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Psychological symptoms of ordinary Chinese citizens based on SCL-90 during the level I emergency response to COVID-19



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ABSTRACT

The World Health Organization (WHO) has declared that the Corona Virus (COVID-19) has become a global pandemic. This study aimed to investigate the psychological symptoms of ordinary Chinese citizens during the Level I Emergency Response throughout China. From January 31 to February 2 2020, an online questionnaire, Symptom Checklist 90 (SCL-90) was designed, and differences in GSI T-scores among subgroups were examined by ANOVA. Based on a cut-off point of the GSI T-scores of 63, the overall sample was divided into high and low-risk groups. Of the 1,060 participants investigated in China, more than 70% of them have moderate and higher level of psychological symptoms specifically elevated scores for obsessive compulsion, interpersonal sensitivity, phobic anxiety, and psychoticism. There were no significant differences between males and females. Those who were of over 50 years old, had an undergraduate education and below, were divorced or widowed, and agricultural workers had significantly more symptoms. However, significantly more minors and medical staff were in the high-risk group. These results show that COVID-19 has a significant adverse socio-psychological influence on ordinary citizens. Therefore, governments should equip psychological health departments and pay attention to the people who are in high-risk groups, providing psychological interventions and assistance.

1. Introductions

mid-December, the novel coronavirus disease (COVID-19) was first detected in Wuhan, China, and spread rapidly across the country. On January 30, 2020, the WHO declared the COVID-19 outbreak a Public Health Emergency of International Concern (PHEIC) (World Health Organization, 2020a). On March 11, 2020, the WHO announced that COVID-19 could be characterized as a pandemic. The COVID-19 outbreak in China was declared by the WHO as a Public Health Emergency of International Concern (PHEIC) on January 30, 2020, and became a pandemic on March 11 2020, (World Health Organization, 2020b). On April 5, 2020, a total of 81,669 cases were confirmed in mainland China, and 3329 patients were died (National Health Commission of the People's Republic of China, 2020). A total of 1133,758 cases were confirmed worldwide, 62,784 patients died, and 209 countries, areas, or territories had reported cases (World Health Organization, 2020c).

The public health emergencies were classified into particularly significant (Level I), major (Level II), large (Level III), and general (Level IV) by the Chinese government. Due to the rapid spread of COVID-19, the Level I Emergency Response was implemented across all

provinces, autonomous regions, and municipalities in mainland China on January 29. It means the most stringent nationwide implementation of public life restrictions had been started in China. All cities were under partial lockdown and most transportation had been ceased aimed at preventing the outbreak from spreading further. Further, all major Chinese Spring Festival celebrations had been canceled, and every citizen should comply with home quarantine requirements. Schools, universities, government offices, libraries, museums, and factories were temporarily closed until the effective containment of the outbreak (Chen et al., 2020b.)

Historically, there has been an exaggerated fear response to epidemic. Due to the infectivity, epidemic, and uncertainty of infectious diseases, strong protective measures such as personal protective equipment (PPE) and isolation are required (Ji et al., 2017). It can be found that several psychological changes may arise in not only medical staff but also average citizens, being feared, anxiety, depression, psychological unrest or uncertainty (Kamara et al., 2017; Otte et al., 2017; Pappas et al., 2009). Post-epidemic investigations detected that most confirmed patients often suffer from significant feelings of mild distress or depression, anxiety disorders, shame, stigma, and grief

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Nomenclature

Abbreviation

WHO	World Health Organization
COVID-19	Corona Virus Disease 2019
SCL-90	Symptom Checklist 90
PHEIC	Public Health Emergency of International Concern
SOM	Somatization
OC	Obsessive-Compulsive
IS	Interpersonal Sensitivity
DEP	Depression
ANX	Anxiety

HOS	Hostility
PHOB	Phobic Anxiety
PAR	Paranoid Ideation
PSY	Psychoticism
ADD	Additional items
GSI	Global Severity Index
PSDI	Positive Symptom Distress Index
PST	Positive Symptom Total
PPE	Personal Protective Equipment
SD	Standard Deviation
ANOVA	One-Way Analysis of Variance
IBM SPSS 26.0	Statistical Package for the Social Sciences

(Kamara et al., 2017), while people who have undergone quarantine tend to be aware of the fear and risk perceptions (Tracy et al., 2009; Van Bortel et al., 2016). Based on the Symptom Checklist-90 (SCL-90), research groups used to analyze the psychological impact of the epidemic outbreak on medical staff or survivors (Cai et al., 2017; Ji et al., 2017; Li et al., 2015; Tanaka et al., 2016). So far, only limited researches have analyzed the psychological symptoms and experiences of people during the COVID-19 without the SCL-90 (Qiu et al., 2020; Wang et al., 2020; Yang et al., 2020). However, the reliability and validity of SCL-90 which is recognized as a classical scale have been tested in China (Chen and Zhang, 2004; Cheng and Hamid, 1996; Zhong et al., 2013), and the norm of SCL-90 for ordinary Chinese citizens was developed in 1986 (Jin et al., 1986). Therefore, it is imperative to use the SCL-90 to investigate the psychological symptoms of more groups including ordinary citizens in this epidemic.

This study aims to investigate the severity of psychological symptoms of ordinary Chinese citizens during the Level I Emergency Response period through the SCL-90. The results can contribute to develop a promising strategy for controlling the spread of COVID-19 and improve the comprehensive emergency management system, especially with respect to psychological health emergency management.

2. Objects and methods

2.1. Object

Between January 31 and February 2 2020 we carried out a cross-sectional observational study of ordinary Chinese citizens during the COVID-19 epidemic outbreak. The initial sample consisted of 1132 participants covered all the provinces in China, and finally, after eliminating the questionnaires invalidated by their incorrect completion, the total sample was 1060 (93.64%). The sample was comprised of 549 males and 511 females, with variables occupations and educational levels. The participants varied in age from 13 to 76 years (mean = 35.01, standard deviation (SD) = 12.8). The comparison was made between this sample and the norms of the SCL-90 for ordinary Chinese citizens developed in 1986 Chinese Journal of Neuropsychological Diseases (Jin et al., 1986).

2.2. Method

Between January 31 and February 2 2020, the questionnaires were uploaded onto Wenjuanxing, an online survey platform used to collect survey data. All subjects voluntarily participated and signed informed consent in this survey and identified via snowball sampling by region, age, gender, education level, marital status and occupation. The psychological symptoms were assessed by the SCL-90 questionnaire in Chinese.

The SCL-90, a 90-item self-report symptom inventory, was used to

assess psychological distress and symptoms of psychopathology. This scale produces nine primary symptom dimensions and three Global Indices. The nine symptom dimensions are Somatization (SOM), Obsessive-Compulsive (OC), Interpersonal Sensitivity (IS), Depression (DEP), Anxiety (ANX), Hostility (HOS), Phobic Anxiety (PHOB), Paranoid Ideation (PAR), and Psychoticism (PSY). Furthermore, seven additional items (ADD) assess disturbances in appetite and sleep. The three Global Indices measure composite psychological distress, including Global Severity Index (GSI), Positive Symptom Distress Index (PSDI), and Positive Symptom Total (PST) (Derogatis and Unger, 2010).

The GSI was considered the overall index of psychological symptoms in this study, which was calculated as the mean of all 90 items in SCL-90. For convenience, the raw GSI scores were converted into T-score (mean = 50, SD = 10) (Monteiro et al., 2017). Participants with dimensions or GSI T-scores ≥ 63 were defined as having clinically significant psychological distress (high distress) (Derogatis and Spencer, 1993). In this study, GSI T-scores ≥ 63 was considered as the high-risk group for psychological symptoms and GSI T-scores < 63 as was considered as the low-risk group for psychological symptoms with for further psychological evaluation. The GSI T-score threshold has been proven valid and reliable marker for identifying severe psychological condition that requires assessment and possible intervention, and it has been used extensively in psychological researches in recent years (Arneiro et al., 2018; Black et al., 1998; Fauerbach et al., 2007; Monteiro et al., 2017; Otte et al., 2017; Recklitis et al., 2017).

2.3. Statistical methods

Data were analyzed using the Statistical Package for the Social Sciences (IBM SPSS 26.0). Descriptive statistics, one-sample *t*-test, and one-way analysis of variance (ANOVA) were performed for data comparison among groups. Statistical significance was determined at the 0.05 significance level.

2.4. Ethics

The study was approved by the institutional ethics committee of Xi'an University of Science and Technology. All subjects had received thorough information regarding the aims of the investigation. Written informed consent was obtained from the participants for study participation, data collection and publication. All procedures were performed following the guidelines of our institutional ethics committee and the tenets of the Declaration of Helsinki were adhered to throughout.

3. Results

3.1. General information

As shown in Fig. 1 and Table 1, a total of 1060 individuals

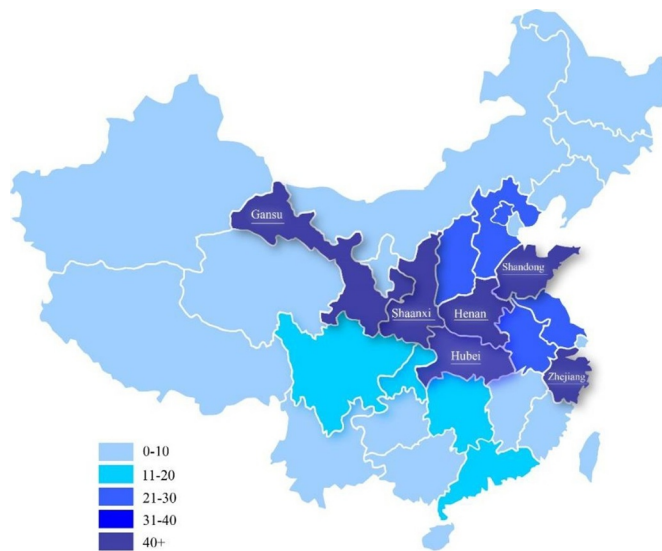


Fig. 1. Distribution of the overall sample in China (n = 1060).

Table 1
Characteristics of the ordinary Chinese citizens included in this sample (n,%).

Variables	Overall N	%
Age (years)		
< 18	22	2.10%
18–29	413	39.00%
30–39	241	22.70%
40–49	209	19.70%
50–60	139	13.10%
> 60	36	3.40%
Gender		
Male	549	51.79%
Female	511	48.21%
Educational attainment		
Junior middle school	66	6.23%
Junior high school	110	10.38%
Junior college	49	4.62%
Bachelor	463	43.68%
Master	250	23.58%
Doctor	122	11.51%
Marital status		
Married	586	55.28%
Unmarried	448	42.26%
Divorced	20	1.89%
Widowed	6	0.57%
Occupation		
Medical staff	42	3.96%
Teacher	200	18.87%
Civil servant	54	5.09%
Student	330	31.13%
Agricultural workers	41	3.87%
Enterprise staff	278	26.23%
Other	115	10.85%

completed the survey, 1055 of whom belonged to 31 provinces, cities, and autonomous regions in China, and the others were from overseas. Among them, 459 were from Shaanxi Province (43.3%), 119 were from Gansu Province (11.2%), 60 were from Shandong Province (5.7%), 59 were from Hubei Province (5.6%), 46 were from Zhejiang Province (4.3%), 43 were from Henan Province (4.1%), 30 were from Beijing (2.8%), 30 were from Jiangsu Province (2.8%). The majority of them were 18–29 years old (39.00%); nearly half of the respondents were female (48.21%); 78.77% of them had a bachelor's degree or higher; more than half were married (55.28%); approximately one-third of them were students (31.13%).

The primary ten outcomes of the SCL-90 in this study sample with

respect to their subgrouping are shown in Fig. 2, and the overall symptom severity distribution is shown in Table 2. In Fig. 2, boxes represent the distribution of symptoms and bar inside the box represents mean value; the upper bar represents the maximum of distribution; the lower bar represents the minimum of distribution. It can be seen that the overall score distribution and severity of the SCL-90's ten dimensions were basically similar, with an average value between 1.81 and 2.24. The average score of the low-risk group was between 1.65 and 2.08, and the average score of the high-risk group was between 2.96 and 3.33. Among these ten dimensions, OC, IS, PHOB, and ADD were all positive, indicating that the general public felt OC, IS, PHOB, and a poor appetite with sleeplessness during the epidemic due to various uncertainties of the novel coronavirus.

3.2. ANOVA of different groups

One-way ANOVA was applied to determine whether there were differences in GSI T-scores between the different groups. Before performing ANOVA analysis, we ran the Levene's test to examine the homogeneity of variance.

As shown in Table 3, in Levene's test of homogeneity of variance, the variance of the sample between different age groups was significantly different ($P = 0.003$). Therefore, Welch analysis was used for ANOVA. According to the Shapiro-Wilk normality test, the data from each group complied with the normal distribution ($P > 0.05$). The difference in the GSI T-score between different age groups was significant, Welch $F = 7.377, P < 0.001$. The GSI T-score of each group was ranked as follows: $> 60, 50-60, 40-49, 30-39, < 18, \text{ and } 18-29$.

As shown in Table 4, in Levene's homogeneity of variance test, the variance between men and women was uniform ($P = 0.964$). In the Shapiro-Wilk test, the data of each group followed a normal distribution ($P > 0.05$). However, the ANOVA showed that no significant difference in the GSI T-score between different gender, $F = 0.122, P = 0.72$.

As shown in Table 5, in Levene's homogeneity test of variance, the variance was not uniform between different levels of educational attainment ($P = 0.048$). Therefore, the Welch analysis method was used for the ANOVA. In the Shapiro-Wilk test, the data of each group obeyed a normal distribution ($P > 0.05$); the difference in GSI T-scores between different levels of educational attainment was significant, Welch $F = 8.108, P < 0.001$. The GSI T-score of each group was ranked as follows: junior high school, junior middle school, junior college, bachelor, doctor, and master.

As shown in Table 6, in Levene's homogeneity of variance test, the variances among marital status in this sample were uniform ($P = 0.127$). In the Shapiro-Wilk test, the data of each group obeyed a normal distribution ($P > 0.05$). The ANOVA showed that the difference in GSI T-scores between marital status groups was significant, $F = 9.136, P < 0.001$. The GSI T-score of each group was ranked as follows: divorced or widowed, married, and unmarried.

As shown in Table 7, in Levene's homogeneity of variance test, the variance among different occupations in this sample was uniform ($P = 0.546$). In the Shapiro-Wilk test, the data of each group obeyed a normal distribution ($P > 0.05$); the ANOVA showed that the difference in GSI T-scores between different occupational groups was significant, $F = 7.472, P < 0.001$. The GSI T-score of each group was ranked as follows: agricultural worker, others, medical staff, enterprise staff, civil servant, teacher, and student.

3.3. High-risk and low-risk groups

As showed in Table 8, the whole sample was divided into two groups of high-risk and low-risk by the cut-off point of GSI T-score = 63. They were sub-divided by demographic variables such as age, gender, educational attainment, marital status, and occupation. Furthermore, the mean and standard deviation, sample size, percentage, and the percentage difference between the high-risk and low-risk groups were all calculated.

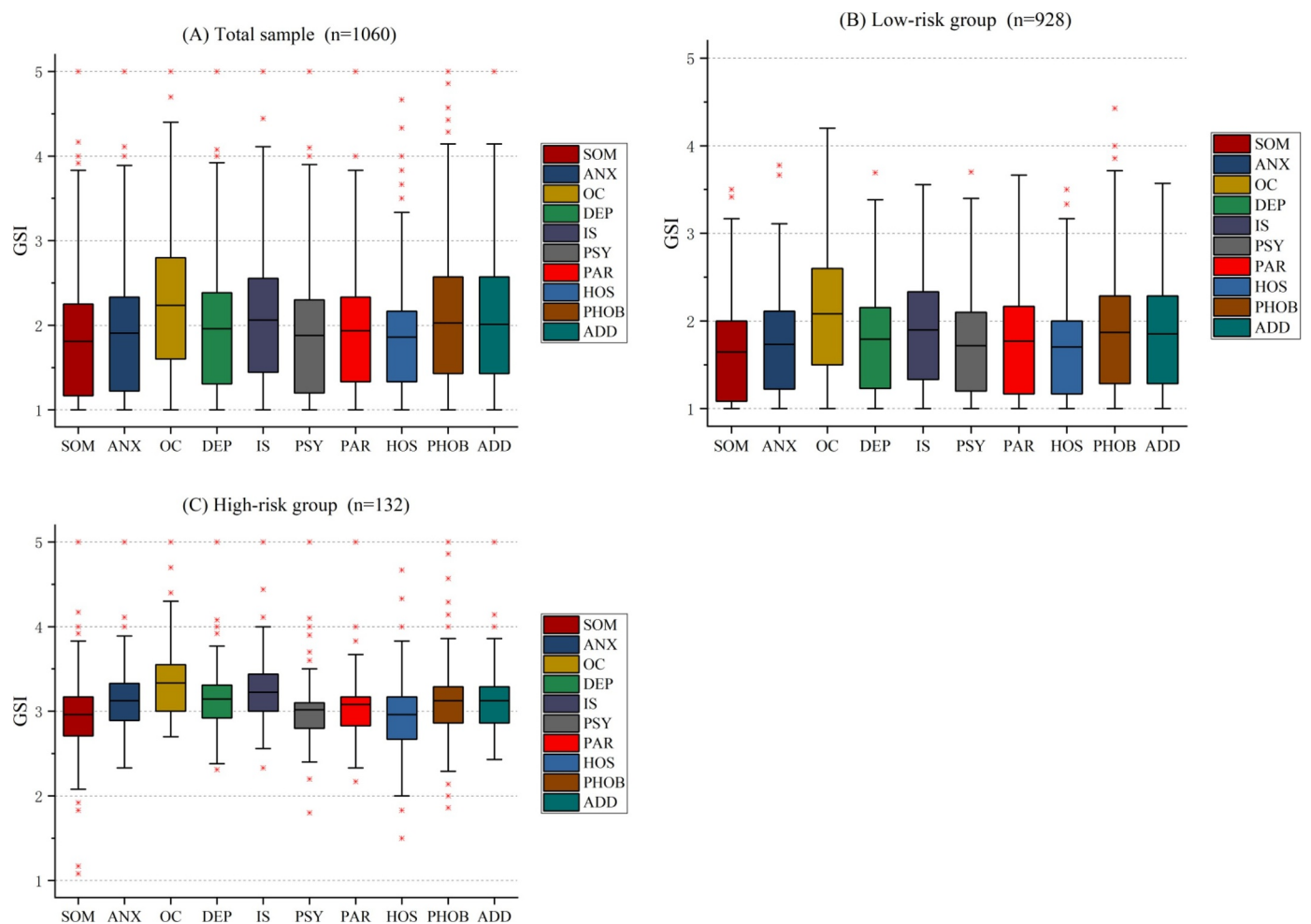


Fig. 2. Scores of the ten dimension of SCL-90 in the total sample and the two groups (Mean ± SD). Note: * indicates an abnormal value.

Table 2
SCL-90 scale score severity distribution in this study sample (n, %).

Dimension	1		1 < i ≤ 2		2 < i ≤ 3		3 < i ≤ 4		4 < i ≤ 5	
SOM	184	17.36%	520	49.06%	304	28.68%	50	4.72%	2	0.19%
ANX	159	15.00%	478	45.09%	357	33.68%	64	6.04%	2	0.19%
OC	59	5.57%	372	35.09%	482	45.47%	141	13.30%	9	0.85%
DEP	89	8.40%	514	48.49%	385	36.32%	70	6.60%	2	0.19%
IS	110	10.38%	425	40.09%	444	41.89%	77	7.26%	4	0.38%
PSY	172	16.23%	470	44.34%	373	35.19%	43	4.06%	2	0.19%
PAR	171	16.13%	477	45.00%	359	33.87%	52	4.91%	1	0.09%
HOS	174	16.42%	538	50.75%	306	28.87%	40	3.77%	2	0.19%
PHOB	145	13.68%	440	41.51%	400	37.74%	68	6.42%	7	0.66%
ADD	152	14.34%	417	39.34%	428	40.38%	61	5.75%	2	0.19%

Note: i refers to the dimension score.

3.3.1. Severity of symptoms in the high-risk group

As can be seen from Table 8, with regard to the severity of group psychological symptoms among all age groups, the GSI T-score of people under 18 was the highest (72.89 ± 4.83). The GSI T-score of males (68.13 ± 0.72) was generally higher than that of females (66.65 ± 0.46). Among the educational attainment groups, those who graduated from high school had the highest GSI T-score (68.03 ± 1.09); among the above-mentioned occupational groups, medical staff had the highest GSI T-score (70.28 ± 3.64); among the marital status groups, the divorced or widowed people had the highest GSI T-score (67.78 ± 2.31).

3.3.2. Difference in the proportion of high-risk and low-risk groups

From the difference in the proportions between the two groups, when the proportion is high-low > 0, it means that the group has a higher probability of appearing in the high-risk group. As shown in Table 8, among all occupations, compared with the low-risk group, others, enterprise staff and agricultural worker groups had the highest likelihood of being in the high-risk group; participants over the age of 50 and those below the age of 18 also had a significantly increased likelihood; divorced and widowed people also had a higher chance of appearing in the high-risk group. The proportion of females was slightly higher than that of males in the high-risk group.

Table 3
One-way ANOVA of GSI T-score for age groups.

Age	Number	Mean ± sd	N	%	Homogeneity of variance test	F
<18	1	49.19 ± 2.82	22	2.08%	0.003*	7.377***
18–29	2	48.52 ± 0.51	413	38.96%		2 < 1 < 3 < 4 < 5 < 6
30–39	3	49.59 ± 0.63	241	22.74%		
40–49	4	50.3 ± 0.61	209	19.72%		
50–60	5	53.37 ± 0.77	139	13.11%		
>60	6	55.42 ± 1.76	36	3.40%		

Note:
* indicates $P = 0.05$,
*** indicates $P < 0.001$.

Table 4
One-way ANOVA of GSI T-score for gender groups.

Gender	Number	Mean ± sd	N	%	Homogeneity of variance test	F
Male	1	49.9 ± 0.43	549	51.79%	0.964	0.122***
Female	2	50.11 ± 0.43	511	48.21%		

Note:
*** indicates $P < 0.001$.

3.4. Comparison with the Chinese norms of SCL-90

Table 9 shows the comparison data of the SCL-90 between COVID-19 and Chinese norms of SCL-90. The *t*-test results show that the ten dimensions of the SCL-90 were more significant than those of the Chinese norms of SCL-90. Among them, the degree of the PHOB dimension had the largest deviation. Participants were generally positive for OC symptoms, and it is necessary to confirm what they had done repeatedly; after the Level I Emergency Response was initiated in China, ordinary citizens should comply with home quarantine requirements, and they used mobile phones or the Internet to connect with others, which cause the positive IS dimension.

4. Discussion

From mid-December 2019, a novel coronavirus disease epidemic broke out in China and spread rapidly worldwide. On March 11, 2020, the WHO declared the COVID-19 a global pandemic. The last officially declared pandemic occurred on June 11, 2009, and the WHO declared the H1N1 influenza a global pandemic. The epidemic had spread to more than 70 countries. According to estimates from the Centers for Disease Control and Prevention, between April 2009 and April 2010 alone, it infected more than 60 million people in the United States and caused 12,469 deaths (Centers for Disease Control and Prevention, 2010). Generally speaking, the outbreak of an epidemic will cause a crisis of psychological health (Ji et al., 2017; Kamara et al., 2017; Maunder et al., 2003), and therefore, we must pay attention to people's psychological health in the fight against the epidemic. Since

Table 5
One-way ANOVA of GSI T-score for educational attainment groups.

Educational attainment	Number	Mean ± sd	N	%	Homogeneity of variance test	F
Junior middle school	1	53.6 ± 1.08	66	6.23%	0.048*	8.108***
Junior high school	2	54.34 ± 0.92	110	10.38%		5 < 6 < 4 < 3 < 1 < 2
Junior college	3	50.95 ± 1.25	49	4.62%		
Bachelor	4	49.54 ± 0.47	463	43.68%		
Master	5	48.28 ± 0.6	250	23.58%		
Doctor	6	49.03 ± 0.93	122	11.51%		

Note:
* indicates $P = 0.05$,
*** indicates $P < 0.001$.

the outbreak of COVID-19, some research groups have applied a self-made scale to assess the psychological impact of the epidemic on Chinese people (Qiu et al., 2020; Wang et al., 2020). However, no studies to date have applied the SCL-90 to assess the psychological status of ordinary Chinese citizens. The purpose of this study was to investigate the psychological status of different groups among ordinary Chinese citizens during the epidemic based on the SCL-90.

4.1. Ten dimensions of SCL-90

The present results show the mental state of ordinary Chinese citizens from January 31 to February 2, 2020, when all provinces across China had activated Level I Emergency Response, and the WHO declared the COVID-19 a PHEIC. All the respondents had varying degrees of psychological symptoms. Of them, 29.91% had some symptoms, 49.81% had symptoms, 18.96% had many symptoms, and 1.23% had extreme symptoms. Compared with the norms of SCL-90 developed in 1986, the SCL-90 outcomes revealed that ordinary Chinese citizens generally had certain psychological symptoms during the epidemic. From the perspective of the severity of psychological symptoms, factors that scored 2 or higher in the SCL-90 were OC, IS, and PHOB presenting with more severe positive symptoms; from the perspective of the replacement of psychological symptoms, PHOB, PSY, and OC were the three dimensions that had the largest differences from the norms of the SCL-90 developed in 1986. The psychological impact of the epidemic on ordinary Chinese citizens was primarily concentrated in OC, IS, PSY, and PHOB.

In the ten sub-questions within the OC dimension, except for question 51 (your mind going blank), which was not positive, the average value of all others was greater than 2. It indicates that ordinary Chinese citizens had OC symptoms during the epidemic, particularly, being forgetful, worrying about the neatness of clothes and manners, and having to wash hands repeatedly. Of the nine sub-questions in the IS dimension, more than half of the mean values were positive, including feeling uncomfortable eating in public places, demanding blame from others, feeling vulnerable, and feeling inferior to others and feeling worse than others and uncomfortable when others look at them or talk about them. Among the seven sub-questions of PHOB, four questions were positive. People were afraid to take trams, buses,

Table 6
One-way ANOVA of GSI T-score for marital status groups.

Marital status	Number	Mean \pm sd	N	%	Homogeneity of variance test	F
Married	1	50.89 \pm 0.4	586	55.28%	0.127	9.316***
Unmarried	2	48.59 \pm 0.49	448	42.26%		2 < 1 < 3
Divorced or widowed	3	54.31 \pm 2.19	26	2.45%		

Note:.

*** indicates $P < 0.001$.

subways, and trains or be in open spaces or on the street, tried to avoid certain things, places or activities, and felt uneasy in crowds such as shopping or at a movie. Of the ten sub-questions of PSY, two were answered positively, including thoughts of not being their own and that they should be punished for being themselves. These psychological symptoms are caused by the high infectivity and lethality of the COVID-19 outbreak and the limited information available to humans regarding this infectious disease (N. N. Chen et al., 2020). Therefore, the government, the National Health Commission, and relevant departments must announce the development status, protective measures, and future trends of the epidemic to the public in a timely and transparent manner.

4.2. High-risk group

The results show that older ordinary people have more severe psychological symptoms, owing to the average death age of COVID-19 being 55.5 years (N. N. Chen et al., 2020), and older ordinary people generally felt anxious about infection or suspecting themselves to be infected. Compared to other occupations, the intensity of psychological symptoms was more severe in agricultural workers (2.22 \pm 0.66). Most Chinese agricultural workers are migrant worker families with low levels of education and are prone to depression (Lu et al., 2012). As such, when they face this kind of epidemic, they were more likely to have adverse psychological symptoms. With regard to education, ordinary people with only high school education or below had significantly higher level of psychological symptoms than those with undergraduate education or above.

It also shows that with the increase in academic qualifications, people's rational judgment rate for new things increases, thereby reducing the corresponding psychological burden (Cui et al., 2019). With regard to marital status, divorced or widowed people showed a more positive result. Possible causes of these are, people reported more somatization, paranoid ideation, obsessive-compulsion, depression, anxiety, phobic anxiety, and psychoticism compared to single or married people (Al-Krenawi and Graham, 2004).

In the high-risk group, the GSI T-score of the group under-18 was the highest in terms of the severity of psychological symptoms. On January 27, the Ministry of Education of the People's Republic of China notified that all universities, middle schools, primary schools, and kindergartens should not begin to function until the epidemic has been effectively controlled. Further, students should stay at home during the Spring Festival, and college students are not allowed to return in

advance without school approval (Ministry of Education of the People's Republic of China, 2020). Teaching should be carried out online. It can be predicted that as minors grow up, they will undergo many physiological, psychological, cognitive, and social changes (Rytälä-Manninen et al., 2016). Minors were more likely to experience positive psychological symptoms such as panic, anxiety, and depression during the epidemic affected by the delayed start of the school term and the use of online teaching methods. Among the occupations, medical staff had the most severe psychological symptoms. During the outbreak of infectious diseases, medical staff are frontline workers, who tend to show more intense anxiety, fear, and stigma than ordinary citizens (Curto et al., 2018; Kamara et al., 2017). Previous research has shown that the psychological symptoms of females are generally higher than that of males (Lim et al., 2018). However, data from our study show that during the epidemic, men's psychological symptoms were generally higher than women's, which may be because most of the deaths resulting from COVID-19 occurred in men (N. Chen et al., 2020). With regard to education level, the psychological symptoms of those who graduated from high school were the most serious. In China, most of the migrant workers are below the undergraduate level who have to leave their hometown and take public transportation (such as high-speed rail, trains, and planes) to work in big cities. Some scholars have concluded that the psychological symptoms level of migrant workers in large Chinese cities is generally higher than those of local citizens (Ji et al., 2020; Lu et al., 2012).

During the COVID-19, due to the need for overall isolation and control, migrant workers should resume work in batches under the country's deployment after the extended Spring Festival holiday. The uncertain time of returning to work and infections associated with public transportation further exacerbated their psychological symptoms. The psychological symptoms of divorced or widowed people are obvious. Studies conducted by some research groups have shown that the psychological symptoms level of divorced or widowed people is generally higher than those of unmarried and married people (Al-Krenawi and Graham, 2004; Lindström and Rosvall, 2012).

With regard to the difference in the proportion of the high-risk and low-risk groups, the differences were the largest in three groups, namely, others, enterprise staff, and agricultural workers, when compared to that in the other occupations. In other words, the above three groups account for more of the high-risk group. The common characteristics in these three groups in China are that their jobs are not stable, and wages are greatly affected by market fluctuations. Some

Table 7
One-way ANOVA of GSI T-score for occupation groups.

Occupation	Number	Mean \pm sd	N	%	Homogeneity of variance test	F
Medical staff	1	52.21 \pm 1.42	42	3.96%	0.546	7.472***
Teacher	2	48.26 \pm 0.66	200	18.87%		4 < 2 < 3 < 6 < 1 < 7 < 5
Civil servant	3	48.27 \pm 1.27	54	5.09%		
Student	4	48.21 \pm 0.56	330	31.13%		
Agricultural workers	5	53.75 \pm 1.57	41	3.87%		
Enterprise staff	6	51.6 \pm 0.58	278	26.23%		
Other	7	52.97 \pm 0.92	115	10.85%		

Note:.

*** indicates $P < 0.001$.

Table 8
Comparison of high-risk and low-risk groups based on GSI T-score = 63.

Variables	GSI T-score < 63			GSI T-score ≥ 63			Discrepancy rate Proportion_high-low
	Mean ± sd	N_low	Proportion_low	Mean ± sd	N_high	Proportion_high	
Total	47.52 ± 0.26	928	100.00%	67.4 ± 0.43	132	100.00%	0.00%
Age							
< 18	45.44 ± 2.14	19	2.05%	72.89 ± 4.83	3	2.27%	0.23%
18–29	45.86 ± 0.41	362	39.01%	67.38 ± 0.82	51	38.64%	-0.37%
30–39	47.59 ± 0.54	217	23.38%	67.75 ± 0.98	24	18.18%	-5.20%
40–49	48.48 ± 0.54	187	20.15%	65.81 ± 0.41	22	16.67%	-3.48%
50–60	50.67 ± 0.65	117	12.61%	67.71 ± 0.92	22	16.67%	4.06%
> 60	50.63 ± 1.54	26	2.80%	67.88 ± 1.53	10	7.58%	4.77%
Gender							
male	47.36 ± 0.35	482	51.79%	68.13 ± 0.72	67	50.76%	-1.03%
female	47.7 ± 0.37	446	48.21%	66.65 ± 0.46	65	49.24%	1.03%
Educational attainment							
Junior middle school	50.9 ± 0.9	55	5.93%	67.06 ± 1.45	11	8.33%	2.41%
Junior high school	51.11 ± 0.78	89	9.59%	68.03 ± 1.09	21	15.91%	6.32%
Junior college	49.07 ± 1.05	44	4.74%	67.52 ± 1.91	5	3.79%	-0.95%
Bachelor	47.08 ± 0.4	407	43.86%	67.44 ± 0.75	56	42.42%	-1.43%
Master	46.24 ± 0.5	225	24.25%	66.61 ± 0.74	25	18.94%	-5.31%
Doctor	46.57 ± 0.76	108	11.64%	67.97 ± 1.34	14	10.61%	-1.03%
Marital status							
Married	48.62 ± 0.34	515	55.50%	67.35 ± 0.49	71	53.79%	-1.71%
Unmarried	46.01 ± 0.39	394	42.46%	67.42 ± 0.79	54	40.91%	-1.55%
Divorced or widowed	49.34 ± 1.83	19	2.05%	67.78 ± 2.31	7	5.30%	3.26%
Occupation							
Medical staff	50.31 ± 1.15	38	4.09%	70.28 ± 3.64	4	3.03%	-1.06%
Teacher	46.68 ± 0.59	184	19.83%	66.49 ± 0.75	16	12.12%	-7.71%
Civil servant	46.8 ± 1.14	50	5.39%	66.64 ± 1.04	4	3.03%	-2.36%
Student	45.83 ± 0.45	294	31.68%	67.66 ± 1.12	36	27.27%	-4.41%
Agricultural workers	50.38 ± 1.35	33	3.56%	67.64 ± 1.87	8	6.06%	2.50%
Enterprise staff	48.86 ± 0.48	238	25.65%	67.89 ± 0.69	40	30.30%	4.66%
Other	49.43 ± 0.81	91	9.81%	66.39 ± 0.74	24	18.18%	8.38%

Table 9
Comparison of SCL-90 scores between the COVID-19 period and the Chinese norms (mean ± SD).

Dimension	This study sample (n = 1060)	1986 (n = 1388)	t
SOM	1.81 ± 0.69	1.37 ± 0.48	20.67***
ANX	1.91 ± 0.71	1.39 ± 0.43	23.56***
OC	2.24 ± 0.75	1.62 ± 0.58	26.81***
DEP	1.96 ± 0.70	1.50 ± 0.59	21.49***
IS	2.06 ± 0.73	1.65 ± 0.61	18.41***
PSY	1.88 ± 0.69	1.29 ± 0.42	27.98***
PAR	1.93 ± 0.71	1.43 ± 0.57	23.17***
HOS	1.86 ± 0.68	1.46 ± 0.55	19.28***
PHOB	2.03 ± 0.74	1.22 ± 0.41	35.43***

Note: * indicates P = 0.001.

studies have analyzed that the mental state of agricultural workers and found that it is generally higher than that of other citizens (Zhong et al., 2013). People in these other occupations (such as middle and small-sized enterprise owners, individual industrial and commercial households) may lose their jobs or go bankrupt due to the impact of the epidemic. Staff may face layoffs and salary cuts, while fruits and vegetables may go unsold, as they cannot be gathered and processed, causing loss of money. Migrant workers may not be able to return to work due to the impact of the epidemic, and their wages may be damaged. With regard to academic qualifications, those with high school education and below accounted for more of the high-risk group. Some studies have found that people's psychological symptoms decrease with the increase in academic qualifications, which is consistent with the finding of this study (Assari, 2018; Erickson et al., 2016). Among all age groups, those aged 50 and older accounted for more number in the high-risk group, which may be due to the average age of death in COVID-19 being 55.5 years (N. Chen et al., 2020), and ordinary people are usually anxious about being infected or suspecting they have been infected. Studies have shown that SOM, OC, and PHOB increase with

age (Hessel et al., 2002). Moreover, the proportion of women in the high-risk group was slightly higher than that of men. These results are consistent with the results of previous studies (Prunas et al., 2012; Urbán et al., 2014). During the epidemic, women are often more sensitive to the guarantee of family stability, the main bearer and implementer of educating children and the caregiver and therapist of family members' emotions. Therefore, multiple stresses have affected women's psychological and physical health.

4.3. Suggestions

For the above groups, the following suggestions are given:

- 1) Focus on the psychological health of individuals under 18 and middle-aged to older people (over 50 years of age) and provide targeted psychological intervention through multiple channels such as television, Internet, and telephone. For minors under 18 years of age, government education departments, schools and teachers should guide them to understand the epidemic correctly. They should also aim to ease panic and fear by establishing an optimistic and positive attitude. For middle-aged and older people over 50 years of age, the government should encourage the children of this group to explain the popular science of the epidemic and to accompany them more often to ensure good psychological health.
- 2) Provide targeted psychological intervention and assistance to special groups severely affected by the epidemic. Establish a professional psychological assistance organization, based on ensuring the health and safety of frontline medical staff, regularly check the psychological status of medical staff, provide psychological intervention services for medical staff and their families to protect their psychological health. For groups such as other, enterprise staff and agricultural workers, the government should publicly and transparently announce the development of the epidemic and adopt appropriate subsidy policies to alleviate the economic pressure on the

general population caused by the epidemic. The media should objectively report the progress of the epidemic and increase publicity for psychological counseling.

- 3) Focus on the psychological health of people with lower education levels, the government should adopt a simple and easy-to-understand method to increase publicity efforts, to allow the general population to have an objective understanding of the epidemic to reduce unnecessary panic and stress.
- 4) Pay attention to the psychological health of women and sensitive groups such as divorce or widowed individuals and provide professional psychological assistance and counseling.

4.4. Methodological considerations

Several methodological limitations should be considered when interpreting the results of this study. First, the study population is based on a voluntary selection, which may introduce a self-selection bias. Second, we conducted measurements only at a single time point, which might not reflect long-term exposure to the dimensions related to Chinese' psychological health when facing the COVID-19 epidemic. Moreover, people's psychology could be different with the development of the epidemic. Finally, considering the average citizens were quarantined at home during the epidemic, this study used an online questionnaire and the snowball sampling strategy to collect data. As such, there was an oversampling of a particular network such as highly educated people, leading to selective bias in data results. Therefore, the results of this study should not be extrapolated to the whole of China. Notwithstanding the above limitations, this study provides valuable information on the initial psychological responses of average citizens after all the provinces of China adopted the Level I Emergency Response to the outbreak of COVID-19. In addition to individual differences, social factors (such as infection rates, transparency of government information disclosure, media orientation) can also affect psychological symptoms. We are also studying the analysis of psychological symptoms of ordinary Chinese citizens during the epidemic of social factors. More importantly, our results could be used as a reference which can help psychological intervention during the COVID-19 and prevent and control the psychological impact of the epidemic on average citizens.

To conclude, the results show that the COVID-19 epidemic has had a significant socio-psychological impact on ordinary citizens, and more than 70% of ordinary Chinese citizens have psychological symptoms that are moderate or more, mainly concentrated in the OC, IS, PHOB, and PSY 4 dimensions, compared with the Chinese norms of SCL-90 developed in 1986. Psychological test results in special groups such as minors, middle-aged, and older people, medical staff, agricultural workers, low-educated people, women, and divorced or widowed people were higher than those in other groups. Countries and international organizations such as the WHO should pay attention to the psychological symptoms of the high-risk group, providing appropriate interventions and psychological assistance.

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CRedit authorship contribution statement

Fangyuan Tian: Writing - original draft, Software, Formal analysis, Investigation, Visualization, Funding acquisition. **Hongxia Li:** Supervision, Funding acquisition. **Shuicheng Tian:** Supervision, Funding acquisition. **Jie Yang:** Writing - review & editing. **Jiang Shao:** Writing - review & editing. **Chenning Tian:** Writing - review & editing.

Declaration of Competing Interest

We declare that we do not have any commercial or associative interest that represents a conflict of interest in connection with the work submitted.

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