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Comparison of Safety and Health Risk Perceptions Toward COVID-19 Pandemic Based on Gender in Korean University Students' Work While Studying

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ABSTRACT

Background: This study aims to identify the safety and health risk perceptions toward the coronavirus disease-2019 (COVID-19) pandemic based on gender in Korean university students who work and study during the pandemic.

Methods: A nationwide convenient sampling method was implemented to eliminate any regional characteristics in 757 university students, including those who studied while working. The participants answered the online questionnaire for one week. The collected data were analyzed using the R version 3.4.1 program.

Results: The results comparing the safety and health risk perceptions toward COVID-19 based on the gender of the subjects who work while studying, "I often use the Internet to obtain information on COVID-19 infection control" are females appeared to use the internet more often ($t = -2.18, p = 0.031$) than males. "Compared to pre-COVID-19, I am currently feeling safe after the outbreak" is females felt less safe ($t = 3.43, p < 0.001$). Although COVID-19 infection control awareness is high among Korean university students and officials, males reported higher scores over females in all the questions, which was statistically significant.

Conclusion: There should be prioritized psychological measures for prevention against COVID-19 for vulnerable groups with high mental health risks. A network must be established to protect the mental health of such groups, and candidates who require intervention must be actively identified and supported. Therefore, there must be efforts to deliver accurate information based on scientific evidence of the infectious disease, and the actions should be supported through such active communication.

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1. Introduction

The type 2 severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was labeled as coronavirus disease-2019 (COVID-19) after human infection was reported in December 2019. More than 400,000 infected cases were reported worldwide in December 2020, causing damage to the entire international community [1,2]. Considering the number of infected patients, including those who have not been officially counted, and the number of increasing

cases of infection and fatality, the danger of COVID-19 has been historically unprecedented.

The safety and health risk perceptions are affected by psychological, social, and political factors [3]. A plethora of social information relevant to infectious diseases becomes available to the public during emergencies that threaten their safety and health, such as the spread of contagious diseases. Newspapers or news on television were traditionally the key sources of information, however, with the increased usage of social media in recent years, the

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information distribution medium has altered substantially. Therefore, the perception of safety and health risks can vary dynamically according to the public's approach to information on infectious diseases and the degree of their understanding [4].

A multinational safety and health risk perception survey was conducted on 6,991 people in 10 countries, including the United States, between mid-March to mid-April 2020. As a result, social amplification of personal recognition and experience of the virus and pro-social values highly influenced the risk perception. Moreover, males' safety and health risk perception were low in almost all countries and demonstrated a strong correlation with preventative behaviors for health [5].

University students experience the transitional period in which they belong to both late adolescence and early adulthood. In this period of life, they experience various changes and encounter numerous stresses to adapt to new environments preparing for psychological, economic, and social independence [6]. The daily stress of university students is reported to be lower in male students than in female students [7]. However, studies that report higher psychological well-being in male students [7] and studies that reveal no differences according to gender [8] have not been an agreement between the opinions to date. However, some studies report higher psychological well-being in male students. In contrast, others argue no differences based on gender, showing that there has not been an agreement between the opinions up-to-date. In particular, the stress experienced by university students who both work and study, affects their lives. The increase in pressure affects their abilities to perform their roles and threaten their physical and mental health [9]. If there is a difference in university students' daily stress and psychological well-being according to gender, the degree of safety and health risk perception may also differ according to gender. However, the number of studies that verify the effects according to gender is scarce. In addition, as of March 2022, the number of confirmed cases in Korea is increasing exponentially compared to other countries, and the number of confirmed cases is renewing higher every day. In particular, March is the time when college students start classes. In particular, since most of the non-face-to-face classes that have been conducted over the past two years have been converted to face-to-face classes, it is meaningful to compare the perception of COVID-19 pandemic safety and health risks among Korean college students.

Therefore, this study intends to identify the safety and health risk perceptions toward the COVID-19 pandemic based on gender in Korean university students who work and study during the pandemic and provide helpful information in formulating public health policies that consider various demographic characteristics and contexts.

2. Materials and methods

2.1. Instrument

A structured questionnaire was used as a tool for this study. The means for general characteristics included seven questions about the respondent's gender, age, university year, region, whether the respondent worked at a workplace that provides four major insurance coverages, and whether the respondent was infected with COVID-19 or if any of their acquaintances were infected, and who they were. The tool for COVID-19 pandemic safety and health risk perception consisted of 14 questions, with ten questions regarding personal factors and four questions on social factors. A proven tool has not yet been developed to investigate COVID-19 pandemic safety and health risk awareness among college students. So in this study, the tool was used after being verified by one expert in the safety field and one infectious medical doctor. The questions were

answered using a 5-point Likert scale, measured from 1 point for "Not at all" to 5 points for "very much."

2.2. Study population

The data collection period for this study was between December 28, 2020 and January 4, 2021. A nationwide convenient sampling method was implemented to eliminate any regional characteristics. The results were derived by identifying and analyzing the perceptions of safety and health toward the COVID-19 pandemic in 757 university students, including university students who studied while working.

2.3. Statistical analysis

The collected data were analyzed using the R version 3.4.1 program, and the general characteristics were analyzed using frequency analysis and descriptive statistics. Furthermore, to explore the correlation between sociodemographic factors with each question, a Chi-square test using a contingency table was used when the question values were categorical, and the t-test was used to compare two groups when the question values were ordinal. ANOVA analysis was performed when there were three or more groups.

2.4. Ethics approval

An online questionnaire was created and previous permission was secured from the professor in charge of I University, which runs a statewide online course, to publish information about participation in the survey as well as in the recruitment of application materials. The participants answered the questionnaire by confirming the recruitment document before accessing the link to join in the survey. To prevent duplicate participants, which frequently occur during online survey, and secure the reliability of the data, the IP address was checked at the structural level. The integrity of the responses and confirmations for duplicated responses were reviewed by examining the pattern of the response contents and the demographic characteristics of the participants. Mobile phone numbers were also collected with consent to provide predetermined gifts to the survey participants, which was also used as a device to reconfirm the participation from each participant. A gift certificate was provided to all participants through the mobile phone numbers collected during the questionnaire.

3. Results

3.1. General characteristics of the participants

This study compared the perceptions of safety and health risks according to the gender in Korean university students during the COVID-19 pandemic. Total of 757 students participated, of which 58.12% (440 students) were males, and 41.88% (317 students) were females. In terms of age, 24.83% (male: 71 students, female: 117 students) were aged 20 years or younger, 49.27% (male: 201 students, female: 172 students) were between 21 and 24 years of age, and 25.89% (male: 168 students, female: 28 students) were aged 24 years and over. Regarding the university year of the respondents, 11.36% (male: 59 students, female: 27 students) were in their first year, 35.14% (male: 140 students, female: 126 students) were in their second year, 28.93% (male: 132 students, female: 87 students) were in their third year, and 24.57% (male: 109 students, female: 77 students) were in their fourth grade and beyond. In terms of the region of residence, 20.34% (male: 79 students, female: 75 students) lived in Seoul, 50.86% (male: 237 students, female: 148

students) lived in Gyeongin (Gyeonggi-do and Incheon), and 28.80% (male: 124 students, female: 94 students) lived in other areas, such as Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, Gyeonggi, Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam, and Jeju. In terms of four major insurances for a company, 18.63% (male: 87 students, female: 54 students) worked for a company with four major insurances, 81.37% (male: 353 students, female: 263 students) worked for a company with four major insurances. The percentage of neither students who had never been infected nor their acquaintance was 91.68% (male: 402 students, female: 292 students), which was the majority. There were 8.32% (male: 38 students, female: 25 students) of students who were infected. Most of such infection was found in their friends or colleagues (male: 32 students, female: 17 students), with no cases found in themselves or their families in Table 1.

3.2. The mean comparison of the safety and health risk perceptions toward COVID-19 based on the gender of the participants

The results of comparing the safety and health risk perceptions toward COVID-19 based on the gender of the participants are as follows: For “I am interested in COVID-19,” females showed higher interest ($t = -4.34, p < 0.001$) with 4.33 ± 0.03 points than males with 4.13 ± 0.03 points. For “I know the infection control rules of COVID-19,” females had a better understanding ($t = -3.46, p < 0.001$) at 4.24 ± 0.03 points than males with 4.07 ± 0.03 points. For “There was a change in the risk perception associated with safety and health due to COVID-19,” females had a more significant change in the perceptions ($t = -2.37, p = 0.018$) with 4.07 ± 0.03 points than males with 3.96 ± 0.03 points. For “I was aware of the dangers of such virus outbreak before COVID-19 occurred,” males reported having more awareness of the risk ($t = 3.72, p < 0.001$) at 2.70 ± 0.05 points, than females at 2.44 ± 0.05 points. For “I feel great fear due to COVID-19,” females had greater fear ($t = -5.80, p < 0.001$) with 3.95 ± 0.04 points than males with 3.65 ± 0.04 points. For “I often use the Internet to obtain information on COVID-19 infection control,” females were reported to use the Internet more frequently ($t = -3.03, p = 0.003$) at 3.77 ± 0.04 points than males at 3.60 ± 0.04 points. For “I generally felt safe before COVID-19,” males tended to feel safer ($t = 2.03, p = 0.043$) at 3.96 ± 0.04 points than females at 3.84 ± 0.05 points. However, males felt safer ($t = 6.24, p < 0.001$) with 2.81 ± 0.04 points for the survey, “After the outbreak of COVID-19, I am currently feeling safe” than females

who had 2.42 ± 0.04 points, the scores presented by the males were dramatically lower when than the pre-COVID-19 score. For “Compared to pre-COVID-19, I am currently feeling safe after the outbreak,” females scored lower ($t = 6.24, p < 0.001$) at 2.52 ± 0.04 points than males with 2.89 ± 0.04 points.

Regarding social factors, males scored higher ($t = 2.90, p = 0.004$) for “The level of COVID-19 infection control awareness is high among Korean university students” with 3.19 ± 0.04 points than females with 3.00 ± 0.05 points. For “The level of COVID-19 infection control awareness is high among Korean university officials,” males scored higher once again ($t = 3.79, p < 0.001$) with 3.50 ± 0.04 points than females at 3.27 ± 0.05 points. There were no statistically significant differences found in the other questions in Table 2.

3.3. Comparison of the safety and health risk perceptions toward COVID-19 based on the gender of the participants according to the questions

The results of comparing the safety and health risk perceptions toward COVID-19 by the gender of the participants according to each of the questions are as follows: For “I am interested in COVID-19” females had a greater interest ($\chi^2 = 22.10, p < 0.001$) as 38.17% (121 participants) answered “very interested” than 27.95% (123 participants) of the males who answered the same. Accordingly, 82.05% (361 participants) of the male students responded “aware” and “highly aware” for “I know the infection control rules of COVID-19,” while 91.80% (291 participants) of the female students provided the same answers, which showed higher percentage in the female students ($\chi^2 = 19.64, p < 0.001$). However, for “I am satisfied with the immediate actions taken by the government and the people after the outbreak of COVID-19,” 23.86% (105 participants) males responded “satisfied,” which was lower in females ($\chi^2 = 9.95, p = 0.041$) with 16.09% females (51 participants) being “satisfied.” For “I feel great fear due to COVID-19,” 61.37% (270 participants) of the males and 61.37% (270 participants) of the females answered “afraid” or “highly afraid,” which showed much greater fear in females ($\chi^2 = 34.05, p < 0.001$). For “I often use the Internet to obtain information on COVID-19 infection control,” 39.77% (175 participants) of the males and 46.06% (146 participants) of the females answered “often,” which showed more frequent use of the Internet by the females ($\chi^2 = 14.41, p = 0.006$). There were no statistically significant differences between males and females for “I generally

Table 1
General characteristics of the subjects ($n = 757$)

Characteristics	Variables	n (%)		χ^2	p
		Male	Female		
Age (years)	<20	71 (16.14)	117 (36.91)	96.06	<.001
	21 - < 24	201 (45.68)	172 (54.26)		
	≥24	168 (38.18)	28 (8.83)		
Grade	1	59 (13.41)	27 (8.52)	7.61	0.055
	2	140 (31.82)	126 (39.75)		
	3	132 (30.00)	87 (27.44)		
	≥4	109 (24.77)	77 (24.29)		
Region	Seoul	79 (17.95)	75 (23.66)	4.95	0.084
	Gyeongin	237 (53.86)	148 (46.69)		
	Others	124 (28.18)	94 (29.65)		
Are you working for a company with four major insurances?	Yes	87 (19.77)	54 (17.03)	0.91	0.340
	No	353 (80.23)	263 (82.97)		
Is there anyone infected with COVID-19 or infected around?	Yes	38 (8.64)	25 (7.89)	0.14	0.713
	No	402 (91.36)	292 (92.11)		
If there is an infected person, who is it? ($n = 63$)	Oneself	0 (0.00)	0 (0.00)	2.44	0.296
	Family	0 (0.00)	0 (0.00)		
	Relatives	1 (2.63)	2 (8.00)		
	Friends and Colleague	32 (84.21)	17 (68.00)		
	Others	5 (13.16)	6 (24.00)		

Table 2Mean comparison of the safety and health risk perceptions toward COVID-19 based on the gender of the participants ($n = 757$)

Questions	Males ($n = 440$)	Females ($n = 317$)	t	p
	Mean \pm SD	Mean \pm SD		
I am interested in COVID-19	4.13 \pm 0.03	4.33 \pm 0.03	-4.34	<.001
I know the infection control rules of COVID-19	4.07 \pm 0.03	4.24 \pm 0.03	-3.46	.001
I am satisfied with the immediate actions taken by the government and the people after the outbreak of COVID-19	2.80 \pm 0.05	2.76 \pm 0.05	0.65	.517
There was a change in the risk perception associated with safety and health due to COVID-19.	3.96 \pm 0.03	4.07 \pm 0.03	-2.37	.018
I was aware of the dangers of such a virus outbreak before COVID-19 occurred	2.70 \pm 0.05	2.44 \pm 0.05	3.72	<.001
I feel great fear due to COVID-19	3.65 \pm 0.04	3.95 \pm 0.04	-5.80	<.001
I often use the Internet to obtain information on COVID-19 infection control	3.60 \pm 0.04	3.77 \pm 0.04	-3.03	.003
I generally felt safe before COVID-19	3.96 \pm 0.04	3.84 \pm 0.05	2.03	.043
After the outbreak of COVID-19, I am currently feeling safe	2.81 \pm 0.04	2.42 \pm 0.04	6.24	<.001
Compared to pre-COVID-19, I am currently feeling safe after the outbreak	2.89 \pm 0.04	2.52 \pm 0.04	6.62	<.001
The level of COVID-19 infection control awareness is high among Korean university students	3.19 \pm 0.04	3.00 \pm 0.05	2.90	.004
The level of COVID-19 infection control awareness is high among Korean university officials	3.50 \pm 0.04	3.27 \pm 0.05	3.79	<.001
I think the level of safety and health perception in Korea is high when compared with other countries.	3.80 \pm 0.04	3.68 \pm 0.05	1.86	.063
I think it is essential to reduce the risk of COVID-19 infection control in Korea.	4.23 \pm 0.04	4.22 \pm 0.04	0.02	.986

felt safe before COVID-19" ($\chi^2 = 7.02, p = 0.135$). However, for "After the outbreak of COVID-19, I am currently feeling safe," 33.86% (149 participants) of the males and 50.16% (159 participants) of the females reported to "disagree" ($\chi^2 = 39.25, p < 0.001$). For "Compared to pre-COVID-19, I am currently feeling safe after the outbreak," 27.73% (122 participants) of the males and 52.37% (166 participants) of the females felt "unsafe" ($\chi^2 = 56.03, p < 0.001$), which reflected females to handle the more significant threat and anxiety about their safety after the outbreak of COVID-19. According to such results, for "The level of COVID-19 infection control awareness is high among Korean university officials," 2.50% (39 participants) and 9.77% (157 participants) of the male students answered "disagree" or "somewhat," respectively. For the female students, 11.36% (36 participants) and 42.90% (136 participants) answered "disagree" or "somewhat," respectively, which reported a significant difference in the perception toward university officials according to gender ($\chi^2 = 17.10, p = 0.002$) in Table 3.

3.4. Comparison of the changes in the safety and health risk perceptions toward COVID-19 and the cause of COVID-19 by the gender of the participants

The results comparing the changes in the safety and health risk perceptions toward COVID-19 and the cause of COVID-19 based on the gender of the participants are as follows: For "What do you think is the biggest cause of COVID-19 across the world?" 48.41% (213 participants) of males and 52.37% (166 participants) of the females responded "Inadequate response at the early stages," which accounted for most of the participants. This was followed by "Difficulties in maintaining the economy and preventing the disease" in 26.14% (115 participants) of the males and 20.50% (65 participants) of the females, which was statistically significant ($\chi^2 = 11.22, p = 0.024$). For "If there has been a change in your perception about safety and health, in which areas did the change occur?" the most common change in perception was associated with the "danger of virus," which was found in 40.0% (176 participants) of the males and 43.85% (139 participants) of the females. However, males' second most common change in perception was "Personal ability to cope with the disaster," which was found in 22.05% (97 participants). In comparison, 27.13% (86 participants) of the females answered "Pandemic phenomenon" as the second most common change in their perception, which was statistically significant ($\chi^2 = 27.42, p < 0.001$) in Table 4.

3.5. The mean comparison of the safety and health risk perceptions toward COVID-19 based on the gender of the participants who work while studying

A total of 141 participants were working at companies that provided coverage over four major insurances. This accounted for 18.63% of the total number of participants in this study due to reconfirming the gender ratio using this as the total number, 87 males (61.7%) and 54 females (38.3%). The results of comparing the safety and health risk perceptions toward COVID-19 based on the gender of the participants who work while studying are as follows: For "I often use the Internet to obtain information on COVID-19 infection control," females appeared to use the Internet more often ($t = -2.18, p = 0.031$) with 3.81 ± 0.10 points compared to males with 3.53 ± 0.08 points. For "Compared to pre-COVID-19, I am currently feeling safe after the outbreak," females felt less safe ($t = 3.43, p < 0.001$) at 2.43 ± 0.09 points compared to males with 2.87 ± 0.08 points. In terms of whether the level of COVID-19 infection control awareness ($t = 2.25, p = 0.026$) is high among Korean university students ($t = 2.19, p = 0.030$) and officials ($t = 2.01, p = 0.046$), males reported higher scores than females in all the questions, which was statistically significant in Table 5.

4. Discussion

COVID-19 was first discovered in Wuhan, China, in December 2019 and spread through Asian countries in February 2020 before spreading to the world. It even reached the extent of being declared a pandemic (a global pandemic), the highest warning level for infectious diseases, by the World Health Organization (WHO) on March 11. In a survey conducted by the Pew Research Center after the pandemic declaration, numerous European countries appeared to perceive climate change as a significant threat still while 9 out of 10 Korean citizens perceived the spread of infectious diseases as a serious threat [10]. Therefore, this study compared the safety and health risk perceptions toward COVID-19 based on the gender of Korean university students at an exploratory level.

Gender is associated with negative psychology, such as the fear of a novel infectious disease [11,12]. As a result of this study, males had higher awareness of the risk of virus outbreak before COVID-19, but the females had more interest in COVID-19 than males after the outbreak. Females were reported to use the Internet more often to obtain information on COVID-19 infection control and were also said

Table 3
Comparison of the safety and health risk perceptions toward COVID-19 based on the gender of the participants according to the questions ($n = 757$)

Questions	Categories	Males ($n = 440$)	Females ($n = 317$)	χ^2	p
		n (%)	n (%)		
I am interested in COVID-19.	Not interested at all	0 (0.00)	0 (0.00)	22.10	<.001
	Not interested	2 (0.45)	1 (0.32)		
	Somewhat	60 (13.64)	14 (4.42)		
	Interested	255 (57.95)	181 (57.10)		
	Very interested	123 (27.95)	121 (38.17)		
I know the infection control rules of COVID-19.	Highly unaware	0 (0.00)	1 (0.32)	19.64	<.001
	Unaware	7 (1.59)	0 (0.00)		
	Somewhat	72 (16.36)	25 (7.89)		
	Aware	243 (55.23)	186 (58.68)		
	Highly aware	118 (26.82)	105 (33.12)		
I am satisfied with the immediate actions taken by the government and the people after the outbreak of COVID-19	Highly unsatisfied	41 (9.32)	22 (6.94)	9.95	.041
	Unsatisfied	130 (29.55)	100 (31.55)		
	Average	154 (35.00)	136 (42.90)		
	Satisfied	105 (23.86)	51 (16.09)		
	Very satisfied	10 (2.27)	8 (2.52)		
There was a change in the risk perception associated with safety and health due to COVID-19.'	Absolutely no change	4 (0.91)	1 (0.32)	10.39	.034
	No change	10 (2.27)	1 (0.32)		
	Neutral	64 (14.55)	31 (9.78)		
	There were changes	284 (64.55)	225 (70.98)		
	There were big changes	78 (17.73)	59 (18.61)		
I was aware of the dangers of such a virus outbreak before COVID-19 occurred	Highly unaware	44 (10.00)	47 (14.83)	16.58	.002
	Unaware	152 (34.55)	124 (39.12)		
	Somewhat	149 (33.86)	106 (33.44)		
	Aware	81 (18.41)	39 (12.30)		
	Highly aware	14 (3.18)	1 (0.32)		
I feel great fear due to COVID-19.	No fear at all	0 (0.00)	0 (0.00)	34.05	<.001
	Not afraid	27 (6.14)	4 (1.26)		
	Average	143 (32.50)	58 (18.30)		
	Afraid	229 (52.05)	205 (64.67)		
	Highly afraid	41 (9.32)	50 (15.77)		
I often use the Internet to obtain information on COVID-19 infection control	Never	1 (0.23)	0 (0.00)	14.41	.006
	Rarely	16 (3.64)	1 (0.32)		
	Sometimes	194 (44.09)	121 (38.17)		
	Often	175 (39.77)	146 (46.06)		
	Very frequently	54 (12.27)	49 (15.46)		
I generally felt safe before COVID-19.	Not at all	3 (0.68)	4 (1.26)	7.02	.135
	Disagree	13 (2.95)	21 (6.62)		
	Somewhat	92 (20.91)	69 (21.77)		
	Agree	222 (50.45)	152 (47.95)		
	Highly agree	110 (25.00)	71 (22.40)		
After the outbreak of COVID-19, I am currently feeling safe.	Not at all	18 (4.09)	27 (8.52)	39.25	<.001
	Disagree	149 (33.86)	159 (50.16)		
	Somewhat	189 (42.95)	107 (33.75)		
	Agree	68 (15.45)	19 (5.99)		
	Highly agree	16 (3.64)	5 (1.58)		
Compared to pre-COVID-19, I am currently feeling safe after the outbreak	Very unsafe	6 (1.36)	11 (3.47)	56.03	<.001
	Unsafe	122 (27.73)	166 (52.37)		
	Normal	236 (53.64)	105 (33.12)		
	Safe	67 (15.23)	33 (10.41)		
	Very safe	9 (2.05)	2 (0.63)		
The level of COVID-19 infection control awareness is high among Korean university students	Not at all	18 (4.09)	13 (4.10)	13.45	.009
	Disagree	74 (16.82)	76 (23.97)		
	Somewhat	183 (41.59)	134 (42.27)		
	Agree	135 (30.68)	87 (27.44)		
	Highly agree	30 (6.82)	7 (2.21)		
The level of COVID-19 infection control awareness is high among Korean university officials	Highly disagree	7 (0.68)	11 (3.47)	17.10	.002
	Disagree	39 (2.50)	36 (11.36)		
	Somewhat	157 (9.77)	136 (42.90)		
	Agree	203 (47.73)	126 (39.75)		
	Highly agree	34 (39.32)	8 (2.52)		
I think the level of safety and health perception in Korea is high when compared with other countries.	Not at all	8 (1.82)	6 (1.89)	6.42	.170
	Disagree	33 (7.50)	24 (7.57)		
	Somewhat	94 (21.36)	90 (28.39)		
	Agree	207 (47.05)	143 (45.11)		
	Highly agree	98 (22.27)	54 (17.03)		
I think it is important to reduce the risk of COVID-19 infection control in Korea.	Not at all	3 (0.68)	2 (0.63)	0.15	.997
	Disagree	11 (2.50)	7 (2.21)		
	Somewhat	43 (9.77)	33 (10.41)		
	Agree	210 (47.73)	151 (47.63)		
	Highly agree	173 (39.32)	124 (39.12)		

to have more knowledge on the COVID-19 infection control guidelines. In addition, females experienced more changes in their risk perceptions associated with safety and health due to COVID-19. Females also had a greater fear of COVID-19, which was also evident in

the Korean university students studying while working at companies, which ensured coverage for the four major insurances. Some studies have reported that females experience more negative emotions, such as anxiety and fear, or worry about infectious diseases

Table 4

Comparison of the changes in the safety and health risk perceptions toward COVID-19 and the cause of COVID-19 based on the gender of the subjects (N = 757)

Questions	Males (n = 440)	Females (n = 317)	χ^2	p
	n (%)	n (%)		
What do you think is the most significant cause of COVID-19 across the world?	–	–	11.22	.024
Indifference to the virus	50 (11.36)	47 (14.83)		
Inadequate response at the early stages	213 (48.41)	166 (52.37)		
The structural vulnerability of human beings	38 (8.64)	14 (4.42)		
Lack of cooperation abilities from countries around the world	24 (5.45)	25 (7.89)		
Difficulties in maintaining the economy and preventing the disease	115 (26.14)	65 (20.50)		
If there has been a change in your perception about safety and health, in which areas did the change occur?	–	–	27.42	<.001
There has been no change	14 (3.18)	2 (0.63)		
The danger of the virus	176 (40.00)	139 (43.85)		
Pandemic phenomenon	90 (20.45)	86 (27.13)		
Personal ability to cope with the disaster	97 (22.05)	26 (8.20)		
Crisis management ability of the government	63 (14.32)	64 (20.19)		

Table 5

Mean Comparison of the safety and health risk perceptions toward COVID-19 based on the gender of the subjects who work while studying (n = 757)

Questions	Males (n = 87)	Females (n = 54)	t	p
	Mean ± SD	Mean ± SD		
I am interested in COVID-19	4.29 ± 0.06	4.30 ± 0.08	-0.09	.930
I know the infection control rules of COVID-19	4.09 ± 0.08	4.24 ± 0.08	-1.27	.205
I am satisfied with the immediate actions taken by the government and the people after the outbreak of COVID-19	2.92 ± 0.11	2.74 ± 0.14	1.02	.310
There was a change in the risk perception associated with safety and health due to COVID-19.'	3.98 ± 0.07	4.07 ± 0.09	-0.86	.393
I was aware of the dangers of such a virus outbreak before COVID-19 occurred	2.54 ± 0.10	2.43 ± 0.13	0.69	.494
I feel great fear due to COVID-19	3.78 ± 0.08	3.81 ± 0.09	-0.25	.804
I often use the Internet to obtain information on COVID-19 infection control	3.53 ± 0.08	3.81 ± 0.10	-2.18	.031
I generally felt safe before COVID-19	3.98 ± 0.08	3.67 ± 0.12	2.20	.029
After the outbreak of COVID-19, I am currently feeling safe	2.61 ± 0.08	2.35 ± 0.12	2.20	.029
Compared to pre-COVID-19, I am currently feeling safe after the outbreak	2.87 ± 0.08	2.43 ± 0.09	3.43	<.001
The level of COVID-19 infection control awareness is high among Korean university students	3.22 ± 0.10	2.87 ± 0.12	2.19	.030
The level of COVID-19 infection control awareness is high among Korean university officials	3.59 ± 0.08	3.29 ± 0.12	2.01	.046
I think the level of safety and health perception in Korea is high when compared with other countries.	3.90 ± 0.10	3.50 ± 0.15	2.25	.026
I think it is essential to reduce the risk of COVID-19 infection control in Korea.	4.31 ± 0.09	4.00 ± 0.12	2.13	.035

[11,12]. However, there are also opposing studies that report males to experience 3.5 times more psychological disabilities than females [13], which reflect inconsistency between the study results. However, in addition to the results of this study, a survey on the national mental health in Korea reported females to be more concerned about COVID-19 than males [14]. Therefore, Korean females appear to have more severe perceptions of safety and health risks toward the COVID-19 pandemic than their counterparts.

In terms of feeling safe before COVID-19, males appeared to have felt safer than the females, which was also evident from surveying the level of safety felt by the participants even after the outbreak of COVID-19. However, the scores were significantly lower than the safety felt before the outbreak, and females were found to feel much more threatened and unsafe than males after the outbreak. In terms of the social factors, numerous responses from the females reflected that they were unsatisfied with the immediate actions taken by the government or the people following the COVID-19 outbreak. On the contrary, males showed a higher score for "The

level of COVID-19 infection control awareness is high among Korean university students and university officials" than females, which depicted a difference according to gender. Following a previous study, which reported that having trust in the organization one belongs to acts as a social factor that reduces the fear of a novel infectious disease [15,16], measures to increase the belief in the organization they belong to will be essential for the females.

The level of threat people feel about a novel infectious disease is more potent than existing diseases, and the anxiety increases during the outbreak of the disease [17]. As a result of comparing the changes in the safety and health risk perceptions based on the gender toward COVID-19 and the cause of COVID-19, both males and females reported the most significant cause of COVID-19 across the world as the inadequate response at the early stages and the difficulties in maintaining the economy and preventing the disease. Such fear of new infectious diseases causes changes in people's actions and daily lives, including direct consumption rigidity and refraining from leaving home or attending meetings. Just as the

Middle East respiratory syndrome (MERS) in 2015 caused a decline in the activities of daily living, social disconnection, and a slow-down in economic activities [18], the financial difficulties were also outlined as an essential factor from this study, aside from the preventions directly related to COVID-19. This reflected the same pattern demonstrated from the MERS outbreak in 2015.

The most common difference in males was related to the fear of the virus and the personal ability to cope with the disaster according to the changes in perceptions of safety and health. The most common change of perception for females was the danger of the virus, followed by the pandemic phenomenon. The reason for the most significant change in the perceptions related to the threat of the virus and the pandemic phenomenon is consistent with the results of this study, which showed females are more interested in COVID-19 than males, used the Internet more often to obtain information on infection control, and had a better understanding of the COVID-19 infection control guidelines.

5. Conclusion

Based on the results outlined above, the intervention plan for the safety and health risk perceptions toward the COVID-19 pandemic in Korean university students who work while studying are as follows: there should be prioritized psychological measures for prevention against COVID-19 for vulnerable groups with high mental health risks. A network must be established to protect the mental health of such groups, and candidates who require intervention must be actively identified and supported. Moreover, the present pandemic situations of COVID-19 can be accompanied by the infodemic of infectious diseases due to incorrect information. Therefore, there must be efforts to deliver accurate and prompt information based on professional and scientific evidence of the contagious disease, and support must be provided through such positive and active communication.

Conflict of interest

The authors declare no conflict of interest.

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