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Original article

## The Psychological Impact of the COVID-19 Pandemic on Teenagers in China


 Caiyun Zhang, M.D.<sup>a,b,1</sup>, Maolin Ye, Ph.D.<sup>c,1</sup>, Yunwei Fu, M.D.<sup>d</sup>, Minyi Yang, M.D.<sup>c</sup>, Fen Luo, M.D.<sup>c</sup>,  
 Jinhua Yuan, M.D.<sup>c</sup>, and Qian Tao, Ph.D.<sup>a,b,e,\*</sup>
<sup>a</sup> Department of Public Health and Preventive Medicine, School of Basic Medicine, Jinan University, Guangzhou, China<sup>b</sup> Division of Medical Psychology and Behavior Science, School of Basic Medicine, Jinan University, Guangzhou, China<sup>c</sup> School of Management, Jinan University, Guangzhou, China<sup>d</sup> Guangdong-Hong Kong-Macau Institute of CNS Regeneration, Ministry of Education CNS Regeneration Collaborative Joint Laboratory, Jinan University, Guangzhou, China<sup>e</sup> Center for Brain Science and Brain-Inspired Intelligence, Guangdong-Hong Kong-Macao Greater Bay Area, Guangzhou, China

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### ABSTRACT

**Purpose:** The 2019 COVID-19 pandemic poses a challenge to adolescent psychological health. The aim of this study was to survey junior high and high school students in China to better understand the psychological consequences, such as anxiety, depression, and stress, of the COVID-19 pandemic.

**Methods:** A cross-sectional online survey using structural questionnaires was conducted from April 7, 2020, to April 24, 2020. Demographic information and general information related to the pandemic were collected. Psychological consequences were assessed by the Impact of Event Scale-Revised and the Depression, Anxiety and Stress Scale. Influencing factors were assessed by the Brief Resilience Scale and Coping Style Questionnaire.

**Results:** Our sample comprised 493 junior high school students (male = 239, mean age = 13.93 years) and 532 high school students (male = 289, mean age = 17.08 years). Resilience and positive coping were protective factors for the occurrence of depressive, anxiety, and stress symptoms in junior high and high school students ( $p < .05$ ). Positive coping was a protective factor for trauma-related distress in junior high school students ( $p < .05$ ). Negative coping is a risk factor for depression, anxiety, stress symptoms, and trauma-related distress in junior high and high school students ( $p < .05$ ).

**Conclusions:** During the COVID-19 pandemic in China, more than one fifth of junior high and high school students' mental health was affected. Our findings suggested that resilience and positive coping lead to better psychological and mental health status among students. In contrast, negative coping is a risk factor for mental health.

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### IMPLICATIONS AND CONTRIBUTION

The psychological impact of the COVID-19 pandemic on teenagers and adolescents is substantial, causing more than one fifth of Chinese junior high and high school students to experience symptoms of depression, anxiety, and stress. When addressing these symptoms, resilience and positive coping are protective factors, whereas negative coping is a risk factor.

**Conflicts of interest:** The authors have no conflicts of interest to declare. This study was carried out in accordance with the recommendations of the Declaration of Helsinki with written informed consent obtained from all subjects. The protocol was approved by the Ethics Committee at Jinan University, China.

\* Address correspondence to: Qian Tao, Ph.D., Department of Public Health and Preventive Medicine, School of Basic Medicine, Jinan University, Guangzhou 510632, China.

E-mail address: [taoqian16@jnu.edu.cn](mailto:taoqian16@jnu.edu.cn) (Q. Tao).

<sup>1</sup> These authors contributed equally to the study.

Infectious diseases remain one of the biggest threats to the health and well-being of the human race. Since December 2019, novel COVID-19 infection has spread rapidly all over China and internationally [1]. According to the statistics released by the World Health Organization, there have been 16,523,815 confirmed cases of COVID-19 infection in 216 countries, with at least 655,112 deaths as of July 29, 2020. The pandemic resulted in not only the risk of death from the viral infection but also psychological consequences among people, particularly because of the long-term nature of the pandemic, which is still developing. Previous research has revealed a profound and wide range of psychological impacts of infectious outbreaks on survivors, family members of infected patients, medical staff, and the general public [2,3]. The psychological consequences of infectious diseases have been reported to include depressed mood, anxiety, poor sleep, and increased fear and stress levels [4,5], with posttraumatic stress disorder (PTSD) and depressive disorders being the most prevalent long-term psychological conditions [6].

The psychological impacts of the COVID-19 pandemic on teenagers and adolescents seem to be far greater than the impact on adults because they are more vulnerable to the negative effects of stress [7]. Following the outbreak, national school closures had been implemented, and students were required to stay at home. Reduced social interaction, stay-at-home restrictions, difficulties in schoolwork, substantial changes to daily routine, fear of becoming sick, and boredom can create dramatic psychological effects on teenagers and adolescents. Developmental motivations and hormonal changes make teenagers and adolescents highly attuned to peer groups, making it challenging to isolate at home. For instance, during the Severe Acute Respiratory Syndrome (SARS) epidemic, a cross-sectional study revealed that psychiatric morbidities in a general population were associated with younger age [8]. The psychological impact of COVID-19 on teenagers is a serious concern during the outbreak and thereafter. The present study sought to examine depressive, anxiety, stress, and trauma-related distress symptoms in a sample of junior high and high school students.

The COVID-19 pandemic can be regarded as an acute, large-scale, and uncontrollable stressor that will have a significant effect on individuals' mental health. However, little is known about how teenagers cope with acute large-scale stressors such as the COVID-19 pandemic. Accumulated evidence has indicated that different coping strategies are associated with different adjustment outcomes after trauma [9,10]. Generally, there are two types of coping strategies: active and passive coping. Active coping involves actively doing something to reduce stress, such as problem-solving, planning, and cognitive restructuring, whereas passive coping involves ignoring and avoiding sources of stress, such as denial and substance use [11]. We expected teenagers with positive coping to be associated with better mental health outcomes during the COVID-19 pandemic.

Another potential factor influencing teenagers' psychological outcome in the event of the COVID-19 pandemic is resilience. The construct of resilience refers to an ability to maintain positive mental health in the face of adversity or stress [12]. A high level of resilience provides protection from various mental health conditions. For instance, higher resilience in adolescents aged 14–18 years was associated with a lower level of depression, stress, and anxiety [13]. When dealing with stress induced by the

COVID-19 pandemic, teenagers with a high level of resilience are expected to have a positive mental health status.

A web-based cross-sectional study was performed to assess the psychological impacts of the COVID-19 pandemic on junior high and high school students. We hypothesize that positive coping and a high level of resilience are protective factors for the mental health consequences of the COVID-19 pandemic.

## Methods

### Setting and participants

A cross-sectional online survey using structural questionnaires was conducted from April 7, 2020, to April 24, 2020. Participants, stratified by age and gender, were recruited from Guangzhou No. 75 Middle School and Longchuan No. One Middle school in Guangdong, China. The study was approved by the Ethics Committee of Jinan University, and all participants provided written consent before they answered the questionnaires.

### Measures

**Demographic and general information.** Demographic information was collected, including age, gender, grade, and education levels of parents. In addition, information related to the COVID-19 pandemic was collected, such as residence location during the pandemic, whether their parents were frontline personnel during the pandemic, whether they were confirmed cases, whether their family or friends were confirmed cases, and whether they had peers around during the pandemic.

**Brief Resilience Scale.** The Brief Resilience Scale (BRS) was developed as a reliable measure of a unitary construct to measure the most basic and original meaning of resilience, that is, "an individual's ability to bounce back or recover from stress" [14]. It represents a factor related to resilience resources and health outcomes. The participants were asked to indicate the extent to which they agreed with a statement according to a 5-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The BRS has been validated in a variety of populations under different levels of stress and has demonstrated good psychometric properties. The Chinese version of the BRS has demonstrated acceptable internal consistency with Cronbach's alpha values of .76 and .72 in Hong Kong and mainland samples, respectively [15]. To the best of our knowledge, the BRS has not been validated in a sample of teenagers. We conducted psychometric analyses on the data set. Results of exploratory factor analysis suggested extraction of two factors (positive and negative items) that account for 72.94% of total variance. The Cronbach's alpha coefficient was .80, suggesting good reliability of the Chinese version of the BRS.

**Coping Style Questionnaire.** The Coping Style Questionnaire (CSQ) was developed by Xie [16] on the basis of both Chinese and foreign scales [17]. It consists of 20 items measuring the use of coping strategies with two dimensions, active coping (12 items) and passive coping (eight items). A higher score represents a greater active/passive coping tendency. Participants rate the frequency with which they adopt the strategy in the face of stress on a 4-point scale, ranging from 0 (never) to 3 (very often). Xie validated the CSQ in a Chinese sample aged 20–65 years. Its internal consistency was .90, with two subscales and whole

scale's Cronbach's alpha were .79, .78, and .82, respectively. A previous study investigating a sample aged 12–18 years indicated that the internal consistency measured by Cronbach's alpha were .90, .89, and .78 for the subscales and the whole scale, respectively [18]. Nevertheless, the CSQ has been used in several studies with teenagers as the subjects [19,20]. The instrument also demonstrated good reliability and validity in Chinese samples [21]. We conducted psychometric analyses on the data set. Results of exploratory factor analysis suggested extraction of two factors (positive coping and negative coping) that account for 52.05% of total variance. The Cronbach's alpha coefficients for the two subscales were .91 (active coping) and .76 (passive coping), suggesting good reliability of the Chinese version of the scale.

**Impact of Event Scale-Revised.** The original Impact of Event Scale (IES) is a 22-item measure of psychological responses to trauma. There are three subscales, namely, the intrusive subscale, avoidance subscale, and hyperarousal subscale. Participants rate each item on a 5-point scale, ranging from 0 (no problems) to 4 (frequent problems). The mean score for PTSD is 20, and a cutoff score of 20 has been used to estimate the prevalence of PTSD symptoms [22,23]. The IES-Revised (IES-R) can be anchored to any specific event, such as SARS or COVID-19 infection. The IES has been validated in a sample of adolescents in Taiwan who had experienced floods and mudslides caused by Typhoon Morakot [24]. The results suggested that the IES was a reliable and valid instrument with Cronbach's alpha of .94 and three factors of intrusion, hyperarousal, and avoidance accounted for 58.1% of the variance. Another study validated the IES in a sample of urban high school students who experienced the September 11, 2001, terrorist attack [25]. The results yielded three factors (intrusion, hyperarousal, and avoidance) and found a moderate correlation between the IES and My Worst Experience Scale as a measure of posttraumatic stress reactions in individuals exposed to a specific traumatic stressor [25]. The Chinese version of the IES-R has demonstrated good reliability and validity with Cronbach's alpha of .90 in a student sample [26], and Cronbach's alpha for the three subscales were .89 (intrusion), .85 (avoidance), and .83 (hyperarousal) in a patient sample from the Accident and Emergency Department [23]. In our sample, Cronbach's alpha coefficients for the three subscales were .85 (intrusion), .83 (avoidance), and .81 (hyperarousal), suggesting good reliability of the Chinese version of the scale.

**Twenty-one-item Depression Anxiety Stress Scale.** The 21-item Depression Anxiety Stress Scale (DASS-21) is a well-developed instrument evaluating levels of depression, anxiety, and stress, with seven items in each subscale. It asks whether the described situation is applicable and requires participants to rate the applicability on a 4-point scale, ranging from 0 (never) to 3 (almost always). The total scores of the full scale and subscales were obtained, and a higher score indicates a more severe level of depression, anxiety, or stress. The depression subscale score was divided into normal (0–9), mild depression (10–12), moderate depression (13–20), severe depression (21–27), and extremely severe depression (28–42). The anxiety subscale score was divided into normal (0–6), mild anxiety (7–9), moderate anxiety (10–14), severe anxiety (15–19), and extremely severe anxiety (20–42). The stress subscale score was divided into normal (0–10), mild stress (11–18), moderate stress (19–26), severe stress (27–34), and extremely severe stress (35–42). The DASS-21 has been demonstrated to be a reliable and valid

measure in assessing mental health in the Chinese population [27]. The DASS was previously used in research related to SARS [3]. The DASS has been widely used in children and adolescents between the ages of 7 and 15 years [28–30]. We conducted psychometric analyses on the data set. The results of exploratory factor analysis suggested extraction of three factors (depression, anxiety, and stress) that account for 58.86% of total

**Table 1**  
Characteristics of the participants

Items	All, n (%) / mean (SD)	Junior school students, n (%) / mean (SD)	High school students, n (%) / mean (SD)
Gender			
Male	528 (51.5)	239 (48.5)	289 (54.3)
Female	497 (48.5)	254 (51.5)	243 (45.7)
Age	15.56 (1.89)	13.93 (1.12)	17.08 (.99)
Grade			
First grade	371 (36.2)	166 (33.7)	205 (38.5)
Second grade	319 (31.1)	155 (31.4)	164 (30.8)
Third grade	335 (32.7)	172 (34.9)	163 (30.6)
Father's education level			
Primary	97 (9.5)	16 (3.2)	81 (15.2)
High school	717 (70.0)	312 (63.3)	405 (76.1)
College/university	168 (16.4)	122 (24.7)	46 (8.6)
Graduate school	43 (4.2)	43 (8.7)	0 (.0)
Mother's education level			
Primary	159 (15.5)	23 (4.7)	136 (25.6)
High school	699 (68.2)	336 (68.2)	363 (68.2)
College/university	155 (15.1)	122 (24.7)	33 (6.2)
Graduate school	12 (1.2)	12 (2.4)	0 (.0)
Annual household income			
< 50,000	374 (36.5)	99 (20.1)	275 (51.7)
50,000–200,000	495 (48.3)	257 (52.1)	238 (44.7)
200,000–500,000	127 (12.4)	116 (23.5)	11 (2.1)
> 500,000	29 (2.8)	21 (4.3)	8 (1.5)
Do you have siblings?			
Yes	830 (81.0)	342 (69.4)	488 (91.7)
No	195 (19.0)	151 (30.6)	44 (8.3)
Is there a peer partner around you?			
Yes	826 (80.6)	420 (85.2)	406 (76.3)
No	199 (19.4)	73 (14.8)	126 (23.7)
Area during the COVID-19 pandemic			
Hubei Province	6 (.6)	5 (1.0)	1 (.2)
Mainland China (except Hubei)	1,014 (98.9)	485 (98.4)	529 (99.4)
Hong Kong/Macao SAR, China	2 (.2)	1 (.2)	1 (.2)
Foreign countries	2 (.4)	1 (.2)	3 (.3)
Any confirmed/suspected cases with COVID-19 around you?			
Yes	12 (1.2)	10 (2.0)	2 (.4)
No	1,013 (98.8)	483 (98.0)	530 (99.6)
Are your parents a frontline antiepidemic person?			
Yes	14 (1.4)	8 (1.6)	6 (1.1)
No	1,011 (98.6)	485 (98.4)	526 (98.9)

variance. The Cronbach's alpha coefficients for the three subscales were .86 (depression), .82 (anxiety), and .87 (stress), suggesting good reliability of the Chinese version of the scale.

*Statistical analysis*

Statistical analysis was performed using SPSS version 16.0 (IBM, Chicago, IL). First, descriptive analyses were conducted to describe the demographic characteristics of Chinese junior high and high school students. All results of quantitative variables are reported either as the mean ± standard deviation (SD) or frequency (percentage). Second, to investigate the variables contributing to coping and resilience, multivariate regression analysis was used to assess the association between demographic variables and three dependent variables, including positive coping, negative coping, and resilience. Third, the prevalence of depressive, anxiety, stress, and trauma-related distress symptoms were calculated for the junior high and high school students. Finally, multivariate logistic regression models were performed to explore potential influencing factors of depressive, anxiety, stress, and trauma-related distress symptoms during the COVID-19 pandemic. The variables of age, gender, grade, and other general information related to the pandemic were included as covariates. Adjusted odds ratios, and 95% confidence intervals (95% CIs) were obtained from logistic

regression models. Each hypothesis was tested using a two-tailed analysis at the  $\alpha = .05$  level of significance.

**Results**

*Participant characteristics*

The questionnaires were administered to 564 junior high school students, and 493 completed the questionnaires with a response rate of 87.41%. Of the 493 junior high school students (male = 239, mean age = 13.93 years), 342 (69.4%) had siblings, 420 (85.2%) had peer partners, and 485 (98.4%) stayed in Mainland China (places other than Hubei) during the COVID-19 pandemic. The questionnaires were administered to 780 high school students, and 532 completed the questionnaires with a response rate of 68.21%. Of the 532 high school students (male = 289, mean age = 17.08 years), 488 (91.7%) had siblings, 406 (76.3%) had peer partners, and 529 (99.4%) stayed in Mainland China (places other than Hubei) during the COVID-19 pandemic. The demographics and general information are summarized in Table 1.

*Association between demographics and coping/resilience*

The results are summarized in Tables 2 and 3. Only a few demographic variables had a significant association with the

**Table 2**  
Association between demographic variables, resilience, and coping style in junior high school students

Items	Resilience			Positive coping			Negative coping		
	R <sup>2</sup>	B (95% CI)	p	R <sup>2</sup>	B (95% CI)	p	R <sup>2</sup>	B (95% CI)	p
Gender									
Male									
Female	.041	-1.810 (-2.582, -1.037)	<.001**	.001	-.460 (-2.019, 1.098)	.562	.001	.221 (-.631, 1.073)	.610
Age	<.001	-.051 (-.423, 0.320)	.787	.001	.202 (-.532, 0.936)	.588	<.001	.081 (-.320, 0.482)	.691
Father's education level									
<College level									
≥College level	.009	.894 (.062, 1.726)	.035*	.007	1.540 (-.105, 3.186)	.067	.005	-.751 (-1.651, 0.149)	.102
Mother's education level									
<College level									
≥College level	.004	.664 (-.220, 1.549)	.140	.001	.750 (-1.000, 2.500)	.400	.005	-.756 (-1.711, 0.119)	.120
Annual household income									
<200,000									
≥200,000	.003	.567 (-.312, 1.446)	.205	.003	1.002 (-.736, 2.739)	.258	.001	-.403 (-1.353, 0.547)	.405
Do you have siblings?									
No									
Yes	.004	.607 (-.246, 1.461)	.163	<.001	.345 (-1.346, 2.035)	.689	.001	-.360 (-1.283, 0.564)	.445
Is there a peer partner around you?									
No									
Yes	.001	.369 (-.741, 1.478)	.514	.001	-.805 (-2.998, 1.388)	.471	<.001	-.130 (-1.329, 1.069)	.831
Any confirmed/suspected cases with COVID-19 around you?									
No									
Yes	.005	2.294 (-.496, 5.084)	.107	.006	4.651 (-.861, 10.163)	.098	.010	-3.471 (-6.476, 0.465)	.024*
Are your parents a frontline antiepidemic person?									
No									
Yes	.004	2.285 (-.829, 5.399)	.150	.005	5.064 (-1.087, 11.215)	.106	.001	.965 (-2.404, 4.335)	.574

AR<sup>2</sup> = adjusted R squared; B (95% CI) = beta (95% confidence interval); R<sup>2</sup> = R squared.  
p < .05\*; p < .001\*\*.



dependent variables. For junior high school students, higher resilience was significantly associated with male gender ( $p < .001$ ) and father’s college education ( $p = .035$ ), whereas negative coping was significantly associated with COVID-19 patients ( $p = .024$ ). For high school students, higher resilience was significantly associated with male gender ( $p < .001$ ), mother’s college education ( $p = .007$ ), and siblings ( $p = .013$ ).

*Psychological outcomes*

The mean scores for the DASS-21 were 16.28 (SD = 22.00) in the junior high school students and 19.77 (SD = 20.40) in the high school students, with a significant between-group difference ( $p = .009$ ). The prevalence of psychological symptoms is summarized in Table 4. Moderate depressive symptoms were found in 9.1% of junior high school students and 6.8% of high school students, and severe-to-extremely severe depressive symptoms were found in 5.3% of junior high school students and 2.6% of high school students, with no significant between-group difference ( $\chi^2 = 4.33$ ;  $p = .363$ ). Moderate anxiety symptoms were found in 10.3% of junior high school students and 10.9% of high school students, and severe-to-extremely severe anxiety symptoms were found in 10.0% of junior high school students and 7.2% of high school students, with a significant between-group difference ( $\chi^2 = 12.33$ ;  $p = .015$ ). Moderate stress

symptoms were found in 5.9% of junior high school students and 6.8% of high school students, and severe-to-extremely severe stress symptoms were found in 3.0% of junior high school students and 2.6% of high school students, with significant between-group difference ( $\chi^2 = 10.84$ ;  $p = .028$ ). Trauma-related distress was found in 20.5% of junior high school students and 22.7% of high school students, with no significant between-group difference ( $\chi^2 = .77$ ;  $p = .404$ ).

*Regression results*

The regression results are presented in Table 5–7. For the junior high school students, depressive symptoms were significantly predicted by resilience (odds ratio [OR] = .747, 95% CI: .688–.811;  $p < .001$ ), positive coping (OR = .928, 95% CI: .894–.965;  $p < .001$ ), and negative coping (OR = 1.086, 95% CI: 1.020–1.156;  $p = .010$ ). Anxiety symptoms were significantly predicted by resilience (OR = .753, 95% CI: .699–.812;  $p < .001$ ), positive coping (OR = .946, 95% CI: .915–.979;  $p = .001$ ), and negative coping (OR = 1.136, 95% CI: 1.072–1.205;  $p < .001$ ). Stress symptoms were significantly predicted by resilience (OR = .736, 95% CI: .680–.795;  $p < .001$ ), positive coping (OR = .962, 95% CI: .929–.996;  $p = .028$ ), and negative coping (OR = 1.104, 95% CI: 1.041–1.172;  $p = .001$ ). Trauma-related distress was significantly predicted by resilience (OR = .876, 95% CI: .817–.938;  $p < .001$ ).

**Table 3**  
Association between demographic variables, resilience, and coping style in high school students

Items	Resilience			Positive coping			Negative coping		
	R <sup>2</sup>	B (95%)	p	R <sup>2</sup>	B (95%)	p	R <sup>2</sup>	B (95%)	p
Gender									
Male									
Female	.047	−1.527 (−2.116, −.939)	<.001**	.001	.512 (−.647, 1.670)	.386	<.001	.076 (−.664, 0.815)	.840
Age	.000	.165 (−.139, 0.468)	.288	<.001	.044 (−.541, 0.628)	.883	<.001	.080 (−.293, 0.453)	.673
Father’s education level									
<College level									
≥College level	<.001	−.067 (−1.135, 1.001)	.902	<.001	−.168 (−2.222, 1.887)	.873	.003	.879 (−.430, 2.188)	.188
Mother’s education level									
<College level									
≥College level	.014	1.702 (.466, 2.939)	.007*	.002	−1.190 (−3.582, 1.202)	.329	.001	.537 (−.990, 2.063)	.490
Annual household income									
<200,000									
≥200,000	.006	−1.460 (−3.073, 0.153)	.076	.006	−2.784 (−5.886, 0.319)	.079	<.001	.476 (−1.509, 2.460)	.638
Do you have siblings?									
No									
Yes	.011	1.369 (.285, 2.453)	.013*	.001	.773 (−1.322, 2.869)	.469	.001	.540 (−.796, 1.877)	.445
Is there a peer partner around you?									
No									
Yes	.002	−.343 (−1.049, 0.363)	.340	.005	−1.088 (−2.443, 0.268)	.471	.001	.261 (−.606, 1.127)	.555
Any confirmed/suspected cases with COVID-19 around you?									
No									
Yes	<.001	−.462 (−5.369, 4.444)	.853	<.001	2.140 (−7.294, 11.574)	.656	.001	1.943 (−4.074, 7.960)	.526
Are your parents a frontline antiepidemic person?									
No									
Yes	<.001	.546 (−2.298, 3.389)	.706	.001	2.324 (−3.140, 7.789)	.404	<.001	.272 (−3.216, 3.761)	.574

AR<sup>2</sup> = adjusted R squared; B (95% CI) = Beta (95% confidence interval); R<sup>2</sup> = R squared.  
 $p < .05^*$ ,  $p < .001^{**}$ .

**Table 4**  
The psychological outcomes of the participants

Items	All, n (%) / mean (SD)	Junior school students, n (%) / mean (SD)	Senior high school students, n (%) / mean (SD)	$t/\chi^2$ value	<i>p</i>
DASS depression					
Normal	799 (78.00)	390 (79.10)	374 (70.30)	4.33	.363
Mild	71 (6.90)	32 (6.50)	108 (20.30)		
Moderate	100 (9.80)	45 (9.10)	36 (6.80)		
Severe	22 (2.10)	7 (1.40)	7 (1.30)		
Extremely severe	33 (3.20)	19 (3.90)	7 (1.30)		
DASS anxiety					
Normal	749 (73.10)	368 (74.60)	381 (71.60)	12.33	.015*
Mild	80 (7.80)	25 (5.10)	55 (10.30)		
Moderate	109 (10.60)	51 (10.30)	58 (10.90)		
Severe	31 (3.00)	19 (3.90)	12 (2.30)		
Extremely severe	56 (5.50)	30 (6.10)	26 (4.90)		
DASS stress					
Normal	754 (73.60)	380 (77.10)	374 (70.30)	10.84	.028*
Mild	177 (17.30)	69 (14.00)	108 (20.30)		
Moderate	65 (6.30)	29 (5.90)	36 (6.80)		
Severe	19 (1.90)	12 (2.40)	7 (1.30)		
Extremely severe	10 (1.00)	3 (.60)	7 (1.30)		
DASS total scores	18.09 (21.25)	16.28 (22.00)	19.77 (20.40)	-2.64	.009**
PTSD					
Yes	222 (21.70)	101 (20.50)	121 (22.70)	.77	.404
No	803 (78.30)	392 (79.50)	411 (77.30)		

\* $p < .05$ , \*\* $p < .01$ .

positive coping (OR = .960, 95% CI: .926–.995;  $p = .025$ ), and negative coping (OR = 1.163, 95% CI: 1.097–1.233;  $p < .001$ ).

For the high school students, depressive symptoms were significantly predicted by resilience (OR = .857, 95% CI: .793–.926;  $p < .001$ ), positive coping (OR = .898, 95% CI: .860–.939;  $p < .001$ ), and negative coping (OR = 1.234, 95% CI: 1.158–1.316;  $p < .001$ ). Anxiety symptoms were significantly predicted by resilience (OR = .859, 95% CI: .802–.920;  $p < .001$ ), positive coping (OR = .927, 95% CI: .892–.962;  $p < .001$ ), and negative coping (OR = 1.233, 95% CI: 1.165–1.304;  $p < .001$ ). Stress symptoms were significantly predicted by resilience (OR = .822, 95% CI: .764–.883;  $p < .001$ ), positive coping (OR = .952, 95% CI: .915–.989;  $p = .013$ ), and negative coping (OR = 1.197, 95% CI: 1.130–1.267;  $p < .001$ ). Trauma-related distress was significantly predicted by resilience (OR = .911, 95% CI: .850–.976;  $p = .008$ ) and negative coping (OR = 1.189, 95% CI: 1.121–1.260;  $p < .001$ ).

## Discussion

To the best of our knowledge, this study is the first to investigate the psychological consequences of the COVID-19 pandemic and its influencing factors on junior high and high school students. This study highlights several important findings. First, the results revealed significant rates of psychological consequences of the COVID-19 pandemic. Second, similar and different patterns

were found between junior and high school students. The junior high and high school students had a similar prevalence of depression and trauma-related distress symptoms, and high school students had a higher prevalence of anxiety and stress symptoms than junior high school students. Third, positive coping and resilience were protective factors for depression, anxiety, and stress symptoms in both junior high and high school students, whereas negative coping was a risk factor for depression, anxiety, and stress symptoms in both samples. For trauma-related distress, resilience was a protective factor, negative coping was a risk factor in both samples, and positive coping was a protective factor for junior high school students but not for high school students.

The rates of depression symptoms (20.9% for junior high school students and 29.7% for high school students) and anxiety symptoms (25.4% for junior high school students and 28.4% for high school students) were higher than the rates reported by recent studies that did not involve any epidemic or pandemic. For instance, a recent study was conducted with a sample of 2,679 children aged 10–15 years old from 25 provinces in China, and the results revealed that the rates of depressive symptoms are significantly lower in urban areas (14%) than in rural areas (23%) [31]. Another study surveyed 1,597 junior high school students aged 10–17 years in Shang Hai City (an urban area in China), and the results showed that the rates of anxious symptoms and

**Table 5**  
Regression model on DASS for junior school students

Factors	Stress		Anxiety		Depression	
	AOR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>
Resilience	.736 (.680, .795)	< .001**	.753 (.699, .812)	< .001**	.747 (.688, .811)	< .001**
Positive coping	.962 (.929, .996)	.028*	.946 (.915, .979)	.001**	.928 (.894, .965)	< .001**
Negative coping	1.104 (1.041, 1.172)	.001**	1.136 (1.072, 1.205)	< .001**	1.086 (1.020, 1.156)	.010*

Adjusted the basic variables of personal information.

AOR = adjusted odds ratio; CI = confidence interval.

\* $p < .05$ , \*\* $p < .01$ .

**Table 6**  
Regression model on DASS for senior high school students

Factors	Stress		Anxiety		Depression	
	AOR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>
Resilience	.822 (.764, .883)	<.001**	.859 (.802, .920)	<.001**	.857 (.793, .926)	<.001**
Positive coping	.952 (.915, .989)	.013*	.927 (.892, .962)	<.001**	.898 (.860, .939)	<.001**
Negative coping	1.197 (1.130, 1.267)	<.001**	1.233 (1.165, 1.304)	<.001**	1.234 (1.158, 1.316)	<.001**

Adjusted the basic variables of personal information.

AOR = adjusted odds ratio; CI = confidence interval.

\**p* < .05, \*\**p* < .01.

depressive symptoms were 16.4% and 17.2%, respectively [32]. In contrast, the rates reported in this study were comparable with those found in previous studies in similar epidemic or pandemic contexts [4,5,22,33]. A study suggested that nearly one in five participants had depressive symptoms in the COVID-19 epidemic, indicating that the uncertainty of epidemic progression would cause greater psychological pressure on the public [5]. A recent cross-sectional study examined the impact of the COVID-19 pandemic on mental health in local Chinese residents, and the results indicated a mild stressful impact [34]. Previous studies have shown that children and adolescents who are exposed to traumatic experiences during disasters may suffer from high levels of posttraumatic stress [35]. Regarding anxious symptoms, a study evaluated the psychological condition of college students during the COVID-19 epidemic, and the results indicated that 24.9% of college students were afflicted with anxiety [1]. Common sources of anxiety during the epidemic include the increasing number of confirmed cases and suspected cases, the increasing number of provinces and countries affected by the outbreak, the shortage of masks and disinfectants, and the overwhelming and sensational news headlines [36]. Furthermore, we found that high school students (28.4%) had a higher prevalence of anxiety symptoms than junior high school students (25.4%). During the data collection period, the schools were still shut down, and the students were staying at home. All junior high and high schools in China were postponing classes and using distant remote learning methods. Troublesome anxiety can be exacerbated during the senior high school years as students face extreme transitions and social and academic pressures [37,38]. This added stress has been shown to increase with age and be related to increased levels of anxiety [38]. According to Muris and Mayer [39], as children age, their brain development continues and allows them to link their physical symptoms to an anxiety-provoking situation. Broeren and Muris [40] maintained that as adolescents gain cognitive abilities, they would have more negative thoughts and interpretations of events, leading to increased anxiety. As part of the increased responsibility and

independence students receive as they get older, emotional support often decreases in secondary school. It has been found that anxiety symptoms can escalate when emotional support decreases [41].

The results showed that positive coping is a protective factor for anxiety, depression, and stress symptoms in junior high and high school students, whereas a negative coping style is a risk factor for anxiety, depression, and stress symptoms in both groups. In our study, active coping style involved positive appraisal and thinking, distancing, problem-solving and help-seeking. These active coping strategies can enhance mental health by promoting an individual's sense of control over a chaotic environment and creating opportunities for satisfying relationships with a support network [42,43]. Accumulating evidence has suggested that positive coping is a protective factor for mental health. For example, it has been found that the use of a positive coping style could promote university students' academic adjustment and reduce displays of maladaptive behaviors [44]. Negative coping includes behaviors of avoidance, such as keeping feelings to one's self, avoiding the situation, and staying away from people. It is suggested that prominent use of negative coping strategies tends to impede adaptation and psychological health [45,46] and to exacerbate the negative effects of stress, perhaps leading to feelings of loss of control and helplessness [47]. A negative coping strategy is employed when an individual's perceived resilience and social support is inadequate and when stressors are perceived as uncontrollable [48,49]. As the COVID-19 pandemic is threatening and unpredictable, it is likely to be perceived as a stressor out of control.

The current results showed that resilience is a protective factor for anxiety, depression, and stress symptoms in junior high and high school students. This could be indicative of the role that resilience plays in safeguarding the mental health of teenagers during the COVID-19 pandemic. Similar findings were reported in previous studies [13,14]. Resilience refers to the ability to bounce back from stress, and the BRS was developed to measure this ability [14,50]. Although the BRS measures a person's belief in how well he or she can bounce back from stress rather than his or her success in doing so, this belief may serve as a prerequisite of the individual's actual ability to bounce back [50].

The current result suggesting that male students have higher resilience is consistent with the literature. On the one hand, previous studies reported higher resilience level in male than female in a university sample [51] and in a community sample [52]. On the other hand, the moderation effect of resilience on health outcomes was more prominent in males than females who exposed to earthquake [53]. Similarly, the moderation effect of resilience on psychological distress was more prominent in males than females in a university sample [54]. The results extended previous findings by demonstrating that higher parental education level was associated with children's higher

**Table 7**  
Binary logistic regression on PTSD symptoms for junior and senior high school students

Factors	Junior school students		Senior high school students	
	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>
Resilience	.876 (.817, .938)	<.001**	.911 (.850, .976)	.008
Positive coping	.960 (.926, .995)	.025	.967 (.929, 1.007)	.108
Negative coping	1.163 (1.097, 1.233)	<.001**	1.189 (1.121, 1.260)	<.001**

Adjusted the basic variables of personal information.

CI = confidence interval; OR = odds ratio.

\**p* < .05, \*\**p* < 0.0.



resilience. This is reasonable because parents with high educational levels are more likely to provide fulfilling educational, employment, and interpersonal futures for their children compared with parents with low educational levels, thus foster more positive self-image, greater life satisfaction, and more available support.

Nevertheless, there are several limitations to the present study. First, the cross-sectional study design precluded the ability to establish a causal relationship between psychological symptoms and coping/resilience, and causal inferences must be drawn with caution. Future work may wish to follow up with young adults and to establish a predictive role of coping style and resilience for the occurrence of psychological symptoms. Second, the online survey method relied on the self-selection of respondents and may lead to biased estimates, particularly when the response rate is low. Finally, all the constructs were assessed by self-report, and the estimated relations among psychological outcomes, coping, and resilience might be biased by the reporter effect. Future work may wish to use a multimethod approach for assessment.

## Conclusions

During the COVID-19 pandemic in China, more than one fifth of junior high and high school students' mental health was affected. Our findings suggested that resilience and positive coping lead to better psychological and mental health status in students. In contrast, negative coping is a risk factor for psychological and mental health. This study can be used to formulate psychological interventions to improve the mental health of junior high and high school students during the COVID-19 pandemic.

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