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Development and Preliminary Validation of the College Students' Coping with Public Health Crisis Scale in Chinese College Students

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Abstract

The authors of this study aimed to develop and validate the College Students' Coping with Public Health Crisis Scale (CSPHCS) among Chinese students, designed to assess coping strategies used during public health crises. This study had a rigorous, three-phase process comprising item development, scale development, and scale evaluation. Within these phases, a total of nine systematic steps were implemented. A total of 548 questionnaires were distributed, with 525 valid responses retained. A random subsample of 300 participants was used for exploratory factor analysis, and the remaining 225 were reserved for confirmatory factor analysis. The exploratory factor analysis revealed a three-factor structure after removing items with high cross-loadings. These factors were identified as (1) Information and Mental Health Support Coping, (2) Communication and Preventive Action Coping, and (3) Self-Regulatory and Expressive Coping, accounting for 50.14% of the total variance. The confirmatory factor analysis supported the three-factor model with acceptable fit indices (CFI = 0.887; TLI = 0.892; RMSEA = 0.077). The scale showed good reliability (α = 0.763, ω = 0.745). To sum up, the CSPHCS is shown to be a psychometrically sound instrument with implications for research and practice in understanding how college students cope with public health crises.

Keywords: coping; public health crisis; college students; scale development; psychometric validation

1. Introduction

Public health crises refer to sudden events that cause or may cause serious harm to the health of the general public, including major infectious disease outbreaks, mass unexplained illnesses, significant food and occupational poisoning, and other events that seriously affect public health (China CDC, 2018). Those crises, such as pandemics and natural disasters, pose significant challenges to the resilience and well-being of populations worldwide. College students are a vulnerable group that may be disproportionately affected by these crises (Wang et al., 2025). The COVID-19 pandemic, for example, led to widespread disruptions in higher education, resulting in increased stress, anxiety, and uncertainty among college students (Elharake et al., 2023). Furthermore, public health crises can disrupt academic routines (Lalin et al., 2024), leading to decreased academic performance and increased stress. Coping strategies during these times are essential predictors of psychological adjustment and academic performance (Luo & Mohammed, 2023), as they

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can help mitigate the negative effects of public health crises on mental health and educational outcomes (Y. Zhang et al., 2022). For example, a previous study showed that Polish students most frequently employed strategies such as acceptance, planning, and seeking emotional support (Babicka-Wirkus et al., 2021). Similarly, another study identified that while maladaptive coping moderated the relationship between COVID-19-related stress and anxiety, it did not have the same effect on the relationship with depression (Reid et al., 2024). In addition, neither adaptive coping nor social support moderated these relationships among international students at a university in the United States. A study conducted in China further illustrated that an active coping style and strong family support acted as protective factors, whereas a passive coping style tended to exacerbate psychological problems among participants (Huang et al., 2021). Despite these findings, the current literature on coping strategies has notable limitations. Many studies have utilized generic coping scales that are not specifically designed for public health crises, potentially overlooking the unique challenges and stressors associated with such events. Furthermore, only a few studies have developed and validated coping scales specifically for college students, a population that may have distinct coping needs compared to other groups. Finally, many of the coping measures in use were developed over 30 years ago, meaning they may not capture important contemporary coping strategies (Hollas et al., 2022).

A growing number of studies have contributed to measuring coping strategies in response to public health crises, each offering distinct perspectives and methodologies. For instance, A. Zhang et al. (2021) developed a public health emergency coping capacity measurement scale in China. This instrument consists of 12 items that capture four dimensions of coping capacity, providing a structured overview of how individuals manage and adapt to public health threats. The scale's design emphasizes a multidimensional view of coping, considering various aspects of an individual's response to crises. In parallel, Burro et al. (2021) introduced the Robust Pandemic Coping Scale (R-PCS), a novel measure specifically designed to assess coping strategies during epidemics and pandemics. The R-PCS is grounded in a theoretical framework that categorizes coping strategies based on the fundamental human needs for competence, relatedness, and autonomy. This approach not only evaluates the effectiveness of coping mechanisms but also contextualizes them within the broader spectrum of psychological needs, providing a nuanced interpretation of individuals' adaptation processes during public health emergencies. Another contribution comes from Şahi and Okan (2024), who developed a scale aimed at examining post-disaster coping motivations in Turkey following the earthquake. While this scale was created for a disaster context rather than a public health crisis, it offers valuable insights into coping strategies in the aftermath of significant traumatic events. The developers of this scale explore the motivations behind coping strategies, shedding light on how individuals mobilize internal and external resources when faced with the challenges of recovery and adjustment.

The rationale for developing and validating the College Students' Coping with Public Health Crisis Scale (CSPHCS) is grounded in the unique challenges faced by college students during public health emergencies. As a population in a critical developmental stage, college students are particularly susceptible to the academic disruption, psychological distress, social instability, and uncertainty associated with public health crises (Worsley et al., 2022). Their responses to such events may also be shaped by characteristics specific to university life, including reliance on peer networks, digital information, and campus-based support systems. Coping strategies are important predictors of psychological adjustment, health-related behaviors, and academic functioning (Vizoso et al., 2018). However, despite the availability of some measures developed for disaster or public health contexts, there remains a lack of instruments specifically designed to assess coping strategies among college students in these situations. To address this gap, the present study aimed to systematically

develop and validate the CSPHCS, a theoretically grounded instrument intended to capture the specific coping strategies and challenges experienced by college students during public health crises.

2. Aims

The present study aimed to report the process of development and validation of the College Students' Coping with Public Health Crisis Scale.

3. Methods

This study followed established best practices for scale development and validation in the health and social sciences (Boateng et al., 2018). It was designed as a multi-phase investigation consisting of three distinct phases.

3.1. Phase 1: Item Development

3.1.1. Step 1: Conceptualization and Item Generation

A literature review was conducted to identify prevalent coping strategies among college students during public health crises, with particular attention to academic, psychological, and environmental stressors such as natural disasters, pandemics, and personal emergencies reported in the past 10 years. The review was conducted in accordance with the PRISMA statement. It involved searches of seven databases, including PubMed, CINAHL Complete, EMBASE, Web of Science, PsycArticles, China National Knowledge Infrastructure, and Wanfang Data, for primary studies published in English or Chinese between 1 January 2015 and 6 November 2024. Studies using unvalidated tools or measures with fewer than five items were excluded. A total of 41 studies were included, and 27 validated scales were identified. This review examined empirical studies on coping and stress during public health crises, theoretical frameworks of coping, and existing measurement tools for stress and coping in young adult populations.

Guided by Lazarus and Folkman's stress and coping theory (Lazarus & Folkman, 1984), which differentiates between problem-focused and emotion-focused strategies, and by considering the role of social support (from family, classmates, and the college), we developed an initial pool of items to capture a broad spectrum of coping strategies. Based on both the literature review and the theoretical framework, a list of 31 items was generated to represent a comprehensive range of strategies employed by college students during crises. Each item was phrased as a statement describing a specific coping behavior, with responses measured on a 5-point Likert scale ranging from 1 (never) to 5 (always).

3.1.2. Step 2: Expert Review and Individual Interviews

The primary author initially contacted 12 potential experts via email; nine agreed to participate. Experts were selected based on the following inclusion criteria: (1) possession of a doctoral degree or equivalent expertise in a relevant discipline (e.g., public health, psychology, or nursing), (2) a track record of peer-reviewed publications related to stress, coping, or scale development, and (3) experience in scale development or validation. Individuals were excluded if they lacked experience in instrument development.

The final panel consisted of nine experts with disciplinary backgrounds in psychology ($n = 3$), nursing ($n = 2$), public health ($n = 3$), and education science ($n = 1$), with a mean age of 39.4 years (SD = 4.3). All the experts had prior experience in scale development and validation. Each expert received a detailed overview of the study's objectives along with the initial pool of scale items, and they were asked to independently evaluate each item for relevance, clarity, and theoretical alignment with the stress and coping framework using a 4-point Likert scale. Additionally, they were invited to offer qualitative feedback.

Quantitative evaluations followed established procedures, including the Content Validity Ratio (CVR) and the Content Validity Index (CVI) (Madadizadeh & Bahariniya, 2023). CVR values were calculated to assess the degree of consensus among experts regarding the essentiality of each item. Items with CVR values below Lawshe's minimum acceptable threshold were either revised or removed. In addition, the item-level CVI (I-CVI) and scale-level CVI (S-CVI) were computed to further evaluate content validity.

During the expert review process, several items were removed to improve the conceptual clarity and specificity of the scale. For example, the item "During the public health crisis, I search for information from multiple online sources" was deleted because its content overlapped substantially with retained items assessing information-seeking from official or university-related sources. The item "During the public health crisis, I try to handle the situation in my own way" was removed because the wording was too broad and insufficiently specific to reflect a clearly defined coping behavior in the context of public health crises. Similarly, "During the public health crisis, I participate in public welfare or volunteer activities" was deleted because it was judged to reflect social participation rather than coping behavior per se, while "During the public health crisis, I encourage others to remain calm" was excluded because it focused primarily on others' responses rather than the respondent's own coping strategy. In addition, six items were reworded to enhance clarity and theoretical coherence. For instance, vague phrases such as "handle it in my own way" were replaced with more specific descriptions such as "use personal routines to manage stress."

Following this refinement, 22 items were retained for subsequent stages of development. The I-CVI values ranged from 0.82 to 1.00, and the S-CVI based on universal agreement was 0.73, indicating acceptable content validity. Item descriptions were also further refined to improve contextual and theoretical precision.

Example items reflecting coping strategies during public health crises include:

1. During the public health crisis, I discuss my feelings and concerns with friends or family.
2. During the public health crisis, I seek support from mental health professionals.
3. During the public health crisis, I seek information about the crisis to reduce uncertainty.
4. I seek information about the public health crisis from the university health center or student health service center.
5. I discuss the public health crisis with friends and classmates.

To assess cognitive validity, the preliminary version of the scale was purposely administered to 10 college students using cognitive interviewing techniques (Balza et al., 2022). Inclusion criteria for participants were: (1) full-time enrollment in an undergraduate program, and (2) current academic standing as a sophomore, junior, or senior. First-year students were excluded to ensure that participants had sufficient exposure to college-related stressors relevant to the scale's context. During the interviews, participants were prompted to articulate their thought processes while responding to each item, thereby facilitating the identification of issues such as ambiguous wording, interpretive inconsistencies, and potential misalignment with the intended constructs.

The 10 participating college students had a mean age of 20.3 years (SD = 1.3), three identified as female, and all were junior-level students. During the cognitive interviews, students' feedback contributed directly to improving item clarity, cultural relevance, and conceptual alignment. For example, broad expressions such as "take different approaches to managing stress and anxiety" were retained only after adding concrete examples, such as sports activities and online resources, to make the item easier for students to interpret consistently. Similarly, the item on monitoring health status was refined by including

examples such as checking body temperature, symptoms, or using mobile applications, which better reflected the forms of self-monitoring commonly used by college students during public health crises. Students also indicated that items related to information-seeking needed to distinguish between general online information use and more reliable or institution-based sources. As a result, separate items were retained for seeking information from university health services, using social media, and paying attention to official or reliable public health guidance, thereby improving conceptual precision. In addition, expressive coping items were clarified by specifying forms such as writing diaries, painting, and music, which helped ensure that the item captured concrete self-regulatory behaviors rather than vague emotional expression. These revisions strengthened the interpretability and contextual relevance of the scale for the target population. This iterative refinement process resulted in a final set of 20 items that demonstrated both theoretical coherence and contextual appropriateness for use among college students during public health crises.

3.1.3. Step 3: Pilot Testing for Readability and Initial Reliability

A preliminary pilot study was conducted with a convenience sample of 15 college students who met the same inclusion and exclusion criteria used in the cognitive interview phase. The purpose was to evaluate item readability and comprehension. Participants were asked to review each item and provide feedback on its clarity, relevance, and interpretability.

The mean age of the 15 participating college students was 21.6 years (SD = 2.3), with 8 identifying as female. The majority of participants were junior (and senior) students, comprising 79% of the sample. Qualitative feedback indicated that all items were generally well-understood and appropriate within the context of public health crises. Consequently, no major modifications or deletions were required. However, based on participant suggestions, a brief description of the term "public health crisis" along with relevant examples (e.g., pandemics, natural disasters) was added to enhance clarity. On average, students completed the scale in approximately 10~12 min.

3.2. Phase 2: Scale Development

Step 4: Exploratory Factor Analysis

A bulletin detailing the survey study was disseminated through social networking applications, and data collection was conducted online via the WJX.com platform from 8 February 2025 to 1 May 2025. A larger sample of college students, selected according to the predefined inclusion and exclusion criteria, was recruited for the initial field test. The collected survey data were divided into two subsets: one subset was used for Exploratory Factor Analysis (EFA), while the other was reserved for Confirmatory Factor Analysis (CFA).

Data analysis was carried out using SPSS 23 for Windows (SPSS Inc., Chicago, IL, USA). The suitability of conducting factor analysis was confirmed through the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Principal Component Analysis (PCA) was applied to the 20 items to extract the primary factors, with varimax rotation employed to assess the relationships between items and their respective factors. Factors with eigenvalues exceeding 1 were further examined, and factor loadings greater than 0.40 were deemed significant. Items were systematically removed according to predefined criteria, and the EFA model was recalibrated after each deletion, leading to a reduction in the number of items (Schreiber, 2021).

3.3. Phase 3: Scale Evaluation

3.3.1. Step 5: Confirmatory Factor Analysis

The refined scale was administered to a separate subset of the college student sample to validate the factor structure identified through EFA. CFA was conducted to assess the adequacy of the proposed three-factor model. Model fit was evaluated using multiple goodness-of-fit indices (Gallagher & Brown, 2013), including the Tucker–Lewis Index (TLI). Absolute fit indices included the Goodness-of-Fit Index (GFI), the Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA). Relative fit was assessed using the Comparative Fit Index (CFI), the Tucker–Lewis Index (TLI), and the chi-square to degrees of freedom ratio (χ^2/df).

3.3.2. Step 6: Reliability Assessment

The reliability of the CSPHCS was assessed using internal consistency estimates, specifically Cronbach's alpha and McDonald's omega (ω) (Kalkbrenner, 2023), calculated for each subscale as well as for the overall scale.

4. Results

4.1. General Results

A total of 548 questionnaires were distributed, and after checks for completeness and validity, 525 were retained. A random subsample of 300 cases was selected to conduct the EFA, with the remaining 225 cases reserved for subsequent CFA. Frequency distributions appear in Table 1, with item-level descriptive statistics (means, standard deviations) provided in Table 2.

Table 1. Distribution of each item.

	Items	No	Rarely	Sometimes	Often	Always
1.	During the public health crisis, I take different approaches to managing stress and anxiety (such as sports activities, online resources, etc.).	6 (1.1)	22 (4.2)	118 (22.5)	305 (58.1)	74 (14.1)
2.	During the public health crisis, I discuss my feelings and concerns with friends or family.	6 (1.1)	45 (8.6)	144 (27.4)	186 (35.4)	144 (27.4)
3.	During the public health crisis, I seek support from mental health professionals.	62 (11.8)	151 (28.8)	133 (25.3)	109 (20.8)	70 (13.3)
4.	During the public health crisis, I seek information about the crisis to reduce uncertainty.	5 (1.0)	25 (4.8)	112 (21.3)	251 (47.8)	132 (25.1)
5.	I seek information about the public health crisis from the university health center or student health service center.	74 (14.1)	108 (20.6)	122 (23.2)	158 (30.1)	63 (12.0)
6.	I discuss the public health crisis with friends and classmates.	10 (1.9)	39 (7.4)	142 (27.0)	197 (37.5)	137 (26.1)
7.	I use social media to learn about the public health crisis.	4 (0.8)	18 (3.4)	90 (17.1)	198 (37.7)	215 (41.0)
8.	During the public health crisis, I participate in activities that brought me joy and relaxation.	21 (4.0)	69 (13.1)	171 (32.6)	177 (33.7)	87 (16.6)
9.	During the public health crisis, I support and help others.	5 (1.0)	66 (12.6)	162 (30.9)	183 (34.9)	109 (20.8)
10.	During the public health crisis, I pay attention to public health information and guidelines released by official or reliable sources.	3 (0.6)	21 (4.0)	76 (14.5)	195 (37.1)	230 (43.8)
11.	During the public health crisis, I monitor and track my physical and mental health status (including using mobile applications to check body temperature, symptoms, etc.).	17 (3.2)	52 (9.9)	114 (21.7)	212 (40.4)	130 (24.8)

Table 1. *Cont.*

	Items	No	Rarely	Sometimes	Often	Always
12.	During the public health crisis, I participate in online or offline mental health lectures or seminars.	79 (15.0)	164 (31.2)	121 (23.0)	107 (20.4)	54 (10.3)
13.	During the public health crisis, I assess my mental health status and take appropriate measures.	34 (6.5)	94 (17.9)	145 (27.6)	162 (30.9)	90 (17.1)
14.	During the public health crisis, I participate in crisis response training organized by the community or government.	63 (12.0)	103 (19.6)	150 (28.6)	137 (26.1)	72 (13.7)
15.	I access online forums or communities for public health crisis response to obtain information and support.	30 (5.7)	61 (11.6)	122 (23.2)	202 (38.5)	110 (21.0)
16.	During the public health crisis, I express my emotions and concerns through writing diaries, painting, music, and other means.	69 (13.1)	99 (18.9)	119 (22.7)	152 (29.0)	86 (16.4)
17.	During the public health crisis, I follow the advice of the public health department and took practical actions (such as wearing masks, maintaining social distancing, and washing hands frequently) to protect my own and others' health.	1 (0.2)	19 (3.6)	53 (10.1)	143 (27.2)	309 (58.9)
18.	I actively learn how to correctly use and dispose of personal protective equipment to reduce the risk of infection.	8 (1.5)	22 (4.2)	79 (15.0)	204 (38.9)	212 (40.4)
19.	During the public health crisis, I ensure that I have sufficient rest time and avoid overexertion.	4 (0.8)	32 (6.1)	106 (20.2)	237 (45.1)	146 (27.8)
20.	I share my coping strategies and experiences in the public health crisis with others.	19 (3.6)	91 (17.3)	140 (26.7)	189 (36.0)	86 (16.4)

Note. Frequencies with percentages were presented in this table.

Table 2. Descriptive statistics of each item.

Item	Mean	SD	Min	Max
1	3.798	0.772	1.000	5.000
2	3.794	0.977	1.000	5.000
3	2.950	1.225	1.000	5.000
4	3.914	0.857	1.000	5.000
5	3.053	1.245	1.000	5.000
6	3.785	0.977	1.000	5.000
7	4.147	0.876	1.000	5.000
8	3.457	1.041	1.000	5.000
9	3.619	0.981	1.000	5.000
10	4.196	0.870	1.000	5.000
11	3.735	1.041	1.000	5.000
12	2.796	1.221	1.000	5.000
13	3.343	1.148	1.000	5.000
14	3.099	1.216	1.000	5.000
15	3.573	1.114	1.000	5.000
16	3.166	1.279	1.000	5.000
17	4.410	0.828	1.000	5.000
18	4.124	0.919	1.000	5.000
19	3.931	0.888	1.000	5.000
20	3.442	1.068	1.000	5.000

4.2. EFA Results

The demographic analysis of the primary sample revealed that the participants were mainly female ($n = 165$), accounting for 55.0% of the sample. The mean age was 21.24 years (SD = 1.96), with an age range from 18 to 33 years. Preliminary tests indicated that the data were suitable for factor analysis. The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.846, and Bartlett's Test of Sphericity was significant (Approximate Chi-Square = 1311.020, df = 190, $p < 0.001$). During the initial EFA, problematic items were

identified due to cross-loadings; for example, items 14 ("During the public health crisis, I participate in crisis response training organized by the community or government."), item 9 ("During the public health crisis, I support and helped others."), and item 15 ("I access online forums or communities for public health crisis response to obtain information and support.") were deleted because of high cross-loadings. After removing these items, the EFA yielded a clear factor structure corresponding to the theoretically derived dimensions of coping. Four factors emerged after Varimax rotation, which together accounted for a cumulative variance of 50.14%. Although four factors had eigenvalues greater than 1, the scree plot (Figure 1) suggested a three-factor solution. After examining the conceptual similarities between Factor 3 and Factor 4 and consulting with our expert panel, we decided to retain three factors by merging these two, as they shared overlapping meanings and theoretical relevance. Table 3 shows the results of the factor load coefficient.

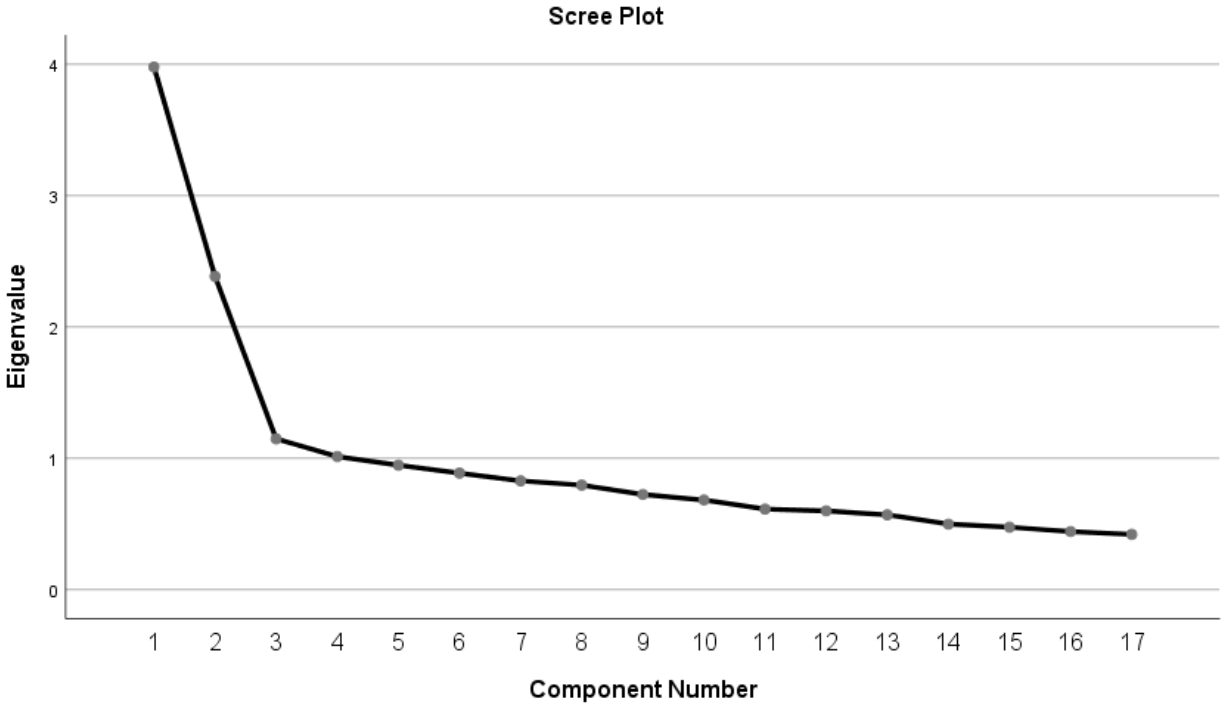


Figure 1. Scree plot.

Finally, our factor analysis identified a three-factor structure underlying coping strategies during public health crises. Each factor was named through a rigorous process of item review and theoretical reflection, ensuring alignment with the conceptual meanings of the associated items. Factor 1, "Information and Mental Health Support Coping", encompasses strategies aimed at enhancing crisis awareness and psychological adjustment. These include information-seeking, participation in mental health activities, consultation with professionals, and the sharing of personal experiences. Factor 2, "Communication and Preventive Action Coping", reflects self-protective and informed decision-making strategies. It includes engagement with authoritative information sources, interpersonal communication, adherence to public health recommendations, and proactive learning of protective skills. Factor 3, "Self-Regulatory and Expressive Coping", represents individual strategies focused on emotional regulation, expressive practices, rest, and engagement in pleasurable or restorative activities.

Table 3. Factor load coefficient after rotation.

Items	Component			
	1	**2**	**3**	**4**
12. During the public health crisis, I participate in online or offline mental health lectures or seminars.	0.776			
5. I seek information about the public health crisis from the university health center or student health service center.	0.729			
3. During the public health crisis, I seek support from mental health professionals.	0.713			
4. During the public health crisis, I seek information about the crisis to reduce uncertainty.	0.666			
13. During the public health crisis, I assess my mental health status and take appropriate measures.	0.631			
20. I share my coping strategies and experiences in the public health crisis with others.	0.557			
10. During the public health crisis, I pay attention to public health information and guidelines released by official or reliable sources.		0.715		
7. I use social media to learn about the public health crisis.		0.696		
6. I discuss the public health crisis with friends and classmates.		0.623		
17. During the public health crisis, I follow the advice of the public health department and took practical actions (such as wearing masks, maintaining social distancing, and washing hands frequently) to protect my own and others' health.		0.539		
2. During the public health crisis, I discuss my feelings and concerns with friends or family.		0.475		
18. I actively learn how to correctly use and dispose of personal protective equipment to reduce the risk of infection.		0.452		
1. During the public health crisis, I take different approaches to managing stress and anxiety (such as sports activities, online resources, etc.).			0.643	
16. During the public health crisis, I express my emotions and concerns through writing diaries, painting, music, and other means.			0.611	
11. During the public health crisis, I monitor and track my physical and mental health status (including using mobile applications to check body temperature, symptoms, etc.).			0.606	
19. During the public health crisis, I ensure that I have sufficient rest time and avoid overexertion.				0.800
8. During the public health crisis, I participate in activities that brought me joy and relaxation.				0.615

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

4.3. CFA Results

The demographic analysis of the CFA sample (n = 225) revealed that participants were predominantly female (n = 144, 64.0%), with a mean age of 21.09 years (SD = 2.05) and an age range of 16 to 32 years.

Table 4 shows the fitted results for CFA. The subsequent CFA confirmed the hypothesized factor structure, demonstrating acceptable fit to the data (CFI = 0.887; TLI = 0.892; RMSEA = 0.077).

Table 4. Model fit indices for the CFA.

Fit Index	Value	Acceptable Range	Interpretation
χ^2/df	2.89	2–5 (acceptable)	Acceptable
CFI	0.887	≥0.80–0.90 (acceptable), >0.90 (excellent)	Acceptable, close to excellent
TLI	0.892	≥0.80–0.90 (acceptable), >0.90 (excellent)	Acceptable, near excellent
GFI	0.911	≥0.90 (excellent)	Excellent
RMSEA	0.077	0.05–0.08 (acceptable), <0.05 (excellent)	Acceptable
SRMR	0.069	0.05–0.08 (acceptable), <0.05 (excellent)	Acceptable

Although the factor loadings of two items fell slightly below the preferred threshold (less than 0.5, though very close), a panel discussion confirmed their theoretical significance; therefore, these items were retained. The final model is presented in Table 5.

Table 5. Standardized factor loadings for the CFA model.

Factor	Item	Estimate	Std. Error	z-Value	*p*
Information and Mental Health Support Coping	12	0.883	0.051	17.426	<0.001
	5	0.862	0.052	16.483	<0.001
	3	0.912	0.050	18.067	<0.001
	13	0.678	0.050	13.516	<0.001
	20	0.552	0.048	11.540	<0.001
	4	**0.462**	0.041	13.920	<0.001
Communication and Preventive Action Coping	10	0.568	0.044	12.847	<0.001
	7	**0.440**	0.054	10.917	<0.001
	6	0.697	0.052	10.685	<0.001
	17	0.570	0.048	11.640	<0.001
	2	0.697	0.052	13.539	<0.001
	18	0.510	0.045	10.515	<0.001
Self-Regulatory and Expressive Coping	16	0.685	0.069	14.430	<0.001
	11	0.646	0.053	16.525	<0.001
	1	0.555	0.042	10.384	<0.001
	19	0.657	0.059	9.331	<0.001
	8	0.722	0.064	10.376	<0.001

4.4. Reliability

Reliability analysis demonstrated that the overall scale exhibited acceptable internal consistency, with a Cronbach's α of 0.763 and a coefficient ω of 0.745. The reliability statistics for each subscale are presented in Table 6.

Table 6. Reliability results.

Factor	Coefficient ω	Coefficient α
Information and Mental Health Support Coping	0.846	0.834
Communication and Preventive Action Coping	0.740	0.739
Self-Regulatory and Expressive Coping	0.783	0.751
Total	0.745	0.763

5. Discussion

The systematic development and rigorous validation process of the CSPHCS indicate that it is a reliable and valid instrument for assessing college students' coping strategies during public health crises. The three-phase process, organized into nine distinct steps, ensured that the scale is both theoretically grounded and empirically sound. In the initial phase, item development was guided by an extensive review of literature and by the core principles of coping theory.

The initial phase of item development was grounded in a literature review and theoretical framework, specifically Lazarus and Folkman's stress and coping theory. This theoretical underpinning ensured that the items generated were not only relevant but also

aligned with established coping strategies. The expert review process further enhanced the scale's content validity, as evidenced by high I-CVI values and an S-CVI indicating acceptable content validity. The iterative refinement of items based on expert feedback and cognitive interviews with students ensured that the final set of items accurately captured the coping strategies relevant to the target population. The qualitative feedback from both experts and students highlighted the importance of clarity and specificity in item wording. For instance, rephrasing vague items into more concrete statements improved the scale's usability and interpretability. This attention to detail is critical in ensuring that respondents can accurately reflect their coping strategies, thereby enhancing the reliability of the data collected.

The results of the EFA revealed a robust three-factor structure underlying the coping strategies employed by college students during public health crises. Although the initial exploratory factor analysis yielded four factors with eigenvalues greater than 1, the scree plot supported a three-factor solution. In addition, the fourth factor contained only two items, which may have limited its psychometric stability as an independent dimension. After considering the conceptual overlap between Factors 3 and 4 and consulting the expert panel, these factors were merged into a broader self-regulatory and expressive coping dimension. Nevertheless, the two items in the original fourth factor may reflect a potentially meaningful physical or activity-based aspect of coping. Future studies should consider developing additional items for this domain and testing a revised factor structure in an independent sample.

Factor 1: "Information and Mental Health Support Coping" includes items that reflect proactive strategies such as seeking help from university health services, consulting mental health professionals, and sharing coping strategies with others. This factor highlights the importance of utilizing formal institutional resources (Sulimani-Aidan, 2024) and adopting self-monitoring practices (Tlili et al., 2022), both of which are widely recognized as effective methods for managing stress and uncertainty. From a cultural perspective, this factor reflects several core features of Chinese society. Respect for authority and institutional trust, influenced by Confucian traditions (Hofstede, 2001), supports students' willingness to follow guidance from educational and governmental bodies. An emerging openness to mental health support, especially among younger populations, also signals a shift toward normalization of psychological care.

Factor 2: "Communication and Preventive Action Coping" encompasses both behavioral adherence to public health measures and interpersonal communication. It includes actions such as following public health guidelines (Schnell et al., 2022), accessing accurate information, and engaging in health-related discussions with peers (Bukowski et al., 2015). This factor integrates both problem-focused and emotion-focused coping approaches, consistent with theoretical models that emphasize the joint role of behavioral compliance and social connectedness. It also aligns with developmental psychology research showing that peer relationships play a vital role in the emotional and cognitive development of adolescents and young adults (Rudolph, 2021). Culturally, this factor embodies collective responsibility (Liu et al., 2024)and social harmony (Qi, 2018), where compliance with public health regulations (e.g., mask wearing, self-isolation) is seen as a moral duty to protect the broader community. Moreover, peer discussion and guanxi (关系) serve not only as emotional outlets but also as mechanisms for maintaining and strengthening interpersonal bonds, reinforcing the dual emotional and practical role of relationships in Chinese society.

Factor 3: "Self-Regulatory and Expressive Coping" captures individualized strategies focused on emotional expression and behavioral regulation, such as engaging in physical activity, journaling, or using music as a creative outlet. These strategies align with components of the Brief COPE Scale, particularly active coping, emotional processing, and

positive reinterpretation. Research supports the benefits of such approaches during crises. For instance, Hernandez-Ruiz (2022) found that music-based interventions significantly reduced anxiety among performing arts students, while Krause et al. (2020) observed that increased music listening during the early stages of the COVID-19 pandemic was positively correlated with life satisfaction, in contrast to passive media use, which had the opposite effect. From a cultural perspective, this factor reflects traditional values of emotional restraint and self-monitoring, where Confucian teachings encourage introspection and the moderation of emotional expression (Peng & Ishak, 2024). Activities such as journaling or tracking symptoms offer culturally congruent ways of processing emotions privately.

Together, these three factors provide a comprehensive and theoretically grounded framework for understanding the multifaceted coping strategies adopted by college students during public health crises. Importantly, they are also culturally resonant, reflecting coping practices commonly observed among Chinese students. The model highlights the dynamic interplay between problem-focused and emotion-focused approaches in fostering psychological resilience and well-being. The four identified factors accounted for 50.14% of the total variance, suggesting a meaningful representation of the underlying constructs. Additionally, the removal of items with high cross-loadings during the EFA process enhanced the clarity and interpretability of the factor structure, further supporting the scale's psychometric validity.

The CFA further validated the hypothesized factor structure, demonstrating acceptable fit indices. Although two items had factor loadings slightly below the preferred threshold, their retention was justified based on theoretical significance, highlighting the balance between statistical criteria and theoretical relevance in scale development.

5.1. Implications for Practice and Future Research

The CSPHCS provides a valuable tool for researchers and practitioners interested in understanding and supporting college students during public health crises. By identifying specific coping strategies, interventions can be tailored to enhance students' resilience and well-being. Furthermore, the scale can be utilized in longitudinal studies to assess changes in coping strategies over time, particularly in response to evolving public health challenges.

Future research should explore the applicability of the CSPHCS across diverse populations and settings, as well as its predictive validity with mental health outcomes. Additionally, qualitative studies could provide deeper insights into the contextual factors influencing coping strategies among college students.

5.2. Limitations

This study has several limitations. First, the sample consisted of a specific group of Chinese college students, which may limit the generalizability of the findings to other populations or to individuals outside academic settings. Second, the study relied on self-reported data, which may be subject to social desirability bias and recall bias. Third, the cross-sectional design captured coping strategies at a single point in time and therefore may not reflect changes in coping across different stages of a public health crisis or across different types of emergencies. Fourth, although a split-sample approach was used to conduct exploratory and confirmatory factor analyses, both subsamples were drawn from the same overall participant pool. This may limit the strength of the validation, as the factor structure was not confirmed in a fully independent sample. In addition, although established procedures for scale development and validation were applied, coping remains a subjective and context-dependent construct, and individual differences in interpreting item meanings may have influenced the results. Future studies should validate the scale

in independent samples, include more diverse populations, and consider longitudinal and qualitative approaches to better understand students' coping experiences during public health crises.

6. Conclusions

In conclusion, this study has developed and validated the CSPHCS, contributing to the literature on coping strategies in the context of public health crises. The scale's theoretical grounding, rigorous validation process, and demonstrated reliability make it a significant advancement in understanding how college students navigate stress during challenging times. As public health crises continue to impact student populations, the CSPHCS will serve as a critical resource for both research and practical applications aimed at fostering resilience and well-being among young adults. Implications for clinical practice include the potential for targeted interventions based on identified coping profiles. Future research can further examine the scale's utility across diverse populations and crisis types.

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