-2.5	45
6-10	0.5-0.8	30
1-5	0.1-0.4	75
0	0	76

<Table 4> shows the number of species by frequency of appearance for 162 cities and counties.

Table 4. Number of species by frequency of appearance for 162 cities and counties.

Frequency of appearance(times)	Appearance rate(%)	Number of species
141 or more	86.4 or more	6
101-140	62.3-86.4	14
76-100	46.9-61.7	14
51-75	31.5-46.3	16
26-50	16.0-30.9	33
11-25	6.8-15.4	33
6-10	3.7-6.2	37
1-5	0.6-3.1	92
0	0	76

3.2. Distribution class classification

<Table 5> shows the distribution grade classification table by matrix analysis.

Table 5. Distribution grade classification table by matrix analysis.

Frequency of appearance in city and county	r	r	r	r	r	r	1	1	1	1	1	1	2	2	2	2	2	
Frequency of appearance in survey place	r	1	2	3	4	5	r	1	2	3	4	5	r	1	2	3	4	5
Distribution grade	r	1	1	2	2	3	1	1	2	2	3	3	1	2	2	3	3	4
Frequency of appearance in city and county	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5
Frequency of appearance in survey place	r	1	2	3	4	5	r	1	2	3	4	5	r	1	2	3	4	5
Distribution grade	2	2	3	3	4	4	2	3	3	4	4	5	3	3	4	4	5	5

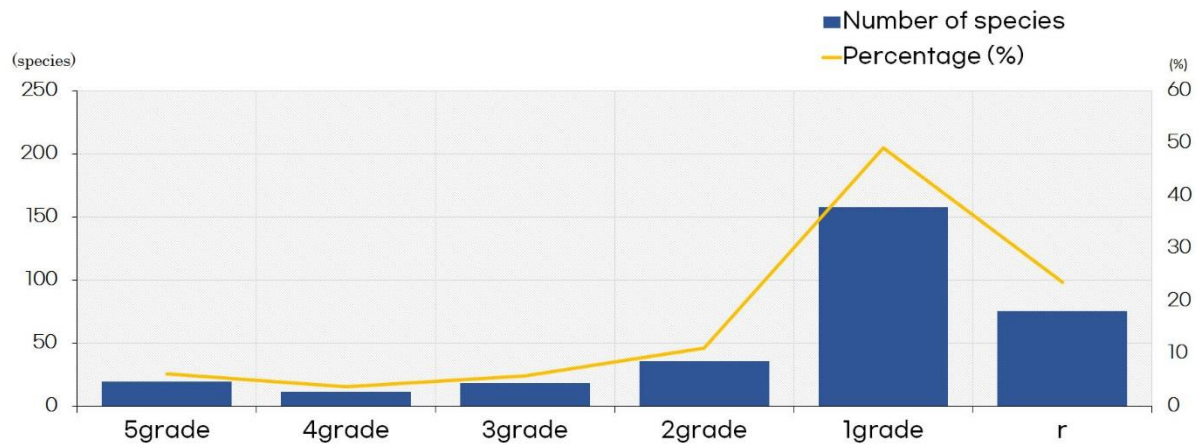
Distribution grades of naturalized plant species are as shown in <Table 6> and <Figure 1>.

Table 6. Distribution grade of naturalized plant species.

Grade	Distribution type	Number of species	Percentage(%)
5	Very high distribution	20	6.2
4	High distribution	12	3.8
3	Normal distribution	19	5.9
2	Low distribution	36	11.2
1	Very low distribution	158	49.2
r	Little distribution	76	23.7

There were 20 species(6.2%) in grade 5, including Field dock, Ragweed, White heath aster. Grade 5 showed a very high distribution type.

Figure 1. Comparison graph of distribution grade of naturalized plant species.



<Table 7> shows the comparison results with previous studies on 20 species with distribution grade 5.

Table 7. Comparison with previous studies for 20 species with distribution grade 5.

List	Distribution grade 5	Lee YM et al.(2011)	Jung SY(2014)
Copse Buckwheat	○		
Field Dock	○		○
Curled Dock	○	○	○
Virginian Poke	○		○
Sticky Mouse-ear		○	
White Goosefoot		○	
Goosefoot		○	○
Speen Amaranth		○	
Juncea		○	
Pepperweed	○		○
Pepper-grass		○	
Penny Cress	○		
Indigobush Amorpha	○	○	○
Black Locust	○	○	○
Red Clover			○
White Clover	○	○	○
Milk Purslane		○	
Tree-of-heaven		○	
Evening Primrose	○	○	○
Pentagona		○	
Wall Speedwell	○		○
Persica		○	○
Ragweed	○	○	○
White Heath Aster	○	○	

3.3.1. Conditions for selection of urbanization indicator species

1. The distribution grade is low,
2. The frequency of appearance is high in 17 administrative districts,
3. The appearance rate is high in areas with a high naturalization rate,
4. Select a species with a high appearance rate in areas with a high urbanization index.

<Table 10> shows the indicators for each item in the first stage evaluation for selecting urbanization indicator species, and <Table 11> shows the indicators for each item in the second stage evaluation.

Table 10. Indicators for each evaluation item in the first stage evaluation.

Division	Grade	Evaluation standard
Distribution grade	5	Distribution grade 1
	4	Distribution grade 2
	3	Distribution grade 3
	2	Distribution grade 4
	1	Distribution grade 5
Frequency of appearance in survey place	5	Frequency of appearance in 1200 places :1-5 times
	4	Frequency of appearance in 1200 places: 6-10 times
	3	Frequency of appearance in 1200 places: 11-50 times
	2	Frequency of appearance in 1200 places: 51-200 times
	1	Frequency of appearance in 1200 places: 201 times or more

Note: The appearance frequency in survey places of X2 was based on 155 species that appeared at an urbanization index of 15% or higher in 1200 research sites.

Table 11. Indicators for each evaluation item in the second stage evaluation.

Division	Grade	Evaluation standard
First evaluation value	5	First evaluation value: grade 5
	4	First evaluation value: grade 4
	3	First evaluation value: grade 3
	2	First evaluation value: grade 2
	1	First evaluation value: grade 1
Frequency of appearance in administrative district	5	Appearance frequency of 17 districts: 15-17 times
	4	Appearance frequency of 17 districts: 12-14 times
	3	Appearance frequency of 17 districts: 9-11 times
	2	Appearance frequency of 17 districts: 6-8 times
	1	Appearance frequency of 17 districts: 1-5 times

3.3.2. Results of selection of urbanization indicator species

As a result of the second stage evaluation, 34 species were selected. There were 28 species with distribution grades ranging from grades 2 to 3.

Six species with a naturalization rate of 15% or higher and an appearance rate of 40% or higher were investigated. 15 species with an urbanization index of 15% or more and an appearance rate of 40% or more were analyzed.

As a result of synthesizing the evaluation items, the researchers selected 6 species as urbanization indicator species, including Juncea, Supina, Coccinea, Great ragweed, Common groundsel, and Asper. <Table 12> shows the results of the selection of urbanization indicator species.

Table 12. Results of selection of urbanization indicator species.

No	List	Distribution grade	Appearance rate at 15% or more of the naturalization rate	Appearance rate at 15% or more of the urbanization index	Final result
1	Princess-feather	2	27	17	
2	Broad-leaved dock	3	20	42	
3	Goosefoot	3	33	25	
4	Glaucum	2	33	25	
5	Lividus	2	0	8	
6	Juncea	3	40	75	★
7	Hairy vetch	2	7	8	
8	Maculata	2	20	50	
9	Supina	3	60	83	★
10	Tree of heaven	3	27	42	
11	Onagraceae	2	7	8	
12	Pentagona	3	20	33	
13	Integriuscula	1	0	17	
14	Lacunosa	2	13	33	
15	Coccinea	3	47	67	★
16	Americanum	2	7	33	
17	Hederaefolia	1	0	8	
18	Persica	4	33	100	
19	Great ragweed	3	47	42	★
20	Slim aster	2	0	25	
21	Garden cornflower	1	0	8	
22	Fleabane	2	7	42	
23	Ebolo	4	27	75	
24	Tall fleabane	2	7	25	
25	White snakeroot	2	7	17	
26	Common groundsel	3	67	83	★
27	Asper	3	40	58	★
28	Southern marigold	3	33	58	
29	Goat's-beard	1	0	8	
30	Bluejacket	2	7	8	
31	Weeping love grass	2	7	33	
32	Rat's-tail fescus-grass	2	13	8	
33	Rye-grass	3	27	50	
34	Fall panicum	3	33	50	

<Table 13> shows photos and explanations of naturalized plants selected as indicators of urbanization.

Table 13. Selected urbanization indicator species photo.

English name (scientific name)	Photo 1	Photo 2	Explanation
Juncea (<i>Brassica juncea</i>)			<ul style="list-style-type: none"> · Introduction period : 1922 · Flowering season : April - May · Native habitat : China · A perennial plant : two years
Supina (<i>Euphorbia supina</i> Raf.)			<ul style="list-style-type: none"> · Introduction period : 1937 · Flowering season : July - September · Native habitat : North America · An annual plant
Coccinea (<i>Quamoclit coccinea</i> Moench)			<ul style="list-style-type: none"> · Introduction period : 1992 · Flowering season : July - October · Native habitat : tropical America · An annual plant
Great ragweed (<i>Ambrosia trifida</i> L.)			<ul style="list-style-type: none"> · Introduction period : 1974 · Flowering season : July - September · Native habitat : North America · An annual plant
Common groundsel (<i>Senecio vulgaris</i> L.)			<ul style="list-style-type: none"> · Introduction period : 1932 · Flowering season : April - October · Native habitat : Europe · An annual plant
Asper (<i>Sonchus asper</i>)			<ul style="list-style-type: none"> · Introduction period : 1949 · Flowering season : May - October · Native habitat : Europe · An annual plant

4. Conclusion

The results of evaluating the frequency of appearance in cities and counties(162 places) and survey sites(1200 places) by matrix analysis are as follows. There were 20 species(6.2%) of grade 5 species with very high distribution. There were 12 species(3.8%) of grade 4 species with high

distribution. There were 19 species(5.9%) of grade 3 species with normal distribution. There were 36 species(11.2%) of grade 2 species with low distribution. There were 158 species(49.2%) of grade 1 species with very low distribution.

There were 76 species(23.7%) of r-grade species with little distribution.

As a result of comparing the 20 species, grade 5 species, with those of the previous study, 11 species such as Curled dock, Indigobush amorphia, and Black locust were the same.

The urbanization indicator species had a low distribution grade, and they had a high frequency of appearance in 17 administrative districts. Researchers selected species of high appearance rates in areas with high naturalization rates and high appearance rates in regions with high urbanization indexes. As a result, 6 species were selected, including Juncea, Supina, Coc-cinea, Great ragweed, Common groundsel, and Asper.

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5.2. Thesis degree

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6. Appendix

6.1. Authors contribution

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

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A Study to Enhance MULTICULTURAL Acceptance of Local Governments through Analysis of Factors Influencing Multicultural Acceptance

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Abstract

Purpose: The purpose of this study is to analyze the multicultural acceptance perception survey to verify the relationship between each demographic and social factor, contact factor, and multicultural education and multicultural acceptance, and to suggest measures to improve multicultural acceptance by region. Most of the preceding studies in Korea have proven simple relevance through multicultural acceptance analysis, but this study focuses on local autonomy and suggests the justification for multicultural acceptance education and central government budget allocation.

Method: This study used the data from the 2018 General Public Multicultural Acceptance Survey, the most recent data of the General Public Multicultural Acceptance Survey conducted every three years by the Ministry of Gender Equality and Family to verify variables affecting multicultural acceptance. This survey selected a total of 4,006 men and 1,970 women as a probability sample (multistage stratified sample by region, gender, and age) based on the 2016 Population and Housing Census(Statistics Office). The variables in this study were the dependent variables such as multicultural acceptance score(subordinate variable), demographic factor, contact factor, and multicultural education(independent variable), and regression analysis was conducted using SPSS 21.0, a statistical program.

Results: As a result of the statistical analysis of this study, it was found that in the case of demographic factors, men, younger age, and higher education had a positive effect on multicultural acceptance. Looking at the contact factors, as direct contact, multicultural events, festivals, and strong relationships with foreigners could increase multicultural acceptance. In the case of indirect contact, multicultural acceptance could be increased when exposed to positive mass media content. In the case of the number of multicultural education sessions, the more education received, the more positive the acceptance was. On the other hand, it was found that household income, occupation and foreign contact, which were factors that had a significant influence in previous studies, did not have a significant effect in this study.

Conclusion: This study, which identified the factors affecting multicultural acceptance by using statistical analysis, believes that it has a value to contribute to preparing measures to improve multicultural acceptance suitable for local governments. In the case of local governments, multicultural education can be conducted by selecting groups by gender, age and educational background. In addition, festivals and events with foreigners can be planned, and positive foreign-related broadcasts can be planned on YouTube videos promoted by local broadcasters or local governments.

[Keywords] Multicultural Acceptance, Multicultural Education, Local Governments, Contact Factor, Demographic and Social Factor

1. Introduction

Homogenous Korea's gradual globalization began about 20 years ago in the 1990s. Starting with the "Foreign Investment Company Training System" introduced in 1991, foreign workers

began to flow into Korea[1], and foreign marriage immigrants flowed into the countryside in place of insufficient marriage-age women due to past preference of sons and migration to cities. From this time on, various terms such as multicultural, multicultural families, foreign workers, and marriage immigrants, which were not previously used much in Korea, began to be used throughout the society, and there were more opportunities to meet foreigners on a daily basis.

So far, there have not been many crimes caused by xenophobia in Korea. However, from September to October 2010, 1,500 petitions were posted on the Ministry of Employment and Labor's website to exclude Islamic countries from labor transmission countries, showing the pattern of Islamophobia. In addition, the widespread hatred of the Korean-Chinese due to the Oh Won-chun Incident and the newly coined word Chao-Phobia appear[2]. In view of this, there is a possibility of social conflict when switching to a multicultural society in earnest.

As of November 2019, the number of foreigners staying in Korea was 2.21 million, accounting for 4.28% of the total population. In general, if the proportion of foreigners exceeds 5%, it is classified as a multicultural society[3] and the transition to a multicultural society is expected as soon as possible with the average number of foreigners staying in Korea rising 7.9% over the past three years. The transition to a multicultural society is expected to take place faster and faster at a time when the population naturally decreases due to severe low birth rates and the lack of labor force due to the aging society.

Therefore, the purpose of this study is to analyze the factors affecting multicultural acceptance by using the data of the Multicultural Acceptance Survey conducted every three years by the Ministry of Gender Equality and Family and to suggest ways to reduce conflicts in the transition to a multicultural society. In particular, the factors affecting multicultural acceptance differ from local government to local government along with the current situation of expanding local autonomy, so the research aims to analyze this and present a baseline for efficient multicultural acceptance of each local government.

2. Theoretical Background and Study Hypotheses

2.1. Factors influencing multicultural acceptance, multicultural education, and contact experience

A lot of studies related to multiculturalism have been conducted due to the lack of labor due to the aging of the Korean society and the low birth rate, and the continuous influx of marriage immigrants. In particular, as direct and indirect contact between Koreans and foreigners increased, many studies related to multicultural acceptance were conducted focusing on Koreans. The concept of multicultural acceptance referred to here differs slightly from scholar to scholar, but to define the concept by combining it, it can be said that it is a posture aimed at diversity beyond a simple homogeneity concept. In other words, it is an attitude that embraces other ethnicities, races, cultures, and religions, breaking away from the concept of Korea as a single nation, race, and culture in the existing practical and mental sense. Prior studies conducted on such multicultural acceptance are basically divided into three main factors that affect multicultural acceptance. First, there are studies on the relationship between demographic factors and multicultural acceptance[4][5][6][7][8][9][10], second, the relationship between multicultural education and multicultural acceptance[11][12][13], and finally, the relationship between direct and indirect contact and multicultural acceptance[14][15][16][17][18][19][20][21]. Previous studies have identified factors to promote multicultural acceptance by proving which factors affect multicultural acceptance, even if the questionnaire questions were not completely consistent. Therefore, the purpose of this study is to statistically verify the relationship between demographic factors, contact factors, and multicultural acceptance of multicultural education using the latest data and to suggest measures to improve multicultural acceptance suitable for each local government.

Previous studies have limitations in analyzing the comprehensive factors affecting multicultural acceptance, and even though alternatives are proposed, abstract alternatives have been proposed at the central government level. However, local governments in Korea have different population groups and group's feature, and accordingly, their budget or strategic importance may change in enhancing multicultural acceptance. Therefore, this study has a value that can contribute to multicultural research and policies and differentiates it from previous studies in that it analyzes microscopic factors affecting multicultural acceptance and presents alternatives and criteria for distributing budgets according to different factors.

Research on multicultural acceptance, a dependent variable of this study, has been continuously conducted. In particular, Multicultural Acceptance Survey, conducted every three years by the Ministry of Gender Equality and Family since 2012[22], has been conducted on the general public and youth, and unlike various questionnaires used to study multicultural acceptance, studies using it exist[8][19]. However, this study, which aims to use the analysis results in combination with local autonomy in a situation where studies using the variables used in the survey are insufficient, analyzes contact factors, multicultural education, and demographic factors, and uses the results to suggest ways to improve multicultural acceptance.

H1: The more experience participating in events with foreigners, the more significant positive effect on multicultural acceptance.

H2: The more volunteer experience with foreigners, the more significant positive effect on multicultural acceptance.

H3: The more experience in clubs with foreigners, the more significant positive effect on multicultural acceptance.

H4: The more simple contact with foreigners, the more significant positive effect on multicultural acceptance.

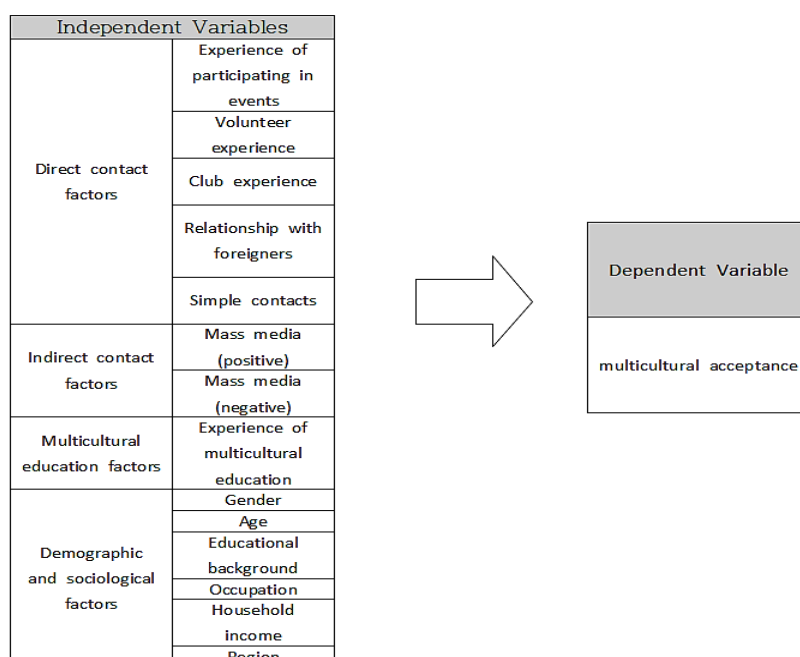
H5: The stronger the relationship with foreigners, the more significant positive effect on multicultural acceptance.

H6: The more negative foreign broadcasts are encountered through the mass media, the more significant negative effect will have on multicultural acceptance.

H7: The more you encounter positive broadcasts related to foreigners through the mass media, the more significant positive effect on multicultural acceptance.

H8: The more multicultural education, the more positive effect on multicultural acceptance

Figure 1. Research design.



3. Method and Results

3.1. Data and variables

Data from the 2018 Multicultural Acceptance Survey were used to verify the factors affecting multicultural acceptance. This data is conducted by the Ministry of Gender Equality and Family every three years from 2012 to confirm the multicultural acceptance of the people and to set policy directions based on changes in multicultural acceptance. The survey targets the general public through random screening, and the survey contents investigate sub-components such as multicultural acceptance, stereotypes, and willingness to exchange.

For multicultural acceptance, a dependent variable of this study, the Korean Multi-culturalism Inventory for Adults(KMCI) was used. It evaluates multicultural acceptance based on a total of 35 questions, including diversity(15 questions), relationship(11 questions), and universality(9 questions). The Cronbach's α coefficient was 0.91, indicating very high reliability, and all questions were measured on a six-point Likert-type scale.

The independent variables are as follows. Demographic factors such as gender(male: 1, female: 2), age(20s: 1, 30s: 2, 40s: 3, 50s: 4, 60s or older:5), academic background(junior high or under: 1, high school: 2, vocational college graduate: 3, college graduate: 4, graduate school and higher: 5), household income - less than 1 mil won: 1, 1-1.99 mil won: 2, 2 - 2.99 mil. won: 3, 3 - 3.99 mil. won: 4, 4 - 4.99 mil. won: 5, 5 - 5.99 mil. won: 6, 6 mil. won or more: 7; and for occupation, service jobs: 1, simple labor: 2, others: 3. For the regions, Seoul metropolitan area: 1, Gyeongsangnam-do: 2, Chungcheong-do: 3, Jeolla-do: 4, Gyeongsangbuk-do: 5, Gangwon-do: 6, and Jeju-do: 7. The contact factors are as follows. Foreign festivals, foreign volunteers, and club activities with foreigners(no participation experience: 1, 1-2 times: 2, 3-4 times: 3, more than 5 times: 4 times). For relationship level with foreigners, strong relationship with foreigners: 1, weak relationship: 2, none: 3. For simple contact with foreigners, see foreigners very often: 1, frequent: 2, occasional: 3, rarely: 4, and never: 5. For positive mass media content among indirect contacts: foreign immigrants doing volunteer work, foreigners working in harmony with Korean, foreigners teaching their culture and language to Koreans, foreigners good at speaking Korean, promotional ad and campaign on understanding multiculturalism, foreigners appearing on Korean TV shows, and foreign athletes who are naturalized Koreans. Negative media content includes married migrant women who suffered violence, illegal foreign workers who are forcibly deported, foreign workers who are treated unfairly at work, and foreign criminals. It was divided in this way and calculated as an average value. Finally, in the case of multicultural education experience, independent variables were input with none: 1, once: 2, twice: 3, three times: 4, and more than four times: 5.

3.2. Hypotheses test

The results of basic statistical analysis of the variables of this study are shown in Table 1 below. In demographic characteristics and major variables, the average of gender factor is 1.49, which is relatively equally distributed. The average age is 2.98, which is distributed over all ages, and it appears that there are more people in the relatively younger generation. In the case of direct contact events, volunteers, and clubs, the average is 1.06-1.08, so most of them do not seem to have participated. In the case of indirect contact, positive and negative contacts appear to have been similarly contacted at 3.07 and 2.84, respectively, but relatively more positive contacts have been made. The results of correlation analysis between variables are shown in Table 2 below. Age and multicultural acceptance were found to have a correlation of 0.23 for event participation experience and multicultural acceptance of 0.13, and multicultural education experience and multicultural acceptance of 0.15.

Table 1. Descriptive statistics.

	Factors	Min. value	Max. value	Avg.	SD
Direct contact factors	Experience of participating in events	1.00	4.00	1.08	0.32
	Volunteer experience	1.00	4.00	1.07	0.30
	Club experience	1.00	4.00	1.06	0.30
	Relationship with foreigners	1.25	3.00	2.88	0.20
	Simple contacts	1.00	5.00	2.51	0.72
Indirect contact factors	Mass media (positive)	1.00	5.00	3.07	0.58
	Mass media (negative)	1.00	5.00	2.85	0.73
Multicultural education factors	Experience of multicultural education	1.00	4.00	1.09	0.43
Demographic and sociological factors	Gender	1.00	2.00	1.49	0.50
	Age	1.00	5.00	2.98	1.35
	Educational background	1.00	5.00	2.71	1.05
	Occupation	1.00	3.00	1.64	0.85
	Household income	1.00	7.00	4.38	1.45
	Region	1	7	2.89	1.72

Table 2. Correlations.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.00														
2	-0.05***	1.00													
3	-0.22***	0.02	1.00												
4	0.23***	-0.10***	-0.55***	1.00											
5	-0.07***	0.18***	0.08***	-0.17***	1.00										
6	0.13***	0.02	-0.27***	0.42***	-0.23***	1.00									
7	-0.04**	0.00	0.05**	-0.07***	0.05**	-0.17***	1.00								
8	0.13***	0.03*	-0.03*	0.07***	0.01	0.03*	0.01	1.00							
9	0.10***	0.00	-0.04**	0.07***	0.00	0.05***	-0.02	0.55***	1.00						
10	0.11***	0.00	-0.06***	0.06***	-0.01	0.03	-0.04*	0.50***	0.46***	1.00					
11	-0.21***	0.00	0.05***	-0.05***	0.04*	-0.05**	0.00	-0.16***	-0.09***	-0.13***	1.00				
12	-0.09***	-0.02	0.06***	-0.07***	0.04*	-0.08***	0.07***	-0.08***	-0.05***	-0.07***	0.22***	1.00			
13	0.21***	-0.02	-0.10***	0.12***	-0.04**	0.15***	-0.06***	0.05**	0.04**	0.04**	-0.12***	-0.17***	1.00		
14	0.07***	-0.02	-0.06***	0.07***	-0.09***	0.11***	0.03*	0.01	0.00	0.02	-0.06***	-0.11***	0.61***	1.00	
15	0.15***	0.00	-0.14***	0.14***	0.06***	0.08***	0.02	0.23***	0.23***	0.12***	-0.11***	-0.05***	0.09***	0.04**	1.00

Note: *p<0.05, **p<0.01, ***p<0.001/ 1. acceptance, 2. gender, 3. age, 4. educational background, 5. occupation, 6. household income, 7. region, 8. event participation experience, 9. volunteer experience, 10. club experience, 11. relationship, 12. simple contact, 13. positive contact with mass media, 14. negative contact with mass media, 15. multicultural education experience.

In order to verify the factors affecting multicultural acceptance, multiple regression analysis was selected and conducted using SPSS21.0, a statistical analysis program. The F value of the multiple regression model was 48.972, which was significant within the significance probability $P<0.001$. As a result of confirming the modified R-value, 0.144, the explanatory power of the independent variables for multicultural acceptance, which is a dependent variable, is 14.4%. In addition, all of the VIF coefficients did not exceed 1.7, below 10, so multicollinearity between independent variables did not appear.

The regression analysis results are shown in <Table 3> below. In this study, a number of significant results were obtained by injecting a number of independent variables, but it was found that regional, household income, number of volunteer experience, number of club experience, and foreign contact did not have a significant effect. First of all, according to gender in demographic and sociological factors, women show a more negative attitude toward multicultural acceptance than men ($\beta=-0.032$, $P<0.05$), and higher education has a positive influence on multicultural acceptance ($\beta=0.110$, $P<0.001$). In addition, the older age group ($\beta=-0.122$, $P<0.001$) In terms of contact factors, the stronger the relationship with foreigners in direct contact, the more positive the acceptance is, and conversely, the weaker the relationship or the absence of a foreigner relationship, the lower the acceptance ($\beta=-0.161$, $P<0.001$). In addition, it was found that participating in events or sports competitions with multicultural environments and foreigners among active direct contacts had a positive effect on acceptance ($\beta=0.049$, $P<0.01$). In indirect contact, positive contact through the mass media had a positive effect on multicultural acceptance ($\beta=0.200$, $P<0.001$), and negative contact had an adverse effect on acceptance ($\beta=-0.084$, $P<0.001$). Finally, participating in multicultural education had a significant effect on

enhancing multicultural acceptance($\beta=0.067$, $P<0.001$). In other words, hypotheses 1, 5, 6, 7, and 8 appear to have a significant effect on multicultural acceptance, so they can be adopted.

Table 3. The result of regression on the influence of contact factors and multicultural education factors on multicultural acceptance.

Variables	Non-standardization coefficient		Standardization coefficient	t	TOL	VIF
	B	SE	β			
(Constant)	67.529	3.098		21.798***		
Experience of participating in events	1.697	.652	.049	2.604**	.601	1.664
Volunteer experience	.178	.668	.005	.267	.639	1.565
Club experience	1.011	.646	.027	1.565	.698	1.432
Relationship with foreigners	-9.040	.862	-.161	-10.493***	.913	1.095
Simple contacts	-.077	.235	-.005	-.329	.919	1.088
Mass media(positive)	3.831	.362	.200	10.591***	.603	1.659
Mass media(negative)	-1.269	.282	-.084	-4.499***	.622	1.607
Experience of multicultural education	1.755	.403	.067	4.354***	.895	1.118
Gender	-.707	.334	-.032	-2.119*	.947	1.056
Age	-.993	.145	-.122	-6.843***	.682	1.466
Educational background	1.164	.200	.110	5.812***	.598	1.673

Occupation	-.371	.201	-.029	-1.844	.895	1.117
Household income	.037	.129	.005	.286	.758	1.319
Region	-.071	.097	-.011	-.738	.954	1.048
<i>F(p)</i>	48.972***					
adj. R^2	0.144					

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

4. Discussion

Due to various factors such as labor, marriage, refugees, and education, the inflow of foreigners into Korea continues to increase, and it has entered a time to break away from the concept of a homogenous nation that Korea has had. Moreover, with this trend and the natural decline of the population due to Korea's low birth rate and aging population, this transition to a multicultural society will accelerate further, and multiculturalism will become a universal situation in Korean society. According to the current status of foreign residents of local governments in 2019[23], Gyeonggi-do, Chungcheongnam-do, Jeju-do's resident foreign population rate is 5.4%, 5.8%, and 5.2%, respectively, exceeding 5% mark, which is a milestone point of a multicultural society. As such, Korea's entry into a multicultural society is already underway differently for each local government.

Therefore, research is needed to analyze the factors affecting Korea's multicultural acceptance and suggest ways to increase multicultural acceptance. In particular, in the case of previous studies, a plan at the central government level was proposed[24], but this study is meaningful in that it was intended to be used by local governments using the analysis results.

This study verified the factors affecting the multicultural acceptance of the people by using the 2018 National Multicultural Acceptance Survey data, the latest data from the multicultural acceptance survey conducted every three years by the Ministry of Gender Equality and Family. As a result of conducting multiple regression analysis using the analysis program SPSS, it was found that gender, education, age, relationship, event participation experience, and positive and negative contact of the mass media had a significant effect. On the other hand, household income, occupation, volunteer experience, club experience, simple contact, and region did not have statistically significant results.

In order to propose the use of the analysis results, first, as a demographic factor, local governments show various civic compositions. Among them, multicultural acceptance can be further enhanced by selecting low-educated and high-aged groups. Second, as a contact factor, relationships and multicultural events are factors that influence multicultural acceptance through direct contact. According to previous studies, there were results that simple contact also had an effect on positive multicultural acceptance[17][18], but it was found that it did not significantly affect the analysis results of this study. However, it was found that the relationship, that is, the group with a strong bond, had a positive effect on acceptance than the group with a weak relationship or the group without a relationship. In previous studies, it could be

interpreted that the quality of contact, not simple contact, had an effect on acceptance. Local governments should provide multicultural education by selecting companies with many foreign workers, middle and high schools, universities, and workplaces based on simple school colleagues, co-workers, and neighbors. In addition, positive contact in the mass media in indirect contact had a positive effect on multicultural acceptance, while negative contact had a negative effect. This was consistent with previous studies on foreign crime contact and cultural development effect[20]. There is a way to naturally increase multicultural acceptance by producing entertainment shows or writing positive articles so that ordinary citizens can frequently access positive foreigners through local broadcasting stations, social media, or YouTube. Finally, in many previous studies and this study, it was found that multicultural education had an effect on improving awareness of foreigners[11][12][13]. However, as a result of the analysis, it was found that most of the people had no experience in multicultural education. Multicultural education in schools became a major agenda when the Ministry of Education announced the "Measures to Support Children from Multicultural Families" in 2006, and multicultural education for teenagers was gradually implemented as the subject of cross-curricular learning in 2007[13]. However, since adults were not in an environment where they could receive such multicultural education, the implementation of individual multicultural education at each workplace became very important. Therefore, in order to utilize this, local governments must select businesses with more than a specific number of employees and provide multicultural education or remote multicultural education.

As a result of the 2018 survey, the average of multicultural acceptance was 52.96 points. However, by region, in Gyeongsang-do and Jeolla-do, multicultural acceptance did not reach the average. In particular, Jeolla-do scored 47.51 points, showing the lowest multicultural acceptance below 50 points. To solve this problem, each local government should analyze special demographic and sociological factors to provide multicultural education for each group or hold various events with foreign cultures and cultural festivals with foreigners. In addition, local governments should make efforts to naturally increase multicultural acceptance, apart from multicultural education, by developing various contents to expose positive aspects of foreigners. Lastly, the current local government system in Korea has a strong centralized nature, so many local governments have budget limitations in implementing the system. Therefore, the central government should transfer a lot of authority and allocate budgets to increase multicultural acceptance in proportion to the characteristics of each local government[25].

In addition, since Korea is entering a multicultural society at a very rapid pace, various programs and policies at the local government level should be continuously developed to resolve the emotional isolation, mental discomfort, verbal discomfort, and economic difficulties of multicultural members[26][27]. Above all, cultures such as economic, physical, and emotional discrimination against women who migrated to Korea should be eradicated[28], and various types of family healing programs, community connection promotion programs, and education programs are needed to reduce confusion in children's school life[29][30].

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6. Appendix

6.1. Authors contribution

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

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A Study on DPPH and ABTS Antioxidant Activity and Sensory Evaluation of Seolgitteok with Walnut and Health CRISIS(Juglans Regia)

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Abstract

Purpose: Life expectancy of human beings has increased due to marked advancement of medical science. Along with this increase, people are becoming more interested in living longer in good health, which in turn has imparted significant effects on dietary life. As such, the advantageous physiological characteristics of food items are being highlighted and gaining in popularity. Therefore, this study is concerned with production of "tteok"(rice cake) with the addition of walnut, a functional ingredient capable of suppressing oxidation and thus having significant effects with regard to diseases.

Method: Based on various research data, it is known that continuous walnut consumption is effective for inducing antioxidation in the human body. Moreover, from experimental results of studies on cancer and stress-mediated diseases, it is known that phenols and flavonoids are effective in inducing antioxidation. Accordingly, this study is aimed at examining the extent of the antioxidation effect from the addition of walnut when making Seolgitteok with non-glutinous rice, as well as the commercial value of that effect.

Results: For this purpose, the correlation between walnut contents of 0%, 1%, 3%, 6% and 9%, as the control group, phenol and flavonoid The content was correlated with the dose through DPPH and ABTS elimination. The chromaticity and other properties of steamed Seolgitteok were quantified through sensory evaluation to identify the optimal walnut content for commercialization.

Conclusion: Accordingly, the results of this study were deemed to be helpful for purposes of qualitative improvement of the tteok industry by disclosing the physiological characteristics of Seolgitteok containing walnut.

[Keywords] Walnut, Seolgitteok, Antioxidation, DPPH, ABTS

1. Introduction

Most modern people are under stress due to the advanced industrial structure and rapid change.

These rapid changes have led to advances in medicine and an increase in life expectancy[1]. It increased the life expectancy of modern people and increased interest in a healthy and long life[2][3].

For this reason, interest in appearance and aging has increased. Aging progresses slowly due to various causes and biological mechanisms. In addition, it lowers the metabolic activity of the body and reduces the activity of each cell and tissue[4]. Studies have been conducted to explain the causes and processes of aging from various angles, and oxidative stress, changes at the gene level, and genetic driver have been found to be the causes of aging. However, research results on fundamental mechanisms are still insufficient[5]. The main cause of aging is active oxygen produced by oxidation. Highly reactive molecules include O₂-(superoxide anion), ¹O₂(singlet

oxygen), OH-(hydroxyl radical)[6], and H₂O₂(hydrogen peroxide). Active oxygen causes continuous oxidative damage, inducing apoptosis, causing damage to function[7]. There are also external factors such as smoking and ultraviolet rays, but it induces a chain of processes that cause cells to die due to metabolic or DNA damage[8][9]. Therefore, cells in our bodies have a mechanism to continuously remove active oxygen. Proteins such as catalase(CAT), isocitrate dehydrogenase 2(IDH2), superoxide dismutase(SOD), forkhead box O₃(FOXO3a), and glutathione peroxidase(GPx) lower the ROS level and increase the activity due to deacetylation of sirtuin 3(SIRT3) by controlling intracellular state[10][11][12][13][14][15][16][17]. Deficiency of SIRT3 or abnormalities in the ROS regulation mechanism raise the ROS level of cells and cause stress, leading to aging and metabolic syndrome. In order to reduce these symptoms, methods of developing and consuming antioxidants obtained from nature or applying them to skin surfaces are being attempted[18][19][20]. Although the activity of enzymes is controlled by adjusting the ROS level, antioxidant and anti-aging studies through non-enzymes such as ascorbic acid, β-carotene, catechin, and glutathione are also being actively conducted[21][22].

Modern people's organs and immunity are suffering from various diseases including diabetes even at an early age due to various additives and processed foods[23][24]. In addition, COVID-19, which has occurred worldwide since 2020, has further increased people's interest in immunity and disease prevention. Studies have shown that natural phenolic compounds that have various adult disease prevention and antioxidant effects and are effective in alleviating diseases including cancer are beneficial to the human body by reducing oxidative stress, the incidence of degenerative diseases, and suppressing polymer oxidation[24][25][26]. Among them, walnuts have been proven to have a high content of phenol that lowers the effect of oxidative stress due to aging[27][28][29].

These antioxidant components of walnuts, such as polyphenol, omega3, and alpha-linolenic acid, also play a role in anti-inflammatory and anti-cancer, antibacterial, and anti-mutation activities[30][31][32]. These physiological activities delayed the progression of aging, and studies have shown that delaying cell aging helps improve the quality of life[33][34][35].

Recently, the preference for rice cakes over bread is increasing, and rice cakes as substitutes for meals are widely consumed[36].

Therefore, we would like to conduct research on rice cake products that can be used as a substitute for a meal while protecting the health of busy modern people by supplementing sseolgitteok with walnuts.

2. Ingredients

2.1. Ingredients

For this study, non-glutinous rice was used. The rice was produced in Sanggil-ri, Daeyang-myeon, Gunsan-si, Jeollabuk-do, then was supplied from Sanggil-ri Farming Association Corporation, and was threshed on April 16, 2020. After soaking this rice in water for more than 3 hours, it was dried, and the sea salt produced in Bigeum, Sinan-gun was obtained and mixed for the first mill with a roller mill. Then SPECIAL SMALL PCS VACUUM walnuts worked on December 7, 2020, from DIAMOND FOODS company in San Francisco, USA, were mixed with the first mill powder for the second mill. After that, the water was mixed for the third mill, and it was steam-cooked in the stainless steel steamer. Rice soaked for 3 hours was used. Based on 1 kg of rice, 11 g of salt and 160 g of water were added. In the first milling, the particles were pulverized to a size of about 4 mm, and salt, water, and walnuts were added and mixed. After that, re-pulverize into 1 millimeter size, grind with a fine SIRU, pour into a syrup, steam for 6 minutes at 3,5 atmospheres, cover with a lid, and steam for 4 minutes. The experiment was conducted by reducing the proportion of rice according to the increase rate of the walnut content.

2.2. Experiments and results

2.2.1. Moisture content

<Table 1> shows the appropriate mixing ratio of Seolgitteok made by varying the ratio of walnut addition.

Table 1. Moisture content of seolgitteok with different walnut content.

Walnut content added(%)	Moisture content(%)
0	37.89 ± 0.25
1	39.36 ± 0.17*
3	39.09 ± 0.07*
6	38.38 ± 0.21
9	36.75 ± 0.09*

Note: * $p < 0.05$, when compared to the 0% groups.

The moisture content measurement was performed by a moisture measurement analyzer(MB45, Ohaus, Parsippany, NJ, USA). First, after removing the wrapping paper of the sample, it was mashed with a mortar and weighed 1 g to measure the moisture content. The moisture content measurement was repeated 3 times per sample.

2.2.2. pH

For pH measurement, distilled water 10 times the weight of the sample was added to the sample to homogenize the sample with a homogenizer, and a supernatant was taken to be measured by the pH meter(pH-240L, NeoMet, Istek, Seoul, South Korea) three times per sample.

Table 2. pH of Seolgitteok with different walnut content.

Walnut content added(%)	pH
0	6.65 ± 0.01
1	6.67 ± 0.01
3	6.63 ± 0.01
6	6.60 ± 0.01*
9	6.55 ± 0.02*

Note: * $p < 0.05$, when compared to the 0% groups.

2.3. Physical properties

2.3.1. Color

After removing the wrapper of the sample, the L^* value representing the brightness, the a^* value representing the redness, and the b^* value representing the yellowness were measured repeatedly for three times each using Minolta chromameter(CR-400, Minolta, Osaka, Japan). Standard color plates($Y = 92.8$, $x = 0.3134$, and $y = 0.3193$) were used for the standardization work of Minolta chromameter.

Table 3. Changes in color of seolgitteok with different walnut content.

Walnut content added(%)	L (Lightness)	a (Redness)	b (Yellowness)	w (Whiteness)	C (Chroma)	h (Hue)
0	84.3 ± 0.8	-1.2 ± 0.1	5.9 ± 0.1	66.5 ± 0.7	6.0 ± 0.1	101.7 ± 0.9
1	85.5 ± 0.5	-0.4 ± 0.0*	6.3 ± 0.3	66.6 ± 1.4	6.3 ± 0.3	93.8 ± 0.5*
3	85.1 ± 0.2	0.0 ± 0.1*	7.4 ± 0.2*	62.9 ± 0.5*	7.4 ± 0.2*	90.0 ± 0.8*
6	79.0 ± 0.4*	0.8 ± 0.1*	11.8 ± 0.4*	43.5 ± 0.9*	11.9 ± 0.3*	86.1 ± 0.6*
9	74.8 ± 1.2*	1.4 ± 0.1*	15.6 ± 0.6*	28.1 ± 2.8*	15.6 ± 0.6*	84.8 ± 0.2*

Note: * p<0.05, when compared to the 0% groups.

Table 4. Changes in texture of seolgitteok with different walnut content.

Walnut content added(%)	Hardness, kg	Cohesiveness, %	Springiness, mm	Gumminess, kg	Chewiness, kg, mm	Adhesiveness, kgf
0	0.59 ± 0.03	0.49 ± 0.08	1.00 ± 0.00	0.29 ± 0.03	0.29 ± 0.03	0.12 ± 0.01
1	0.49 ± 0.04*	0.49 ± 0.06	1.00 ± 0.00	0.24 ± 0.02	0.24 ± 0.02	0.14 ± 0.01
3	0.31 ± 0.04*	0.66 ± 0.04*	1.00 ± 0.00	0.21 ± 0.01*	0.21 ± 0.01*	0.08 ± 0.01*
6	0.34 ± 0.01*	0.57 ± 0.02	1.05 ± 0.09	0.20 ± 0.01*	0.20 ± 0.02*	0.08 ± 0.01*
9	0.33 ± 0.02*	0.56 ± 0.04	1.00 ± 0.00	0.19 ± 0.01*	0.19 ± 0.01*	0.12 ± 0.02

Note: * p<0.05, when compared to the 0% groups.

2.3.2. Texture

After removing the wrapper of the sample, it was measured from top to bottom(right angle) using Instron 3343(US/MX50, A&D Co., MA, USA), a measuring device. Hardness, cohesion, springness, gumminess, chewiness, and adhesiveness were measured repeatedly three times.

2.4. Antioxidant activity

2.4.1. Sample extraction

Seolgitteok with different walnut addition contents were ground using a mortar and weighed 4 g in a 100 ml triangular flask. After that, 40 ml of distilled water was added and mixed well. The temperature of the water bath(BS-31, JEIO TECH CO. LTD, Seoul, South Korea) was set to 100°C and heated for 30 minutes to extract components. The extract was centrifuged at a speed of 12,000 rpm for 20 minutes(MICRO 17R, Hanil, Incheon, Korea), and the supernatant was taken and used to measure antioxidant activity.

2.4.2. ABTS radical scavenging activity

ABTS radical elimination activity was measured by modifying the method of[37]. After mixing 7 mM ABTS 5 ml and 140 mM potassium persulfate 88 μl , ABTS cations were formed by blocking light at room temperature for 16 hours. This solution was diluted with PBS so that the absorbance value was 0.7 at 734 nm. The absorbance was measured by mixing 190 μl of the ABTS solution and 10 μl of the sample, reacting the mixture at room temperature for 6 minutes, and then using a Versamax microplate reader(Molecular Devices, California, USA) at 734 nm.

The result was calculated by substituting it into the following equation.

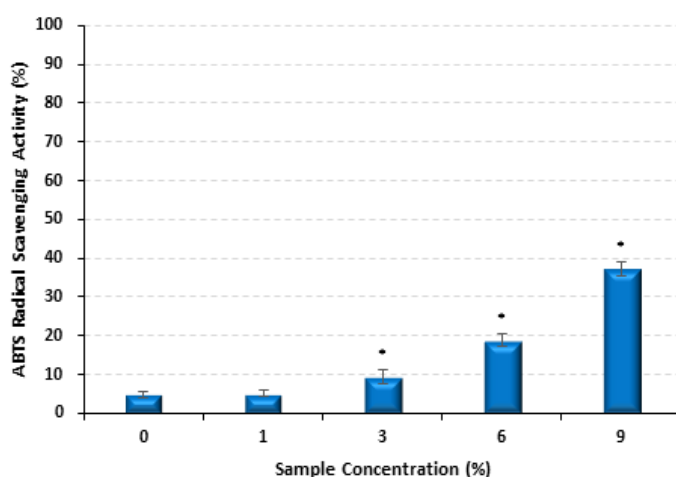
$$\text{ABTS Radical Scavenging (\%)} = \frac{(\text{Contrast absorbance}) - (\text{Sample absorbance})}{(\text{Contrast absorbance})} \times 100$$

Table 5. ABTS radical scavenging activity of Seolgitteok with different walnut content.

Walnut content added(%)	ABTS radical elimination activation(%)
0	4.81 ± 0.71
1	5.14 ± 0.77
3	9.50 ± 1.70*
6	18.89 ± 1.42*
9	37.24 ± 1.79*

Note: *p<0.05, when compared to the 0% groups.

Figure 1. ABTS radical scavenging activity of Seolgitteok with different walnut content.



Note: % *p<0.05, when compared to the 0% groups.

As the walnut addition content increased, ABTS radical scavenging activity increased with concentration dependence <Table 5>, <Figure 1>.

2.4.3. DPPH radical scavenging activity

DPPH radical scavenging activity was measured according to the method used by[38].

A solvent from which the extract was extracted was added to the control group at 12 μ l, and a sample at 12 μ l, and then 6 μ l of Ethanol was added to the test group, and a 222 M of DPPH(0.15 mM 1,1-diphenyl-2-picrylhydrazyl(DPPH)/ethanol) solution was added and mixed. After reaction at room temperature for 30 minutes, absorbance was measured at 517 nm with a Versamax microplate reader(Molecular Devices, California, USA).

The result was calculated by substituting it into the following equation.

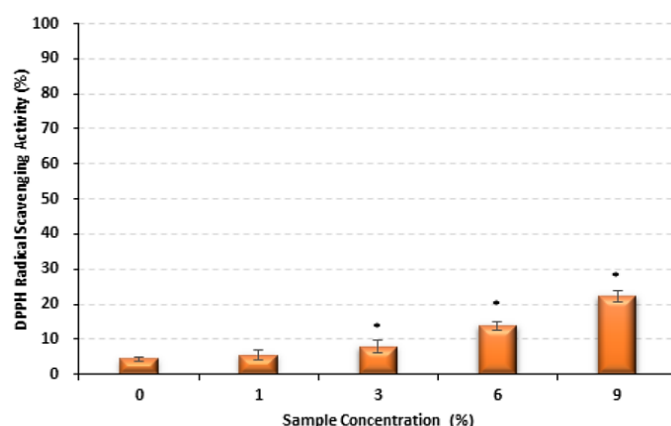
$$\text{DPPH Radical Scavenging (\%)} = \frac{(\text{Contrast absorbance}) - (\text{Sample absorbance})}{(\text{Contrast absorbance})} \times 100$$

Table 6. DPPH radical scavenging activity of Seolgitteok with different walnut content.

Walnut content added(%)	DPPH radical elimination activation(%)
0	4.36 ± 0.71
1	5.48 ± 1.55
3	7.84 ± 1.86*
6	13.96 ± 1.17*
9	22.36 ± 1.55*

Note: * p<0.05, when compared to the 0% groups.

Figure 2. DPPH radical scavenging activity of Seolgitteok with different walnut content.



Note: %, *p<0.05, when compared to the 0% groups.

It was confirmed that the DPPH radical scavenging activity increased as the walnut content increased <Table 6>, <Figure 2>.

2.5. Total polyphenol

2.5.1. Sample extraction

Samples were extracted in the same manner as antioxidant activity.

2.5.2. Total polyphenol content

The total polyphenol content was measured by modifying the Foline-cocalteau method[39].

First, sodium carbonate(Na₂CO₃) was diluted with purified water to prepare 700 mM, and 2N Folin-Ciocalteu Reagent(47641-100ML-F, Sigma-Aldrich, St. Louis, MO, USA) was diluted to 1 N.

Samples diluted for each concentration were added to the test tube by 100 μ l, and 1 N Folin-Ciocalteu Reagent was added by 200 μ l and mixed well. 700 mM Na₂CO₃ 700 μ l was further added and mixed and reacted at room temperature for 30 minutes, and then absorbance was measured at 650 nm with a UV spectrophotometer(Optizen POP, Mecasys CO., Ltd, Daejeon, South Korea).

A calibration curve was prepared using Gallic acid(G7384-100G, Sigma-Aldrich, St. Louis, MO, USA) as standard material, and the total polyphenol content was obtained therefrom.

A: The absorbance after the sample reaction

B: Y-intercept of Gallic Acid Standard Curve

C: Slope of Gallic Acid Standard Curve

Phenolic compounds are one of the secondary metabolites widely distributed in the plant world, and because they have a phenolic hydroxyl(OH) group, they are known to easily bind to proteins and other large molecules to exhibit various physiological activities in vivo [40][41].

Table 7. Gallic acid calibration curve.

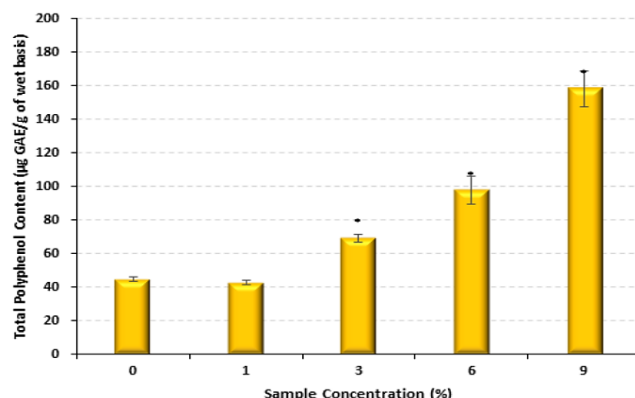
Gallic acid($\mu\text{g/ml}$)	O.D.(650 nm)	Calibration curve equation
0	0.017	$y = 0.0056x + 0.0107$ $R^2 = 0.9997$
1	0.022	
5	0.042	
10	0.069	
50	0.279	
100	0.560	
250	1.419	

Table 8. Total polyphenol content of Seolgitteok with different walnut content.

Walnut content added(%)	Total polyphenol content($\mu\text{g GAE/g of wet basis}$)
0	44.69 ± 1.27
1	42.70 ± 1.35
3	$69.10 \pm 2.33^*$
6	$97.55 \pm 8.31^*$
9	$158.08 \pm 10.64^*$

Note: * $p < 0.05$, when compared to the 0% groups.

Figure 3. Total polyphenol content of Seolgitteok with different walnut addition content.



Note: Total polyphenol content of Seolgitteok with different walnut addition content.

<Table 8> and <Figure 3> show the total polyphenol content of seolgitteok with different walnut contents. In the control group without walnuts, the total polyphenol content was 44.69 µg GAE/g, and the total polyphenol content of seolgitteok with 1, 3, 6, and 9% added walnuts was 42.70, 69.10, 97.55, and 158.08 µg GAE/g, respectively, increasing the total polyphenol content significantly according to the walnut addition.

Reported the total polyphenol content of aronia powder-free seolgitteok as 4.55 ug GAE/g[42][43]. In this experiment, the total polyphenol content of the walnut-free seolgitteok was 44.69 µg GAE/g.

2.6. Total flavonoids

Flavonoids are a generic term for phenolic compounds with C6-C3-C6 as the basic structure, are pale yellow or yellow, and are widely distributed in the natural world.

Only higher plants and some green algae including vegetables can synthesize them. They are only in plants because animals cannot synthesize them. They exist in almost all parts of plants, including leaves, flowers, fruits, stems, and roots of vegetables and related plants(the explanation of the health functional foods code test method).

Flavonoids include flavonol-based quercetin, kaempferol, and myricetin, and flavonol-based apigenin, luteolin, limonin, and momilin are known. And among flavonoids, quercetin and others are known to be able to suppress cytotoxicity and oxidation of low-density lipoprotein(LDL) in vitro(the explanation of the health functional foods code test method).

2.6.1. Sample extraction

Samples were extracted in the same manner as antioxidant activity.

2.6.2. Total flavonoid content

The total flavonoid content was measured by applying the method of[44].

In a glass test tube, 150 µm of purified water and 75 µm of 5% NaNO₂ were added to 125 µm diluted by concentration and reacted at room temperature for 6 minutes. Then, 10% AlCl₃ was added 150 µm each and reacted at room temperature for 5 minutes. Finally, 1 N NaOH was dispersed at 750 µm and reacted at room temperature for 15 minutes, and then absorbance was measured at 492 nm with a UV spectrophotometer(Optizen POP, Mecasys CO., Ltd., Daejeon, South Korea).

The total flavonoid content was calibrated with Quercetin(Q4951-10G, Sigma-Aldrich, St. Louis, MO, USA) as a standard substance, and the total flavonoid content was obtained therefrom.

A: The absorbance after the sample reaction

B: Y-intercept of Quercetin Standard Curve

C: Slope of Quercetin Standard Curve

Table 9. Quercetin calibration curve.

Quercetin(µg/ml)	O.D.(492 mn)	Calibration curve formula
0	0.001	$y = 0.0006x + 0.0015$ $R^2 = 0.9995$
1	0.003	
5	0.004	
10	0.008	
50	0.031	
100	0.061	

Flavonoids are a generic term for phenolic compounds with C6-C3-C6 as the basic structure, are pale yellow or yellow, and are widely distributed in the natural world.

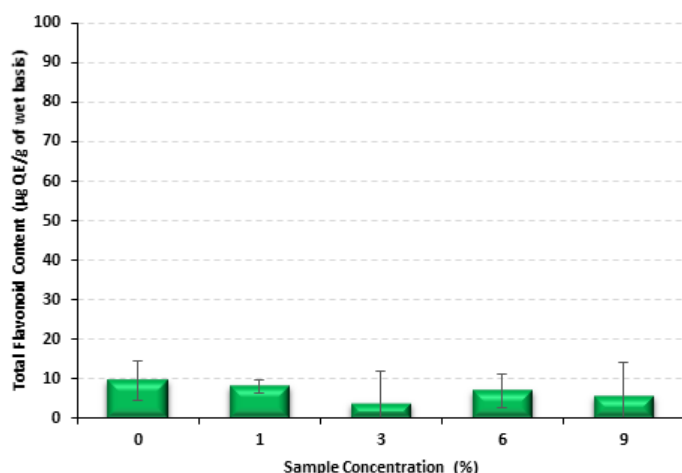
Only higher plants and some green algae including vegetables can synthesize them. They are only in plants because animals cannot synthesize them. They exist in almost all parts of plants, including leaves, flowers, fruits, stems, and roots of vegetables and related plants(the explanation of the health functional foods code test method).

Flavonoids include flavonol-based quercetin, kaempferol, and myricetin, and flavonol-based apigenin, luteolin, limonin, and momilin are known. And among flavonoids, quercetin and others are known to be able to suppress cytotoxicity and oxidation of low-density lipoprotein(LDL) in vitro(the explanation of the health functional foods code test method).

Table 10. Total flavonoid content of Seolgitteok with different walnut content.

Walnut content added(%)	Total flavonoid content ($\mu\text{gQE/gofwetbasis}$)
0	9.65 ± 5.02
1	7.97 ± 1.67
3	3.51 ± 8.42
6	6.86 ± 4.21
9	5.46 ± 8.86

Figure 4. Total flavonoid content of Seolgitteok with different walnut addition content.



Note: $\mu\text{g QE/g of wet basis}$.

<Table 10> and <Figure 4> show the total flavonoid contents of seolgitteok with different walnut contents. Even if the walnut content increased, the total flavonoid content of seolgitteok to which walnut was added did not affect.

2.7. Processing the statistics

Excel 2020(Microsoft, Redmond, WA, USA) was used for statistical processing. The measurement data were conducted by a paired t-test, and it was determined that there was a statistically significant difference when the significance probability $p < 0.05$ was significant in the 95% confidence interval.

3. Survey

The number of sensory tests was tested on 30 students of the Department of Medicinal Plants at Sungkyul University Graduate School, targeting males and females aged 20 to 60 years. The sensuality evaluation of seolgitteok with 0, 1, 3, 6, and 9% of walnuts added is divided into A, B, C, D, and E, and are divided into five categories including color, flavor, texture, taste, and overall preference. The five items are measured as "very bad, bad, average, good, and very good," and the survey results were filled out after tasting the sample three times.

4. Consideration

In the case of seolgitteok containing 0%, 1%, 3%, 6%, and 9% walnuts, there was no significant change as shown in <Table 3> of moisture content, <Table 4> of pH, <Table 10> of flavonoid content, and <Figure 1> Times.

Table 11. Sensory evaluation of seolgitteok supplement.

Concentration(%)					
	0	1	3	6	9
Color1)	3.33±0.06	3.27±0.06	3.6±0.17	3.9±0.1***	4.13±0.06***
Flavor1)	3±0.17	3.27±0.12	3.83±0.12**	4.07±0.06***	4.27±0.06***
Texture1)	3.47±0.15	3.7±0	3.9±0.17*	4.07±0.12**	4.2±0.1**
Taste1)	3.3±0	3.47±0.06**	3.7±0.17**	4±0.1***	4.33±0.12***
Overall preference1)	3.17±0.06	3.33±0.06*	3.93±0.06***	3.5±0.1***	4.3±0.1***

Note: 1) Mean±SD, * p<0.05 : Means in a column are significantly different at 5% significance level by t-test, ** p<0.01 : Means in a column are significantly different at 1% significance level by t-test, *** p<0.001 : Means in a column are significantly different at 0.1% significance level by t-test.

Among the physical properties experiments, the chromaticity decreased in brightness, whiteness, and color due to the increase in walnut content as shown in <Table 3>, while the redness, yellowness, and saturation increased. In the case of texture, as shown in <Table 4>, hardness, gumminess, and chewiness decreased with an increase in walnut content while adhesiveness increased, and cohesiveness, springness, and adhesiveness did not produce significant results. ABTS and DPPH radical scavenging activity increased with concentration dependence. In relation to <Table 5>, <Figure 1>, <Table 6>, and <Figure 2>, the total polyphenol content of seolgitteok with different added contents is shown in Table 8 and Figure 4. In the control group without walnuts, the total polyphenol content was 44.69 μg GAE/g, and the total polyphenol of seolgitteok with 1, 3, 6, and 9% added walnuts was 42.70, 69.10, 97.55, and 158.08 μg GAE/g, respectively, indicating that the total polyphenol content increased significantly. Through this experiment, it can be seen that it had a positive effect on the antioxidant properties of seolgitteok containing walnuts. Similar results were found in the paper on the case of containing walnuts in bread[45].

As a result of synthesizing the above experimental results and sensory evaluation, it can be seen that 6% and 9% have high taste and flavor. For the overall preference, 6% and 9% content were received as "good" and "very good", but the 9% content showed a slight decrease in texture. Therefore, it seems necessary to further experiment with content between 6% and 9%, and it can be seen that the addition of walnut content between 6% and 9% is beneficial from the perspective of the sensory aspect and antioxidant characteristics. We could see the results of the flavonoids and phenols of seolgitteok containing walnuts, but we have not been able to

study what mechanisms produced these results, and more parameters are needed due to the low parameters of the sensory evaluation of this study[46].

As mentioned above, the antioxidant function of walnut seolgi helps to live a healthy life by reducing stress on cells and organs in the body of modern people with increased life expectancy. Currently, Walnut Seolgi is commercialized and sold, and the response from customers is also good. In the next paper, it is expected that the commercial value of walnut seolgitteok can be shown if a study on the satisfaction and relationship continuity of customers' selection attributes is added.

5. References

5.1. Journal articles

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	YK	-Set of concepts <input checked="" type="checkbox"/> -Design <input checked="" type="checkbox"/> -Getting results <input checked="" type="checkbox"/> -Analysis <input checked="" type="checkbox"/> -Make a significant contribution to collection <input checked="" type="checkbox"/>
Corresponding Author*	YK	-Final approval of the paper <input checked="" type="checkbox"/> -Corresponding <input checked="" type="checkbox"/> -Play a decisive role in modification <input checked="" type="checkbox"/> -Significant contributions to concepts, designs, practices, analysis and interpretation of data <input checked="" type="checkbox"/>
Co-Author	KK	-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 Academic Burnout of Elementary School Students on the Smartphone Game Addiction CRISIS: Mediating Effects of Anxiety and ADHD Tendency

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Abstract

Purpose: The purpose of this study was to examine and understand the effect of academic burnout of elementary school students on the smartphone game addiction and investigate as to what mediating effects of anxiety and ADHD tendency have in this process.

Method: A survey was conducted targeting 654 elementary school students from two elementary schools in the capital area, and the levels of academic burnout, anxiety, ADHD tendency, and smartphone game addiction were surveyed. The collected data were analyzed based on the structural equation modeling (SEM).

Results: The results were as follows. First, the academic burnout turned out to directly or indirectly increase the smartphone game addiction. Second, anxiety turned out to indirectly increase the smartphone game addiction, while the ADHD tendency directly increased the smartphone game addiction. Third, three pathways of academic burnout on the smartphone game addiction were verified, where the direct pathway of 'academic burnout → smartphone game addiction' and the two indirect pathways of 'academic burnout → ADHD tendency, → smartphone game addiction' and 'academic burnout → anxiety → ADHD tendency → smartphone game addiction' turned out to be significant.

Conclusion: The results of this study indicate that in order to prevent the smartphone game addiction of the elementary school students, the intervention for academic and emotional problems such as academic burnout, anxiety, and ADHD tendency ought to be conducted together.

[Keywords] Academic Burnout, Anxiety, ADHD Tendency, Smartphone Game Addiction

1. Introduction

As the term of "fourth industrial revolution" symbolizes, our society is undergoing significantly rapid changes with technological innovations. As indicated by the term 'contactless,' which has become a hot topic of social changes recently, the face-to-face society of the past has transformed into an online centric society[1]. In particular, the rapid expansion of COVID-19, which has rattled the world in 2020, is accelerating such social changes further[2][3]. As a new social policy called 'social distancing' was implemented to prevent infectious diseases, contactless life was forced, such as by prohibiting people from meeting face-to-face with more than a certain number of people[4][5]. Restaurants and cafes could not sell food other than takeouts, and the schools and universities introduced full online classes fledgedly. As the COVID-19 crisis prolongs, those who were initially unfamiliar with the contactless social relationships, work, and education are increasingly getting used to the formation of the new online centric social relationships. Recently, as the completion rate of the COVID-19 vaccination in Korea has exceeded 70%, a new policy called 'With Corona' has been introduced, yet a few people expect that it will help us return to the face-to-face offline society as in the past. Now, in almost every field, the online centric society has advented.

Smartphone is an essential device in the transition towards an online centric society. Often called a computer in the palm of hand, smartphone is a key device which has made the transition to the online society by allowing many of the services and social activities which were only made available and possible in the past face-to-face to be converted online. How important have smartphones become in our lives is reflected by the smartphones' rate of use. According to a survey on smartphone usage by Gallup Korea, the rate of smartphone use for adults in Korea reached 95%, yielding that almost all Koreans are using smartphones as a matter of analysis[6]. Smartphone has now become an indispensable device in our lives to the extent that a new word called "Phono sapiens" has been conceived[7].

However, not all of rapid supply of smartphones are yielding positive effects only. Among the typical examples is the addictive use of smartphones, which manifests serious problems in social life, schoolwork, and family life due to the excessive use of smartphones. According to a survey conducted on the smartphone overdependence by the Ministry of Science and ICT(MIST) and the Korea Intelligent Information Society Agency(NIA), as of 2020, the proportion of the Korean population at risk for the smartphone dependence posted 23.3%, which turned out to be an increase of 3.3% year on year, which is also the largest in recent years. In particular, it is noteworthy that the rate of smartphone dependence among adolescent increased significantly from 30.2% in 2019 to 35.8% in 2020[8].

The addictive use of smartphones may be classified into various types, and among which, the addictive use of smartphone games is drawing attention recently. This is because, as the smartphone specifications have improved and the wireless communication networks have expanded from 4G to 5G, various Internet games which were previously only made available for use with the wired desktop or laptop computers can now be played on the smartphones. Given the development of smartphone devices and the expansion of communication networks, it is highly likely that the addictive use of smartphone games will continue to increase. In fact, even among the 2020 smartphone overdependence statistics, it turned out that the percentage of adolescent who primarily use the smartphone games turned out be significantly higher than that of the students who used other things[8].

The addictive use of smartphone games or smartphones has caused various issues in the lives of adolescent. Physically, it has been shown that it can harm health such as by aggravating eyesight and hearing[9], and emotionally, it causes mental health related issues by increasing negative emotions as depression, anxiety, aggression, and impulsivity[10]. Furthermore, it is reported that academically, it causes learning problems by lowering attention and self-regulatory skills[11]. Hence, it is important to prevent and mediate the smartphone game addiction in advance, and to do so, first, the studies exploring what specific paths of influence and contents exist need to be conducted concerning how those factors go through which paths and processes to cause the smartphone game addiction to increase. In that context, it is worth paying attention to the recent studies showing that learning problems such as learning stress or academic burnout and emotional problems including anxiety and ADHD tendency can influence the smartphone or Internet addiction.

First, based on the study of Jung and Kim[12], Kim, Park, and Jang[13], Suh[14], and Yoo and Choi[15] which analyzed the effects of academic stress or academic burnout on the smartphone addiction, it turned out that the higher the burnout level, the higher the level of level of smartphone addiction. Among the emotional problems, according to the study of Yeo, Kang, and Kim[16], Koh and Kim[17], and Son[18], who analyzed the relationship between anxiety and smartphone addiction among the emotional problems, the higher the students' level of anxiety, the higher the level of smartphone addiction. Furthermore, according to the study of Oh and Hah[19], Choi[20], and Ryu and Kim[21], who analyzed the relationship between ADHD tendency, which is another emotional problem, and the smartphone addiction, the smartphone addiction also increased as the ADHD tendency increased.

However, most of the current studies have only analyzed the general tendency of learning or emotional problems on the smartphone addiction, and it is difficult to find a study analyz-

ing the influences of smartphone game addiction among the smartphone addictions. Furthermore, there are few studies on how such learning or emotional problems influence the smartphone game addiction. Therefore, this study tried to examine the effect of academic burnout among learning problems on the smartphone game addiction and also analyze what mediating effects of anxiety and ADHD tendency among emotional problems in the process were manifested. In particular, the study subjects were limited to grades 4 through 6 among the elementary school students since the addictive use of smartphone games can create greater side effects among the elementary school students in the early phase of their adolescence, whose brains have not yet fully developed for self-regulation. Specifically, the following two research questions led this study.

First, how do academic burnout, ADHD tendency, and anxiety influence the smartphone game addiction?

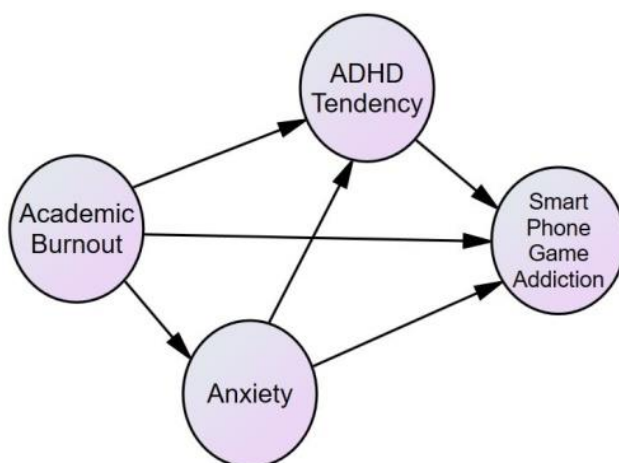
Second, what mediating effects do ADHD tendency and anxiety have on the effect of academic burnout on the smartphone game addiction?

2. Research Method

2.1. Hypothetical model

Based on the analysis of the previous studies, in this study, in terms of the relationship between academic burnout, smartphone game addiction, anxiety and ADHD tendency, the structural relationship which indirect influence was caused via the mediation of anxiety and ADHD simultaneously while causing a direct influence of academic burnout on the smartphone game addiction was set as the research model as illustrated in <Figure 1>.

Figure 1. Hypothetical model.



2.2. Research subject

The subjects of this study were a total of 654 students in grades 4 through 6 at two elementary schools in the capital area, who were conveniently sampled. A survey was conducted on academic burnout, smartphone game addiction, anxiety, and ADHD tendency, etc., among the students participating in the study. The basic characteristics of the students who participated in the study were as presented in <Table 1>.

Table 1. Characteristics of the research subjects.

Characteristic	Classification	Frequency(N)	Ratio(%)
Gender	Male	338	51.7
	Female	314	48.0
	Non-responsive	2	0.3
Grade year	4	265	40.6
	5	206	31.6
	6	181	27.8
	Non-responsive	2	0.3

2.3. Measurement tools

The measurement tools of the academic burnout, smartphone game addiction, anxiety, and ADHD tendency of the participant were as follows.

2.3.1. Academic burnout

In order to measure the level of academic burnout of the elementary school students, in this study, Hah's children's academic burnout scale was employed[22]. This scale was consisted of a total of 15 questions for 3 sub-areas(emotional exhaustion–5 questions, academic uninterested–4 questions, and academic inefficacy–6 questions), and self-evaluation was conducted on a 4-point scale. The Cronbach's α for each sub-area of the academic burnout measurement tool manifested in this study was emotional exhaustion-.858 academic uninterested-.848 academic inefficacy-.847, and the overall scale was .895.

2.3.2. Smartphone game addiction

In this study, to measure the level of smartphone game addiction of elementary school students, the smartphone addiction scale for children developed by NIA was modified and used as the smartphone game addiction scale[23]. The revised and supplemented contents were inspected for their validity by 2 incumbent elementary school teachers with over 10 years of experiences and 2 college professors of related fields. This scale has a total of 15 questions, and the students self-evaluated on a 4-point scale. The Cronbach's α of the smartphone dependence scale manifested in this study is .858.

2.3.3. Anxiety

In this study, in order to measure the level of anxiety of elementary school students, a scale was formed by using the anxiety related questions of the Korean version of the simplified mental diagnosis test of Kim, Won, Lee, and Kim[24]. This scale was consisted of a total of 10 questions and was structured to allow for the self-evaluation by using a 4-point scale. The Cronbach's α of the anxiety scale used in this study turned out to be .927.

2.3.3. ADHD tendency

In this study, Choi's elementary school students' ADHD symptom measurement tool was used to measure the ADHD tendency[25]. This scale was consisted of a total of 18 questions of attention deficit and hyperactivity/impulsivity, and was structured to allow for evaluation by using a 4-point scale. The Cronbach's α for each sub-area of the ADHD tendency verified in this study was attention deficit-.790, hyperactivity/impulsiveness-.840, and the overall scale turned out to be .887.

2.4. Data analysis

The collected data were analyzed by using structural equation modeling (SEM). The analytical process and procedure were as follows. First, the descriptive and correlation analysis were performed to validate as to whether there was an issue with the assumption of normality of the measured variables. Second, the model conformity analysis was performed to test the validity of the set research model. Third, the path analysis was performed to verify the influence between the variables of the accepted research model. Fourth, the effect decomposition was performed to examine and understand the total, direct, and indirect effects among the latent variables. Lastly, a phantom variable was set to examine the path of academic burnout influencing the smartphone game addiction, then the multi-mediated effect analysis was performed through bootstrapping.

3. Research Results

3.1. Correlation and descriptive analysis

As a result of analyzing the correlation between the measured variables, it turned out that there was a positive correlation between all of the measured variables as illustrated in <Table 2>. Following which, as a result of performing the technical analysis to determine as to whether the assumption of normality was satisfied, both the skewness and kurtosis turned out to be 3 or less based on the absolute value, demonstrating that there was no issue with the assumption of normality.

Table 2. Descriptive statistics and correlations of the measurement variables.

	Emotional exhaustion	Academic uninterested	Academic inefficacy	S. game addiction1	S. game addiction2	Anxiety1	Anxiety2	Attention deficit	Hyperactivity impulsiveness
Academic uninterested	.708**								
Academic inefficacy	.347**	.390**							
S. game addiction1	.368**	.386**	.319**						
S. game addiction2	.361**	.360**	.268**	.734**					
Anxiety1	.517**	.479**	.276**	.276**	.216**				
Anxiety2	.469**	.485**	.314**	.281**	.239**	.800**			
Attention deficit	.643**	.640**	.353**	.452**	.474**	.501**	.510**		
Hyperactivity impulsiveness	.489**	.450**	.212**	.369**	.392**	.392**	.424**	.680**	
M	1.755	1.681	2.119	1.565	1.681	1.444	1.399	1.786	1.727
SD	.725	.727	.707	.529	.553	.629	.617	.573	.507
Skewness	.895	1.049	.624	1.145	.845	1.551	1.748	.578	.762
Kurtosis	.123	.404	.069	1.540	.520	1.913	2.677	-.254	.611

Note: **p<.01.

3.2. Model fit analysis

As a result of the model fit analysis performed to examine whether the basic model of this study was at the acceptable level as a research model, it turned out to be $\chi^2(21)=40.706$, $p=.006$ as shown in <Table 3>. In the case of the χ^2 index, given the fact that it responds sensitively to the number of cases, and as a result of additional analysis of other model fit indices, all of them turned out to be at acceptable levels, and hence, the research model established in this study was accepted.

Table 3. Model fit indices.

	χ^2	df	p	GFI	CFI	TLI	RMSEA
Research model	40.706	21	.006	.977	.990	.983	.049

3.3. Path analysis

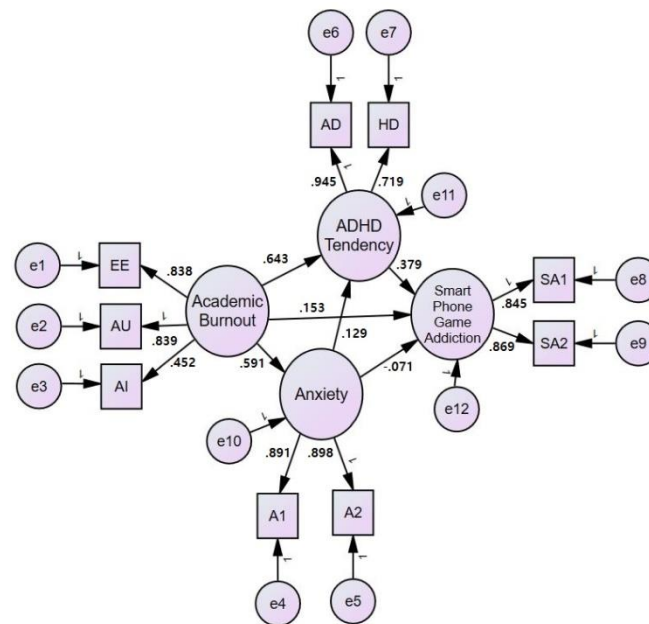
The path analysis was performed between the latent variables of the accepted research model to analyze as to what path relationships were significant among academic burnout, smartphone game addiction, anxiety, and ADHD tendency. As shown in <Table 4>, and among the direct paths established in the research model, all direct paths except 'anxiety → smartphone game addiction' turned out to be significant. Examining them specifically, the pathway of 'academic burnout → smartphone game addiction', 'academic burnout → anxiety', 'academic burnout → ADHD tendency', 'anxiety → ADHD tendency', 'ADHD tendency → smartphone game addiction' turned out to be significant. That is, as the level of academic burnout of elementary school students increased, smartphone game addiction, anxiety, and ADHD tendency increased. In addition, anxiety turned out to increase ADHD tendency, and ADHD tendency turned out to increase smartphone game addiction. The specific path coefficient values between the latent variables and the measured variables of academic burnout, smartphone game addiction, anxiety, and ADHD tendency in the research model are as illustrated in <Figure 2>.

Table 4. Analysis of path coefficients between latent variables.

Pathway	Non-standardized coefficient	Standardized coefficient	Standard error	t
Academic burnout → smartphone game addiction	.153	.209	.068	2.242*
Academic burnout → anxiety	.591	.654	.040	14.837***
Academic burnout → ADHD tendency,	.643	.720	.046	13.937***
Anxiety → smartphone game addiction	-.071	-.088	.046	-1.563
Anxiety → ADHD tendency,	.129	.130	.046	2.822**
ADHD tendency, → smartphone game addiction	.379	.462	.073	5.178***

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

Figure 2. Standardized regression weight between the variables.



Note: EE-emotional exhaustion, AU-academic uninterested, AI-academic inefficacy, A1-anxiety1, A2-anxiety2, AD-attention deficit, HD-hyperactivity/impulsiveness, SA1-smartphone game addiction1, SA2-smartphone game addiction2.

3.4. Effect decomposition

The effect decomposition was performed to analyze the direct and indirect effects between academic burnout, smartphone game addiction, anxiety and ADHD tendency. According to analytical results, it was analyzed that academic burnout directly and indirectly increased the smartphone game addiction, anxiety indirectly increased the smartphone game addiction, and ADHD tendency directly increased the smartphone game addiction. The direct effect, indirect effect, and total effect between each latent variable are as presented in <Table 5>.

Table 5. Results of the effect decomposition.

Pathway	Direct effect	Indirect effect	Total effect
Academic burnout → smartphone game addiction	.209*	.314	.523**
Academic burnout → anxiety	.654*	.	.654*
Academic burnout → ADHD tendency,	.720*	.086*	.806**
Anxiety → smartphone game addiction	-.088	-	-.028
Anxiety → ADHD tendency,	.130*	.060*	.130*
ADHD tendency, → smartphone game addiction	.462*	-	.462*

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

3.5. Validation of multiple mediation effects

As academic burnout was analyzed to directly or indirectly increase the smartphone game addiction, and in order to confirm the specific pathway that academic burnout increases the

smartphone game addiction, phantom variables are set for each mediating pathway and then stopped through bootstrapping to validate the mediating effects. As illustrated in <Table 6>, two pathways turned out to be significant at the 95% of confidence level. Examining specifically, the pathway leading to academic burnout → ADHD tendency, → smartphone game addiction, and the pathway leading to academic burnout → anxiety → ADHD tendency → smartphone game addiction turned out to be significant. That is, as the level of academic burnout of elementary school students increased, anxiety and ADHD tendency also increased, and it turned out that such increased anxiety and ADHD tendency increased the smartphone game addiction.

Table 6. Analysis of the multiple mediation effects.

Pathway	Estimate	SD	<i>p</i>	95% confidence Interval (lower bounds, upper bounds)
Academic burnout → ADHD tendency → smartphone game addiction	.244	.064	.011	(.158, .356)
Academic burnout → anxiety → ADHD tendency → smartphone game addiction	.029	.018	.028	(.008, .072)

4. Discussion

4.1. Effects of academic burnout, ADHD tendency, and anxiety on the smartphone game addiction

First, according to the results, academic burnout turned out to increase smartphone game addiction. Such results are consistent with those of the previous studies analyzing the relationship between academic burnout and Internet/smartphone addiction, or between academic burnout and game addiction[12][13][14][15]. The cause as to why academic burnout increases smartphone game addiction may be found in the possibility of using smartphone games as a way to relieve or avoid stress caused by academic problems.

When humans experience stress due to external threats, they choose their own coping method to be responsive, and the choice of such coping method is closely related to the experience of overcoming similar stress in the past and the resulting confidence. In general, when people have the confidence and experience of successfully overcoming similar stress in the past, they choose an active and rational way to cope with stress, whereas when they have failed experiences or lack of confidence in the past, they tend to choose a passive coping method to avoid it. In most cases, academic burnout is caused by the repeated learning failures over a long period of time rather than the short-term failures or difficulties. Therefore, in the case of the students experiencing learning exhaustion, there is a high possibility that they will manifest the tendency to avoid rather than actively try to solve it, and there is a possibility that smartphone games will be used as the means of avoidance.

Second, the results indicated that ADHD tendency tended to significantly increase smartphone game addiction. These results are consistent with various previous studies which analyzed the relationship between ADHD or ADHD tendency and smartphone addiction or Internet game addiction[19][20][21]. There may be two main reasons for the elementary school students' ADHD tendency to increase the smartphone game addiction. First, it is possible that it is due to the characteristics of the students' ADHD tendency, which reacts more sensitively to stronger stimuli and external stimuli. The attention deficit symptoms of students with ADHD tendency are generally unchanged or even appear larger in weak external stimuli, and to the contrary, they manifest more active and sustained attention to the colorful and strong

stimuli[26]. In this respect, a smartphone game with colorful graphics and an immediate reward system is the most effective external stimulus to draw attention to students with ADHD tendency. In fact, it has been reported that students with ADHD or ADHD tendency often demonstrate hyper attention for the Internet games or smartphone games.

Following which, there is a possibility that it is caused by a decrease in the self-regulation skills due to ADHD tendency. Impulsivity, one of the main characteristics of students with ADHD tendency, was actually caused by a lack of self-regulation skills[27]. According to the studies which directly analyzed the brains of the actual ADHD students, their prefrontal cortex, a cerebral tissue responsible for self-regulation, has lower functions compared to that of the normal students[28]. Comparing the previous studies to the results of this study, it may be estimated that addictive use of smartphone game occur due to the inability of the students with ADHD tendency to properly self-regulate while playing the smartphone games.

Third, according to the results, anxiety appeared to influence the smartphone game addiction. What needs to be paid attention is the fact that anxiety turned out to have an indirect effect through ADHD tendency, rather than increasing the smartphone game addiction by itself. These results only partially support the results of the previous studies which analyzed the relationship between emotional problems such as anxiety and smartphone addiction or Internet game addiction. Concerning why anxiety indirectly increases the smartphone game addiction, the cause may be estimated from the characteristics of the emotional mechanism called “anxiety.”

Anxiety is a form of behavioral response to the external stress or situations of intimidation[29]. Humans instinctively avoid whichever objects that makes them feel anxiety, which in turn make humans safe, and hence, anxiety is an essential mechanism for the human survival. However, when the state of anxiety becomes a persistent and chronic state, various problems will appear to the contrary. Among the typical examples is a decrease in cognitive judgement and control ability, and the decrease in the cognitive judgement and control ability is a typical problem where the students exhibit ADHD tendency. In fact, numerous previous studies have consistently demonstrated that an increase in level of anxiety can aggravate the ADHD tendency[30][31]. In light of the results of this study, it may be assumed that anxiety increased ADHD tendency among the elementary school students, and this increased ADHD tendency increased the smartphone game addiction.

4.2. Analysis of the pathway where academic burnout influences the smartphone game addiction

According to the results, academic burnout can increase the smartphone game addiction via the following three pathways. The first pathway is a direct one, where academic burnout directly increases the smartphone game addiction, as discussed in the above. The second pathway is one mediated by ADHD tendency, and academic burnout increases the ADHD tendency, and the increased ADHD tendency again increases the smartphone game addiction. The previous studies which analyzed the relationship between academic burnout and self-regulation skills consistently demonstrate a positive correlation between academic burnout and self-regulation skills[32][33]. That is, if academic burnout is significantly lowered, the self-regulation skills are also highly likely to be significantly lowered. Considering the fact that the main characteristic of the students exhibiting ADHD tendency is a decrease in their self-regulation skills, these studies demonstrate that academic burnout has the potential to increase the ADHD tendency. In fact, the study of Bae et al., which analyzed a significant positive relationship between ADHD tendency and academic burnout, is supportive of such estimate[34]. As such, after academic burnout increases the ADHD tendency, it is possible to estimate the pathway of ADHD tendency, which increases the smartphone game addiction, as described in the above.

The third is a pathway mediated by anxiety and ADHD tendency where academic burnout increases the anxiety, and after the increased anxiety increases the ADHD tendency, the in-

creased ADHD tendency increases the smartphone game addiction. The studies analyzing the relationship between academic burnout and anxiety consistently demonstrate a positive relationship between academic burnout and anxiety, which means that academic burnout is likely to induce anxiety[35][36]. A typical symptom of academic burnout is low self-confidence. Considering the fact that the emotion of anxiety is based on a decrease in self-confidence such that one cannot adequately respond to the unpredictable future events, it may be easily assumed that academic burnout leads to anxiety. As described above, after academic burnout increases anxiety, it is possible to estimate the pathway which anxiety increases ADHD tendency, and which increases the smartphone game addiction.

4.3. Limitations and Suggestions

The limitations of this study and the suggestions for the follow-up studies are as follows. First, the data of this study were basically created based on the self-evaluation of the elementary school students. Therefore, there are limitations to objectively evaluating the academic burnout, anxiety, ADHD tendency, and smartphone game addiction of the elementary school students. In the follow-up studies, more objective data collection such as direct observation or psychological evaluation would be necessary. Second, this study may have limitations in generalizing the study results to the elementary school students in other small towns or rural areas in that the participants were sampled from two elementary schools in the capital area. A more extensive research sample is needed for the follow-up studies. Third, Due to the lack of previous studies, sufficient analysis of previous studies was not performed. Therefore, there is a possibility that the validity of the established research model may be lowered. Subsequent studies need to be conducted in a state where previous studies have been sufficiently accumulated to present a more valid research model. This study indicates that learning problems such as academic burnout and emotional problems such as anxiety and ADHD tendency ought to be considered as well, beyond the provision of guidance on the use of smartphone in order to prevent the smartphone game addiction among the elementary school students.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
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"/>
		-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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Influencing Factors on Knowledge Attitude and Performance of CPR of Faculty and Staff

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Abstract

Purpose: This Study aimed to investigate elementary school teacher's knowledge, attitude regarding cardio pulmonary resuscitation(CPR) and Explore which factors affect their intention to performance CPR.

Method: Data were collected from March 1 to November 30, 2019 from 164 elementary school teacher's. The collected data were analyzed by SPSS/WIN 23.0 program for descriptive statistics, independent t-test, One way ANOVA, Pearson correlation coefficients, and logistic regression.

Results: There were significant differences in knowledge and attitude and intention to performance CPR according to education satisfaction. There were positive correlation between attitude and intention to performance CPR. Factors influencing. These factors explained 15.0% of the variance in intention to perform the CPR.

Conclusion: The results of this study suggest that In CPR education, it is important to develop and apply standardized programs such as education contents, education time, and education methods, and it is necessary to operate effective CPR education programs by conducting education that meets the educational needs of the subjects.

[Keywords] CPR, Knowledge Attitude, Performance, Intention, CPR Education Program

1. Introduction

1.1. Need for study

Acute cardiac arrest is unpredictable, and whether the CPR is performed promptly by the first witness at the scene where the patient is plays an important role in saving the lives of the patients with the cardiac arrest[1]. According to the statistics of the Korea Centers for Disease Control and Prevention(KCDC), the rate of CPR for the general public during the acute cardiac arrest is increasing each year from 1,721 cases(6.9%) in 2012 to 6,694 cases(24.7%) in 2019. Furthermore, the rate of survival according to whether the CPR is performed for the general public has increased from 262 people(15.2%) in 2012 and 327 people(13.5%) in 2013 to 918 people(14.3%) in 2018 and 1,005 people(15.0%) in 2019[2]. Examining the places of the occurrence of cardiac arrest patients outside of hospitals, it is reported that 60.0% of the cases occur most frequently at home, and other public places and multi purpose facilities[2], and hence, it is necessary to educate the general public on the basic CPR to ensure that they can recognize an immediate emergency and respond thereto accordingly[3].

As of 2021, the number of elementary school students is 2,672,340 and the number of teachers is 569,723[4], and a large number of people live in school, even when the staff other than the teachers in school are excluded, and most of the health care is handled by a single public health teacher, yet there are some places where a school health teacher is not permanently resident. In the case of acute cardiac arrest, there is a limit to contacting the public health

teacher and providing the prompt CPR given the nature of the classroom. Rather, students and faculty spend more time in the same space, and hence, they are more likely to be the first witness for the acute cardiac arrest. Furthermore, school constituents are mainly consisted of young students, and their safety accidents are an important factor in causing death and disability[5][6], and various difficult problems caused by violence in schools are also highlighted[7].

Changes in the knowledge, attitude, and the performance of elementary and secondary school faculty and staff regarding the CPR and performance are expected, as the School Health Act was amended in 2017, making it mandatory for the elementary and secondary school faculty and staffs to participate in the CPR and first aid training every year for at least 3 hours[8]. However, there is no specifics, such as the educational contents, timing, educational method, and educational cost subsidization for the CPR and first aid performed in schools, and hence, the CPR and first aid education is provided in various schools by school.

However, while the education on safety accidents is provided in health education and physical education classes for elementary school students[9], there is no education on the CPR and first aid except for the educational programs and training for the elementary school faculty and staffs.

Examining the studies related to the CPR conducted in Korea, the studies on knowledge, attitude, and performance of the general public[10][11][12][13][14][15] and the medical personnel[16][17][18][19][20] have been conducted. Furthermore, studies[21][22] are underway to raise the awareness of disasters and safety beyond the education on the CPR and first aid. According to the study results, it is reported that the educational opportunities of the CPR for the general public are very limited, and the knowledge and attitude are less, and when knowledge and attitude are increased through the CPR education, the intention to perform and performance skills are also increased[23][24].

Accordingly, this study investigated the knowledge, attitude, and general characteristics of the CPR on the elementary school faculty and staffs, and verified the factors influencing the will to perform the CPR for these variables, thereby providing the basic data for the vitalization of the CPR education program for the faculty and staff who are involved in many activities in school life.

2. Purpose of Research

The purpose of this study is to verify the general characteristics of elementary school faculty and staffs members affiliated with City I, Jeollabuk-do, and identify the educational status, knowledge, attitude, and willingness to perform the CPR and the factors influencing the will to perform the CPR, and the specific purposes are as follows.

- 1) To identify the knowledge, attitude, and willingness to perform the CPR of the elementary school faculty and staffs.
- 2) To identify the differences in knowledge, attitude, and willingness to perform the CPR according to the general characteristics of the elementary school faculty and staffs.
- 3) To identify the correlation between knowledge, attitude, and willingness to perform the CPR of the elementary school faculty and staffs.
- 4) To identify the factors influencing the will of elementary school faculty and staffs to perform the CPR.

3. Research Method

3.1. Research design

This study is a descriptive research study intended to identify the general characteristics of the elementary school faculty and staffs affiliated with City I, Jeollabuk-do, and the educational status, knowledge, attitude, and performance confidence of the CPR, and identify the factors influencing the will to perform the CPR.

3.2. Research tools

3.2.1. Knowledge of the CPR

The knowledge of the CPR was consisted of 10 questions by modifying and supplementing the research tools of Park JM & Jun SE[24] in accordance with the Korean CPR guidelines amended in 2015[25]. It is consisted of multiple choices, and the correct answer is given 1 point and an incorrect answer is given 0 point, while the measurable score ranges from 0 to 10, with higher scores significating the higher knowledge of the CPR.

3.2.2. Attitude towards the CPR

To characterize the attitude towards CPR, the tool developed by Park SH. et al[26] was modified and supplemented for use, and it as consisted of a total of 10 questions. Using a Likert 5-point scale for each question, the scores ranged from 1 point of 'Absolutely disagree' to 5 points of 'Strongly agree' and for the negative questions, the score was converted inversely. The measurable score ranged from 10 to 50 points, with the higher scores indicating a more positive attitude towards the CPR. The reliability of the tool used for the previous study was .80 for the Cronbach's α , and the reliability for the tool used for this study was .83 for the Cronbach's α .

3.2.3. Willingness to perform the CPR

The tool for the subject's willingness to perform the CPR was consisted of a total of 9 questions by modifying and supplementing the performance confidence measurement tool developed for the nurses in the artificial kidney room by Cho MK & Kim CG & Chun SH[27]. The Visual Analogue Scale(VAS) in the units of 0 cm to 10 cm was presented, and the confidence in the CPR was consisted of a scale of 0 point for 'Lacking will to perform at all' to 10 points for 'Highest willingness to perform.' The measurable score ranged from 0 to 90 points, indicating that the higher the score, the higher the will to perform the CPR.

4. Data Collection Method

This study collected the data from March 2019 until November 2019 targeting 164 teachers and staffs of 10 elementary schools in City I, Jeollabuk-do. For the data collection, the researcher was allowed to visit after explaining the purpose and method of the research to the principal and the public health teacher of each school. The study subjects were explained that there was no penalty for not participating in the study and the description of the study, and they were asked to complete a self-report questionnaire, and the researcher collected the questionnaire in person on site.

5. Method of Data Analysis

The data collected for this study were analyzed by using the SPSS/WIN 23.0 program, and the detailed analytical method is as follows.

1) The general characteristics of subjects and the actual conditions related to the CPR education were analyzed by using frequency, percentage, mean and standard deviation.

2) The subject's knowledge, attitude, and willingness to perform the CPR were analyzed by using the mean, standard deviation, and mean score.

3) The independent sample t-test and the on-way ANOVA were performed for education status, knowledge, attitude, and will to perform according to the general characteristics of subjects, and the expost test was analyzed by using the Scheffe test.

4) The knowledge, attitude, and willingness to perform the CPR according to the subject's CPR education related characteristics were analyzed by using the t-test and ANOVA, and the expost test was analyzed by using the Scheffe's test.

5) The Pearson's correlation coefficient was performed to determine the correlation between the subject's knowledge, attitude, and willingness to perform the CPR.

6) The multiple logistic regression analysis was performed to identify the factors influencing the will to perform the CPR.

6. Ethical Consideration

After applying the unique identification symbols, the questionnaire for this study was coded in a designated place and stored in a secure file after the statistical processing, while the personal PC was encrypted and managed to ensure that other people could not access it. The collected questionnaire's data were separated from the consent form and the questionnaire, blended without rules, and stored in the researcher's laboratory under a double lock, and no one except the researcher was allowed to access them. This questionnaire will be discarded through a shredder 3 years after the data collection.

7. Results

1) General characteristics of the subject

A total of 164 people by gender were 44 males(26.8%) and 120 females(73.2%), with the age of 41.41 years on average.

110 people responded that they had religion(67.1%), 54 responded no religion(32.9%), 102 responded that they are college graduates(62.2%), and 32 responded that they are graduate school graduates or higher(37.8%) <Table 1>.

Table 1. General characteristics of subjects.

Item	Classification	n or Mean±SD	%
Gender	Male	44	26.8
	Female	120	73.2
Age	Average age	41.41±9.87	
Religion	Yes	110	67.1
	No	54	32.9
Educational background*	College graduate	102	62.2
	Graduate school or higher	62	37.8

Length of service	Career (years, months)	15 years and 6 months	
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Note: N=164.

2) Current status of the CPR education

154 people responded that they have the CPR education related experiences(93.9%), and 10 responded that they don't(6.1%). As for the number of training hours per session, 30 people responded 1 to less than 2 hours(18.3%), 66 people responded 2 to less than 3 hours(40.2%), and 68 responded 3 hours or longer(41.5%). As for the form of education, 48 people responded practice oriented(29.3%), and 116 people responded theory and practice(63.4%). After education, 122 people responded very satisfied(74.4%), 36 responded somewhat(22%), and 6 people responded average(3.7%). 132 people responded that they have the willingness to voluntarily participate in the education(80.5%), and 32 people had none(19.5%). 110 people responded that they have a willingness to participate in the public certification(67.1%), and 54 responded that they have none(32.9%). As for the cost of the certification course for the general public, 12 people responded with less than 10,000 won(7.3%), 52 responded 1 to less than 20,000 won(31.7%), 62 responded 2 to less than 30,000 won, 20 responded 3 to less than 40,000 won(12.2%), and 18 people responded 4 to less than 50,000 won. As for the preferred training time, 20 people responded with 30 minutes to less than 1 hour(12.2%), 86 responded 1 to less than 2 hours(52.4%), 44 people responded 2 to less than 3 hours(26.8%), and 14 responded with 3 hours or longer(8.5%). As for the appropriate training cycle, 20 people responded with less than 1 year(12.2%), 44 responded with 1 year(26.8%), 80 responded 2 years(48.8%), and 20 responded with 3 years(12.2%) <Table 2>.

Table 2. The CPR education related status.

Item	Classification	n	%
Educational experience	Yes	154	93.9
	No	10	6.1
Educational hours per session (hr)	≤1~<2	30	18.3
	≤2~<3	66	40.2
	≤3	68	41.5
Form of education	Practice centric	48	29.3
	Theory + practice	116	70.7
Post education evaluation related experience	Yes	60	36.6
	No	104	63.4
Post education satisfaction	Very much	122	74.4
	Mostly so	36	22
	Average	6	3.7
	Mostly not so	-	-
	Very much not so	-	-

Willingness to voluntarily participate in education	Yes	132	80.5
	No	32	19.5
General public's willingness to participate in certification program	Yes	110	67.1
	No	54	32.9
Cost of general public's certification program (KRW 10,000)	<1	12	7.3
	≤1~<2	52	31.7
	≤2~<3	62	37.8
	≤3~<4	20	12.2
	≤4~<5	18	11.0
Preferred hours of education	≤0.5~<1	20	12.2
(hr)	≤1~<2	86	52.4
	≤2~<3	44	26.8
	≤3	14	8.5
Appropriate educational cycle	1>	20	12.2
(years)	1	44	26.8
	2	80	48.8
	3	20	12.2

Note: N=164.

3) Education status, knowledge, attitude, and will to perform according to the general characteristics of the subject

Among the knowledge, attitude, and will to perform according to the general characteristics of the subjects, according to their educational background, college graduation(75.82±13.90) and graduate school or higher(79.90±9.06) were statistically significant($t=-2.25$, $p<.05$). Gender, religion, and educational experience were not statistically significant in terms of knowledge, attitude, and will to perform <Table 3>.

Table 3. Knowledge, attitude, and will to perform according to the general characteristics of the subjects.

Item	Classification	Knowledge		Attitude		Willingness to perform	
		Mean±SD	t(p)	Mean±SD	t(p)	Mean±SD	t(p)
Gender	Male	8.95±.89	1.94	35.05±6.76	-2.01	77.68±14.01	.29
	Female	8.60±1.09	(.054)	37.13±5.52	(.046**)	77.03±12.15	(.77)
Religion	Yes	8.76±1.10	1.19	36.89±6.56	.98	77.78±13.76	..83

	No	8.56±.93	(.233)	35.93±4.39	(.329)	76.04±9.96	(.407)
Educational background	College graduate	8.69±1.02	-.68	35.90±6.44	-1.68	75.82±13.90	-2.25
	Graduate school or higher	8.81±1.01	(.495)	37.52±5.06	(.095)	79.90±9.06	(.026)**
Educational experience	Yes	8.78±.94	4.24	36.47±6.02	-.89	77.36±12.32	.62
	No	7.40±1.71	(.000)*	38.20±4.42	(.373)	74.80±13.22	(.536)

Note: N=164, *p<0.001, **p<0.05.

4) Knowledge, attitude, and will to perform CPR according to the characteristics of the subject's CPR education

The results of the subject's knowledge, attitude, and will to perform according to the characteristics of the CPR education are as follows <Table 4>.

The attitude of a single training time experienced were 1 to less than 2 hours(35.13±5.68), 2 to less than 3 hours(35.36±5.74), and 3 hours or longer(38.38±5.84), and 1 to less than 2 hours turned out to be lower than expected(F=5.72, p<.05). As for the knowledge of satisfaction after education, it was very much(8.72±1.08), mostly so(8.44±.91), and average(9.67±.52), and average turned out to be higher than mostly so(F=3.78, P<.05). As for the attitude of satisfaction after education, it was very much(37.57±5.70), mostly so(33.44±6.00), and average(35.00±4.10), and very much turned out to be higher than mostly so(F=7.50, P<.001). As for the will to perform after education, it was very much(79.56±10.90), mostly so(70.11±15.06), and average(72.00±14.39), and very much turned out to be higher than mostly so(F=9.13, P<.001). As for the cost of the general certification course, it was 10,000 won(8.67±.49), 1 to less than 20,000 won(8.81±.97), 2 to less than 30,000 won(8.87±.80), 3 to 40,000 won(8.10±1.62) and 4 to 50,000 won(8.44±1.29), demonstrating a statistically significant difference(F=2.56, p<.05). As for knowledge, it was less than 10,000 won(35.50±5.18), 1 to less than 20,000 won(34.73±6.41), 2 to less than 30,000 won(37.26±4.65), 3 to 40,000 won(37.30±7.64), and 4 to less than 50,000 won (39.44±5.68), demonstrating a statistically significant difference(F=2.80, p<.05). As for the willingness to perform, it was less than 10,000 won(80.67±6.95), 1 to less than 20,000 won(7.38±15.45), 2 to less than 30,000(79.61±9.10), 3 to 40,000 won(71.80±15.72), and 4 to less than 50,000 won(83.67±7.50), demonstrating a statistically significant difference(F=4.41, p<.05). As for the appropriate educational cycle, it was less than 1 year(8.00±1.65), 1 year(8.32±.98), 2 years(9.00±.78), and 3 years(9.00±.80) in terms of knowledge, with less than 1 year turned out to be lower than 2 years, and less than 1 year turned out to be lower than 3 years, and 1 year turned out to be lower than 2 years(F=8.76, p<.001).

Table 4. Differences in knowledge, attitude, and will to perform according to characteristics related to the CPR education.

Item	Classification	Knowledge			Attitude			Willingness to perform		
		Mean±SD	t/F (p)	Scheffe	Mean±SD	t/F (p)	Scheffe	Mean±SD	t/F (p)	Scheffe
1 training time experienced*	≤1~<2 ^a	8.73±1.01	.047		35.13±5.68	5.72	a<c	75.33±14.38	.754	
	≤2~<3 ^b	8.67±1.10	(.954)		35.36±5.74	(.004**)		76.70±12.79	(.472)	
	≤3 ^c	8.71±1.02			38.38±5.84			78.53±11.67		
Form of education	Practice centric	8.54±1.36	-1.015		37.38±4.61	1.11		77.58±11.17	.245	
	Theory + practice	8.76±.88	(.314)		36.24±6.39	(.367)		77.05±13.17	(.807)	

Post education evaluation related experience	Yes	8.53±1.30	-1.36		37.77±5.63	1.97		79.47±10.50	1.75	
	No	8.79±.87	(.117)		35.88±6.03	(.050)		75.90±13.59	(.082)	
Post education satisfaction	Very much ^a	8.72±1.08	3.78	b<c	37.57±5.70	7.50	a>b	79.56±10.90	9.13	a>b
	Mostly so ^b	8.44±.91	(.025 ^{**})		33.44±6.00	(.001 [*])		70.11±15.06	(.000 [*])	
	Average ^c	9.67±.52			35.00±4.10			72.00±14.39		
Willingness to voluntarily participate in education	Yes	8.68±1.09	-.33		37.44±5.86	3.96		79.02±11.71	3.88	
	No	8.75±.84	(.742)		33.00±4.89	.001 [*]		69.75±13.72	(.001) [*]	
General public's willingness to participate in certification program	Yes	8.76±1.00	1.20		36.89±6.04	.98		78.51±12.24	1.90	
	No	8.56±1.14	(.223)		35.93±5.72	(.329)		74.56±13.11	(.059)	
Cost of general public's certification program	<1 ^a	8.67±.49	2.56	-	35.50±5.18	2.80	-	80.67±6.95	4.41	-
	≤1~<2 ^b	8.81±.97	(.041 ^{**})		34.73±6.41	(.028) ^{**}		73.38±15.45	(.002 ^{**})	
	≤2~<3 ^c	8.87±.80			37.26±4.65			79.61±9.10		
	≤3~<4 ^d	8.10±1.62			37.30±7.64			71.80±15.72		
	≤4~<5 ^e	8.44±1.29			39.44±5.68			83.67±7.50		
Preferred hours of education	≤0.5~<1	8.50±1.67	2.01		35.40±8.67	2.63		78.60±15.74	1.26	
	≤1~<2	8.88±.85	(.115)		36.12±4.07	(.052)		75.44±11.63	(.290)	
	≤2~<3	8.50±1.05			37.73±7.27			78.95±13.76		
	≤3	8.43±.94			40.57±5.32			80.57±8.99		
Appropriate educational cycle	1 ^a	8.00±1.65	8.76	c>a, d>a	36.60±11.10	2.18		78.80±11.82	.412	
	1 ^b	8.32±.98	.000 [*]	c>b	38.45±3.78	(.092)		78.36±12.62	(.745)	
	2 ^c	9.00±.78			35.78±5.36			77.33±13.31		
	3 ^d	9.00±.80			35.60±3.95			74.60±11.02		

Note: N=164, *p<.001, **P<.005.

5) Correlation between the subject's knowledge, attitude, and willingness to perform the CPR

Attitude and willingness to perform the CPR demonstrated a significant correlation with knowledge of the CPR, attitude, and will to perform of 164 subjects($r=.156$, $p<.005$) <Table 5>.

Table 5. Correlation between CPR knowledge, attitude, and willingness to perform.

Variable	Knowledge(r/p)	Attitude(r/p)	Willingness to perform(r/p)
Knowledge	1	.001(.994)	.129(.100)
Attitude	.001(.994)	1	.156(.046) ^{**}
Willingness to perform	.129(.100)	.156(.046) ^{**}	1

Note: N=164, **p<.005.

6) Identification of the factors influencing the will to perform the CPR

Performance of the multiple logistic regression analysis

In the first phase of model setting, and if the CPR education were operated as a certification course for the general public, voluntary participation would be first input as a predictive factor, and the explanatory power turned out to be 8.5%($p=.000$). In the second phase, the CPR education related satisfaction was added as a predictive factor, and increased by 3.9%, yielding the total explanatory power of 12.4%($p=.000$). In step 3, academic background was more input as a predictive factor, and the explanatory power increased by 2.6%, yielding a total explanatory power of 15%($p=.000$) <Table 6>.

Table 6. Multiple logistic regression analysis with willingness to perform CPR as a dependent variable.

Model	Predictor	R ²	R ² change	β	F	p
1	General public's willingness to voluntarily participate in certification program	.085	.085		15.055	.000*
2	Educational satisfaction	.124	.039	.112	11.402	.000*
3	Educational background	.150	.026	0.47	9.400	.000*

Note: N=164.

8. Discussion

This study confirmed the status of the CPR education, knowledge, attitude, and the will to perform the CPR education targeting 10 elementary school faculty and staffs in City I, Jeollabuk-do, and the very purpose of this study is to provide the basic data for the revitalization of the educational programs on the CPR for the elementary school faculty and staffs by identifying the factors influencing the will to perform.

Among the elementary school faculty and staffs, 93.9% of the elementary school faculty and staffs have had experiences in the CPR, which was higher than that of the studies targeting the general public[10][11][12][13][14][15], which also demonstrated similar results as with those of the studies targeting the public health professionals including nursing students[16][17][18][19][20]. Furthermore, their results were similar to those of the study of Song & Park[28], which examined the educational experience of the CPR targeting the elementary and secondary school teachers. This is thought to be so since the CPR and first aid education for the elementary and secondary school faculty and staffs was converted into the mandatory education every year according to the School Health Act in 2017, and accordingly, various educational experiences were provided to the faculty and staffs.

Furthermore, as for the form of education, the case where theory and practical education were combined accounted for 70.7%, which turned out to be lower than the result of the study of Song & Park[28] which had 94.6%, and it was apparent that most of the education was conducted with the practice oriented CPR education rather than theory. When examining the CPR practice training method conducted for the non-medical professionals as in the research result of Oh YH & Kim BJ[29], and after the selection of subjects, examining the size of the effect of education which conducted the first practical performance evaluation of CPR(9.91 points), 2nd

practical performance evaluation(21.62 points) after distribution of books, self learning and written test, and the 3rd practical performance after one-on-one training of theory and practical training(97.84 points), it may be confirmed that the practice centric education for the CPR education has had a large effect. Furthermore, it is better that a professional instructor with extensive field experience conduct the training which includes practical skills for the scenarios including emergency situations. Furthermore, just as the study which claimed that the one-on-one practical education using simulation significantly improved the CPR performance skills of the general public[29], it would be important to improve the practical performance skills through practice and improve the will to perform together.

Furthermore, the higher the post educational satisfaction with the CPR education, the higher the level of knowledge($F=3.78$, $p<.05$), attitude($F=7.50$, $p<.001$), and will to perform($F=9.13$, $p<.001$), which is similar to the results of a study where the higher educational satisfaction with the CPR education for civil servants demonstrated significant differences in terms of knowledge, attitude, and will to perform[12]. It is necessary to improve the efficiency of the CPR education, which is repeated each year, by increasing the satisfaction of subjects after education through the qualitative management of education on the CPR and access to various teaching methods. According to the School Health Act of 2017, not only the CPR education but also the first aid education ought to be provided, yet most of the education is only focused on the CPR, and hence, it is thought that a variety of educational approaches to the educational contents such as dressing and various bandages, immobilization using splints, and methods for the airway obstruction would be needed.

In this study, among the questions about the CPR education, and whether there is willingness to voluntarily participate in the certification process, it demonstrated the research results of knowledge($t=-0.33$, $p=.742$), attitude($t=3.96$, $p<.001$), and will to perform($t=3.88$, $p<.001$), which is consistent with the study[30] which claims that the voluntary participation in the CPR training increases the will to perform CPR($\chi^2=56.93$, $p<.001$). However, in the case of current elementary and secondary school faculty and staffs, the CPR education is mandatory under the School Health Act, and hence, they are undergoing education every year at the level of work extension rather than voluntary participation. Furthermore, according to the School Health Act, the education hours are about 3 hours, and the theory and practical education are provided every year. Therefore, the results of this study which related that 'If it is linked to the certification curriculum for the general public, I will participate(67.1%)', 'It is better to have the education hour for 1 to less than 2 hours', and 'It is recommended that the training cycle be every two years' makes it apparent that there is a need to improve the CPR education program for elementary school faculty and staffs, and it is necessary to proceed with a program which reflects the needs of the elementary and middle school faculty and staffs members in the field. Furthermore, since there are various instructors and institutions conducting the CPR training, the training methods and contents of CPR are different depending on the instructors and institutions, and hence, it is thought that the educational process should be operated by setting the standardized criteria towards this end.

In this study, as a result of analyzing the correlation between the subjects' knowledge, attitude, and will to perform, there turned out to be no correlation between knowledge and will to perform, but a positive correlation between attitude and will to perform was evident. This is different from the research result which claimed there is a correlation between knowledge, attitude, and will to perform[10][11][12], yet are similar to the research results showing the correlation between attitude and performance rather than the correlation between knowledge and performance[11][12].

In Sweden, the CPR education strengthens the motivation to try CPR immediately and emphasizes the will to do so[31], and just as it is important for the CPR education, the education which enables the students to have an active attitude rather than knowledge should be provided.

As a result of the multiple logistic regression analysis performed for the factors influencing the will to perform the CPR of elementary school faculty and staffs, it was evident that the

intention to participate voluntarily, satisfaction after training, and academic background when CPR education was operated as a certification course for the general public were significant.

While the subjects of this study are different, in the study of emergency room nurses, the reason for receiving the CPR training influences the individual work evaluation and the evaluation results of the hospital, and hence, 30.0% of the nurses participated in the mandatory education, 28.3% did for self development, and 20.6% did to maintain their relevant certifications[32]. In the case of nurses, they are often the first witnesses to the patient safety, and hence, the education on the CPR is designated as essential education in the evaluation items of medical institution certification evaluation, and so there was also the purpose of participating for the purposes of strengthening the capacity to apply the CPR more promptly and accurately to the patients[28]. Accordingly, in view of the results, the CPR education is classified as a mandatory education for elementary school faculty and staffs, but considering the extent of improvement in the CPR implementation rate for the general public, by applying to the public certification course voluntarily, it is possible to respond to the emergencies which may occur in school, which is thought to be the will to strengthen the ability to improve the counter responsive ability.

The results are similar to those of the study[23] where the group with educational experience manifested a lower will to perform than the group without the educational experience in the CPR education for the civil servants. It is considered that a continuous feedback process would be needed to activate the CPR education by identifying the needs of elementary school teachers and staff for the CPR, and identifying improvements. Furthermore, it would be necessary to improve the educational satisfaction by providing support and incentives for the continuous education based on the development and application of the customized CPR education programs in the training course for the elementary school faculty and staffs.

It influences the will of one resident to perform the CPR in an emergency situation, and the OR(Odds Ratio; OR) is 6.11 times more consistent with the study results [33], where the level of educational achievement was higher than that of the uneducated.

The CPR education is divided into the basic course and the advanced course in the general course conducted by the Korean Association of Cardiopulmonary Resuscitation. In the case of the general basic course and the advanced course, the general public over the age of 10 can participate, and it has the advantage of being educated through video lectures, and hence, it is easy to access the standardized CPR education [34]. Furthermore, in the case of the CPR education conducted within the school, considering the fact that an efficient CPR education is difficult to achieve given the lack of educational equipment, training places, and manpower to prepare, it would be important to request a training institution which operates the CPR education in each region so that quality education can be provided. Furthermore, since there is a period of 2 years for maintaining the qualification when a certificate is acquired, it would be necessary to consider a plan to enable the CPR education by using such a curriculum.

In this study, too, the factors influencing the knowledge, attitude, and will to perform the CPR education were examined for the faculty and staffs of 10 elementary schools in City I, Jeollabuk-do, and the standardization of education content, time, and method were applied to activate the CPR education, and it would be necessary to find venues to conduct the education based on the voluntary will.

9. Conclusion and Recommendation

This study is a research study which attempted to examine and understand the factors influencing the knowledge, attitude, and will to perform the CPR education for the elementary school faculty and staffs since the School Health Act of 2017. As a result of the study, there turned out to be a correlation between the attitude towards the CPR and the will to perform the CPR after the CPR training, and the factors influencing the will to perform were the

willingness to voluntarily participate in the general public course, satisfaction after training, and the academic background. Accordingly, as for the CPR education, it would be important to develop and apply the standardized programs such as educational contents, training hours, and educational methods, and it would also be necessary to operate an efficient CPR education program by conducting the education which meets the educational needs of the subjects.

Follow-up studies are needed to help develop a standardized CPR education program moving forward, and it would be necessary to discuss the operation of an education program which can help increase the satisfaction of the subjects.

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11. Appendix

11.1. Authors contribution

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

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Development of a Program Model for Improving the SAFETY Problem Solving Thinking Ability of Childhood

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Abstract

Purpose: This study is to design a program model to improve the ability of young children to solve safety problems. Because safety has a dynamic relationship with life psychologically and physically, it not only affects the quality of life of infants but also can be directly connected to life, so the purpose of this study is to develop a method to improve thinking ability to solve problems in safety situations.

Method: For this purpose, seven areas of safety related picture books were selected based on the seven standards of school safety: life safety, traffic safety, violence and personal safety, drug cyber addiction safety, disaster safety, occupational safety and first aid.

Results: This study is to construct a model system. The model system can convert safety-related picture books into experiences that can occur in the life of young children and repeat the experience of solving problems through musical drama activities

Conclusion: The musical drama activities using safety-related picture books proposed in this paper will improve the safety problem solving thinking ability of young children. This is difficult to expect the effect of early childhood safety education when it is conducted with knowledge. The musical drama program model using safety-related picture books has significance in that it experiences problem solving while experiencing the experience with the child's own understanding and reasoning repeatedly based on the safety situation. In conclusion, safety problems are the ability to improve through the experience of solving the children themselves.

[Keywords] Safety Related, Picture Book, Musical Drama, Safety Problem, Solving Ability

1. Introduction

The overall development of children is possible when health and safety are guaranteed [1]. In childhood, curiosity evoked by all static and dynamic objects included in the radius of action is amplified. This is a time when situational awareness and behavioral control ability are insufficient due to vigorous curiosity and behavioral patterns, so there is more exposure to safety-related accidents than ever [2]. Also, it is difficult to predict the risk of situations in which safety-related accidents can occur, and there is a high possibility of accidental incidents [3]. Therefore, it is necessary to recognize risks in advance in childhood to control risky activities, or to cultivate the ability to cope with sudden danger so that risk factors can be blocked and a safe life can be led on their own. For this, it is necessary to improve various environmental factors that may cause accidents. In addition, safety education should be provided to prevent situations in which safety-related accidents can occur by changing the behavior of children, and measures to improve their ability to solve safety problems are needed. The following are the suggestions from Korea and the United States.

In Korea, Article 4(1) and 31(1) of the Child Welfare Act and Article 28(1) of the Enforcement Decree of the same Act stipulate on time, cycle, content, and methods regarding providing sexual violence and child abuse prevention education, missing and kidnapping prevention education, drug misuse prevention education, anti-disaster safety education, and traffic safety education. This enhances the dignity of human life along with the safety awareness of the social environment that children will encounter as they grow up and recognizes potential risk factors throughout society so that they can acquire the knowledge and skills necessary to fundamentally prevent accidents[4].

In the case of an accident prevention program in the United States[5], it is suggested that education on child safety-related accident prevention should not be limited to simply inducing accident prevention knowledge, attitudes, behavior formation, and change[6].

Improving safety problem-solving thinking abilities requires that children have not only knowledge but also integrated problem-solving thinking abilities so that they can protect themselves when exposed to dangerous situations[7]. This is conscious behavior that can recognize risks around one's daily life and protect oneself and should be provided systematically, actively, repeatedly, and continuously according to the appropriate method for the developmental stage[8].

Education for improving safety problem-solving thinking ability should be conducted based on knowledge and experience in forming specific skills and attitudes based on one's own knowledge in the surrounding environment directly related to the child[1]. In other words, it is necessary to accurately recognize the problem situation through repetitive experiences in actual dangerous situations or similar situations. In addition, if a series of "experiences" from knowledge to behavior is acquired by internalizing the connected knowledge as a way to utilize it in the situation, safety-related accident prevention education can have sufficient effect. Accordingly, they naturally think about the surrounding environment as a safety priority and become a member of society that realizes the value of life preservation.

Education for improving children's safety problem-solving thinking ability has little effect on changes in children's behavior when it is focused on linear knowledge transfer. Therefore, it can be seen that it is most effective to combine situational plays and role-plays similar to the actual situation[9]. In addition, it seems that simple knowledge-oriented education methods only have a slight effect on changes in safety-related behavior[10]. Children cannot fully protect themselves by simply recognizing safety-related situations or stories, so they need to make it a habit through practice about their skills. In addition, after knowledge transfer, children should be aware of the necessary knowledge and countermeasures in as many situations as possible until they are fully learned, and apply them directly to provide sufficient opportunities to escape danger on their own. When the safety situation was set to be linked to the daily life of children and conceptualized safety education related to the contextual theme, the child's active response to the dangerous situation came out, and an accurate and correct solution was suggested, and they asked questions voluntarily[11].

Based on these preceding studies, we intend to develop a musical play program model using safety-related picture books as a safety problem-solving thinking ability improvement program. This will allow children to actively and voluntarily participate in the prevention of safety-related accidents in combination with safety-related knowledge given in real life. In addition, this will contribute to fostering effective problem-solving thinking abilities to help children grow healthy and holistic in a safe environment.

2. A Program to Improve Child Safety Problem-Solving Thinking Abilities

Safety-related accidents that occur in childhood are frequently caused by human factors due to lack of knowledge or carelessness in behavior, and by medium factors due to defects in objects such as bicycles that cause accidents. This is greatly influenced by the environmental

factors of the home, school, and community to which the child belongs. Therefore, comprehensive measures are needed not only to eliminate accident risk factors in advance but also to improve children's ability to solve safety-related problems to minimize the aftereffects of accidents. This is because safety-related accidents that occur in childhood are likely to be predictable, so the effect is high when multilateral efforts and education are conducted to improve safety problem-solving thinking ability at home, school, community, and national level [12].

Education on improving safety problem-solving thinking ability should be able to increase the likelihood and expectation of avoiding risks while reducing unintentional behavior that may be at risk. This should be done so that it can be maintained continuously, not once. To this end, if various types of play-oriented integrated education are provided, children will explore safety knowledge with interest, recognize and cope with dangerous situations. They should be able to modify their own dangerous behavior and learn knowledge, functions, and attitudes about safety. Since simple knowledge-oriented education methods do not affect behavioral changes [13], it is effective to perform simulation or role-playing similar to real-life situations in the long run and repeatedly, and to frequently provide opportunities to strengthen skills [9]. As a result of comparing the effects of 25 types of safety education programs in the United States, comprehensive programs that repeatedly educate children and provide opportunities for reinforcement over the longest period of time were most effective. On the other hand, it has been reported that the least effective program is to teach only abstract concepts [14]. In addition, safety knowledge, safety problem-solving thinking ability, safety attitude, and understanding of safety technology that will have permanent effects until adulthood should be prioritized [15].

Therefore, this study focuses on achieving the effectiveness of teaching and learning methods to improve children's safety problem-solving thinking ability. To this end, we intend to improve safety problem-solving thinking ability based on basic safety rules that reproduce the facts, conceptual principles, and methods learned about safety without mistake and safety knowledge about the characteristics and potential risks of safety-related situations. As a method, children can consider the safety-related situation as an indirect experience in safety-related picture books, and repeatedly experience the process of solving thinking safety-related problems according to the situation through three-step musical play activities, resulting in the same effect in their daily lives.

Safety problem-solving thinking ability is reflective thinking that solves and applies conflicts or problems caused when faced with new risk-related problems or situations. To this end, it is more effective to use an experience-oriented approach in a situation similar to reality than to education focusing on knowledge acquisition in the form of talking [16]. Safety knowledge and safety problem-solving thinking ability work together when faced with a situation, and children cannot experience and acquire it directly. Therefore, based on safety-related fairy tales or picture books, children can develop their ability to cope with situations through indirect experiences, focusing on extreme-linked activities or activities. In this respect, it can be seen that picture books are appropriate as teaching media for early childhood safety education.

Safety-related picture books are important educational resources that provide children with indirect experiences and make them feel interested and fun [4]. Children can understand the safety-related situations surrounding them and the appropriate problem-solving measures. In addition, it deals closely with child life, so there are many stories about using factual techniques based on life experiences, and stories related to familiar daily life are provided, making it easy for children to empathize, understand, and identify with themselves [17].

Musical play activities are the most suitable integrated approach to promote the overall growth and development of children centering on the story [18][19], and are a good subject for repetitive learning [20]. Used with safety-related picture books, musical plays can satisfy children's intrinsic desire to explore new things in safety-related stories and make them approach naturally and with interest [21]. In addition, as children actively participate in the entire musical play process and experience differences from themselves through various lives of the characters [22], integrated education in which educational fields are closely connected is possible [23]. In

addition, musical plays have a positive effect on the development of language, body expression, social and creative thinking[24], and are effective in the holistic development of children as it is connected to social science fields as well[25]. Children actively and voluntarily remember safety-related events in order through musical play activities. In addition, they can naturally experience solving safety problems appropriate to the situation by accumulating their safety knowledge and expressing their thoughts and emotions through safety-related picture books through musical plays.

The contents of musical play activities using safety-related picture books are as follows. After children listen to picture books containing safety content, they integrate music, motion, art, and play with the safety content implied in the picture books. Then they can naturally acquire safety knowledge and experience safety problem-solving thinking by making songs into children's melody and singing songs familiar to them.

Therefore, this study aims to develop a program model to improve children's safety problem-solving thinking ability by musical play activities using safety-related picture books.

3. The Conceptual System of the Safety Problem-Solving Thinking Ability Improvement Program Model

The Ministry of Education announced the Seven Standards for Safety Education so that schools can provide safety education more efficiently in accordance with comprehensive safety measures in the field of education to realize respect for life and a safe society[26]. The "Seven Standards for Safety Education" consists of seven areas: life safety, traffic safety, anti-violence and personal safety, anti-drug and cyber activity addiction safety, anti-disaster safety, occupational safety, and first aid activities. They consist of 26 middle categories, 57 sub-categories, and 134 educational contents. In the United States, accident prevention education is included as a part of the early childhood curriculum[27], and is planned in various ways depending on the level of development, interest, and necessity of children[9].

In this study, as a conceptual system for setting the criteria for the child safety-related accident prevention program model, "Seven standards for school safety," safety-related picture books, and musical plays were analyzed. Based on this, the basis for the tentative direction, principles, and methodology for education goals, educational contents, teaching-learning methods, teaching materials, and early childhood safety-related accident prevention education was prepared.

3.1. Seven standards for school safety

Seven standards for school safety enacted by Ministry of Education consist of seven areas: life safety, traffic safety, anti-violence and personal safety, anti-drug and cyber activity addiction safety, anti-disaster safety, occupational safety, and first aid activities.

3.2. Selection of safety-related picture books

The selection of safety-related picture books was based on the areas and contents presented in the Seven Standards for School Safety(Ministry of Education, 2016). The related research and materials are as follows: Effect of safety education activities using picture books on safety knowledge and safety problem-solving by Effect of creative problem-solving process using picture books on children's story understanding and safety by[28] safety picture books presented on the effect of integrated safety education[29] activities using fairy tales on children's story understanding and safety capabilities by[30]. Based on these, 22 books were first selected after discussions with two teachers with more than 10 years of experience, two Ph.D. in Early Childhood Education, and two teachers in the early childhood education doctorate course. Among the first selected picture books, a total of 13 books were selected as the second after discussion

between the researcher, two teachers with more than 10 years of experience, and two Ph.D. in early childhood education.

Table 1. Safety-related picture book list.

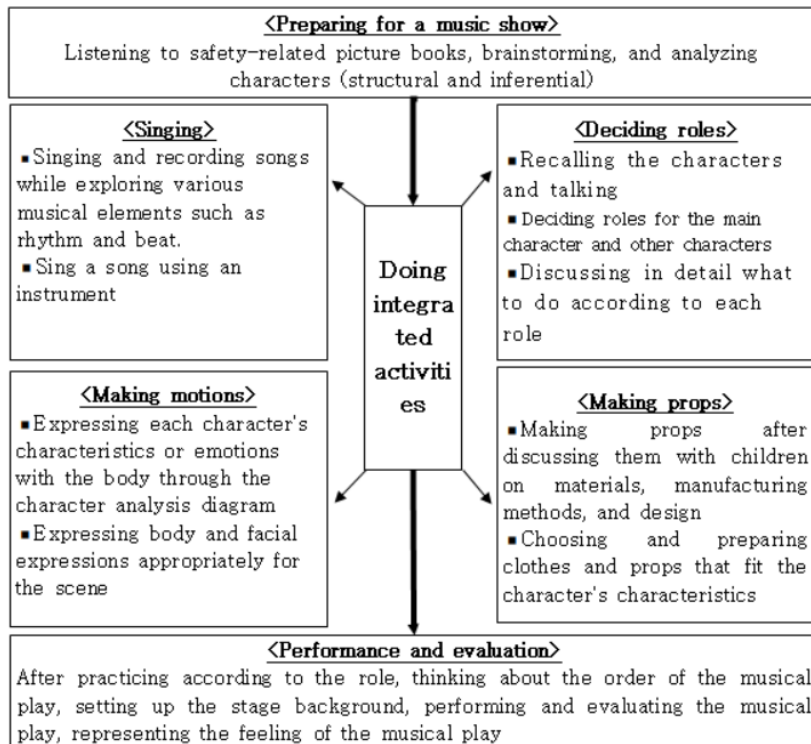
Safety theme	Book title
Life safety	I did because I was bored
	No, David
Traffic safety	Please make way for baby ducks
	My happy family
	Uncle Gumpy's boating
Anti-violence and personal safety	You can't follow strangers
	Sad Randolin
Anti-drug and cyber activity addiction safety	Help me! Little Prince's trip to Seoul
Anti-disaster safety	Iseul's first errand
	Let's go hunting bears
	There's a fire
Occupational safety	Locomotive chi-chi, the tomboy
First aid activities	What should I do when I get hurt? First aid

3.3. Musical play activities using safety-related picture books

Musical play activities using safety-related picture books are to change the contents presented in safety-related picture books to suit the melody of children's songs that children are well aware of. This makes them internalize safety-related situations presented in the safety-related picture books while acting linguistically, musically, kinetically, artistically, and dramatically by virtualizing safety-related situations that may occur in real life. Through this, it is possible to improve their safety problem-solving thinking ability by providing indirect experiences to them in case of actual or similar situations.

Musical play activities naturally allow children to play the role of characters through hypothetical activities on problem-solving for various safety-related situations. Through this, children can share thoughts and feelings of themselves and others, share and sympathize with experiences about the new world[31]. In addition, musical play activities are integrated educational activities that can give children creative and emotional experiences as well as various dramatic experiences, musical experiences, and physical expression experiences[32]. Therefore, musical play activities using safety-related picture books will allow children to think about safety-related accidents that can occur in their daily lives, compose meaning, and comprehensively grasp various relationships.

Figure 1. A music show program using safety-related picture books.

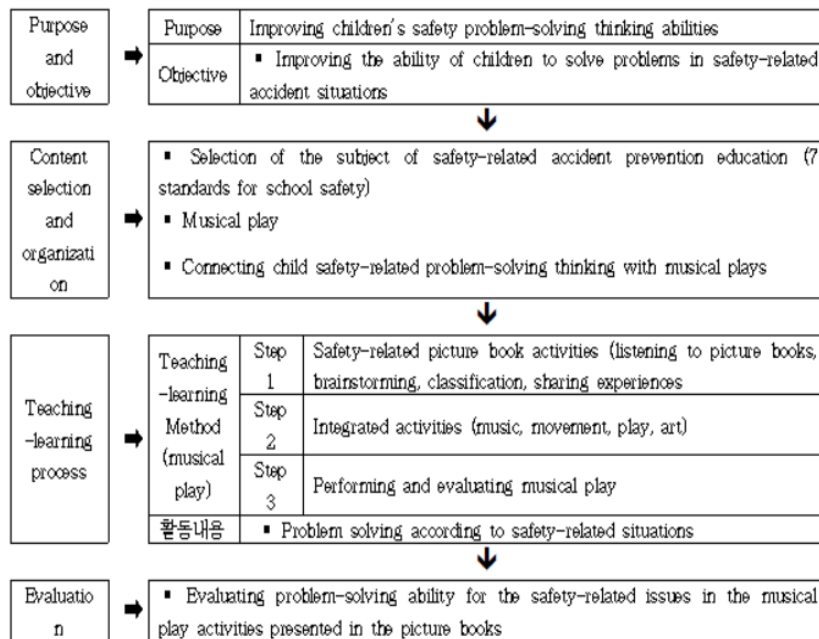


4. A Model for an Child Safety Problem-Solving Thinking Ability Improvement Program

This study conducted a theoretical search to construct a program model for improving thinking ability to solve early childhood safety-related problems and consulted with four incumbent teachers over three years of experience to diagnose suitability from incumbent teachers at the early childhood education sites. The model constructed through consultation was revised by collecting the opinions of three early childhood education experts, and the safety problem-solving thinking ability improvement program model was revised and supplemented based on the determined content.

This study established a safety-related accident prevention program model as shown in <Figure 2> based on safety-related picture books and musical plays suggested by previous studies based on the Seven Standards for School Safety.

Figure 2. Model for an child safety problem-solving thinking ability improvement program.



The characteristics of the child safety problem-solving thinking ability improvement program model designed in this study are as follows.

First, since the program is actually applied, it can specifically improve the ability to solve safety-related problems.

Second, the contents of this program were selected for safety-related picture books corresponding to the areas presented in the Seven Standards for School Safety and organized into musical play activities.

Third, in the teaching-learning process, this program should be lifestyle education in a systematic way and is designed to be repeatedly implemented in connection with the life of children.

Fourth, in the early childhood education field, it is possible to conduct an authentic assessment through observation by teachers, counseling records, interviews with parents, story-telling, and daily conversations.

Safety-related accidents can also be directly related to life, so prevention education is very important. Therefore, children should not stop doing musical play activities using safety-related picture books for a certain period of time. This study can be seen as valuable because it consists of the process of children singing repeatedly or recalling the safety-related contents of picture books.

According to education on improving safety-related problem-solving thinking ability based on development according to the age in childhood is very important in preventing safety-related accidents in childhood[33]. Through this, it was said that the changed knowledge and practice have an effect over a long period of time. In addition, accident prevention education for children can make children understand the knowledge and attitudes necessary for the safety of themselves and others in their daily lives. It also has a long-term effect of fostering a habit of respecting the lives of oneself and others and leading a safe and healthy life. It has also been found that parental participation is essential for the effective implementation of child accident prevention programs[14]. In other words, it is important for parents to participate in the entire safety education program, receive letters about what children have learned from early childhood education institutions, and learn how to evaluate and strengthen what has been learned.

5. Conclusion

This study is to develop a program model aimed at improving children's safety-related problem-solving thinking ability. Since "risk" can be observed in advance and "accidents" can be predicted based on this, the most important thing regarding safety is to develop "safety sensitivity" from childhood. Accordingly, this study investigates, analyzes, and constructs a model for systematic early childhood accident prevention program model design.

Child safety-related problem-solving thinking ability can be formed when systematically and repeatedly performed[34][35]. This should be an integrated experience in combination with various activities carried out in children's daily lives. This is a sufficient opportunity for children to recognize what knowledge and coping methods are needed in various situations and apply them directly to escape danger on their own. In addition, it may appear to be effective just by using safety-related picture books to improve safety-related problem-solving thinking ability, but furthermore, safety knowledge, attitude, and understanding of safety-related stories can be improved[36].

As such, the child safety-related problem-solving thinking ability improvement program utilizes seven areas presented in the Seven Standards for School Safety and a singing play program[37] using safety-related picture books[28][29][30] and a musical play program using picture books[36]. This activity-oriented child safety-related accident prevention education program improves child safety-related accident prevention knowledge and provides an integrated experience. This will be a program in which children actively accept attitudes toward safety-related accident prevention and learn them skills.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Lead Author	SP	-Set of concepts <input checked="" type="checkbox"/> -Design <input checked="" type="checkbox"/> -Getting results <input checked="" type="checkbox"/> -Analysis <input checked="" type="checkbox"/> -Make a significant contribution to collection <input checked="" type="checkbox"/> -Final approval of the paper <input checked="" type="checkbox"/> -Corresponding <input checked="" type="checkbox"/>
Corresponding Author*	HL	-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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Policy Response to the CRISIS of New Drugs Crime

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Abstract

Purpose: Drugs made for medical purposes could have been a mysterious potion if they were used only for their original purpose, but the reason why many people are concerned about the safety of mankind due to the enormous destructive power of drugs. It may be close to instinct for people to avoid pain and discomfort, chase joy, and pleasure, but if they borrow the power of drugs for this pleasure, the price will return to tremendous harm like boomerang. Research policy countermeasures against new drugs crime in Korea.

Method: Traditional drugs are usually classified into natural drugs, synthetic drugs, and psychotropic drugs. Through the classification and definition of drugs, the characteristics of new drugs are identified and the current status of distribution of new drugs is analyzed. Policy countermeasures are derived through foreign cases. By analyzing the characteristics of crimes against new drugs, the government will subdivide punishment standards for temporary drugs and study ways to prepare bills to quickly punish the inhalation of unspecified hallucinogenic substances.

Results: In order to cope with new drugs at this point, the priority introduction of a unified one-stop system through transnational institutions is required. Through this, it is necessary to establish a system that can focus on responding to crimes related to new drugs by integrating the system of crackdown agencies that are currently sporadically divided, such as the police, prosecutors, the Korea Maritime Police Agency, and the Korea Customs Service. In addition, continuous management is needed through linkage with treatment and rehabilitation facilities.

Conclusion: Laws should be prepared to analyze the characteristics of crimes against new drugs to subdivide punishment standards for temporary drugs and to promptly punish the inhalation of unspecified hallucinogenic substances. In addition, crackdown and punishment on drug offenders are important, but it should not be forgotten that continuous management through connection with treatment and rehabilitation facilities is necessary to fundamentally prevent recidivism of drug offenders.

[Keywords] Drugs, New Drugs, New Drugs Crime, Narcotics, Super Drugs

1. Intro

In the wake of the so-called Burning Sun incident involving famous entertainment agencies and celebrities, Korea's shameful bare face, which was proud to be a drug clean zone, was clearly exposed. As suspicions of sex crimes using drugs were raised one after another in the club, the people who watched the incident must have felt the seriousness of drug crimes. In the end, this case was also a disproving that drugs had entered our society deeply.

In the international community, \$500 billion worth of drugs are illegally traded annually, and more than 200 million people abuse them.

Drugs made for medical purposes could have been a mysterious potion if they were used only for their original purpose, but the reason why many people are concerned about the safety of

mankind due to the enormous destructive power of drugs. The pain will be gone and refreshed quickly[1].

It may be close to instinct for people to avoid pain and discomfort, chase joy, and pleasure, but if they borrow the power of drugs for this pleasure, the price will return to tremendous harm like boomerang.

Narcotics are highly addictive, such as dependence, withdrawal symptoms, resistance, and recurrence due to their characteristics. Addiction is the principle of satisfaction when using certain stimuli, so if you want these stimuli to be repeated continuously and stop using them, you will experience unpleasant feelings and withdrawal symptoms.

In short, it makes them physically and mentally dependent on stimuli. In particular, drug addiction can be applied not only to intoxicated drugs but also to all substances with similar ingredients. Drugs brought into Korea will be spread throughout the country through sales measures in Korea[2][3].

In terms of pharmacology, Narcotics are treated as drugs, and drugs refer to any drug or psychotropic drug that changes behavior or mental state[4]. Taken together, drugs can be defined as substances that are dependent and abused on humans and that are responsible for drugs, marijuana, and psycho-tropic drugs[5].

Narcotics, which were first used as drugs, were transformed into "evil" and used inappropriately and illegally, causing mental, family, and daily destruction to individuals, social and confusion, economic outflow of illegal funds, and distortion of the flow of funds. The result of this study will be basis for empirical research[6].

2. From Drugs to Super Drugs

Health is determined by social, economic, environmental and physical factors, as well as individual characteristics and behaviors[7].

This The legal definition of narcotics defines narcotics as drugs, psychotropic drugs and hemp. According to the World Health Organization, the desire for drug use is compulsory, the amount of drugs tends to increase, withdrawal occurs, and this phenomenon is defined as a drug that harms society, not just individuals[8].

Psychotropic drugs are those that act on the human central nervous system and are recognized as significant harm to the human body if abused or abused. Hemp refers to cannabis and its resin or any product manufactured from it, except for its seeds, roots and stems from mature cannabis and its products.

In terms of pharmacology, Narcotics are treated as drugs, and drugs refer to any drug or psychotropic drug that changes behavior or mental state[9].

Traditional drugs are usually classified into natural drugs, synthetic drugs, and psychotropic drugs. Natural drugs can be obtained from nature such as cannabis, and synthetic drugs are a synthesis of chemicals. In particular, synthetic drugs aimed to have a similar labor effect to morphine in the process of drug development.

Morphine has been used as a pain reliever for a long time, and in the early stages of use, mood changes such as tranquility and dreamlike sleep state occur, and unrealistic confidence increases, but when addicted, dependence and side effects appear and cause strong hallucinations. It is also common to fall into malnutrition due to loss of appetite.

Synthetic drugs are classified in various ways according to the similarity of the material structure, and among them, petidine-based and methadone-based drugs are most widely abused. Psychotropic drugs typically include methamphetamine, also known as hiropon.

This also acts on the central nervous system and causes physical and mental dependence when abused. At this time, psychotropic drugs include all hallucinations, awakening, habitual, addictive drugs, and substances that cause hallucinations.

Sensitivity and anxiety increase, leading to paranoid delusions that you are always being watched by someone or being involved in a conspiracy[10]. A methamphetamine addict is aggressive, impulsive, impatient, lacks patience for frustration of needs, is not afraid of any harm, and has severe sexual conflicts. Also, methamphetamine addicts are generally depressed and have low self-esteem, so they try to have self-esteem in physical changes through drugs[11]. According to the process of methamphetamine addiction, drug abuse gradually develops from weak strength to strong strength. At first, it can be seen that the process gradually evolved from smoking to bond, butane gas, and methamphetamine[12]. It has been shown that methamphetamine addicts are not alert to psychotropic drugs such as methamphetamine because they have used different types of drugs before methamphetamine[13]. In general, methamphetamine users tend to concentrate on more than one behavior after taking the medication, with sexual activity being the most prevalent[14].

Health is determined by social, economic, environmental and physical factors, as well as individual characteristics and behaviors[15][16][17]. However, if we are not physically healthy, we cannot achieve the meaning of health on other components of health[18][19].

Traditional drugs, which were represented by cannabis and methamphetamine, have recently evolved into new drugs. New drugs exist in various types and forms, including Yaba, Ecstasy, Cart, GHB, and LSD, as well as highly concentrated liquid hemp and hemp cookies.

New drugs are relatively cheap, but the hallucination effect is stronger, and as they are easily available, the route of importation is gradually diversifying. In particular, the number of new drugs ordered from overseas Internet sites is increasing rapidly in smuggling through international mails is increasing rapidly.

Highly concentrated liquid hemp is about four times the price of gold, and its hallucinability is about 40 times higher than that of ordinary hemp. Ordinary hemp smells a lot, so people around him can quickly tell when smoking, but liquid hemp is difficult to detect because it does not smell well, so recently, highly concentrated liquid hemp has a high preference.

Meanwhile, the original medical purpose of psychotropic drug phentermine was an appetite suppressant prescribed for obese patients. However, there are cases in which people who want to lose weight or gain awakening effects to improve concentration are caught illegally trading the drug on the Internet even though they are not obese.

Psychotropic drugs must be consulted with a doctor and taken safely with appropriate prescriptions, but as the number of illegal transactions of drugs increases, their safety related to taking drugs is threatened out of control.

3. Status of Increase or Decrease in Drug Offenders

Crime technology is an unwanted but unavoidable race[20]. Technology-facilitated drug trafficking is directly connected to cybercrimes. Cyber-crimes are any illegal act that occurs via or in cyberspace[21].

According to statistics from the Supreme Prosecutors' Office, the total number of narcotics offenders, which has been on the rise since 1995, exceeded the 10,000 mark for the first time in 1999, and has exceeded the 10,000 mark for the fourth consecutive year until 2002. However, in 2002, 224 people (Arrested prosecution 162 people) from 10 supply organizations, including smuggling, were caught due to the blocking of drug supply lines, which decreased to 7,000 over the four years from 2003 to 2006, and increased to 10,000 from 2007 to below 2014.

In 2015, 11,916 drug offenders were caught and again exceeded the 10,000 mark, and the number increased significantly to 14,214 in 2016, 14,123 in 2017, and 12,613 in 2018. The reason for this is the recent spread of drug distribution through SNS such as the Internet, the dark web, and Telegram, and the increase in the number of cases in which ordinary people purchase drugs overseas through domestic and foreign distribution structures linked to the Internet.

Looking at the distribution ratio of narcotics offenders, the market share of Psychotropic medicine offenders began to exceed 50% since 1995 and accounted for 78.7% in 2011, 82.5% in 2012, 80.9% in 2013, 81.3% in 2014, 80.7% in 2015, 80.2% in 2016, 77.3% in 2017, and 76.2% in 2018. Looking at all drug offenders by type of behavior, the number of drug offenders is mainstream at 49.0%, followed by trafficking(21.9%) and possession(8.6%), of which smuggling, smuggling, and possession are increasing every year[22].

In the past, drug offenders engaged in certain occupations such as entertainment establishments and gangsters or had a high proportion of men, but recently, the proportion of workers in various occupations such as office workers, unemployed, agricultural workers, and workers is increasing.

Table 1. Composition ratio by gender and occupation of drug offenders in 2018.

(Unit : people, %)

Gender By occupation	Male		Female	
Sum	9,824	(78.4)	2,719	(21.6)
Not employed	2,721	(72.5)	1,032	(27.5)
Agriculture	259	(60.8)	167	(39.2)
Wholesale and retail businesses	62	(98.4)	1	(1.6)
Entertainment business	38	(36.5)	66	(63.5)
Service industry	132	(75.4)	43	(24.6)
Finance / securities	14	(66.7)	7	(33.3)
Real estate business	25	(78.1)	7	(21.9)
Labor	392	(96.3)	15	(3.7)
An office worker	433	(81.1)	101	(18.9)
Industrial	120	(95.2)	6	(4.8)
Construction	80	(100.0)	0	(0.0)
Medical	47	(48.0)	51	(52.0)
Transportation business	96	(98.0)	2	(2.0)
Housekeeping	0	(0.0)	168	(100.0)
Art / entertainment	39	(90.7)	4	(9.3)
Fishing	26	(89.7)	3	(10.3)
Student	100	(81.3)	23	(18.7)
Unknown job	1,202	(87.0)	180	(13.0)
Etc.	4,108	(83.0)	843	(17.0)

Note: Supreme prosecutors' office, white paper on narcotics crimes, p.43(2018).

*()That's the composition ratio. %

4. When You Need an Active Alternative

According to international standards, if there are less than 20 drug offenders per 100,000 population, the country belongs to a drug-cleaning country.

Currently, Korea has already lost its status as a clean country with 24 people per 100,000 people. According to data from the Supreme Prosecutors' Office, the number of drug offenders cracked down in 2018 reached 12,613.

In addition to drug offenders detected by investigative agencies, it is estimated that the number of domestic drug offenders will exceed 300,000, including male and female crimes that have not been cracked down on.

Table 2. Status of crackdowns by drugs in 2018.

* () That's the composition ratio. %

Drugs \ Sortation	Number of cases	Sum(people)	Number of persons	
			Arrested prosecution	Prosecution without detention
Sum	10,584	12,613(100)	2,151	10,462
Drug	1,393	1,467(11.6)	47	1,420
Psychotropic medicine	8,072	9,613(76.2)	1,943	7,670
Cannabis	1,119	1,533(12.2)	161	1,372

Note: Supreme prosecutors' office, white paper on narcotics crimes, p125(2018).

It is also a mistake to think that drugs are exclusive to older generation criminals. Narcotics spread throughout Korea have recently spread out to teenagers and twenties.

Existing drug offenders were dominated by those in their 30s and older with economic life and income. However, it is time to take measures as the number of drug offenders in their teens and 20s is increasing rapidly.

Table 3. Trends in the increase or decrease of narcotics by age.

* (Unit : number of persons)

Sortation	Sum	10s	20s	30s	40s	50s	60s	Unknown
In 2017	14,123	119 (0.8%)	2,112 (15.0%)	3,676 (26.0%)	3,919 (27.8%)	2,589 (18.3%)	1,491 (10.6%)	217 (1.5%)
In 2018	12,613	143 (1.1%)	2,118 (16.8%)	2,996 (23.8%)	3,305 (26.2%)	2,352 (18.6%)	2,457 (11.6%)	242 (1.9%)
July, In 2019	7,003	114 (1.6%)	1,553 (22.1%)	1,606 (22.8%)	1,443 (20.5%)	1,083 (15.4%)	1,085 (15.4%)	149 (2.1%)

Note: Supreme prosecutors' office, white paper on narcotics crimes, 2017, page190. Supreme prosecutors' office, white paper on narcotics crimes, p207(2018).
Data from the national assemblyman's office of Kim Byung-kwan(2019.09.14).

Recently, the distribution of drugs through the Internet and SNS has spread, and the number of cases in which ordinary people purchase drugs abroad is increasing due to the domestic and international distribution structure linked to the Internet.

Technology-facilitated drug trafficking is directly connected to cybercrimes. Cyber-crimes are any illegal act that occurs via or in cyberspace and without cyberspace, drug suppliers and consumers would not be able to seal their deals and exchange payments.

Digital or software drug trading can be implemented by organized crime groups or dealers via the use of Internet and darknet, which provides suppliers the ability to advertise and show their products along with ratings and prices[23].

Technology gave rise to cybercrimes, and cy-becrimes, in turn, gave rise to the darknet and illegal e-commerce websites, where tech-nology-facilitated drug trafficking flourishes[24].

Today, national security throughout the world is expanding and deepening the scope and types of transnational threats such as terrorism, cybercrime, weapons of mass destruction, and drug offenses[25].

In addition, in the past, drug offenders engaged in specific occupations such as entertainment establishments and gangsters, or had a high proportion of men, but in recent years, the proportion of workers in various occupations such as office workers, unemployed workers, agricultural workers, and workers is also increasing.

Given that the ratio of women and students is increasing, it can be inferred that now an unspecified number of people can easily access drugs in various ways.

On the other hand, narcotics crimes have the characteristic that they cannot distinguish between perpetrators and victims.

This is because drug sellers can benefit financially and buyers can experience pleasure with drugs, so transactions proceed under voluntary agreement with each other. As long as you are not caught in an investigation network due to the nature of these drug-related crimes, intimate trading relationships will inevitably continue.

In particular, drugs are highly addictive, so even if they are legally punished, they often fall into drugs again after returning to society. Therefore, as of 2018, the recidivism rate of drug addicts reached 36.6%, and the number of cracked down drug offenders reached 12,613[26].

Currently, Korea's drug policy is largely divided into three areas. The crackdown on illegal drugs is controlled by the Prosecutors' Office, the National Police Agency, the Maritime Police Agency, and the Korea Customs Service by controlling the smuggling, smuggling, and trafficking of drugs and raw materials.

The Ministry of Health and Welfare, the Ministry of Food and Drug Safety, the Korea Food and Drug Safety Agency, and local governments in each city and province are in charge of comprehensive policy tasks such as revision of the Narcotics Control Act, trade of medical drugs and raw materials, rehabilitation of addicts, and prevention of misuse[22].

The Ministry of Health and Welfare and the Ministry of Education, Science and Technology are in charge of youth education, publicity, and campaigns to curb drug abuse[27].

Other NGOs, including the Korea Anti-Drug Movement Headquarters, are also engaged in demand reduction activities such as prevention promotion, treatment rehabilitation, and rehabilitation centers for a "healthy society without drugs."

The Ministry of Health and Welfare and the Ministry of Education, Science and Technology are in charge of youth education, publicity, and campaigns to curb drug abuse.

The United States has formed the President's Council on Counter-Narootics under the direct control of narcotics.

The committee consists of 18 members, including Vice President, Justice Minister, Central Intelligence Director, Finance Minister, Defense Minister, Transportation Minister, Secretary of State, Health Minister, Education Minister, UN Representative Management and Budget Office, Presidential Advisor, Presidential Advisor, and Vice Presidential Security Advisory.

The committee's mission is to oversee, coordinate, and supervise the implementation of the National Drug Control Strategy and the affairs of each ministry related to narcotics.

In addition, it serves as a major meeting body on drug policy establishment, along with presidential advice and assistance on the direction and comprehensive measures of the national drug eradication strategy.

The National Drug Policy Bureau(ONDCP) has set early prevention, prevention of drug use, intervention and treatment for users, and removal of the base of the drug market in three areas of prevention, treatment, and crackdown, respectively.

In particular, with an emphasis on prevention, it aims to protect the youth, crime rate, poor educational performance, and productivity.

It is striving to provide a justification for rejecting the temptation of drugs and systematic treatment rehabilitation through deportation of drugs to local communities for teenagers, school anti-drug programs, and activities with parents' prevention groups.

The National Drug Administration(DEA) is a federal police organization established in the Ministry of Justice under the direction of the National Drug Control Administration(ONDCP) and has established and operated branches at home and abroad[22].

Therefore, in order to cope with new drugs at this point, the preferential introduction of a unified one-stop system through transnational institutions such as the USA's Presidential Committee on Anti-Drug Control(PCCN) and the National Drug Control Organization(ONDCP) is required.

Through this, it is necessary to establish a system that can focus on responding to crimes related to new drugs by integrating the system of crackdown agencies that are currently sporadically divided, such as the police, prosecutors, the Korea Maritime Police Agency, and the Korea Customs Service.

Finally, laws should be prepared to analyze the characteristics of crimes against new drugs to subdivide punishment standards for temporary drugs and to promptly punish the inhalation of unspecified hallucinogenic substances.

In addition, crackdown and punishment on drug offenders are important, but it should not be forgotten that continuous management through connection with treatment and rehabilitation facilities is necessary to fundamentally prevent recidivism of drug offenders.

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6. Appendix

6.1. Authors contribution

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

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A Study on the CRISIS of Nursing College Students' Family Intimacy, Interpersonal Relationship Tendency, and Communication Ability on Self-Leadership

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Abstract

Purpose: This study was attempted to find out the influencing factors of self-leadership in nursing college students.

Method: This study is a descriptive research study to identify the correlation between family intimacy, interpersonal relationship tendency, communication ability, self-leadership and the factors influencing self-leadership. Data collection was conducted from June 7 to June 20, 2020, targeting 236 nursing universities located in Gyeonggi-do and Gangwon-do.

Results: The subjects' family intimacy, interpersonal tendency, communication ability, and self-leadership showed statistically significant correlations in the positive direction. As a result of multiple regression analysis, the F value of the regression model fit was statistically significant at 42.29(<.001). Factors influencing self-leadership were family intimacy, interpersonal relationship tendency, and communication ability.

Conclusion: In order to help nursing students adapt to college life, it is necessary to develop self-leadership, which is an individual's inner ability, develop a curriculum that strengthens interpersonal skills, and develop curriculum and comparison programs to enhance coping methods.

[Keywords] Self-Leadership, Family-Intimacy, Interpersonal-Relations, Communication, Nursing-Students

1. Introduction

1.1. Necessity of research

Along with the recent increase in nursing demand due to the entry into the aging society and the increase in chronic disease patients, the demand for new jobs for nurses is increasing, including integrated nursing services and expansion of visiting nursing services[1]. As the employment outlook for nursing school graduates is positive, the number of nursing students expanded, increasing 1.71 times from 12,509 to 21,391 in 2019[2]. In addition to this situation, the quantitative increase of nursing students and the continuous increase in nursing departments need

to confirm whether high-quality nursing education can be efficiently and appropriately conducted, and continuous efforts are needed to produce competent graduates[3]. Nursing education aims to acquire the necessary knowledge and skills so that nursing students can fully play their role as professional nurses after completing the curriculum[1]. As a professional nurse after graduation, it is necessary to develop the ability to respond appropriately to the changing clinical field. The Korea Nursing Education and Evaluation Agency presents leadership as a major nursing competency among the core competencies that nursing students should have, so nursing students should be educated to have leadership[4]. Among leadership, self-leadership exerts influence on oneself to motivate oneself[5], which increases interest in the study and academic satisfaction by accompanying oneself with initiative and passion[6]. It also allows individuals to feel responsible for and grow their own goals and actions[7].

Family relationships are the most fundamental relationships among human relations and are unique and dynamic interactions[8]. Family intimacy is a relationship in which family members interact with each other, and the higher the family intimacy, the more positive the school life, and it was confirmed that interpersonal competence was affected[9]. Nursing students acquire empathic attitudes and skills as the basis of family relations during college and improve interpersonal skills, thereby preparing for interpersonal skills with patients and other professional occupations in clinical situations as well as adaptation to college life. In addition, the higher the self-leadership, the more interesting it is in learning, showing results, and helping nursing college students improve the necessary competencies, resulting in a positive effect on college life adaptation[10]. Since this self-leadership affects interpersonal skills and has a positive effect on not only academic and employment strategies but also personal growth[11], it is important to check interpersonal relationships and self-leadership.

Communication ability, another factor for enhancing self-leadership, is a process of effectively dealing with an opponent by properly expressing one's intention in the process of communication or clearly describing one's perspective when disagreeing with others[10]. Communication ability is an essential element in nursing education and is included in the core competency of nursing education, and Yun MJ & Kwon YC[12] explain that communication ability is a major factor in improving self-leadership.

Taken together, it is confirmed that family intimacy, interpersonal skills, and communication skills are deeply related to each other in improving the self-leadership competency of nursing students, and research on nursing students is necessary. Among the studies related to self-leadership of nursing college students so far, major variables are clinical practice stress, clinical practice satisfaction, self-efficacy, and self-directed learning readiness, empowerment relationship, critical thinking tendency, communication ability, and interpersonal ability. However, no research has been conducted on whether family intimacy, interpersonal skills, and communication skills affect self-leadership[11][12][13][14][15][16][17]. Therefore, this study aims to identify the influencing factors of self-leadership for nursing college students to prepare basic data for program development that improves adaptability to college life and clinical adaptability as professional nurses by strengthening self-leadership capabilities.

2. Purpose of Research

The purpose of this study is to investigate the influencing factors of self-leadership for nursing college students, and the specific purpose is as follows.

- 1) It identifies the general characteristics, family intimacy, interpersonal tendency, communication ability, and degree of self-leadership of nursing college students.
- 2) It identifies differences in family intimacy, interpersonal tendency, communication ability, and self-leadership according to the general characteristics of nursing college students.
- 3) It identifies the correlation between family intimacy, interpersonal tendency, communication ability, and self-leadership of nursing college students.

- 4) It identifies the influencing factors of self-leadership of nursing college students.

3. Research Method

3.1. Research design

This study is descriptive research to identify family intimacy, interpersonal relationship tendency, communication ability, and degree of self-leadership, and to identify the relationship between them to identify factors influencing nursing college students' self-leadership.

3.2. Research subjects and data collection method

The subjects of this study are college students enrolled in nursing schools. Students enrolled in three nursing departments in Gyeonggi-do and Gangwon-do were arbitrarily selected. As a result of calculating the number of G*Power 3.1 samples, 204 people were sampled in consideration of the dropout rate. Data collection took place from June 7 to June 20, 2020. The purpose of the study, anonymity, and confidentiality were explained to the subjects, a prior consent form was provided, and questionnaires were distributed only to students who agreed to participate in the study. The survey response time took about 10 minutes. Of the 240 copies distributed, 236 copies were used for data analysis, excluding 4 with insincere answers.

3.3. Research tool

3.3.1. Family intimacy

The intimacy scale reconstructed by Kim JY[18] was used. Emotional intimacy consisted of 16 questions such as liking, honesty, acceptance of criticism, respect, and reliability. The score of each question consisted of a Likert 5-point scale, implying that the higher the score, the higher the intimacy. In the study of Kim JY[18] the reliability of the tool was Cronbach's $\alpha=.93$, and the reliability of this study was Cronbach's $\alpha=.93$.

3.3.2. Interpersonal tendencies

In this study, the interpersonal behavior model of Leary T[19] FIRO(Fundamental Interpersonal Relations Orientation) developed by Schutz WC[20] and the 'interpersonal orientation test' tool reconstructed by referring to the interpersonal response characteristics revealed by Krech D & Richard SC & Egerton LB[21] were used. The score of each question was composed of a Likert 5-point scale, implying that the higher the score, the higher the intimacy[22]. The reliability of this study was Cronbach's $\alpha=.84$.

3.3.3. Communication skills

In this study, the Global Interpersonal Communication Competition(GICC) developed by Gur GH[23] was measured using a modified and supplemented tool by Bae JY[24] which studied communication skills for nurses working in general wards of university hospitals. The score of each question was composed of a Likert 5-point scale, and the higher the score, the better the degree of communication ability. In Bae JY[24] Cronbach's $\alpha= .85$, and in this study Cronbach's $\alpha= .88$.

3.3.4. Self-leadership

The self-leadership measurement tool developed by Manz CC[25] was translated and used by Kim H[26]. The questions about self-leadership consisted of a total of 18 questions, including 3 self-expectation questions, 3 rehearsal questions, 3 goal setting questions, 3 self-compensation questions, 3 self-criticism questions, and 3 constructive thinking questions. The response to

each question consists of the choice of the Likert 5-point scale. At the time of development, the reliability of the tool was Cronbach's $\alpha = .87$, and the reliability of this study was .87.

4. Data Analysis

The SPSS/Win 21.0 program was used for the analysis of the collected data. Technical statistics were used for general characteristics, family intimacy, interpersonal tendency, communication ability, and self-leadership. The differences in family intimacy, interpersonal relationship tendency, communication ability, and self-leadership according to general characteristics were analyzed by t-test and ANOVA. The correlation between family intimacy, interpersonal tendency, and communication ability between self-leadership was analyzed using Pearson's correlation coefficients, and multiple regression was used to identify the factors affecting self-leadership.

5. Results

5.1. General characteristics of the subjects

Among the general characteristics of nursing students who were the subjects of this study, the average age was 22.69 ± 2.71 years old. In terms of gender, 33 males(14.0%) and 203 females(86.0%). The grades were 25(10.6%) in the first year of college, 116(49.2%) in the second year, 65(27.5%) in the third year, and 30(12.7%) in the fourth year. As for religion, 139 people(58.9%) were non-religious. As for the presence or absence of siblings, all but 17(7.2%) were found to have siblings. Among the siblings, 94(39.8%) were the first child, and 70(29.7%) were the youngest. The main caregivers were mothers with 19180.9%. In the form of home education, 31 people(13.1%) described it as "strict," and the rest were said to be "normal" or "free." As for the experience of living with grandparents, 134(56.8%) were currently living together or had experience living together, and 102(43.2%) had no experience <Table 1>.

Table 1. General characteristics in subjects.

Variables		N	%	M \pm SD (Max~Min)
Age				22.69 \pm 2.71 (20~40)
Gender	Male	33	14.0	
	Female	203	86.0	
Grade	Grade 1	25	10.6	
	Grade 2	116	49.2	
	Grade 3	65	27.5	
	Grade 4	30	12.7	
Religion	Catholicism	18	7.6	
	Christianity	59	25.0	
	Buddhism	17	7.2	
	No religion	139	58.9	
	Etc.	3	1.3	
Siblings	Only one	17	7.2	
	2	168	71.2	
	3	43	18.2	
	More than 4	8	3.4	
Rankings of siblings	Only one	17	7.2	

	Frist	94	39.8	
	Middle	55	23.3	
	Youngest	70	29.7	
Dad's educational background	Under middle school	17	7.2	
	High school	103	43.6	
	College/university	109	46.2	
	University(over)	7	3.0	
Mom's educational background	Under middle school	20	8.5	
	High school	138	58.5	
	College	71	30.1	
	University	7	3.0	
Main caregivers	Father	28	11.9	
	Mother	191	80.9	
	Grandmother	4	1.7	
	Maternal grandmother	1	0.4	
	Etc	12	5.1	
Family income	3 million won(under)	63	26.7	
	300-450	70	29.7	
	450-600	44	18.6	
	600-750	33	14.0	
	7.5 million won(over)	26	11.0	
Type of home education	Strict	31	13.1	
	Normal	95	40.3	
	Free	110	46.6	
Experience of living with Grandparents	Living with	26	11.0	
	Have experience	108	45.8	
	No experience	102	43.2	

Note: N =236.

5.2. Subjects' family intimacy, interpersonal relationship tendency, communication skills, and self-leadership

The subject's family intimacy was reported to be 63.58 ± 9.58 points, with a minimum of 35 points to a maximum of 80 points. The interpersonal tendency was 130.25 ± 12.90 , which was distributed from a minimum of 98 to 185. Communication ability ranged from a minimum of 39 points to a maximum of 75 points, with an average of 56.08 ± 6.78 points. Self-leadership averaged 64.80 ± 8.24 points, ranging from a minimum of 40 points to a maximum of 90 points <Table 2>.

Table 2. Level of family intimacy, interpersonal tendencies, communication skills and self-leadership.

Variables	Mean	SD	Min~Max
Family intimacy	63.58	9.58	35~80
Interpersonal tendencies	130.25	12.90	98~185

Communication skills	56.08	6.78	39~75
Self leadership	64.80	8.24	40~90

Note: N =236.

5.3. Family intimacy, interpersonal relationship tendency, communication ability, and self-leadership according to the general characteristics of the subjects

summarizes the results of family intimacy, interpersonal relationship tendency, communication ability, and self-leadership according to the general characteristics of the subjects. In the case of age, when checked based on average age, family intimacy, interpersonal relationship tendency, and communication ability were not statistically significant, but self-leadership was significant($t=-2.62$, $p=.009$). According to gender, communication ability($t=2.61$, $p=.010$) and self-leadership($t=2.27$, $p=.024$) showed significant results. In addition, in terms of experience living with grandparents, it was reported as a significant result of family intimacy($t=-2.07$, $p=.040$). The school year, religion, siblings, income, educational background of the parents, etc. were not statistically significant <Table 3>.

Table 3. Family intimacy, interpersonal tendencies, communication skills and sel-leadership according to general characteristics.

Variables		Family intimacy			Interpersonal tendencies			Communication skills			Self-leadership		
		M±SD	t/F	p	M±SD	t/F	p	M±SD	t/F	p	M±SD	t/F	p
Age	22years (under)	63.34±9.71	-0.57	.571	129.18±11.71	-1.74	.085	55.74±6.65	-1.16	.247	63.87±8.02	-2.62	.009
	23years (over)	64.11±9.33			132.63±15.05			56.85±7.04			66.88±8.40		
Gender	Male	64.91±9.21	0.89	.380	133.09±13.45	1.37	.173	58.91±7.35	2.61	.010	67.79±10.66	2.27	.024
	Female	63.34±9.64			129.78±12.79			55.63±6.58			64.32±7.70		
Grade	Grade 1	64.47±9.71	1.20	.311	129.80±10.86	0.56	.644	55.40±6.93	0.24	.869	64.44±7.49	1.82	.144
	Grade 2	62.94±9.45			130.36±12.56			55.76±6.44			64.16±8.71		
	Grade 3	65.18±9.90			129.48±13.45			56.98±7.53			64.60±7.92		
	Grade 4	61.80±9.14			131.83±14.91			55.97±6.41			68.03±7.19		
Religion	Yes	64.92±8.68	1.80	.073	130.41±11.70	0.17	.869	56.32±6.83	0.44	.658	65.94±7.98	1.78	.077
	No	62.65±10.09			130.13±13.72			55.92±9.76			64.07±8.35		
Siblings	Yes	63.61±9.61	-0.21	.837	130.08±12.73	0.72	.474	56.19±6.77	-0.87	.385	64.78±8.32	0.16	.870
	No	63.12±9.48			132.41±15.25			54.71±7.01			65.12±7.40		
Dad's educational	Highschool (under)	63.10±9.69	-0.78	.434	128.80±11.30	-0.54	.590	56.33±6.76	0.57	.568	64.79±8.38	-0.02	.986

background	University (over)	64.08±9.47			130.71±14.42			55.83±6.82			64.81±8.13		
Mom's educational background	Highschool (under)	63.16±9.76	-0.96	.336	129.56±12.23	-1.16	.248	55.96±6.86	-0.40	.693	65.20±8.14	1.05	.295
	University (over)	64.44±9.21			131.63±14.16			86.33±6.64			64.00±8.43		
Experience of living with grandparents	Yes	62.46±9.58	-2.07	.040	130.81±12.43	0.77	.440	55.84±7.03	-0.63	.532	64.91±8.61	0.23	.815
	No	65.05±7.03			129.50±13.53			56.40±6.46			64.66±7.77		
Family income	Less than 4.5 million won	61.79±9.72	-1.40	.164	130.40±10.70	0.17	.867	54.92±6.38	-1.23	.222	65.25±7.14	0.70	.484
	More than 4.5 million won	63.83±9.65			130.07±13.59			56.17±6.93			64.44±8.84		

Note: N =236.

5.4. Relationship between the subjects' family intimacy, interpersonal tendency, communication ability, and self-leadership

The relationship between family intimacy, interpersonal tendency, communication ability, and self-leadership of nursing college students showed a statistically significant positive correlation <Table 4>.

Table 4. Correlation between family intimacy, interpersonal tendencies, communication skills and self-leadership.

Variables	Family intimacy <i>r(p)</i>	Interpersonal Tendencies <i>r(p)</i>	Communication skills <i>r(p)</i>	Self-leadership <i>r(p)</i>
Family intimacy	1	.23 (<.001)	.44 (<.001)	.34 (<.001)
Interpersonal tendencies		1	.50 (<.001)	.44(<.001)
Communication skills			1	.56 (<.001)
Self leadership				1

Note: N =236.

5.5. Factors influencing the subjects' self-leadership

The factors influencing the self-leadership of nursing students are as follows <Table 5>. In order to understand the factors influencing the self-leadership of nursing students, who are the subjects of the study, multiple regression analysis was conducted step by step using family intimacy, interpersonal relationship tendency, and communication ability as independent variables. The subjects' family intimacy, interpersonal tendency, and communication ability showed a statistically significant influence relationship in the positive direction. As a result of multiple regression analysis, the F value of the regression model fit was 42.29, which was statistically significant(<.001). As a result of the Durbin-Watson test, it was confirmed that there was no problem in explaining the dependent variable because it was near 2 as 2.15. The variance expansion

index(VIF) was 1.24-1.56, which was lower than 10.0, so there was no multicollinearity problem. The explanatory power of the model was 34.5%, and it was confirmed that the higher the family intimacy, interpersonal tendency, and communication ability, the higher the self-leadership <Table 5>.

Table 5. Factors influencing self-leadership of nursing students.

Dependent variables	Independent variable	β	t	p	Tolerance	VIF	R ²	F(p)	Durbin-Watson
Self-leadership	Family intimacy	.112	1.90	.049	.81	1.24	.345	42.29 (<.001)	2.15
	Interpersonal tendencies	.209	3.42	.001	.75	1.33			
	Communication skills	.404	6.12	<.001	.64	1.56			

6. Discussion

This study identified the factors influencing family intimacy, interpersonal relationship tendency, and communication ability on self-leadership for nursing college students. Through this, it was attempted to prepare basic data for program development that improves adaptation to college life and clinical adaptation as a professional nurse by strengthening self-leadership capabilities.

Based on the results of the study, we identify and discuss the factors influencing the self-leadership of nursing students. The family intimacy of the subjects of this study was 63.58 points, higher than the average, and higher than the results of Park DY & Kim MJ[27] for nursing students, indicating that the intimacy with the family is higher than that of the subjects of previous studies. Although it cannot be generalized only as a result of this study, it was once again confirmed that family intimacy is an important factor in light of the results of previous studies of Park DY & Kim MJ[27] that confirmed that the higher the family intimacy, the better to cope with conflict situations between members. Therefore, it is necessary to find ways to improve family intimacy so that nursing students can adapt well to college life and clinical sites in the future by increasing intimacy among family members.

The interpersonal tendency of nursing college students was 130.25, which was lower than the average. However, this was higher than the study by Lee YO & Joen YH & Kim MS[28] and these results were considered necessary to understand the interpersonal tendencies of nursing students through repetitive research and research on various subjects. Research by Lee et al. suggests that the higher the grade, the more burdensome the curriculum may affect interpersonal relationship tendencies[28]. Through the results reported in this study, it would be helpful to increase communication time between students by activating non-major programs to increase interpersonal relationships. If a situation of insufficient interpersonal communication occurs in the current COVID-19 situation, meetings other than classes among students will decrease, and these can be factors that can affect interpersonal tendencies. Accordingly, it is believed that the interpersonal relationship tendency was measured to be low in the results of this study. Therefore, in light of nursing clinical life where interpersonal relationships are important, it is necessary to support the department so that interpersonal relationships can be maintained through clubs, seniors, juniors, and meetings with professors as the school year goes up.

The communication ability of nursing students was 56.08 points, higher than the average, and similar to the score reported by Jo EH & Kim HS & Hwang SJ[29]. According to the research results of Jo EH & Kim HS & Hwang SJ[29], it is believed that communication skills can be improved as first-year students are in the process of learning communication as a basic major subject for the first time after graduating from high school. Since this study was applied to all 1st

to 4th graders, it is also necessary to accurately measure communication skills for each grade. In addition, there is a need to apply various communication skills programs for each grade. Specifically, freshmen need to improve their communication skills through systematic education because they are less prepared and trained in communication in the process of encountering college life and adapting to unfamiliar environments. For second, third, and fourth-year students who have adapted to college life, it is necessary to provide learner-centered communication education and various related programs through interest and management.

The self-leadership score of nursing students was 64.80 points, higher than the average. This was higher than the research results of Lee YO & Joen YH & Kim MS[28] and similar to the research results of lower school year students[10]. As explained in a study of nursing college 2nd and 3rd-year students[28], if new students are educated focusing on self-leadership education through various non-class program activities, self-leadership will be improved compared to senior students who lack education through clinical practice or major theory subjects. However, in a study by Lee et al., there was a result that the score of self-leadership increased as the school year went up[7], so it is considered that repeated studies to grasp self-leadership for all school year students are needed.

It was confirmed that self-leadership showed significant results according to the general characteristics, age, and gender of nursing students. The results of this study show that the significant results of self-leadership according to age are similar to those of Won HJ[10], who studied lower school year students. Therefore, if self-leadership improvement programs are operated from lower school years, it is thought that they can enter the nursing field after graduation with a high level of self-leadership. In addition, as for the results according to gender, a study by Lee YS & Park SH & Kim JK[11] on nursing students reported the difference in the degree of self-leadership according to gender, indicating that it is similar to the results of this study. Based on the results of this study, it is necessary to consider gender differences in preparing measures to improve self-leadership.

The family intimacy, interpersonal tendency, communication ability, and self-leadership of nursing college students showed statistically significant influence relations in the positive direction. In other words, it can be seen that the higher the intimacy between families, the more positive the interpersonal relationship experience is, the higher the interpersonal tendency is. In addition, I think that if this intimacy rises and interpersonal tendencies are high, communication skills with the other person are high, and this result will demonstrate positive self-leadership. Regarding self-leadership, family intimacy, interpersonal relationship tendency, and communication ability were all found to be influencing factors. This was reported similar to the results of Lee YS & Park SH & Kim JK[11] study showing that self-leadership and interpersonal variables have a direct effect. Therefore, in order to improve self-leadership, family intimacy, interpersonal relationships, and communication skills should be supported.

Based on the results of this study described so far, the importance of family intimacy, interpersonal relationship tendency, and communication ability as variables to strengthen self-leadership in changing situations could be confirmed. If self-leadership is strengthened, it will help nursing students adapt to college life, and it is believed that it will also help clinical practice and establish relationships with patients and colleagues in the future. Therefore, it is considered necessary for nursing colleges to develop curriculum and coping methods that strengthen self-leadership, interpersonal skills, and communication skills, including curriculum, non-curricular programs, and competency-building programs.

7. Conclusion and Suggestion

This study confirmed the effect of family intimacy, interpersonal relationship tendency, and communication ability on self-leadership in nursing students. It was attempted to prepare basic

data for program development that improves adaptation to college life and to clinical trials as a professional nurse by strengthening self-leadership capabilities.

Based on the results of this study, it is necessary to implement self-leadership training programs for nursing students at each school so that nursing students can further promote self-leadership obtained through the current curriculum. Through this, it will be a major measure to lower the turnover rate of nurses in the clinical field and improve the quality of nursing services in the future[29][30]. In order to provide evidence for the composition of self-leadership programs, it is necessary to develop specific and practical program education that considers family intimacy, interpersonal relationship tendency, and communication skills[31][32]. In addition, it is thought that increasing the self-leadership of nursing students by applying family intimacy, interpersonal relationship tendency, and communication skills will help improve academic satisfaction as a nursing college student and future nurse. This study is a survey of some nursing students, and the results cannot be generalized, and there are limitations in grasping the causal relationship of variables[33][34]. However, this is meaningful in that the relationship between family intimacy, interpersonal relationship tendency, and communication ability on self-leadership was identified for nursing college students, and the factors influencing each self-leadership were identified. Based on the results of this study, we would like to provide the following suggestions.

First, we propose a follow-up study that can ultimately improve self-leadership by identifying new related variables that affect the self-leadership of nursing students. Second, research should be continued to develop self-leadership development programs suitable for nursing students.

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9. Appendix

9.1. Authors contribution

	Initial name	Contribution
Lead Author	MP	-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*	SP	-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	BP	-Significant contributions to concepts, designs,
	SP	practices, analysis and interpretation of data <input checked="" type="checkbox"/>
	MK	-Participants in Drafting and Revising Papers <input checked="" type="checkbox"/>
	SP	-Someone who can explain all aspects of the paper <input checked="" type="checkbox"/>