Research article

Validation of the Chinese version of the COVID-19 Phobia Scale among Chinese college students

Bo Zhao [a,b,1], Jing Xu [c,d,1], Fanlei Kong [c,d,*], Eun Woo Nam [a,b,**]

[a] Department of Health Administration, Graduate School, Yonsei University, 1 Yonseidae-gil, Wonju, Gangwon-do 26493, South Korea
[b] Yonei Global Health Center, Yonsei University, 1 Yonseidae-gil, Wonju, Gangwon-do, 26493, South Korea
[c] Centre for Health Management and Policy Research, School of Public Health, Cheeloo College of Medicine, Shandong University, Jinan, 250012, China
[d] NHC Key Lab of Health Economics and Policy Research, Shandong University, Jinan, 250012, China

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ABSTRACT

Background and objective: Different languages and versions of the COVID-19 Phobia Scale (C19P–S) have been developed and tested in several countries. Chinese college students are a large vulnerable group and are susceptible to psychological problems during the COVID-19 pandemic. However, no studies had yet examined the reliability and validity of the C19P–S in China among college students group. This study aims to evaluate the COVID-19-related phobia of Chinese college students and examine the reliability and validity of this scale.
Methods: A total of 1689 Chinese college students participated in this study from April 27 to May 7, 2022. They finished the online questionnaire including demographic information and C19P–S. Cronbach's alpha and split-half reliability were used to examine the internal consistency of the scale. Confirmatory factor analysis was further used to examine the scale's construct validity. Convergence validity was also confirmed.
Results: This scale in Chinese had high reliability and validity. The Cronbach's alpha and split-half reliability of the total scale were 0.960 and 0.935, respectively. The construct validity-related indicators of the total scale met the standards (RMSEA = 0.064, IFI = 0.907, TLI = 0.906, and CFI = 0.907). Regarding the subscales, the composite reliability (CR) and average variance extracted (AVE) also met the cutoff values (CR > 0.7 and AVE >0.5). Comparison between gender groups showed that total and subscale scores between male and female students differed significantly.
Conclusion: The Chinese version of the C19P–S was appropriate for evaluating phobic symptoms among Chinese college students. Therefore, this tool could be used to evaluate the mental health of college students in the future.

1. Introduction

With the first reported COVID-19 case in Wuhan, Hubei, China was reported to be the first country in the world to be affected by the virus [1,2]. This public health emergency has endangered people's health [3]. As of July 2022, the cumulative number of confirmed COVID-19 cases in China had reached around 900 thousand, and the number of confirmed COVID-19 deaths was more than 5 thousand [4]. The COVID-19 pandemic has affected China's social and economic development to varying degrees, inconveniencing international exchanges and cooperation [5]. To fight against the pandemic, the Chinese government implemented strict control measures [6], and effectively controlled the outbreak in late February 2020 [7]. Despite the virus not being wholly eradicated, China has gradually promoted the resumption of labor and production [8].

After the first wave of the pandemic, the COVID-19 situation in China remained stable for a long time. However, the pandemic in China became severe again in early March 2022, with an increasing number of newly confirmed cases daily, which continued for almost a month and was controlled until late May 2022 [9]. Repeated outbreaks could result not only in challenges to the economy and social work but also bring a wide range of effects on people's psychological health [10–12]. Today, the situation in other countries is still very serious, and the risk of being infected by the virus persists.

As a serious public health emergency, COVID-19 is considered to possibly affect mental health significantly. Numerous studies showed that many Chinese people have experienced varying degrees of anxiety, depression, stress, and post-traumatic stress disorder symptoms following the outbreak [13,14], especially in vulnerable groups (e.g.: health workers and older adults). Studies showed that Chinese medical personnel experienced poorer sleep quality and significantly more negative emotions during this pandemic [15], and the most of elderly also experienced negative emotions [16]. In addition to its psychological effect on the population, the COVID-19 outbreak has also resulted in a series of social issues such as discrimination, stigma, and social isolation [17,18].

College students are in the transition stage from adolescence to adulthood [19,20], and the majority of mental health issues peak during young adulthood [21]. Their immature physical and mental development is a high-probability prone to mental health problems [22]. During the COVID-19 pandemic, studies also pointed out that they were a large vulnerable group in society and were susceptible to the pandemic [23,24]. For example, COVID-19 prevention and control measures such as delayed school start, online study, and closure have significantly affected students' lives and studies [25]. The sudden, contagious, widespread, and dangerous COVID-19 outbreak has seriously disrupted the lives and study plans of college students, resulting in a series of psychological problems, such as anxiety, depression, fear, and stress [26–29]. Being in close contact with those infected by COVID-19, excessive use of social media, low levels of social support, and pre-existing mental health problems were risk factors for psychological problems among college students [30–32]. Fear and insomnia have also been common among college students during the COVID-19 pandemic [33]. College students play a key role in the economic development of future society, and the college years are a special and crucial period to improve the identification and treatment of psychological problems [34]. Therefore, the mental health of college students during the pandemic deserves more attention [35].

"Fear" refers to an unpleasant subjective experience that occurs when an individual is exposed to a life-threatening event [36]. When this fear significantly affects a person's ability to live a normal life, we refer to it as "phobia" [37]. Any pandemic of a new infectious disease is likely to drive fear; and COVID-19 is no exception [38,39]. However, persistent fear can negatively affect an individual's mental health, decreasing quality of life and even increasing indirect mortality from the disease [40,41]. A study of Chinese university students showed that more than half of them experienced fear symptoms during the COVID-19 pandemic [42]. COVID-19-related fear or phobia could exacerbate levels of depression, anxiety, and stress among university students [43].

To evaluate COVID-19-related fears, Arpaci et al. developed the English version of the COVID-19 Phobia Scale (C19P–S) in 2020, a 20-item scale with psychological, psycho-somatic, social, and economic dimensions [44]. Its initial psychometric properties were tested. The C19P–S has been translated into several languages and tested, such as Korean [45] and Portuguese [46]. The results of these studies indicated that the scale has good reliability and validity. However, to date, there is no appropriate scale to measure COVID-19 phobia in China among college students, let alone the clarification of the reliability and validity of the Chinese version of the C19P–S.

Given the large vulnerable characteristics of Chinese college students and the highly active internet users with high social needs [47], the subject of this study is positioned in the group of Chinese college students. To fill up the gap on the validation of the C19P–S in China, this study aims to translate the C19P–S into a Chinese version and examine its reliability and validity among Chinese college students, with the results serving as a basis for providing psychological support to college students.

2. Methods

2.1. Study design and participants

We collected data from the respondents using an anonymous questionnaire. Snowball sampling was used to recruit the participants. An online questionnaire created from an online platform (Wenjuan.com) was distributed among Chinese college students through WeChat. The survey began on April 27, 2022, and ended on May 7, 2022, with 1689 participants.

2.2. Measurement

C19P–S: The Chinese version of the C19P–S was used to evaluate the fear of COVID-19 among college students [44]. The 20-item scale was divided into four dimensions namely psychological (items gauging the degree to which one experiences social anxiety),

psychosomatic (items relating to the physical symptoms of coronavirus phobia), economic (items relating to hoarding behaviors caused by excessive fear of running out of supplies), and social (items relating to the extent to which one experiences social anxiety) [48]. The scale is similar to a 5-point Likert scale, with ratings from 1 = strongly disagree to 5 = strongly agree, with total scores ranging from 20 to 100, and higher scores indicating more severe phobia.

2.3. Ethical considerations

All the participants provided informed consent for inclusion in the study. This study was approved by the Shandong University Institutional Ethics Committee (task no. LL20220425).

2.4. Statistical analysis

Descriptive analyses, Chi-square test, and ANOVA test were conducted to explore the characteristics and distribution differences between male and female students. A *p*-value < 0.001 denotes statistical significance. Critical indicators of the quality of a measuring instrument are reliability and validity [49]. Depending on the type of questionnaire, some validity tests are mandatory to apply (such as the reliability internal consistency, construct validity or construct convergent validity) [50]. In this study, internal consistency reliability, construct validity, and convergent validity were chosen to verify the quality of the C19P–S. All analyses were performed using the Statistical Package for Social Sciences (SPSS, IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. IBM Corp., Armonk, NY, USA).

2.4.1. Reliability
The reliability of the Chinese version of the COVID-19 Phobia Scale was tested using Cronbach's alpha (α > 0.8) [51] and split-half reliability (> 0.85) [52], indicating good internal consistency of the scale. Cronbach's alpha was conducted first, while the Spearman-Brown formula was then used to analyze the split-half reliability to compare with Cronbach's alpha; both of which met the criteria to indicate good reliability of the scale [53].

2.4.2. Construct validity
Then, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test were used to test the suitability of the data for factor analysis. We used a KMO of ≥0.8 and a significant Bartlett's test p-value <0.05, as empirical evidence of a sufficiently large sample size for factor analysis [54,55].

Since C19P–S is a four-factor scale, a confirmatory factor analysis (CFA) was used to investigate its construct validity by the factor structure model [56]. CFA is a widely used method for confirming the number of factors in a scale, which could test how well the data fit the proposed model [57]. Multiple criteria including χ^2/df < 3.00, root mean square error of approximation (RMSEA) < 0.08, incremental fit index (IFI) > 0.900, Tucker-Lewis index (TLI) > 0.900, and comparative fit index (CFI) > 0.900 were indicated a reasonable fit [58].

2.4.3. Convergent validity
Finally, to test the correlation between the four factors of the C19P–S, the average variance extracted (AVE) and composite reliability (CR) were used to evaluate the convergent validity of the scale when AVE > 0.5 and CR > 0.7, indicating that the convergent validity of the scale is acceptable [59]. The advantage of AVE is that it could help the researchers to take measurement error in variables into account [60], while CR could provide a less biased estimate of reliability than Cronbach's alpha [61].

3. Results

3.1. Characteristics of participants (N = 1689)

Table 1 shows the demographic characteristics of these participants. The majority of them were between 19 and 22 years old, with

Table 1
Descriptive statistics of participants.

Characteristics	Categories	Total	Male	Female	*p value*
		N (%)	N (%)	N (%)	
Age (years old)	≤18	267 (21.1)	149 (20.8)	218 (22.5)	0.210
	19–22	1011 (59.9)	447 (62.3)	564 (58.1)	
	≥23	311 (18.4)	122 (17.0)	189 (19.5)	
Residential area	City	1522 (90.1)	653 (90.9)	869 (89.5)	0.323
	Rural	167 (9.9)	65 (9.1)	102 (10.5)	
Educational level	First and second-year undergraduate	537 (31.8)	241 (33.7)	295 (30.4)	0.002
	Third and fourth-year undergraduate	646 (38.2)	294 (40.9)	352 (36.3)	
	Master and others	506 (30.0)	182 (25.3)	324 (33.4)	

971 (57.5%) women and 718 (42.5%) men. Moreover, over 90.0% (1522) of students were living in the city at the time of the survey, and 70.0% (1183) of students were studying undergraduate programs. The male and female college students differed significantly in terms of residential location ($p < 0.001$) and educational level ($p = 0.002$).

3.2. Reliability

Results of statistics and reliability tests for the total and four-dimensional scores of the Chinese version C19P–S are displayed in Table 2. In this study, the α of all the 20 items was 0.960, and the split-half reliability was 0.935, both of which were higher than the standard value of 0.8. Additionally, the α for each subscale was above 0.8.

3.3. Validity

3.3.1. Construct validity
In this study, KMO = 0.967, and Bartlett's test significance level was $p < 0.001$. Multiple criteria in the CFA analysis showed a good fit to the four-factor structural model [58], RMSEA = 0.064, IFI = 0.907, TLI = 0.906, and CFI = 0.907 (Fig. 1).

3.3.2. Convergent validity
Table 3 shows that the CR and AVE values were conducted to examine the convergent validity of the psychological, psychosomatic, social, and economic subscales. All four subscales met the standard AVE >0.50 and CR > 0.70 [50]. The Chinese version C19P–S further demonstrated convergent validity. The results also find the values of the standardized factor loadings and residuals; the social dimensional subscale has one question with a factor loading less than 0.5, and the rest of the entries are greater than 0.5.

3.4. Group comparisons

One-way ANOVA between male and female students on the total score and the scores of each of the four dimensions of the C19P–S were also conducted (Table 4). Females scored lower than males on both the total score (53.3 ± 18.7 VS. 60.1 ± 22.4) and the scores of each of the four dimensions. The dimension with the largest difference in scores was the psycho-somatic dimension. Moreover, there were significant differences between male and female students in both the total and individual scores for the four dimensions ($p < 0.001$).

4. Discussion

This study investigated the validation of the Chinese version of C19P–S among college students in terms of Cronbach's alpha, split-half reliability, structural validity, and convergent validity. The results showed that it was appropriate for evaluating phobic symptoms among Chinese college students. Under the second outbreak waver, this study is the first to examine its reliability and validity of the C19P–S in a Chinese population and supplements the previous research topics. This may provide a basis in the literature for future researches of COVID-19 phobia in China.

The scale had good internal consistency reliability, which was consistent with previous studies [46,62,63]. Cronbach's alpha and split-half reliability were both used in this study to verify the reliability of the C19P–S. Most of the previous studies used only Cronbach's alpha as a reliability test [46,62,63], this study added a split-half reliability test, which could strengthen the stability of our results. The Cronbach alpha for the overall scale was 0.926 for the original scale [44]. The results of our study were slightly better at 0.960. Cronbach's alpha for each subscale was lower than the original scale but higher than the Japanese (0.90) and Arabic (0.92) versions [63,64]. Additionally, the split-half reliability of the questionnaire was 0.935.

Besides KMO and Bartlett's tests, CFA in this study also confirmed that the four-factor structure of the model was appropriate. Regarding the correlation of the four factors, the results of our study were consistent with the original scale in that the strongest relationships were found between the psychological and social factors [44], but inconsistent with the Korean and English version of the scale [45,48]. Such differences could be explained by using different data analysis models or methods on the test of the validity of scales, like Rasch Analysis (RA) [65–67]. However, RA contains complex mathematical models and statistical concepts that are very difficult for non-mathematicians, and it requires a large number of observations to estimate the model parameters [68–70]. The advantage of CFA used in this study is that it could disprove the models or hypotheses effectively, yet the, results may also indicate

Table 2
Descriptive statistics and reliability analysis of 4 dimensions and total scores.

	Mean	SD	Skewness	Kurtosis	α	Split-Half
Total 20 items	56.20	20.631	0.360	−0.718	0.960	0.935
Psychological	18.90	6.256	−0.063	−0.793	0.869	0.848
Psycho-Somatic	10.77	6.466	0.858	−0.648	0.952	0.887
Economic	12.23	4.488	−0.079	−0.879	0.854	0.791
Social	14.30	5.480	0.188	−0.857	0.854	0.830

*SD: Standard Deviation.
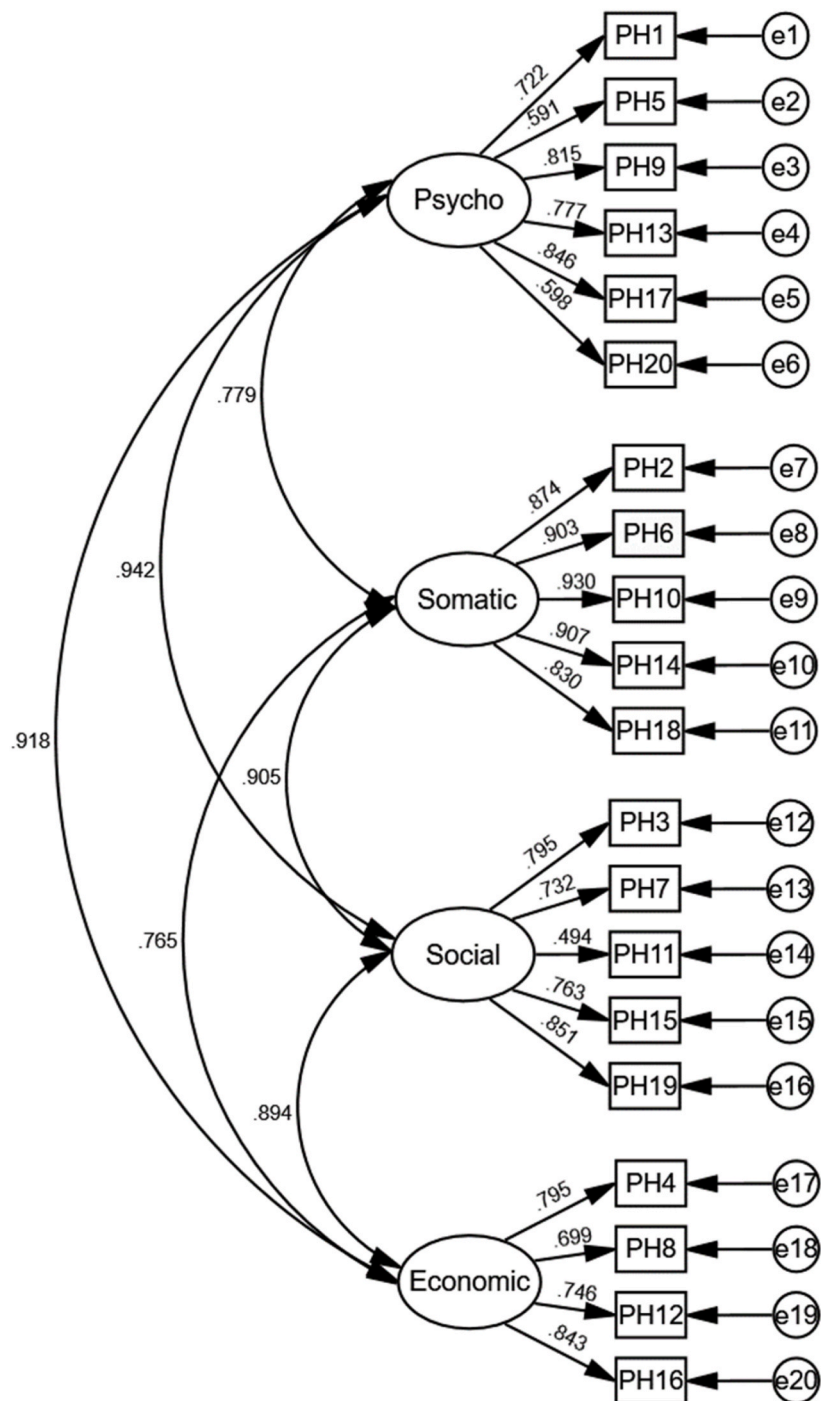
Fig. 1. The measurement model.

Table 3
CR and AVE Values for the four subscales.

Dimension	Items	Standardized factor loading	Residual	CR	AVE
Psychological	Psy1	0.722	0.479	0.872	0.535
	Psy2	0.591	0.651		
	Psy3	0.815	0.336		
	Psy4	0.846	0.284		
	Psy5	0.777	0.396		
	Psy6	0.598	0.642		
Psycho-Somatic	Som1	0.874	0.236	0.950	0.791
	Som2	0.903	0.185		
	Som3	0.930	0.135		
	Som4	0.907	0.177		
	Som5	0.830	0.311		
Economic	Eco1	0.795	0.368	0.855	0.597
	Eco2	0.699	0.511		
	Eco3	0.746	0.443		
	Eco4	0.843	0.289		
Social	Soc1	0.795	0.368	0.853	0.544
	Soc2	0.732	0.464		
	Soc3	0.494	0.756		
	Soc4	0.763	0.418		
	Soc5	0.851	0.276		

Table 4
Comparison between groups by gender.

Score	Male(n = 718) Mean (SD)	Female(n = 971) Mean (SD)	p value
Total score	60.1 ± 22.4	53.3 ± 18.7	< 0.001
Psychological	19.5 ± 6.6	18.4 ± 5.9	< 0.001
Psycho-Somatic	12.7 ± 7.0	9.4 ± 5.7	< 0.001
Economic	12.7 ± 4.7	11.9 ± 4.3	< 0.001
Social	15.3 ± 5.8	13.6 ± 5.1	< 0.001

potential adjustments that should be studied further in the following analyses [71].

In the convergent validity test, the CR and AVE values for all four subscales indicated that the items in each subscale could effectively evaluate the content of interest, and the four factors were independent of each other. The results of the study showed that the third question in the social dimension, "Following COVID-19, I have noticed that I spend extensive periods cleaning my hands," had a standardized factor loading of less than 0.5. This is attributable to the fact that college students are not able to make physical contact with others easily following the strict social distancing policy [72]. Consequently, they do not wash their hands very often. Additionally, COVID-19 mainly spreads through coughing, sneezing, and respiratory droplets or aerosols [73]. However, students performed well in adopting preventive measures such as disinfection.

The comparison between genders among these Chinese college students showed that female students were less afraid than male students. Previous surveys of fear of COVID-19 among university students in Kazakhstan and Spain showed that female students were more likely to experience fear symptoms [74,75]. Some general population studies also showed that females had higher levels of fear [76,77], however, the differences between genders in this study were significant in both the total score and the subscales, which was inconsistent with most previous studies [66,78,79]. Ahorsu et al. indicated that COVID-19-driven fear did not differ between sexes [39]. The inconsistency between our findings and those of other studies was attributable to the fact that Chinese female college students had higher levels of knowledge and practice on COVID-19 than male students [80,81]. The higher the level of knowledge about COVID-19, the less likely they are to develop negative emotions, such as stress and fear [82].

This study also has some limitations. First, due to the pandemic of COVID-19, the online method we used in this study may cause bias in sampling. Some students who did not have access to the internet or missed the data collection period were unable to participate in the survey. Second, the survey population was limited to the college student group. Because this group has a high level of social media use and receives a wide variety of information, there may be differences in the level of COVID-19-driven fear among the general population. Future studies should be conducted with other sample sizes and diverse backgrounds, including various age groups, to eliminate this limitation and generalize the findings into broader contexts. Third, our survey was conducted in 2022, the second peak of the pandemic in China. Two years had passed since the first detection of the COVID-19 pandemic. This study may have a certain time lag compared with the studies conducted in 2020 and 2021, which may have resulted in differences in the study results.

5. Conclusion

This study is the first to use the C19P–S to evaluate the level of COVID-19-driven fear among Chinese college students. The C19P-S

had good reliability and validity in this study. Although the results of this study differ from those of previous studies, it could provide a method and basis for psychological assistance and crisis interventions for college students. Future research should attempt to extend this tool to other populations to obtain wider applications.

Declarations

Data availability statement

Data will be made available on request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

Abbreviations

C19P–S   COVID-19 Phobia Scale
CFA   Confirmatory factor analysis
KMO   Kaiser-Meyer-Olkin
RMSEA   Root mean square error of approximation
IFI   Incremental fit index
TLI   Tucker-Lewis index
CFI   Comparative fit index
AVE   Average variance extracted
CR   Composite reliability
SD   Standard Deviation

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