

Research Article

Relationship between eHealth, Perceived Risk, and Phobia of COVID-19 among Chinese University Students in Korea and China

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Objective. To examine the relationship between eHealth literacy, perceived risk, and COVID-19 phobia among Chinese university students studying in Korea (the international group) and China mainland (the mainland group). **Methods.** A cross-sectional survey was conducted using an online questionnaire. With 1,107 student samples, structural equation modeling (SEM) was performed to examine the relationship between eHealth, perceived risk, and COVID-19 phobia among the two groups. **Results.** These Chinese university students had a COVID-19-related eHealth literacy of 30.23 (SD 6.65), with scores of the mainland group higher than those of the international group. The international group students (56.47 ± 17.64) reported a higher level of COVID-19 phobia than the mainland group students (48.89 ± 17.76). The findings indicated that use frequency and information trust were higher when students possessed a higher level of COVID-19 eHealth literacy. Information trust would not have a significantly positive relationship with COVID-19 phobia, while higher levels of information use and perceived risk were positively associated with COVID-19 phobia. **Conclusion.** eHealth literacy, information factors, and perceived risk were associated with Chinese university students' phobia status. There may be substantial feasibility and practicality in conducting relevant interventions that consider the university students' psychological status and risk perception based on eHealth literacy and information factors.

1. Introduction

As the COVID-19 pandemic ebbs and flows, people's psychological experiences are also recurring, resulting in a series of problems such as stress, fear, and phobia [1–4]. Previous studies have pointed out that the psychological burden of fear and phobia of COVID-19 varies by country, and the health and well-being of vulnerable groups must be prioritized [5–7]. University students are well-educated, socially engaged, and highly active young adults. They have traditionally been considered one of the most vulnerable populations to mental health concerns [8, 9]. The high risk of exposure and infection possibility with

COVID-19 may cause increased phobias [10, 11]. Meanwhile, the importance of studying mental health and phobia among international university students has been evidenced in many countries [12, 13]. Studies emphasized that the COVID-19 pandemic could increase the pressure and challenges they face, as they lack support systems such as family and friends that domestic students have access to and various study issues raised by COVID-19 [14–16]. There is also an urgency for further care of international students' phobia status [17, 18].

eHealth literacy is the ability to search for, find, understand, and generate critical analyses of specific health information from online health resources, followed by making the best choice to

handle health issues [19]. eHealth literacy is crucial for quickly locating high-quality information in a complicated Internet environment inundated with contradictory signals [20], as well as making sound practice decisions and having an effect on COVID-19 phobia [21, 22]. Individuals could profit from eHealth services if they had basic eHealth literacy during this pandemic. At the same time, the relationship between eHealth literacy and information use or trust should be regarded as a key exploration because they may impact how dependable or trustworthy the information is perceived to be by the information seeker [23, 24].

Because of the implementation of home isolation and restricting in-person social interactions, public outings and social interactions have been severely restricted [25, 26]. As a result, it is vital for university students to maintain contact with their family and friends and quickly obtain up-to-date health information via the internet and social media [27–29]. This is also because an extraordinary amount of misinformation and fake news about the pandemic has been spread [30]. Worryingly, many young social media users may receive or interpret information incorrectly, perceive more severe risks, and facilitate the spread of false information [31, 32]. Health authorities have pointed out that fake news or misleading information could interfere with or undermine individuals' or public responses to the pandemic and jeopardize government and healthcare efforts to manage COVID-19, as well as cause perceived risk and fear [33, 34]. To disseminate evidence-based information and effectively combat misinformation, eHealth literacy should be considered to relieve the public risk and subsequent phobia perception with accurate and high-quality information [35, 36].

Korea and China had fared well in containing COVID-19 and were regarded as model examples for other countries to learn from [37–39]. However, the situation in Korea has been worse than ever in 2022. In March 2022, the number of daily new cases topped 407,000, implying that one in five South Koreans had COVID-19 [40]. As the severity and number of COVID-19 infections in Shanghai and a few other areas increased, other Chinese cities began to tighten curbs, even in places with no recent infections [41, 42]. Although the pandemic has lasted for more than two years, its sudden severity in these two countries and subsequent curbs may exacerbate restlessness and phobia in university students, especially international students [43].

Based on these, it could be suggested that a public health crisis may affect university students' phobia of COVID-19 through eHealth, information use/trust, and perceived risk [44, 45]. Given the limited evidence, it is critical to closely investigate the probable associations between these variables among university students [46] as COVID-19 continues. Thus, this study aimed to examine the association between eHealth literacy, information sources' use frequency and trust, perceived risk, and phobia among Chinese university students and to compare the differences between Chinese university students studying in Korea and China mainland.

2. Methods

2.1. Study Design and Participants. This study was a cross-sectional and comparative study. Yonsei Global Health

Center (YGHC) designed a questionnaire to conduct a cross-sectional and comparative study. The online survey was conducted from April 8, 2022, to April 30, 2022 (Figure 1), with a total of 1,107 university students. Of these, 788 were studying in China mainland (referred to as the mainland group hereafter) and 319 were international Chinese university students studying in South Korea (the international group).

2.2. Procedure. English version of the questionnaire was first made by researchers and coauthors via focus group discussions. Items and scales were designed and aimed to assess eHealth literacy, information factors and perceived risk, and COVID-19 phobia among university students. Because of the social distancing and infection risk during COVID-19, an online survey was chosen. Then, the Chinese version of the questionnaire was translated with the assistance of coauthors and native speakers and hosted on survey platforms (<https://Wenjuan.com>).

Before the survey started, a questionnaire pretest was conducted among some students living in China and Korea to check that the questions being asked accurately reflect the information the researcher seeks and that the respondent could answer the questions. Researchers assessed the readability, understanding, and convenience of the online survey for the respondents. The survey was distributed via Uniform Resource Locator (URL) to each school's researchers to invite potential students to participate, along with a consent form that included the research purpose and anonymity protection. Consent forms were ensured to be completed by participants were informed about the questionnaire before the survey started.

Student participants spent about 8–10 minutes answering all the questions, which were checked by using mobile responses. The Chinese URL of the online questionnaire was firstly shared by the researchers on social media (WeChat, QQ, e-mail). To scale up the sample size and cover more areas in each country, collaborators and researchers in each country invited colleagues and students from their universities and other universities to send URLs to students to invite them to participate in the online questionnaire survey.

As for the form of the questions of the online questionnaire survey, there are single-choice, multiple-choice, and fill-in-the-blanks. The researchers stipulated that all questions in the survey were mandatory, meaning the participants had to complete all answers before their submission, which could improve the quality of the questionnaire and the rate of response to questions. Finally, 788 Chinese university students living in China mainland and 319 living in South Korea were included in the database.

2.3. Measurements. Scales for measuring eHealth literacy and COVID-19 phobia have been developed in the previous studies [20, 48–50]. The questionnaire consisted of questions on the following: (1) demographic characteristics, (2) COVID-19 information factors and perceived risk, (3) eHealth literacy, and (4) COVID-19 phobia.

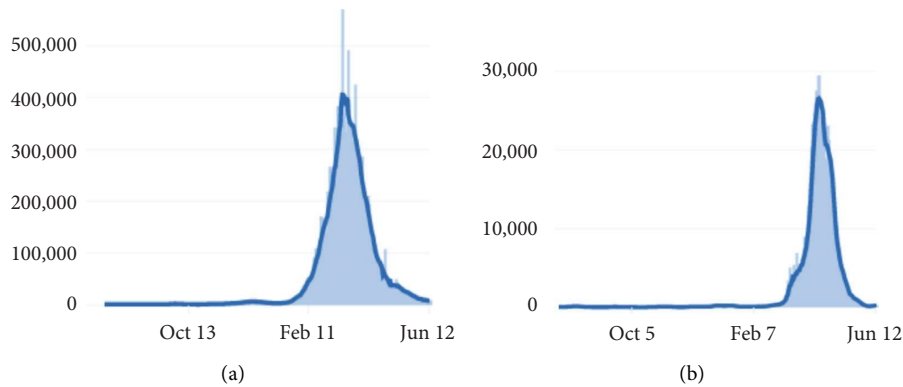


FIGURE 1: Weekly new confirmed COVID-19 cases in (a) South Korea and (b) China from October 2021 to June 2022 [47]. The 7-day average cases were 138,869 in Korea and 26,394 in China on April 16, 2022.

- (i) The demographic characteristics elicited from the respondents included gender, age, educational level, living area, and living status.
- (ii) The COVID-19 information factors comprised (1) information sources' use frequency (1 = never, 5 = always), Cronbach's α value of 0.667, and Kaiser–Meyer–Olkin (KMO) of 0.735; (2) information trust (the level of trust towards information sources, 1–10 scores), Cronbach's α value of 0.720 and KMO of 0.664. And, perceived risk of COVID-19 (perceived susceptibility and perceived severity) [51] was rated on a 5-point Likert-type scale, with "1 = very low, 3 = neither low nor high, and 5 = very high." Cronbach's α value was of 0.858.
- (iii) The Chinese version coronavirus-related eHealth literacy scale (CoV-eHEALS) [20, 48] was adopted in this study. The scale consists of eight items to assess an individual's self-rated ability to use the Internet to find and utilize health information about COVID-19, each of which is answered on a 5-point Likert scale ("disagree" to "agree"). The overall score varies from 8 to 40, with higher scores indicating greater eHealth literacy. The scale in this study had a Cronbach's α value of 0.939 and a KMO of 0.927 (Table 1).
- (iv) The COVID-19 phobia Scale (C19P-SE) has been developed and confirmed [49, 50]. It purports to assess phobic reactions using 20 items followed by 4-factor categories and graded on a five-point Likert scale ("strongly disagree" to "strongly agree"). The total scale scores range from 20 to 100, with higher scores indicating more phobia. The total scale in this study had a Cronbach's α value of 0.941 and a KMO of 0.948. The reliability and validity of the subscales were tested (Table 1).

2.4. Data Analysis. Descriptive analysis, *t*-test, or one-way analysis of variance (ANOVA) were used to assess statistical differences in the distribution of COVID-19-related degrees of eHealth literacy and phobia across different socio-demographic factors. Structural equation modeling (SEM)

TABLE 1: Descriptive characteristic of the coronavirus-related eHealth literacy scale (eHEALS) and the COVID-19 phobia scale (C19P-SE) ($N = 1107$).

Scale	Items	Range	α	KMO
CoV-eHEALS	8	8–40	0.939	0.927
C19P-SE	20	20–100	0.941	0.948
Psychological	6	5–30	0.851	0.879
Psycho-somatic	5	5–25	0.910	0.874
Social	5	5–25	0.828	0.790
Economic	4	5–20	0.825	0.786

using SPSS Amos (version 23.0, IBM Corp) was conducted to examine the relationship between eHealth literacy, information factors (sources' use frequency and trust), perceived risk, and COVID-19 phobia among the two groups. Goodness-of-fit was evaluated using the following indicators: adjusted goodness-of-fit index ($AGFI \geq 0.80$), comparative fit index ($CFI \geq 0.80$), incremental fit index ($IFI > 0.80$) [52, 53], and root mean square error of approximation ($RMSEA \leq 0.80$) [54, 55]. All statistical significance levels were set at $\alpha = 0.05$, and all statistical tests were two-tailed.

2.5. Ethical Statement. This study was approved by the Yonsei University Institutional Ethics Committee (Task No. 1041849-202204-SB-078-01) and Shandong University Institutional Ethics Committee (Task No. LL20220425).

3. Results

3.1. Demographic Characteristics. Table 2 reports the social demographic characteristics of Chinese University students in the mainland and international groups. The average age of the mainland group was lower than that of the international group (22.88 ± 2.46 ; 26.53 ± 4.60). The proportion of male and female students was similar between the two groups. Meanwhile, there were more undergraduate students in the mainland group and more graduate students in the international group (Appendix S1). More than half of the surveyed Chinese students studying in China mainland were pursuing medical-related majors, and most of them did not live alone. Regarding living areas, both groups had a greater

TABLE 2: Characteristics of Chinese study participants and their mean score on the Cov-eHEALS and C19P-SE ($N=1107$).

Variables	International group ($N=319$) n (%) / mean \pm SD	Mainland group ($N=788$) n (%) / mean \pm SD	Total ($N=1107$) n (%) / mean \pm SD	P
Age ^a	26.53 \pm 4.60	22.88 \pm 2.46	23.93 \pm 3.62	<0.001
Gender				
Male	111 (34.8)	276 (35.0)	378 (35.0)	0.942
Female	208 (65.2)	512 (65.0)	720 (65.0)	
Education level				
Undergraduate and below	66 (20.7)	471 (59.8)	537 (48.5)	<0.001
Graduate and above	253 (79.3)	317 (40.2)	570 (51.5)	
Major type				
Medical/health-related	34 (10.7)	461 (58.5)	495 (44.7)	<0.001
Nonmedical	285 (89.3)	327 (41.5)	612 (55.3)	
Living alone				
Yes	162 (50.8)	44 (5.6)	206 (18.6)	<0.001
No	157 (49.2)	744 (94.4)	901 (81.4)	
Living area				
City	295 (92.5)	730 (92.6)	1025 (92.6)	0.925
Rural	24 (7.5)	58 (7.4)	82 (7.4)	
CoV-eHEALS ^a	29.48 \pm 7.00	30.53 \pm 6.48	30.23 \pm 6.65	0.018
C19P-SE ^a	56.47 \pm 17.64	49.89 \pm 17.76	51.78 \pm 17.97	<0.001
Psychological ^a	19.14 \pm 6.01	17.31 \pm 5.98	17.84 \pm 6.05	<0.001
Psychosomatic ^a	9.63 \pm 4.91	8.74 \pm 5.10	9.00 \pm 5.06	0.008
Social ^a	17.08 \pm 5.07	12.78 \pm 4.93	14.02 \pm 5.33	<0.001
Economic ^a	10.62 \pm 4.26	11.06 \pm 4.25	10.93 \pm 1.26	0.117

Note. a = mean value.

proportion of students living in the cities. As for the eHealth literacy level, the mean scores of the mainland and international groups were 30.53 (SD 6.48) and 29.48 (SD 7.00), respectively. The scores of the subscales of the C19P-SE found that the international group secured significantly higher scores than the mainland group except for on the economic scale.

The information sources used by these university students varied (Table 3). Both groups preferred to obtain information via cell phones, followed by internet/TV news and social media. Students in both groups ranked the frequency of having conversations with family and friends to get information as higher than “sometimes” (score = 3); the data suggested that they rarely received information through radio or from medical personnel in hospitals or public health centers. Except for social media, statistically significant differences were reported in the use frequency of the other six sources.

Comparing students studying in the mainland to those studying abroad, the mainland students had much higher levels of public and media trust ($p < 0.001$) (Table 3). In addition, the two groups perceived the risk of being infected with COVID-19 (perceived susceptibility) as higher than “neither high nor low” (score = 3) ($M = 4.40$, $SD = 0.73$ vs. $M = 3.28$, $SD = 1.22$); the average perceived severity scores were lower than perceived susceptibility. Perceived severity in oneself and family/friends were both significantly higher in the international group ($M = 2.56$, $SD = 1.06$; $M = 2.87$, $SD = 1.04$).

3.2. Structural Model. Structural equation modeling (SEM) analysis was conducted with the score of COVID-19-related phobia as the dependent variable, while the independent variables consisted of eHealth literacy, information source

use frequency, information source trust, and perceived risk. The path coefficients among the latent variables derived from the SEM are β values (regression weights: estimate how many standard deviations a dependent variable will change for one standard deviation increase in the independent variable) between the mainland group students and the international group students.

3.2.1. Multiple-Group Analysis. The fitness indices between the mainland and international groups were first compared to demonstrate whether the group variable is suitable for the intended comparison. There were several fitness indicators regarding measurement invariance across groups and fitness indices in the six different models (Table 4). When the sample size used is sufficiently large, as was the case in this study, a nonsignificant chi-squared value is rare [56], which demonstrates the usefulness of this test, given the sample-size dependency [57]. Table 4 shows that the fitness indices of the international and mainland groups were the same (AGFI = 0.810, CFI = 0.823, IFI = 0.824, RMSEA = 0.066 in both M_1 and M_2). The AGFI, CFI, and IFI values surpassed 0.80, and the RMSEA values were < 0.080 , indicating that the measurement invariance between the two groups could be further explored in other models.

Then, the measurement invariance across groups and the model were established across both the mainland group student and the international group students in this study. We used the ΔCFI and $\Delta RMSEA$ between M_3 (unconstrained model), M_4 (measurement weights model), M_5 (structural weights model), M_6 (structural covariance model), and M_7 (structural residuals model) to evaluate the measurement invariance in this study. M_3 does not restrict

TABLE 3: Responses on information factors and perceived risk (N = 1107).

Variables	Range	International group (N = 319) n (%) / Mean ± SD	Mainland group (N = 788) n (%) / Mean ± SD	p
Information sources' use frequency				
Internet/TV news	1-5	3.82 ± 1.15	3.98 ± 0.93	0.027
Conversation with family and friends	1-5	3.08 ± 1.19	3.29 ± 0.93	0.005
From medical personnel in hospitals and public health centers	1-5	1.79 ± 1.13	2.50 ± 1.04	<0.001
Social media (Weibo, WeChat, Facebook, YouTube, KakaoTalk, Instagram, etc.)	1-5	3.83 ± 1.19	3.95 ± 0.94	0.098
Information sent from public institutions	1-5	3.09 ± 1.31	3.60 ± 1.01	<0.001
Cellphone	1-5	3.99 ± 1.27	4.30 ± 0.87	<0.001
Radio	1-5	1.60 ± 1.04	2.04 ± 1.11	<0.001
Information trust (how much do you trust the COVID-19 information provided by)				
Media trust: by internet/TV/social media	1-10	7.15 ± 1.34	7.85 ± 1.68	<0.001
Public trust: by public health personnel/centers/public institutions	1-10	7.50 ± 1.90	8.35 ± 1.75	<0.001
Family/friends trust: by family/friends	1-10	6.74 ± 2.02	6.98 ± 1.92	0.067
Perceived risk				
Perceived susceptibility	1-5	3.28 ± 1.22	4.40 ± 0.73	<0.001
Perceived severity (yourself)	1-5	2.56 ± 1.06	2.04 ± 1.21	<0.001
Perceived severity (family/friends)	1-5	2.87 ± 1.04	2.35 ± 1.17	<0.001

TABLE 4: Model invariance test using multiple-group analysis.

Model	χ^2/df	p	AGFI	CFI	IFI	RMSEA	ΔCFI	$\Delta RMSEA$
Model 1	5.803	<0.001	0.810	0.823	0.824	0.066	—	—
Model 2	5.803	<0.001	0.810	0.823	0.824	0.066	—	—
Model 3	5.803	<0.001	0.810	0.823	0.824	0.066	—	—
Model 4	5.653	<0.001	0.815	0.820	0.820	0.065	0.003	0.001
Model 5	5.660	<0.001	0.814	0.814	0.815	0.065	0.006	0
Model 6	5.649	<0.001	0.815	0.814	0.814	0.065	0	0
Model 7	5.596	<0.001	0.817	0.813	0.814	0.064	0.001	0.001

Note. M_1 , mainland group; M_2 , international group; M_3 , unconstrained; M_4 , measurement weights; M_5 , structural weights; M_6 , structural covariances; and M_7 , structural residuals.

the model coefficient, whereas M_4 implies that the indicator loadings for the corresponding construct are equal for each group. M_5 constrains both the indicator loadings for the corresponding constructs and structural coefficients across the groups. Conversely, the indicator loadings for the corresponding construct and the structural coefficients of each group were assumed to be equal in M_6 . The ΔCFI between M_4 and M_3 , M_5 and M_4 , M_6 and M_5 , and M_6 and M_5 were 0.003, 0.006, 0, and 0.001, respectively; $\Delta RMSEA$ was 0.001 between M_4 and M_3 , 0 between M_5 and M_4 and M_6 and M_5 , and 0.001 between M_7 and M_6 . Previous literature states that a change of <0.010 in the CFI (ΔCFI) signifies that the measurement invariance has formed across groups [58]. Regarding $\Delta RMSEA$, changes of <0.015 in the RMSEA ($\Delta RMSEA$) are considered acceptable when establishing the measurement invariance, if the sample size is more than 300 [59]. As all ΔCFI values in this study were < 0.010 and all $\Delta RMSEA$ values were <0.015, measurement invariance was established between the M_1 , M_2 , M_3 , M_4 , M_5 , M_6 , and M_7 models across both the mainland and international groups in this study.

3.2.2. Relationship between eHealth Literacy, Information Factors, Perceived Risk, and Phobia of COVID-19 among Chinese University Students. The results of the proposed (unconstrained) SEM model of analysis for the mainland and international groups are presented in Figures 2 and 3. The two groups' correlation effects (path coefficients) among the COVID-19-related eHealth literacy level, use frequency, level of trust, perceived risk, and phobia of COVID-19 were reported, respectively, as 0.16 ($p < 0.001$) vs. 0.22 ($p < 0.01$); 0.40 ($p < 0.001$) vs. 0.14 ($p < 0.05$); 0.25 ($p < 0.001$) vs. 0.36 ($p < 0.001$); -0.32 ($p < 0.001$) vs. 0.20 ($p < 0.05$); 0.10 ($p < 0.05$) vs. 0.25 ($p < 0.01$); 0.54 ($p < 0.001$) vs. 0.47 ($p < 0.001$).

The level of eHealth literacy positively affected use frequency and information trust and use frequency positively affected information trust. In other words, the more students mastered COVID-19-related eHealth literacy, the more they used diverse information sources and trusted information. However, use frequency negatively affected the perceived risk in the mainland group students (the more frequent the use, the lower the perceived susceptibility and perceived severity), whereas it was the opposite in the international group students. In addition, both groups showed that the phobia of COVID-19 was positively impacted by use

frequency and perceived risk. Higher information trust related to a higher level of perceived risk was only reported in university students studying on the mainland. The mediating effects of eHealth literacy level on the perceived risk and the phobia of COVID-19 were conducted using AMOS Bootstrapping analysis and measured as indirect effects (Appendix S2).

4. Discussion

This study assessed the level of COVID-19-related eHealth literacy, frequency of information source use and trust, perceived risk, and phobia of COVID-19 among Chinese university students studying in Korea and China mainland. It also examined the relationships between COVID-19-related eHealth literacy and phobia with the impact of information source use frequency, information trust, and perceived risk. To the best of our knowledge, this is one of the few studies that consider the association between these factors among Chinese students studying in the mainland and international students studying in Korea.

The novelty of this study stems from the fact that it investigated levels of COVID-19-related eHealth literacy and COVID-19 phobia among Chinese university students and compared the results of students who have experienced different COVID-19 response policies in China mainland and Korea. The survey period coincided with an increasing number of confirmed cases in both countries. China mainland chose to institute strict lockdown measures while Korea chose to return to normal [40–42], which may have had different impacts on Chinese university students' COVID-19-related eHealth literacy levels, information trust, perceived risk, and phobia of COVID-19.

The findings of the descriptive analysis revealed significant differences between these two student groups' age, level of education, major type, and whether they lived alone. More graduate students studying in Korea for a higher level of education chose to live alone [60] due to the pandemic. Compared to other studies [21, 61], the Chinese university students' COVID-19-related eHealth literacy scores of 30.23 (SD 6.65) in this study were lower than that of university students in Wuhan, China 30.68 (SD 7.16), and higher than that of US adults 29.0 (SD 6.1). The mainland group students gained higher eHealth scores than the international group. Previous research indicated that ethnic minority groups had low levels of coronavirus-related eHealth literacy and a low

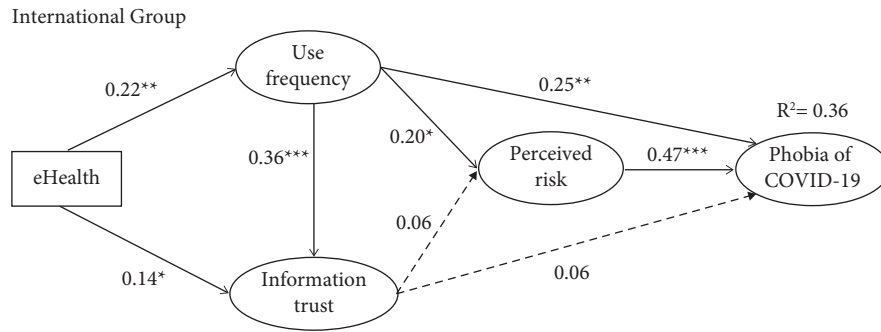


FIGURE 2: Regression weights of the SEM analysis among Chinese University students, international group ($n = 319$). Note: Rectangles represent observed variables; ellipses represent latent variables. The arrows indicate the associations and directions between variables. All parameter estimates were statistically significant ($p < 0.001$). Solid line: significant path, dotted line: non-significant path, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, $\chi^2/DF = 5.803$ ($p = 0.000$), AGFI = 0.810, CFI = 0.823, IFI = 0.824, RMSEA = 0.066.

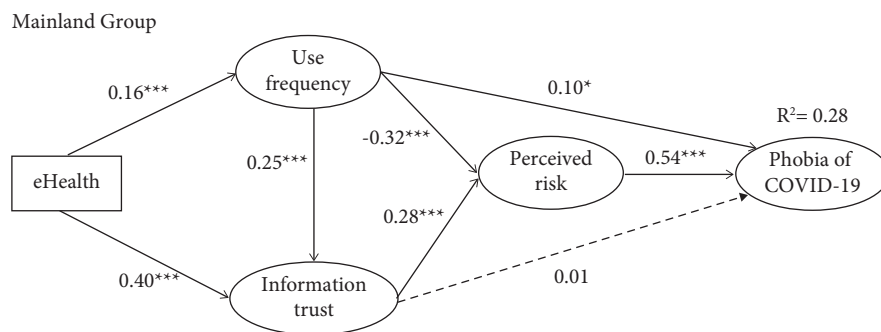


FIGURE 3: Regression weights of the SEM analysis among Chinese University students, mainland group ($n = 788$). Note: Rectangles represent observed variables; ellipses represent latent variables. The arrows indicate the associations and directions between variables. All parameter estimates were statistically significant ($p < 0.001$). Solid line: significant path, dotted line: non-significant path, * $p < 0.05$, *** $p < 0.001$, $\chi^2/DF = 5.803$ ($p = 0.000$), AGFI = 0.810, CFI = 0.823, IFI = 0.824, RMSEA = 0.066.

frequency of obtaining health information on the Internet [62, 63]. The finding of poorer CoV-eHEALS among international university students was of particular concern given the recognized disparities in the impact of COVID-19 on minority groups [64]. Meanwhile, international students reported a higher level of phobia than mainland students, particularly on the psychological, psychosomatic, and social scales. This was consistent with prior studies which stated that international students had more severe COVID-19 phobia and other mental health issues than the normal group [65, 66].

The information sources used by the surveyed Chinese university students were diverse, mainly relying on cell phones, internet/TV news, and social media. However, international students reported a comparatively low frequency of seeking health information from these sources. The information sources from medical personnel and public health centers were at a low level, while the public trust was the highest compared to media trust and family/friends trust in both groups. This was in line with that while most young individuals utilize the internet as their primary source of information, only a small fraction seek information from health professionals [67]. This may be explained by the limitation of the Korean language among international students, which could affect the usage of other information sources compared to those in their native language [60].

Additionally, mainland students reported a higher level of perceived susceptibility (possibility of infection) but lower levels of perceived severity than international students. These differences could be attributable to the different political approaches taken by Korea and China's mainland and to containing COVID-19 [68]. By 2022, Korea experienced three waves of the COVID-19 outbreak and decided to change track to a policy of mitigation, abandoning the strictly supported methods used previously. This social situation may have affected international students in Korea; thus, they may have had to accept this change. China successfully contained the outbreak's first wave and put in place strict measures [69]. After the second outbreak in China in March 2022, strict control in universities may have led to higher levels of perceived susceptibility to infection than those of international students, who may have been more worried about their families or friends. Additionally, in both groups, particularly in the international group, there was a higher level of perceived severity if COVID-19 infected their family/friends than the level of perceived severity if COVID-19 infected the students themselves. These findings supported earlier research on American and German students, which showed that they seemed more concerned about their loved ones than themselves [66, 70].

Furthermore, the results suggested that use frequency and information trust were higher when these students had a higher level of COVID-19-related eHealth literacy; the more information sources used, the more trust in information. Moreover, the relationships between use frequency and perceived risk were opposite in the mainland and international groups, with a higher frequency of information use and linked to higher levels of perceived susceptibility and severity among international students. Previous research on risk perceptions during outbreaks revealed that consumption of news and social media were associated with elevated risk perceptions [71, 72]. Although they were well-educated and active on the internet, conversations with family and friends took the place of discussions with health specialists [73]. The sheer abundance of COVID-19 information available online, along with contradictory knowledge regarding its origins, prevention, and therapy, has produced ambiguity [74], leading to information overload and feelings of hopelessness or fatigue. If students could master the fundamental techniques for efficiently reviewing and verifying information online, they may be better able to obtain accurate information; as a result, the misunderstanding and perceived risk caused by the uncertainty of information and the variety of information sources may be reduced [75].

Information trust was positively related to perceived risk levels, which has been pointed out in a study in the US [76]. However, there was no significant evidence that information trust was related to perceived risk among international students. This could be explained by the fact that many students who went overseas to study encountered a dilemma as a result of hearing conflicting and generally incongruent signals from their family and peers [65, 77]. Being trapped in this discordant situation may often result in great unease and was more likely to lead to mistrust and isolation [78]. The findings also implied that there was a correlation between COVID-19-related phobia and the perceived risk of getting COVID-19, which supported the research of Amin [79], Cori et al. [80], and Leite et al. [81]. A negative psychological impact on young people in the context of high levels of perceived risk was also found [82]. The perceiving risk was regarded as an essential initial step in a fear appeal intended to motivate preventive health practices [83], which encouraged future work in COVID-19 prevention and control based on the intervention of perceived risk and psychological status.

In addition, it has previously been discussed that trust in COVID-19 information sources was significantly associated with the fear of COVID-19 [84]. However, the findings rejected the idea that information trust has a significantly positive association with COVID-19 phobia; instead, they demonstrated that higher levels of information use and perceived risk were positively correlated with COVID-19 phobia. This may indicate that the surveyed Chinese students paid high attention and trusted information from governmental and official sources, helping them embrace protective behaviors implementation and relieve their mood [85]. Meanwhile, the COVID-19 pandemic had a potential impact on the lifestyles and moods of university students,

including sedentary activities and excessive phobia [86]. The next phase of the information campaign should focus on the lifestyle, eating habits, and emotional resilience skills of college students to improve their physical and mental health [87].

4.1. Limitations. Our study has several limitations. First, snowball sampling is a nonprobability sampling method that is commonly used when encountering difficulty in identifying individuals in a group. Because of the constraints arising from the COVID-19 pandemic, we were unable to employ probability sampling. The likelihood of sample and selection bias in snowball sampling restricts the generalization of our findings. Second, the data presented here are from a single cross-sectional study with limited factors analyzed, which potentially limit the investigation of the causes and effects of these factors without involving other factors. For example, university students of different socioeconomic statuses may have different levels of eHealth literacy (e.g., the educational level), and the previous positivity to SARS-CoV-2 infection may have a great impact in COVID-19 phobia and perceived risk. Third, this study only examined the associations among the self-reported level of CoV-eHEALS, information use, information trust, and the phobia of COVID-19 using SEM analysis, which could give rise to subjective results. Thus, further studies involving more variables using other comprehensive methods should be conducted in a larger sample of students in the future.

5. Conclusion

The study found different levels of COVID-19-related eHealth literacy, frequency of information sources' use and trust, perceived risk, and phobia of COVID-19 among Chinese university students studying in Korea and China mainland. Students performed well in eHealth literacy and information sources' use. International group students reported a higher phobia of COVID-19 than the mainland group with relatively higher eHealth scores, more frequent information source use, and higher trust. Both groups showed that the phobia of COVID-19 was positively impacted by information sources' use frequency, perceived risk, and eHealth literacy.

Despite limitations, the findings of this study have substantial implications for public health, particularly in terms of COVID-19 prevention and students' well-being in universities [88]. Many universities in China, Korea, and other countries have conducted back-to-campus studies. The stress and fear of COVID-19 could be worsened by bringing large populations of students back to small campuses. For example, if an infected asymptomatic patient arrives at school, they may infect other students [20], resulting in a high level of phobia and fear. Because university students use social media and the Internet in general, it is viable to teach them effective search skills for COVID-19-related information. The findings also suggest the strict implementation and adherence to quality standards to enhance the clarity of the COVID-19-related information

presentation, which could help improve eHealth literacy and increase information use and trust. In the future, assessing and tracking COVID-19-related eHealth literacy at individual and societal levels may be critical. There may be substantial feasibility and practicality in conducting culture-specific interventions for the psychological status and risk perception based on eHealth literacy and information factors.

Data Availability

Data used for the findings of this study are available from the corresponding author on request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

Bo Zhao contributed to conceptualization, methodology, validation, investigation, formal analysis, and review, and editing. Fanlei Kong was responsible for conceptualization, methodology, validation, investigation, supervision, and reviewing. Eun Woo Nam was responsible for conceptualization, validation, supervision, and reviewing.

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Supplementary Materials

Table S1: additional Information of Chinese University Students in Korea and China mainland. Table S2: AMOS Bootstrapping analysis of eHealth literacy level on the perceived risk and phobia of COVID-19. (*Supplementary Materials*)

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