



## Research article

# Mental health status of Chinese residents and its associated factors in the aftermath of the COVID-19 pandemic: A cross-sectional study

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## ABSTRACT

**Background:** During the COVID-19 pandemic, numerous studies focused on mental health, but few considered both positive and negative aspects within the dual-factor model of psychological well-being. In China, a highly populous country, limited evidence exists regarding mental health and its associated factors following the surge and decline of COVID-19 cases after the loosening of COVID-19 control measures. This study aims to investigate the mental health status of Chinese residents in the aftermath of the pandemic and factors influencing positive and negative indicators using the System-Based Model of Stress.

**Methods:** A cross-sectional online survey of 1,026 participants was conducted in China from March 2–31, 2023, using quota sampling. Structural equation modeling (SEM) was performed to test the conceptual model, where social support, perceived susceptibility, perceived severity, pandemic-related events, coping style, and concern about COVID-19 were considered as predictors, and psychological distress and subjective well-being as outcomes.

**Results:** The results revealed high prevalence rates of psychological distress (23 %) with either of anxiety (15 %) or depression (20 %), and poor subjective well-being (23 %) among Chinese residents after the COVID-19 pandemic. Social support was negatively correlated with psychological distress, and negative coping style, pandemic-related events, and concern about COVID-19 were positively correlated with psychological distress. Moreover, social support was positively correlated with subjective well-being, and negative coping style and pandemic-related events were negatively correlated with subjective well-being.

**Conclusions:** These findings enhance our understanding of the differing correlates of positive and negative mental health, suggesting targeted psychological interventions for post-pandemic and future public health events.

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## 1. Introduction

From the end of 2019 to March 2023, coronavirus disease 2019 (COVID-19), an infectious disease caused by the SARS-CoV-2 virus, infected 676,609,955 people and killed 6,881,955 worldwide [1]. The COVID-19 pandemic has had a dramatic negative impact on both the physical and mental health of individuals. According to the World Health Organization (WHO), the global prevalence of anxiety and depression surged by 25 % in the first year of the pandemic alone [2]. Before 2023, China largely avoided large-scale infections through stringent prevention policies. However, in December 2022, facing new variants and increased global travel, the Chinese government recognized the need for more comprehensive measures and subsequently loosened its prevention policies, leading to an unprecedented COVID-19 outbreak.

### 1.1. Mental health during COVID-19 pandemic

During the COVID-19 pandemic, the evaluation of the mental health status of individuals and its associated factors during COVID-19 has become a focus of interest and research. Most of these studies focused on examining people's mental health status and its associated factors during the COVID-19 outbreak, and there were also some longitudinal studies explored the changes in people's mental health status during the outbreak [3–7]. Extensive research has demonstrated that the COVID-19 pandemic can have various degrees of impact on people's mental health and be associated with more psychological disorders and symptoms such as depression, anxiety, post-traumatic stress disorder (PTSD), loneliness, anger, somatic symptoms, and sleep disorders [3,4,8,9]. Two of the most prevalent psychological distress are anxiety and depression [4]. In addition to having an impact on the negative aspect of mental health, studies have shown that COVID-19 significantly influences people's subjective well-being (SWB) that represents the positive aspect of mental health [10,11]. Further, according to the dual-factor model of psychological well-being [12], mental health should be conceptualized as being represented by the presence of well-being as well as the absence of ill-being. Besides, the predictors of negative mental health are not necessarily the opposite of those associated with positive mental health [13]. Therefore, it is necessary to consider both positive and negative indicators of people's mental health after the pandemic, which could provide a more comprehensive portrayal of mental health functioning. Moreover, it is worth noting that the impact of pandemics on people's mental health is likely to persist over time. For instance, previous long-term follow-up studies on the mental health of severe acute respiratory syndrome (SARS) survivors showed that mental problems persisted and remained severe one to four years after the SARS outbreak [14, 15]. However, after a large-scale outbreak of COVID-19, the mental health status of Chinese people as well as the factors associated with it remain unclear. Meanwhile, there is a lack of research examining mental health within the dual-factor model of psychological well-being. Addressing these gaps, the present study contributes to the existing literature by exploring both negative indicators (i.e., depressive symptoms, anxiety symptoms) and positive indicators (i.e., subjective well-being) of mental health, and examining whether there are unique and common factors associated with them.

### 1.2. Associated factors of mental health during the COVID-19 pandemic

During the COVID-19 pandemic, many associated factors of the mental health of the general public were identified, including perceived susceptibility [16], perceived severity [16,17], previous diagnosis of COVID-19 [18], drug shortage [19], failure to receive timely diagnosis and treatment [19], having a loved one deceased due to COVID-19 [20], and level of concern about COVID-19 [18]. According to previous research, negative life events, such as pandemics, natural disasters, and war conflicts, can have a profound and long-lasting impact on people's mental health, leading to a higher prevalence of mental problems [21,22]. Further, Lazarus' appraisal theory indicates that individuals' cognitive appraisal of stressful events can influence their emotional and behavioral responses [23]. Indeed, negative appraisals of traumatic events and pandemics exacerbate mental problems [24]. Recent research also shows that individuals' cognitive appraisals, perceived severity of COVID-19 in particular, are associated with more mental disorders and adverse emotional and behavioral responses [25]. Moreover, research on infectious diseases pays more attention to "susceptibility". There is also research suggesting that perceived susceptibility to COVID-19 affects people's depression [16]. Furthermore, social support and coping styles are two well-documented and important factors associated with people's mental health [26–28]. Studies during the COVID-19 pandemic demonstrated the same results, showing that positive coping and social support helped improve the participants' mental health [29,30].

Nevertheless, most previous studies have focused on only a few of these associated factors of people's mental health during the pandemic, and very few have comprehensively investigated the associated factors after the pandemic. According to the System-Based Model of Stress proposed by Jiang [31], this study categorized the factors associated with people's mental health during the COVID-19 pandemic into the following aspects to explore that associated with people's mental health after the pandemic: cognitive appraisal (perceived susceptibility, perceived severity), negative life events (pandemic-related events), stress response (concern about COVID-19), social support, and coping styles. Therefore, to enhance the understanding of the mental impact of the pandemic and to enrich the existing relevant research, there is a need for a comprehensive study to explore the factors associated with positive and negative indicators of people's mental health after the pandemic.

### 1.3. Purpose

As highlighted above, there is a need to examine the mental health status of Chinese residents considering both positive and negative aspects of mental health and comprehensively explore its associated factors after the COVID-19 pandemic. Based on the

System-Based Model of Stress, the following hypotheses were identified in light of previous studies: (1) perceived susceptibility will associate positively with psychological distress and negatively with subjective well-being; (2) perceived severity will associate positively with psychological distress and negatively with subjective well-being; (3) pandemic-related events will associate positively with psychological distress and negatively with subjective well-being; (4) concern about COVID-19 will associate positively with psychological distress and negatively with subjective well-being; (5) social support will associate negatively with psychological distress and positively with subjective well-being; (6) negative coping style will associate positively with psychological distress and negatively with subjective well-being.

## 2. Methods

### 2.1. Participants

By using a quota sampling method, only adult residents (aged  $\geq 18$  years) who were lived in mainland China and able to provide informed consent were recruited in this study. The selection of survey units considered regions with a high cumulative number of COVID-19 cases, as well as economic development and geographical distribution. Consequently, five provinces and cities including Beijing, Hubei, Guangdong, Heilongjiang, and Yunnan province were selected as the survey units. Moreover, to ensure the representativeness of the sample, the recruitment process adhered to specific distribution requirements for gender (male: 51 %; female: 49 %), age (18–39 years: 40 %;  $\geq 40$ : 60 %), and urban or rural areas (urban residents: 65 %; rural residents: 35 %), aligning with data from the Chinese seventh national population census. Specifically, the inclusion criteria were as follows: (1) adult residents aged 18 years or older; (2) residents who had lived in any one of the five selected provinces and cities (Beijing, Hubei, Guangdong, Heilongjiang, and Yunnan province) for at least six months; (3) residents who have internet access and the ability to read in Chinese.

The target sample size of participants is determined using formula  $N = Z_{1-\alpha/2}^2 P(1 - P)/d^2$ , in which  $\alpha = 0.05$  and  $Z_{1-\alpha/2} = 1.96$ , and the estimated acceptable margin of error for proportion  $d$  is 0.10. Based on a previous study, the proportion of Chinese residents with mental health symptoms during the COVID-19 pandemic is estimated at 30 % [32]. Thus, at least 81 participants are needed.

### 2.2. Measures

#### 2.2.1. Socio-demographic information

Participants were invited to report on their gender (0 = male, 1 = female), age, and educational level (1 = high school or vocational school or below, 2 = two- or three-year college or associate degree, 3 = four-year college or bachelor's degree, 4 = master's degree or above).

#### 2.2.2. Coping style

To maintain the feasibility of the questionnaire by keeping it concise, the question measuring coping style was adapted from the Simplified Coping Style Questionnaire (SCSQ): "When you encounter difficulties or unhappiness in your daily life, how do you tend to cope with them?" [33]. Participants were asked to choose one of the following two options: cope with them positively (for example: usually thinking of the good side; being able to put the unhappiness out of your mind as soon as possible; believing that difficulties and setbacks can strengthen people; other people can easily make you happy again) (coded as 0); cope with them negatively (for example: easily trapped in the memory of difficulties or unhappiness and can not get rid of them; unpleasant things easily causing emotional fluctuations; preferring to be alone when encountering problems; often blaming yourself for incompetence and resenting yourself when encountering difficulties) (coded as 1).

#### 2.2.3. Cognitive appraisal

This study evaluated two aspects of cognitive appraisal of COVID-19, perceived severity and perceived susceptibility [34]. Perceived severity was measured with the question "How severe do you think the infection of COVID-19 has affected you?" It was rated on a 5-point scale from 1 (Not severe at all) to 5 (Very severe). Similarly, perceived susceptibility was assessed with the question "How likely do you think you are to get COVID-19 if you don't take personal protective measures?" It was rated on a 5-point scale from 1 (Extremely unlikely) to 5 (Extremely likely).

#### 2.2.4. Negative life events

In this study, negative life events were assessed by four pandemic-related events. Participants were asked questions on whether they or their immediate family had experienced a shortage of medical resources since the COVID-19 prevention and control policy was optimized in China (December 7, 2022), whether they had been infected with COVID-19, whether any family member has deceased associated with COVID-19 since December 7, 2022, and whether they still have symptoms of COVID-19. Answer choices for all 4 items were 0 (No) or 1 (Yes). A total score was summed with a higher score representing that the participant experienced more negative life events related to the pandemic.

#### 2.2.5. Stress response

In this study, participants' stress response to the COVID-19 pandemic was assessed by the question "Are you worried about the possibility of a new outbreak of the COVID-19 pandemic caused by virus mutations?" Answer choices for it were 0 (No) or 1 (Yes).

### 2.2.6. Social support

Social support was assessed with the Social Support Rate Scale (SSRS) [35], which is widely used in China. The SSRS measures social support levels across three dimensions: objective support (three items on the living conditions in the past year, problem-solving channels in emergencies, and the sources of psychological comfort in emergencies), subjective support (four items on the number of friends who can offer support and assistance, relationship with neighbors, relationship with colleagues, and the level of support from family members), and social support utilization (three items on the way one expresses when in trouble, the way one seeks help when in trouble, and the willingness of participation in group activities). Items 1 to 4 (the number of friends who can offer support and assistance, the living conditions in the past year, relationship with neighbors, relationship with colleagues) and 8 to 10 (the way one expresses when in trouble, the way one seeks help when in trouble, the willingness of participation in group activities) were rated on a 4-point scale ranging from 1 (representing no support) to 4 (representing the most support). Item 5 (the level of support from family members) was the total score of 5 subitems that were rated on a 4-point scale ranging from 1 (None) to 4 (Full support). Items 6 and 7 (problem-solving channels in emergencies, and the sources of psychological comfort in emergencies) scored 0 if the answer was “No source”, and if the answer was “The following sources”, corresponding scores on account of their listed sources were given. The total social support score was the sum of the scores for the 10 items, and the score for each dimension was the sum of the scores for the corresponding items, with higher scores indicating a higher level of support or support utilization. In the current sample, Cronbach's alpha coefficient and McDonald's omega coefficient for the total scale were 0.87 and 0.84, respectively.

### 2.2.7. Psychological distress

Symptoms of anxiety were assessed using the Generalized Anxiety Disorder 7 (GAD-7) [36], a 7-item tool developed to assess the severity of anxiety symptoms according to the Diagnostic and Statistical Manual of Mental Disorders (DSM). Participants were asked, for example, how often they have been bothered by problems such as “feeling nervous, anxious or on edge” and “not being able to stop or control worrying” over the past two weeks. The items are rated on a frequency scale from 0 (Not at all) to 3 (Nearly every day), and the individual item scores were summed to obtain a total score, with the following cut-off points: 5 for mild, 10 for moderate, and 15 for severe levels of anxiety symptoms. The 10-point cut-off was used in the current study to define having anxiety symptoms. Thus, a score less than 10 was considered not having anxiety symptoms (coded as 0), and a score greater than 10 was considered having anxiety symptoms (coded as 1). In the current sample, Cronbach's alpha coefficient and McDonald's omega coefficient for this scale were 0.85 and 0.86, respectively.

Symptoms of depression were measured with the Patient Health Questionnaire 9 (PHQ-9) [37]. The PHQ-9 uses the DSM diagnostic criteria to assess the severity of depressive symptoms occurring over the previous two weeks, with nine self-reporting items on a frequency scale from 0 (Not at all) to 3 (Nearly every day). Participants were asked, for example, how often they have been bothered by problems such as “little interest or pleasure in doing things” and “feeling down, depressed, or hopeless” over the past two weeks. The individual item scores were summed to obtain a total score, with the following cut-off points: 5 for mild, 10 for moderate, 15 for moderately severe, and 20 for severe levels of depressive symptoms. The 10-point cut-off was used in the present study to define having depressive symptoms. Thus, a score less than 10 was considered not having depressive symptoms (coded as 0), and a score greater than 10 was considered having depressive symptoms (coded as 1). In the current sample, Cronbach's alpha coefficient and McDonald's omega coefficient were for this scale 0.84 and 0.84, respectively.

### 2.2.8. Subjective well-being

Subjective well-being was evaluated through a single-item inquiry “How happy do you feel?”, which required participants to indicate their level of happiness. It was rated on a 5-point scale from 1 (Very unhappy) to 5 (Very happy) [38]. In this study, the first and second options were regarded as poor subjective well-being, and the rest of the options were regarded as good subjective well-being. The single-item measure of subjective well-being has shown satisfactory reliability and validity in previous research [39].

Anxiety, depression, and subjective well-being were used as dichotomous variables for calculating prevalence and conducting Chi-square tests, and as continuous variables in structural equation modeling (SEM).

## 2.3. Procedures

The research was conducted shortly after the pandemic subsided. Given the circumstances, including time and financial constraints, an online survey was chosen to enhance the sample's representativeness and ensure timely data collection. This cross-sectional study was conducted from March 2–31, 2023, using the Wenjuanxing platform, a commercial survey platform with a sample pool of more than 6 million people from a wide range of provinces. Based on the sample requirements, the platform sent targeted research invitations to recruit participants through their website or WeChat official account. A pre-survey was then administered to screen respondents who approximately matched the study's gender, age, and regional sampling criteria. Residents who met all the inclusion criteria were subsequently invited to participate in this study. During the data collection process, some system settings on the platform have been designed to ensure data quality: (1) each electronic device could only fill out the questionnaire once; (2) the questionnaires completed in less than 5 min were regarded as invalid; (3) the time spent on each question of the questionnaire should be at least 3 s. To avoid duplications or fraud in the online survey, the platform implemented stringent measures. Each account within the sample pool was restricted to a single questionnaire submission, with every account bound to the user's ID number, ensuring the uniqueness of each participant. Additionally, the link to the questionnaire sent to the participants expired immediately after submission, further guaranteeing that each person could only complete the survey once. After the preliminary data collecting, we implemented rigorous quality control measures to exclude invalid questionnaires that failed length or quality checks.

This included eliminating entries completed in less than 5 min and those containing incorrect answers to trap questions. Our final dataset comprised 1026 valid responses that met our criteria for reliability and completeness. The mean length of time for participants to complete the questionnaire was 841.82 (SD = 498.77) seconds. The study was approved by the Peking University Institutional Review Board (IRB00001052-22171). Consent for participation and consent for publication were obtained from the participants. Moreover, we followed the STROBE cross-sectional reporting guidelines in this study.

2.4. Data analysis

Firstly, descriptive statistics were presented using means and standard deviations (SD) for continuous variables and proportions for categorical variables. Secondly, Chi-square tests and two-sample *t* tests were performed to explore the relationship between mental health status and its possible associated factors. Finally, SEM was performed to analyze the conceptual model, which consisted of seven variables: social support, perceived susceptibility, perceived severity, pandemic-related events, coping style, stress response, psychological distress (anxiety, depression), and subjective well-being (Fig. 1). Additionally, common method bias analysis were conducted to ensure the validity of the results. Data analyses were performed using the Statistical Package for the Social Sciences (SPSS, version 26.0) and IBM SPSS AMOS 28.0. All hypothesis tests were two-tailed with  $\alpha = 0.05$ .

3. Results

3.1. Common method bias

Because a questionnaire method was used to collect data, which can lead to common method bias, we used the Harman’s one-factor test to detect common method bias [40]. The results of principal component factor analysis without rotation showed four factors with eigenvalues greater than 1, among which, the variation explained by the first factor was only 23.54 %, which was far less than the critical standard of 40 %. Thus, no substantial common method bias existed in this study.

3.2. Descriptive outcomes

A total of 1026 eligible participants were included in this study, with the descriptive outcomes presented in Table 1. In this study, the 10-point cut-off was used to define having anxiety or depressive symptoms, and the options “very unhappy” and “unhappy” were regarded as poor subjective well-being. Among the participants, 210 individuals (20 %) had depressive symptoms, 154 (15 %) experienced anxiety symptoms, and 236 (23 %) reported poor subjective well-being. In sum, 236 participants (23 %) had psychological distress with either anxiety or depression, and 236 participants (23 %) had poor subjective well-being.

Of the total sample, 516 participants (50 %) were male, and the mean age was 38.92 (SD = 10.65) years. Age distribution among the participants was as follows: 25.93 % were ≤30 years old, 19.69 % were 31–40 years old, 42.59 % were 41–50 years old, 10.92 %

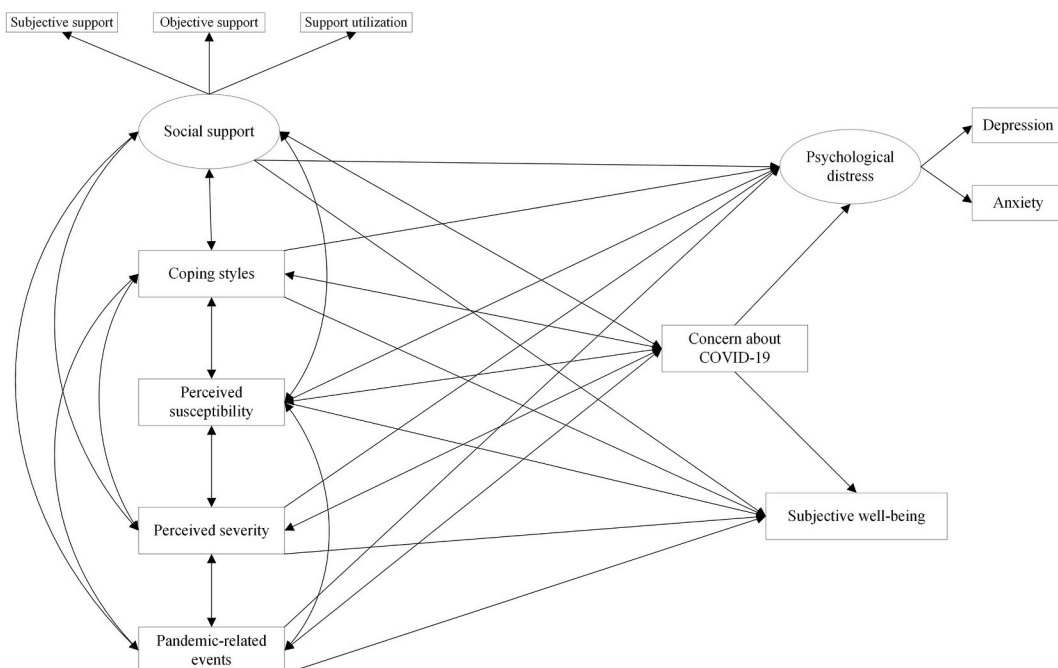


Fig. 1. The conceptual model of this study.

**Table 1**  
Descriptive statistics of the 1026 participants.

Variables	N	%/M±SD
<b>Psychological distress</b>		
No	790	77.00
Yes	236	23.00
<b>Depression</b>		
No	816	79.53
Yes	210	20.47
<b>Anxiety</b>		
No	872	84.99
Yes	154	15.01
<b>Subjective well-being</b>		
Good	790	77.00
Poor	236	23.00
<b>The PHQ-9 score (depression) (0–27 points)</b>	1026	6.26 ± 4.62
<b>The GAD-7 score (anxiety) (0–21 points)</b>	1026	4.97 ± 4.05
<b>Subjective well-being (1–5 points)</b>	1026	3.88 ± 0.78
<b>Gender</b>		
Male	516	50.29
Female	510	49.71
<b>Age</b>	1026	38.92 ± 10.65
<b>Educational level</b>		
High school/vocational school or below	156	15.20
Two-/Three-Year College/associate degree	173	16.86
Four-Year College/bachelor's degree	611	59.55
Master's degree or above	86	8.38
<b>Perceived susceptibility of COVID-19</b>		
Extremely unlikely	13	1.27
Unlikely	73	7.12
Neutral	107	10.43
Likely	416	40.55
Extremely likely	417	40.64
<b>Perceived severity of COVID-19</b>		
Not severe at all	11	1.07
Not very severe	114	11.11
Neutral	324	31.58
Quite severe	459	44.74
Very severe	118	11.50
<b>Shortage of medical resources</b>		
No	536	52.24
Yes	490	47.76
<b>History of COVID-19 infection</b>		
No	186	18.13
Yes	840	81.87
<b>Decease of family member(s) associated with COVID-19</b>		
No	932	90.84
Yes	94	9.16
<b>Symptoms of COVID-19</b>		
No	960	93.57
Yes	66	6.43
<b>Concern about COVID-19</b>		
No	477	46.49
Yes	549	53.51
<b>Social support score (12–66 points)</b>	1026	41.47 ± 9.37
Subjective support score (8–32 points)	1026	23.86 ± 4.79
Objective support score (1–22 points)	1026	9.74 ± 4.13
Score of social support utilization (3–12 points)	1026	7.88 ± 2.06
<b>Coping style</b>		
Cope with them positively	949	92.50
Cope with them negatively	77	7.50

were 51–60 years old, and 0.88 % were >60 years old. For educational level, the largest number of participants received a bachelor's degree (611/1026, 60 %), and among the rest, 156 (15 %) attained the education of high school or vocational school or below, 173 (17 %) obtained a two- or three-year college or associate degree, and 86 (8 %) had the degree of a master or above. Moreover, [Table 1](#) shows descriptive statistics about perceived susceptibility, perceived severity, shortage of medical resources, history of COVID-19 infection, decease of family member(s) associated with COVID-19, symptoms of COVID-19, coping style, concern about COVID-19, and social support.

3.3. Relationship between mental health status and possible associated factors

Tables 2 and 3 show the results of Chi-square tests and two-sample *t* tests between variables. The rate of having anxiety symptoms increased significantly as perceived severity increased ( $\chi^2 = 10.33, p < 0.05$ ). Participants who experienced more pandemic-related events had a higher rate of depressive symptoms or anxiety symptoms than those who experienced less pandemic-related events (depression:  $\chi^2 = 15.00, p < 0.01$ ; anxiety:  $\chi^2 = 8.94, p < 0.05$ ). Participants who tended to negatively cope with difficulties or unhappiness in daily life had a significantly higher rate of depressive symptoms or anxiety symptoms (depression:  $\chi^2 = 95.30, p < 0.001$ ; anxiety:  $\chi^2 = 76.96, p < 0.001$ ) or significantly poorer subjective well-being ( $\chi^2 = 110.23, p < 0.001$ ) than those who tended to positively cope with them. Participants who were concerned about a new COVID-19 outbreak had a significantly higher rate of depressive symptoms or anxiety symptoms than those who were not concerned about it (depression:  $\chi^2 = 13.44, p < 0.001$ ; anxiety:  $\chi^2 = 15.68, p < 0.001$ ) (Table 2). People who were not experiencing depression or anxiety or poor subjective well-being had significantly higher levels of subjective support (depression:  $t = 8.07, p < 0.001$ ; anxiety:  $t = 8.80, p < 0.001$ ; poor subjective well-being:  $t = 12.56, p < 0.001$ ), objective support (depression:  $t = 9.65, p < 0.001$ ; anxiety:  $t = 9.26, p < 0.001$ ; poor subjective well-being:  $t = 11.02, p < 0.001$ ), and support utilization (depression:  $t = 9.15, p < 0.001$ ; anxiety:  $t = 7.52, p < 0.001$ ; poor subjective well-being:  $t = 13.31, p < 0.001$ ) than those who were experiencing depression or anxiety or poor subjective well-being (Table 3).

**Table 2**  
Chi-square tests of potential associated factors of mental health status.

	Depression			Anxiety			Poor subjective well-being		
	%	$\chi^2$	<i>p</i>	%	$\chi^2$	<i>p</i>	%	$\chi^2$	<i>p</i>
<b>Overall</b>	20.47	/	/	15.01	/	/	23.00	/	/
<b>Gender</b>									
<b>Male</b>	18.41	2.70	0.100	13.37	2.18	0.140	21.90	0.71	0.399
<b>Female</b>	22.55			16.67			24.12		
<b>Educational level</b>									
High school/vocational school or below	23.08	2.72	0.437	16.67	3.57	0.312	26.28	3.84	0.280
Two-/Three-Year College/Associate degree	22.54			10.40			25.43		
Four-Year College/bachelor's degree	19.97			15.88			22.42		
Master's degree or above	15.12			15.12			16.28		
<b>Perceived susceptibility of COVID-19</b>									
Extremely unlikely	7.69	6.53	0.163	0.00	8.30	0.081	30.77	3.60	0.463
Unlikely	15.07			10.96			17.81		
Neutral	28.04			22.43			27.10		
Likely	19.71			15.38			24.28		
Extremely likely	20.62			13.91			21.34		
<b>Perceived severity of COVID-19</b>									
Not severe at all	27.27	5.67	0.225	18.18	10.33	0.035	45.45	5.65	0.227
Not very severe	16.67			9.65			20.18		
Neutral	18.21			12.04			21.60		
Quite severe	21.13			16.56			22.88		
Very severe	27.12			22.03			27.97		
<b>Shortage of medical resources</b>									
No	15.86	14.65	< 0.001	11.38	11.59	0.001	19.78	6.59	0.010
Yes	25.51			18.98			26.53		
<b>History of COVID-19 infection</b>									
No	20.43	0.00	0.989	15.59	0.06	0.806	28.49	3.87	0.049
Yes	20.48			14.88			21.79		
<b>Decease of family member(s) associated with COVID-19</b>									
No	19.31	8.33	0.004	14.27	4.36	0.037	22.85	0.13	0.723
Yes	31.91			22.34			24.47		
<b>Symptoms of COVID-19</b>									
No	20.31	0.22	0.638	14.90	0.15	0.697	22.92	0.06	0.804
Yes	22.73			16.67			24.24		
<b>Pandemic-related events</b>									
0	14.68	15.00	0.002	8.26	8.94	0.030	22.02	0.99	0.804
1	17.22			13.68			21.70		
2	22.76			16.71			24.21		
3	33.75			22.50			25.00		
<b>Concern about COVID-19</b>									
No	15.51	13.44	< 0.001	10.27	15.68	< 0.001	23.06	0.00	0.967
Yes	24.77			19.13			22.95		
<b>Coping style</b>									
Positive	16.97	95.30	< 0.001	12.22	76.96	< 0.001	19.07	110.23	< 0.001
Negative	63.64			49.35			71.43		

**Table 3**  
Two-sample *t* tests of potential associated factors of mental health status.

	Age	Subjective support score	Objective support score	Score of social support utilization
No depression	39.06 ± 10.61	<b>24.45 ± 4.70</b>	<b>10.29 ± 4.12</b>	<b>8.14 ± 2.06</b>
Depression	38.37 ± 10.82	<b>21.55 ± 4.43</b>	<b>7.61 ± 3.43</b>	<b>6.87 ± 1.72</b>
<i>t</i>	0.83	<b>8.07</b>	<b>9.65</b>	<b>9.15</b>
<i>p</i>	0.405	< <b>0.001</b>	< <b>0.001</b>	< <b>0.001</b>
No anxiety	39.17 ± 10.57	<b>24.39 ± 4.66</b>	<b>10.17 ± 4.09</b>	<b>8.07 ± 2.04</b>
Anxiety	37.49 ± 11.04	<b>20.84 ± 4.39</b>	<b>7.28 ± 3.47</b>	<b>6.83 ± 1.85</b>
<i>t</i>	1.80	<b>8.80</b>	<b>9.26</b>	<b>7.52</b>
<i>p</i>	0.072	< <b>0.001</b>	< <b>0.001</b>	< <b>0.001</b>
Good subjective well-being	38.98 ± 10.50	<b>24.81 ± 4.39</b>	<b>10.47 ± 4.02</b>	<b>8.28 ± 1.99</b>
Poor subjective well-being	38.70 ± 11.17	<b>20.66 ± 4.70</b>	<b>7.28 ± 3.51</b>	<b>6.54 ± 1.68</b>
<i>t</i>	0.36	<b>12.56</b>	<b>11.02</b>	<b>13.31</b>
<i>p</i>	0.719	< <b>0.001</b>	< <b>0.001</b>	< <b>0.001</b>

### 3.4. Associated factors of psychological distress and subjective well-being

A structural equation model was fit to test the effects of social support, perceived susceptibility, perceived severity, pandemic-related events, coping style, and concern about COVID-19 on psychological distress and subjective well-being. The model with control variables was also evaluated, in which three commonly recognized determinants of mental health, age, gender, and educational level, were incorporated as control variables. However, the inclusion of these control variables did not substantively alter the results, and the model fit decreased compared to the model without control variables. Therefore, the model without control variables was selected. The final model reflected acceptable model fit:  $\chi^2(23) = 105.21$ ; CFI = 0.974; TLI = 0.937; RMSEA = 0.059, 95 % CI = [0.048, 0.071]; SRMR = 0.025. Parameter estimates are presented in Table 4 and Fig. 2. The results showed a negative and significant association between social support and psychological distress ( $\beta = -0.40$ ,  $p < 0.001$ ) and a positive and significant association between negative coping style ( $\beta = 0.22$ ,  $p < 0.001$ ) or pandemic-related events ( $\beta = 0.11$ ,  $p < 0.001$ ) or concern about COVID-19 ( $\beta = 0.18$ ,  $p < 0.001$ ) and psychological distress. Moreover, the analysis showed a positive and significant association between social support and subjective well-being ( $\beta = 0.53$ ,  $p < 0.001$ ) and a negative and significant association between negative coping style ( $\beta = -0.19$ ,  $p < 0.001$ ) or pandemic-related events ( $\beta = -0.08$ ,  $p < 0.01$ ) and subjective well-being. However, there was no statistically significant association between concern about COVID-19 and subjective well-being. Therefore, hypotheses 1, 2 and 5 should be accepted, and hypotheses 3 and 4 should be rejected; hypothesis 6 should be partially accepted. In addition, findings showed that the two most important factors associated with people's psychological distress and subjective well-being were social support and coping style, respectively.

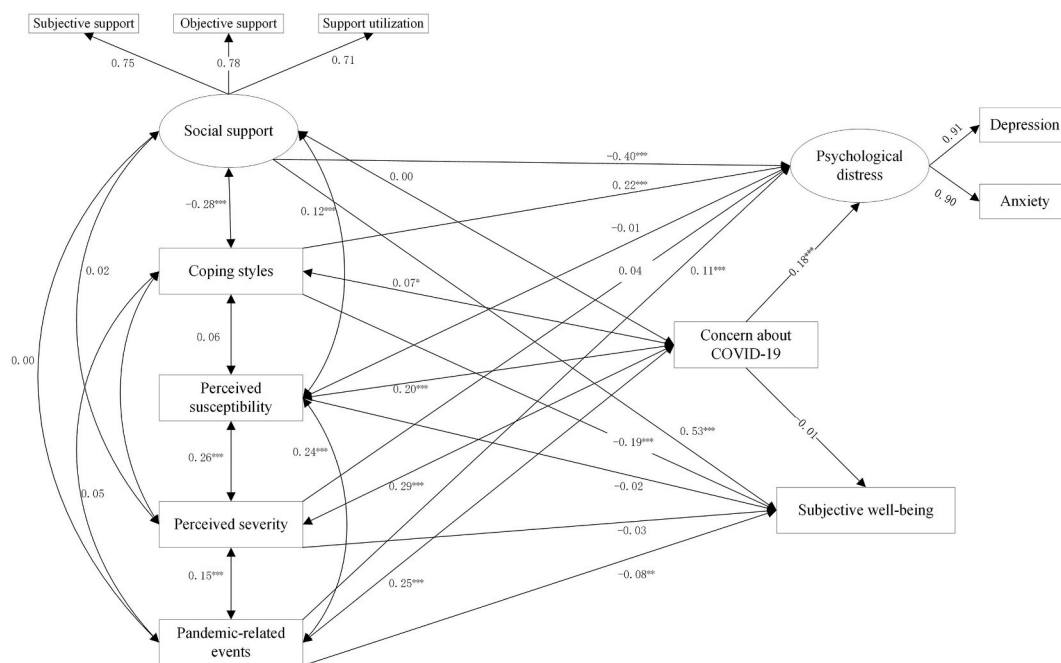
## 4. Discussion

This study found a high prevalence of psychological distress or poor subjective well-being among Chinese residents after the COVID-19 pandemic. Nearly a quarter (23 %) of the participants reported psychological distress, among which 210 (20 %) presented depression and 154 (15 %) experienced anxiety, and 236 participants (23 %) had poor subjective well-being. For the factors associated with people's mental health status, social support was negatively correlated with psychological distress; negative coping style, pandemic-related events, and concern about COVID-19 were positively correlated with psychological distress. Moreover, social support was positively correlated with subjective well-being, while negative coping style and pandemic-related events were negatively correlated with subjective well-being. Among all the factors, social support showed the strongest association with both psychological distress and subjective well-being, followed by coping style as the second most important associated factor.

**Table 4**  
Estimates parameters for the structural equation model.

Model	Independent variable	Dependent variable	Standardized estimate	<i>p</i>	Hypothesis
H1	Perceived susceptibility of COVID-19	Psychological distress	-0.01	0.715	Rejected
		Subjective well-being	-0.02	0.461	
H2	Perceived severity of COVID-19	Psychological distress	0.04	0.181	Rejected
		Subjective well-being	-0.03	0.237	
H3	Pandemic-related events	Psychological distress	<b>0.11</b>	< <b>0.001</b>	Accepted
		Subjective well-being	<b>-0.08</b>	<b>0.003</b>	
H4	Concern about COVID-19	Psychological distress	<b>0.18</b>	< <b>0.001</b>	Partially accepted
		Subjective well-being	-0.01	0.799	
H5	Social support	Psychological distress	<b>-0.40</b>	< <b>0.001</b>	Accepted
		Subjective well-being	<b>0.53</b>	< <b>0.001</b>	
H6	Coping style	Psychological distress	<b>0.22</b>	< <b>0.001</b>	Accepted
		Subjective well-being	<b>-0.19</b>	< <b>0.001</b>	
		Subjective well-being	-0.01	0.799	





**Fig. 2.** Standardized estimation of the associations of possible associated factors with psychological distress/subjective well-being. Note: The coefficients in the figures are standardized; \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ .

#### 4.1. Mental health status in the aftermath of the COVID-19 pandemic

This study found a high prevalence of psychological distress among Chinese residents after the COVID-19 pandemic. Nearly a quarter (23 %) of the participants reported psychological distress, among which 210 (20 %) presented depression and 154 (15 %) experienced anxiety. The result indicates that the prevalence of psychological distress after the pandemic is lower than that during the pandemic, as a meta-analysis found that the prevalence rate was 30 % on average during the COVID-19 pandemic [32]. However, the prevalence in this study was much higher than that before the COVID-19 pandemic, during which the prevalence ranged from 13 % to 18 % [41]. This is consistent with previous studies on SARS, which found that mental distress levels remained elevated after the SARS outbreak [14,15]. One possible explanation for the long-term impact of the pandemic on people's mental health is that during the pandemic, people's main concern was about the threat to their health and lives, whereas after the pandemic, other concerns, regarding complications of COVID-19 and financial problems for example, may surface [15]. In addition, this study found that 236 (23 %) participants had poor subjective well-being after the COVID-19 pandemic, which enhanced the existing body of research on the prevalence of poor subjective well-being during/after the COVID-19 pandemic. These findings indicate that the mental problems among the Chinese population after the COVID-19 pandemic are still quite severe and underscore the importance of ongoing mental health interventions after the pandemic.

It is worth noting that compared to the whole Chinese population, the sample in this study has a higher proportion of younger people and more educated people. According to previous research, younger age is identified as a risk factor for poorer mental health, and lower-educated people generally present more psychological distress [4,42,43]. Therefore, the results of the prevalence rates of depression, anxiety, and poor subjective well-being should be interpreted with caution.

#### 4.2. Associated factors of mental health status

In line with the previous studies [30,44], the current study observed that social support had a positive association with people's psychological distress and a negative association with their subjective well-being. Numerous studies have demonstrated that mental disorders and symptoms often arise following disasters and pandemics, which could be exacerbated by feelings of loneliness and lack of social support [15,27,45]. This suggests that social support has the potential to alleviate negative psychological symptoms. Besides, social support has been shown to enhance people's resilience and facilitate their recovery and rehabilitation after disasters or post-traumatic conditions [46]. Moreover, social support can help people relieve psychological stress, eliminate psychological barriers, and cope with negative events by increasing access to positive resources [47].

As people confront negative life events or various levels of stress, they would either be motivated and perform effectively or respond inappropriately and be overwhelmed by the stress. In such circumstances, coping style is a pivotal factor that influences people's mental health [30]. In line with previous research [29], the current study found that coping style was significantly correlated with individuals' mental health status after the COVID-19 pandemic. To be specific, participants who adopted the positive coping style

exhibited less psychological distress or better subjective well-being, while those who adopted the negative coping style exhibited more psychological distress or poorer subjective well-being. The reason may be that the positive coping style (e.g., seeking support to solve problems, believing that setbacks can exercise people) is for addressing the stressful events themselves, which helps to eliminate or alleviate individuals' negative emotions timely [48]. The negative coping style (e.g., blaming and denying oneself, avoiding communication with others), however, is a short-term approach to stressful events, which is not conducive to effectively addressing the underlying issues, and thus tends to provoke or reinforce negative emotions and leads to psychological problems [48]. The results suggest that during or after a pandemic, the relevant authorities should pay attention to guiding residents to adopt appropriate and positive coping styles and avoid negative coping styles to promote their mental health.

In this study, it was found that among all the associated factors of mental health, social support showed the strongest association with both psychological distress and subjective well-being, and coping style was the second most important factor. These suggest that the two well-documented and important factors, social support and coping styles, are still essential in the aftermath of the COVID-19 pandemic and indicate that interventions on the social support people receive and the coping style they adopt should be prioritized to promote their mental health during or after a pandemic.

Previous research found that negative appraisals of traumatic events and pandemics can intensify mental problems [24]. In particular, perceived severity or perceived susceptibility to COVID-19 has an impact on psychological distress [16,25]. However, different from previous studies, this study revealed that people's cognitive appraisals (perceived severity or perceived susceptibility) of COVID-19 were not associated with people's mental health status (psychological distress or subjective well-being). This discrepancy might be explained by the different study periods. The aforementioned studies were carried out during the COVID-19 pandemic, whereas the current study was conducted when the COVID-19 outbreak had subsided nationwide and people had been returning to normal life. Therefore, the mental health influence related to perceived severity or perceived susceptibility to COVID-19 during the pandemic might have diminished.

Consistent with previous studies [21,22], the current study found that negative life events (pandemic-related events) were associated with people's mental health status. Specifically, participants who experienced more pandemic-related events suffered from more psychological distress or poorer subjective well-being. This is probably because individuals who face negative life events would invariably experience adjustment problems, which can lead to a range of psychological distress or a reduced sense of subjective well-being [49]. Another explanation may be that the occurrence of negative life events causes people to experience resource loss, such as health, work, and money. Thus, according to the Conservation of Resources (COR) Theory, people are likely to suffer from tension and stress reactions, leading to poorer mental health status [50]. Moreover, evidence suggests that more frequent exposure to negative life events is associated with more symptoms of mental health problems [51]. In addition, this finding indicated that the mental health impact of the COVID-19 pandemic on the population could be still exist even after the pandemic has ended. As shown in previous long-term follow-up studies on the mental health of SARS survivors, people's mental problems remained severe one to four years after the SARS outbreak [14,15].

Of note, the current study observed that the level of concern about COVID-19 was positively correlated with psychological distress (anxiety, depression) rather than subjective well-being. Henning-Smith et al. [18] discovered that individuals with greater concern about COVID-19 experienced higher levels of psychological distress (anxiety, depression, loneliness). Consistent with that, our results also presented that concern about COVID-19 was positively correlated with psychological distress (anxiety, depression). This may be because the activation of the stress response system can alter a person's emotional state [52]. Under the stress caused by the COVID-19 pandemic, people may be overly concerned about COVID-19 and experience a wide range of emotions, with anxiety being one of the most common ones [52]. Other emotional reactions may include depression, uneasiness, anger, or apathy [52]. However, the lack of correlation between people's concern about COVID-19 and subjective well-being may be because the predictor for stress response is a negative one in this research and does not include a positive predictor [13]. These findings suggest that the psychological impact of COVID-19 may be more complex than previously understood, and factors associated with positive and negative mental health may be different. This indicates that interventions aimed at improving mental health in the aftermath of a pandemic or during similar public health events need to be multifaceted. Efforts that solely focus on alleviating distress may not necessarily enhance subjective well-being, and vice versa. Additionally, future research can explore these dual pathways further, investigating how specific concerns and stressors may differentially impact the two aspects of mental health.

## 5. Limitations

It is important to note the limitations of the present study. First, the cross-sectional design employed in this study restricts our ability to establish causal relationships between people's mental health status and its associated factors or track changes in mental health status over time. Thus, longitudinal studies are recommended in the future to investigate the causal relationship between study variables, explore the trajectory of mental health outcomes after the COVID-19 pandemic, and examine the longer-term impact of the pandemic on mental health among the general public. Second, while the sample size in our study was adequate for statistical analysis, the sample could be subject to selection bias because the online questionnaire was less accessible to certain groups, such as the elderly and those uninterested in the research. This may constrain the generalizability of our findings to these populations. For example, the proportion of older people in this study was very low (0.88 %), so the results related to the age variable should be interpreted with caution. In addition, evidence suggests that older people experience higher morbidity and mortality from COVID-19 than younger people, which may cause a greater psychological burden in this population [53,54]. Therefore, given adequate and representative research data supplemented with data from older people, future studies could further estimate mental health status and its influencing factors after the COVID-19 pandemic among Chinese residents. Third, to enhance the feasibility, subjective well-being and coping style

were measured with a single-item question instead of utilizing a validated scale, which may have resulted in a less precise measurement of these variables. Therefore, it is recommended to employ validated scales that are suitable for the Chinese population to obtain a more accurate assessment of subjective well-being and coping style in future studies.

## 6. Conclusion

The results indicated that the mental health impact of COVID-19 persisted, with a high prevalence of mental problems among Chinese residents after the COVID-19 pandemic. Furthermore, social support, negative life events (pandemic-related events), and coping style were all identified as factors associated with psychological distress and subjective well-being, and stress response (concern about COVID-19) was found to be solely associated with psychological distress. In addition, social support was identified as the most important associated factor of both psychological distress and subjective well-being, and coping style was the second most important associated factor. These findings contribute to the theoretical understanding of how the research variables relate to or affect each other, as well as further insights regarding practical implications. First, there is an urgent need for timely and dynamic interventions that target high-risk populations, for instance, people with lower social support. Second, the two most important associated factors can both be intervened upon, and thus to enhance people's mental health, it is necessary to strengthen the social support system and explore new approaches to delivering social support for the general public during and after pandemics. Besides, the relevant authorities should pay attention to guiding residents to adopt appropriate and positive coping styles rather than negative coping styles during and after pandemics. Third, since factors associated with positive and negative mental health may differ, targeted interventions are needed to address these distinct aspects in the aftermath of a pandemic or during similar public health events.

## Ethics and consent

Approval was obtained from the Peking University Institutional Review Board (IRB00001052-22171) (ethics approval date: February 21, 2023). The procedures used in this study adhere to the tenets of the Declaration of Helsinki. Informed consent was obtained from the participants before they started the investigation. Consent for publication was also obtained from the participants.

## Data availability statement

The data associated with this study has not been deposited into a publicly available repository. However, the data will be made available upon request.

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## CRediT authorship contribution statement

**Zhijing Li:** Writing – review & editing, Writing – original draft, Software, Methodology, Data curation, Conceptualization. **Yuan Dong:** Conceptualization. **Huizi Jin:** Conceptualization. **Haihua Gu:** Writing – review & editing, Conceptualization. **Xinying Sun:** Funding acquisition. **Juan Cao:** Writing – review & editing, Supervision, Methodology. **Ying Ji:** Writing – review & editing, Supervision, Project administration, Methodology, Conceptualization.

## 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.

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## List of abbreviations

COVID-19	The coronavirus disease 2019
SEM	Structural equation modeling
WHO	World Health Organization
PTSD	post-traumatic stress disorder
SWB	subjective well-being
SARS	severe acute respiratory syndrome
SCSQ	Simplified Copying Style Questionnaire;
SSRS	Social Support Rate Scale

GAD-7 Generalized Anxiety Disorder 7  
 DSM Diagnostic and Statistical Manual of Mental Disorders  
 PHQ-9 Patient Health Questionnaire 9  
 SD standard deviations  
 SPSS Statistical Package for the Social Sciences  
 COR Theory Conservation of Resources Theory

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e37697>.

## References

- [1] COVID-19 dashboard, Available from: <https://coronavirus.jhu.edu/map.html>, 2023. (Accessed 17 March 2023).
- [2] COVID-19 pandemic triggers 25% increase in prevalence of anxiety and depression worldwide, Available from: <https://www.who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide>, 2022. (Accessed 17 March 2023).
- [3] J. Mata, A. Wenz, T. Rettig, M. Reifenscheid, K. Möhring, U. Krieger, S. Friedel, M. Fikel, C. Cornesse, A.G. Blom, E. Naumann, Health behaviors and mental health during the COVID-19 pandemic: a longitudinal population-based survey in Germany, *Soc. Sci. Med.* 287 (2021) 114333.
- [4] J.F. Goularte, S.D. Serafim, R. Colombo, B. Hogg, M.A. Caldieraro, A.R. Rosa, COVID-19 and mental health in Brazil: psychiatric symptoms in the general population, *J. Psychiatr. Res.* 132 (2021) 32–37.
- [5] C.Y. Wang, R.Y. Pan, X.Y. Wan, Y.L. Tan, L.K. Xu, R.S. McIntyre, F.N. Choo, B. Tran, R. Ho, V.K. Sharma, C. Ho, A longitudinal study on the mental health of general population during the COVID-19 epidemic in China, *Brain Behav. Immun.* 87 (2020) 40–48.
- [6] L. Shi, Z.A. Lu, J.Y. Que, X.L. Huang, L. Liu, M.S. Ran, Y.M. Gong, K. Yuan, W. Yan, Y.K. Sun, J. Shi, Y.P. Bao, L. Lu, Prevalence of and risk factors associated with mental health symptoms among the general population in China during the coronavirus disease 2019 pandemic, *JAMA Netw. Open* 3 (7) (2020) e2014053.
- [7] M. Pierce, H. Hope, T. Ford, S. Hatch, M. Hotopf, A. John, E. Kontopantelis, R. Webb, S. Wessely, S. McManus, K.M. Abel, Mental health before and during the COVID-19 pandemic: a longitudinal probability sample survey of the UK population, *Lancet Psychiatr.* 7 (10) (2020) 883–892.
- [8] M.S. Ran, R. Gao, J.X. Lin, T.M. Zhang, S.K.W. Chan, X.P. Deng, B.Z. Zhang, X.F. Zhang, G.P. Huang, D.S. Pu, J.Z. Bai, L.X. Xu, B. Liu, The impacts of COVID-19 outbreak on mental health in general population in different areas in China, *Psychol. Med.* 52 (13) (2022) 2651–2660.
- [9] L.N. Sun, Z.E. Sun, L.L. Wu, Z.W. Zhu, F. Zhang, Z.L. Shang, Y.P. Jia, J.W. Gu, Y.G. Zhou, Y. Wang, N.Q. Liu, Z. Lw, Prevalence and risk factors of acute posttraumatic stress symptoms during the COVID-19 outbreak in Wuhan, China, *medRxiv* 10 (3) (2020) 6, 20032425.
- [10] M. Schwinger, M. Trautner, H. Kärchner, N. Otterpohl, Psychological impact of corona lockdown in Germany: changes in need satisfaction, well-being, anxiety, and depression, *Int. J. Environ. Res. Publ. Health* 17 (23) (2020).
- [11] F. Zhao, Z. Cui, X. Zhao, W. Liu, Did COVID-19 affect rural households' subjective well-being? A social survey from rural China, *Int. J. Disaster Risk Reduc.* 92 (2023) 103736.
- [12] P.J. Greenspoon, D.H. Saklofske, Toward an integration of subjective well-being and psychopathology, *Soc. Indic. Res.* 54 (1) (2001) 81–108.
- [13] R. Sebastião, D.D. Neto, V. Costa, Understanding differential stress and mental health reactions to COVID-19-related events, *Int. J. Environ. Res. Publ. Health* 20 (10) (2023) 5919.
- [14] M.H. Lam, Y.K. Wing, M.W. Yu, C.M. Leung, R.C. Ma, A.P. Kong, W.Y. So, S.Y. Fong, S.P. Lam, Mental morbidities and chronic fatigue in severe acute respiratory syndrome survivors: long-term follow-up, *Arch. Intern. Med.* 169 (22) (2009) 2142–2147.
- [15] A.M. Lee, J.G.S. Wong, G.M. McAlonan, V. Cheung, C. Cheung, P.C. Sham, C.M. Chu, P.C. Wong, K.W.T. Tsang, S.E. Chua, Stress and psychological distress among SARS survivors 1 year after the outbreak, *Can. J. Psychiatr.* 52 (4) (2007) 233–240.
- [16] Q. Wang, L.Y. Xie, B. Song, J.L. Di, L.H. Wang, P.K.H. Mo, Effects of social media use for health information on COVID-19-related risk perceptions and mental health during pregnancy: web-based survey, *Jmir Med Inf* 10 (1) (2022) e28183.
- [17] M.Q. Saleem, A. Bakar, A.K. Durrani, Z. Manzoor, Impact of perceived severity of COVID-19 (SARS-COV-2) on mental health of university students of Pakistan: the mediating role of Muslim religiosity, *Front. Psychiatr.* 12 (2021) 560059, 560059.
- [18] C. Henning-Smith, G. Meltzer, L.C. Kobayashi, J.M. Finlay, Rural/urban differences in mental health and social well-being among older US adults in the early months of the COVID-19 pandemic, *Aging Ment. Health* 27 (3) (2023) 505–511.
- [19] L. Liu, P. Xue, S.X. Li, J.H. Zhang, J.Y. Zhou, W.S. Zhang, Urban-rural disparities in mental health problems related to COVID-19 in China, *Gen. Hosp. Psychiatr.* 69 (2021) 119–120.
- [20] R. Rossi, V. Soccì, D. Talevi, S. Mensi, C. Niuoli, F. Pacitti, A. Di Marco, A. Rossi, A. Siracusano, G. Di Lorenzo, COVID-19 pandemic and lockdown measures impact on mental health among the general population in Italy, *Front. Psychiatr.* 11 (2020) 790, 790.
- [21] Y. Li, A.W. Wang, Y.L. Wu, N.N. Han, H.M. Huang, Impact of the COVID-19 pandemic on the mental health of college students: a systematic review and meta-analysis, *Front. Psychol.* 12 (2021).
- [22] N. Morina, K. Stam, T.V. Pollet, S. Priebe, Prevalence of depression and posttraumatic stress disorder in adult civilian survivors of war who stay in war-afflicted regions. A systematic review and meta-analysis of epidemiological studies, *J. Affect. Disord.* 239 (2018) 328–338.
- [23] R. Lazarus, S. Folkman, *Stress, Appraisal, and Coping*, Springer Publishing Company, New York, 1984.
- [24] S.K.W. Cheng, C.W. Wong, J. Tsang, K.C. Wong, Psychological distress and negative appraisals in survivors of severe acute respiratory syndrome (SARS), *Psychol. Med.* 34 (7) (2004) 1187–1195.
- [25] J.B. Li, A. Yang, K. Dou, L.X. Wang, M.C. Zhang, X.Q. Lin, Chinese public's knowledge, perceived severity, and perceived controllability of COVID-19 and their associations with emotional and behavioural reactions, social participation, and precautionary behaviour: a national survey, *BMC Publ. Health* 20 (1) (2020) 1589.
- [26] O.S. Dalgard, S. Bjørk, K. Tambs, Social support, negative life events and mental health, *BRIT J PSYCHIAT* 166 (1) (1995) 29–34.
- [27] J.Y. Wang, F. Mann, B. Lloyd-Evans, R.M. Ma, S. Johnson, Associations between loneliness and perceived social support and outcomes of mental health problems: a systematic review, *BMC Psychiatr.* 18 (2018) 156.
- [28] W. Lai, W. Li, L. Guo, W. Wang, K. Xu, Q. Dou, J. Shi, K.M. Teopiz, R.S. McIntyre, C. Lu, Association between bullying victimization, coping style, and mental health problems among Chinese adolescents, *J AFFECT DISORDERS* 324 (2023) 379–386.
- [29] S. Budimir, T. Probst, C. Pieh, Coping strategies and mental health during COVID-19 lockdown, *J. Ment. Health* 30 (2) (2021) 156–163.
- [30] Y.M. Huang, X.Y. Su, M.Y. Si, W.J. Xiao, H. Wang, W.J. Wang, X.F. Gu, L. Ma, J. Li, S.K. Zhang, Z.F. Ren, Y.L. Qiao, The impacts of coping style and perceived social support on the mental health of undergraduate students during the early phases of the COVID-19 pandemic in China: a multicenter survey, *BMC Psychiatr.* 21 (1) (2021) 530.
- [31] Q.J. Jiang, *Medical Psychology*, People's Medical Publishing House, Beijing, 2010.
- [32] B. Xiang, K.-Y. Qu, Y. Wang, L. Chen, Y. Xiong, J.F. Wen, W. Hua, B. Teng, C. Dan, J. Zhu, Prevalence of depression, anxiety in China during the COVID-19 pandemic: an updated systematic review and meta-analysis, *Front. Public Health* 11 (2024) 1267764.

- [33] Y.N. Xie, The initial exploration of reliability and validity of simplified coping styles questionnaire, *Chin. J. Clin. Psychol.* 6 (1998) 114–115.
- [34] R. Dai, Y.F. Wu, T. Wang, M.J. Zhu, J.S. Li, A survey of COVID-19 prevention and control attitudes and behaviors among different populations in Guangdong Province, *Mod. Prev. Med.* 48 (12) (2021) 2281–2285.
- [35] S.Y. Xiao, The theoretical basis and research application of the Social Support Rating Scale, *J CLIN PSYCHIAT* (2) (1994) 98–100.
- [36] R.L. Spitzer, K. Kroenke, J.B.W. Williams, B. Löwe, A brief measure for assessing generalized anxiety disorder: the GAD-7, *Arch. Intern. Med.* 166 (10) (2006) 1092–1097.
- [37] K. Kroenke, R.L. Spitzer, J.B.W. Williams, The PHQ-9 - validity of a brief depression severity measure, *J. Gen. Intern. Med.* 16 (9) (2001) 606–613.
- [38] H.F. Du, P.L. Chi, R.B. King, Economic inequality is associated with long-term harm on adolescent well-being in China, *Child Dev.* 90 (4) (2019) 1016–1026.
- [39] A.M. Abdel-Khalek, Measuring happiness with a single-item scale, *Soc. Behav. Pers.* 34 (2) (2006) 139–149.
- [40] P.M. Podsakoff, S.B. MacKenzie, J. Lee, N.P. Podsakoff, Common method biases in behavioral research: a critical review of the literature and recommended remedies, *J. Appl. Psychol.* 88 (5) (2003) 879–903.
- [41] X.L. Fu, K. Zhang, X.F. Chen, Z.Y. Chen, Report on National Mental Health Development in China (2017-2018), Social sciences academic press, Beijing, 2019.
- [42] P. Bracke, V. van de Straat, S. Missinne, Education, mental health, and education-labor market misfit, *J. Health Soc. Behav.* 55 (4) (2014) 442–459.
- [43] X.L. Fu, K. Zhang, X.F. Chen, Z.Y. Chen, Report on National Mental Health Development in China (2021-2022), Social sciences academic press, Beijing, 2023.
- [44] L.Y. Saltzman, T.C. Hansel, P.S. Bordnick, Loneliness, isolation, and social support factors in post-COVID-19 mental health, *Psychol Trauma-Us* 12 (2020) S55–S57.
- [45] D. Satcher, S. Friel, R. Bell, Natural and manmade disasters and mental health, *JAMA, J. Am. Med. Assoc.* 298 (21) (2007) 2540–2542.
- [46] L.Y. Saltzman, R. Pat-Horenczyk, M. Lombe, A. Weltman, Y. Ziv, T. McNamara, D. Takeuchi, D. Brom, Post-combat adaptation: improving social support and reaching constructive growth, *Hist. Philos. Logic* 31 (4) (2018) 418–430.
- [47] X.H. Fang, L. Wu, L.S. Lu, X.H. Kan, H. Wang, Y.J. Xiong, D.C. Ma, G.C. Wu, Mental health problems and social supports in the COVID-19 healthcare workers: a Chinese explanatory study, *BMC Psychiatr.* 21 (1) (2021) 34.
- [48] D.J. Li, H. You, S.M. Zhang, C. Rong, Mental health status and coping style of university teachers during COVID-19 pandemic, *China Occupational Medicine* 48 (6) (2021) 660–665.
- [49] L. Cao, Association between negative life events on mental health and college student adjustment: a mediated moderating effect, *J Healthc Eng* 2021 (2021) 4457222.
- [50] S.E. Hobfoll, The influence of culture, community, and the nested-self in the stress process: advancing Conservation of Resources theory, *Appl Psychol-Int Rev* 50 (3) (2001) 337–370.
- [51] T. Boe, A.S. Serlachius, B. Sivertsen, K.J. Petrie, M. Hysing, Cumulative effects of negative life events and family stress on children's mental health: the Bergen Child Study, *Soc. Psychiatr. Psychiatr. Epidemiol.* 53 (1) (2018) 1–9.
- [52] J.I. Cohen, Stress and mental health: a biobehavioral perspective, *Issues Ment. Health Nurs.* 21 (2) (2000) 185–202.
- [53] S.J. Barber, H. Kim, COVID-19 worries and behavior changes in older and younger men and women, *J Gerontol Ser B Psychol Sci Social Sci* 76 (2020) e17–e23.
- [54] M. Briguglio, R. Giorgino, B. Dell'Osso, M. Cesari, M. Porta, F. Lattanzio, G. Banfi, G.M. Peretti, Consequences for the elderly after COVID-19 isolation: FEaR (frail elderly amid restrictions), *Front. Psychol.* 11 (2020) 565052.