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## Emotional states and coping methods in nursing students responding to COVID-19

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**Original article****Emotional states and coping methods in nursing students responding to COVID-19****Running head:** Nursing students responding to COVID-19

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## Abstract

**Objectives** We aim to investigate correlation between emotional states and regulatory strategies and coping methods in nursing students responding to coronavirus disease 2019 (COVID-19).

**Design** Questionnaires were distributed to 366 nursing students and 380 non-nursing students. Questionnaire was collected, and content of questionnaire included generalized anxiety disorder 7 (GAD-7), patient health questionnaire-9 (PHQ-9), emotion regulation questionnaire (ERQ) and simplified coping style questionnaire (SCSQ).

**Results** There were positive correlations between depression score and ERQ expression inhibition, and between depression level and SCSQ negative coping. A positive correlation was noticed between the depression and ERQ expression inhibition or SCSQ negative coping. There was a negative correlation between SCSQ positive coping and anxiety and depression, respectively. COVID-19 affected the emotional status of the nursing and non-nursing students. Emotional status of the nursing students was less likely to be affected by COVID-19 than that of non-nursing students.

**Conclusions** Emotional status was closely correlated with the emotional regulation strategy and the coping methods. Staff involved in the nursing education should pay attention to the psychological status of nursing students and propose appropriate psychological interference in the presence of COVID-19.

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4 **Keywords:** Coping methods, COVID-19, emotional state, nursing students,  
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6 regulatory strategy  
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9 **Strengths and limitations of this study**  
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11 [1] This survey was performed in the epidemic stage of COVID-19, and it is really a  
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13 problem for the sample collection.  
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15  
16 [2] The number of male students in the nursing profession was lower, which may lead  
17  
18 to bias in the demographic information.  
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21 [3] We can further illustrate the stress pathway of the nursing students in cases of  
22  
23 severe public health events, and then establish a model for the psychological health  
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25 service.  
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29 [4] The data obtained in the setting of COVID-19 could be applied in the specific  
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31 conditions cautiously.  
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## 1 | INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a new type of acute respiratory syndrome that emerged in Wuhan City, Hubei Province in China in late December 2019. On January 30, 2020, COVID-19 was listed as the Public Health Emergency of International Concern by the WHO.<sup>1</sup> It has caused the outbreak of acute infectious pneumonia as it is highly epidemic, spreading to the southern Asia (India, Nepal, and Sri Lanka), eastern Asia (Japan and Korea), southeast Asia (Thailand, Singapore, Malaysia, Vietnam, Philippines, and Cambodia), western Asia (United Arab Emirates), Europe (Germany, France, Italy, UK, Russia, Finland, Spain, and Sweden), North America (USA and Canada), and Australia.<sup>2,3</sup> According to the survey, about 13% of the patients with confirmed 2019-nCoV infection were reported to present severe respiratory symptoms, among which 2% were died.<sup>4</sup> This indeed causes panic events to some extent, as we know little about 2019-nCoV despite great attempts have been made by the scientists. Generally, there might be various mental responses (e.g. anxiety, depression, fear, and anger) and physiological reactions among the population when facing the 2019-nCoV. Adaptation reactions are helpful to the individuals in the presence of infectious diseases, which then contribute to the reactions to the stress events. However, excessive emotional response may lead to somatopsychic disturbance in their daily lives.

To our best knowledge, many individuals presented post-traumatic stress reaction after the onset of severe natural disasters. Such reaction would develop into post-traumatic stress disorder (PTSD) if no effective psychological interferences are

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4 available. <sup>5</sup> For example, in the USA, more than 520,000 individuals showed  
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6 elevation in post-traumatic pressure after the “9.11” event. <sup>6</sup> In addition, in a study  
7  
8 focusing on the psychological effects of quarantine on people in Toronto, Canada, the  
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10 129 quarantined people responded to the Web-based survey were reported to show a  
11  
12 high prevalence of psychological distress. <sup>7</sup> PTSD symptoms and depression were  
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14 observed in 28.9% and 31.2% of respondents who were placed in quarantine during  
15  
16 the severe acute respiratory syndrome (SARS), respectively.  
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22 In the presence of public health emergency, the doctors and nurses fulfilling the  
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24 responsibility of helping the infected individuals by a certain disease are facing a huge  
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26 physical and psychological stress. In a previous study investigated the effects of  
27  
28 SARS on the psychosocial behaviors in Toronto in 2003, Nickell et al. focused on the  
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30 respondents who were allied health care professionals, nurses and doctors serving as  
31  
32 representatives of the hospital staff population as a whole. <sup>8</sup> About 29% of the  
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34 respondents reported SARS-related concern for their own or their families’ health,  
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36 while that rate among nurses was up to 45%. According to the report by the National  
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38 Health Commission of the People’s Republic of China, more than 14,000 doctors and  
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40 nurses were volunteered to manage the patients infected by the COVID-19 from all  
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42 over China. <sup>9</sup> They faced intensive treatment and nursing and beard a heavy working  
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44 pressure and psychological pressure. Up to now, a total of 1,716 doctors and nurses  
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46 were infected by COVID-19, accounting for about 3.8% of the whole number of  
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48 infected patients. In a recent survey on the psychological state of 207 nurses working  
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50 in the COVID-19 designated hospital in Hangzhou, Zhang et al. reported that most of  
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4 the nurses (92.68%) showed psychological disorder. This should raise our attention to  
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6 care about the psychological state of the staff involved in the public health.  
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10 China has a vast number of undergraduate students, which serve as the major  
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12 force for the national development and stability. They are reported to show a mean  
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14 incidence of depression of 30.6% (10%-85%) in a survey between 2009 and 2018.  
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16 Similarly, they presented a higher incidence of depression than other populations.<sup>10</sup>  
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18 In a systemic review, the detection rate of depression among the nursing students was  
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20 17.1% (95%CI: 12.2%-22%). Unfortunately, such rate is still on an increasing trend.  
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25 <sup>11</sup> Moreover, the detection rate for anxiety and depression among the nursing students  
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27 was 15.45-29.3% and 21.22-56.39%, respectively.  
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31 The nursing students are well educated in their profession. They will respond to  
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33 the epidemic diseases based on their background, which may not be similar with the  
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35 non-nursing students. In this study, we aimed to investigate the psychological  
36  
37 behaviors of the students in the nursing profession in the presence of COVID-19. In  
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39 addition, a comparison was conducted between these students and the students with  
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41 non-nursing professions, in order to identify the risk factors associated with the  
42  
43 psychological conditions in face of COVID-19.  
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## 48 | **2 | MATERIALS AND METHODS**

### 49 50 51 | **2.1 | Patient and Public Involvement**

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53 No patient involved.  
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### 55 56 | **2.2 | Subjects**

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4 Each subject was well informed about the questionnaire and signed the informed  
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6 consent online. In this study, we distributed our questionnaire to 770 students in the  
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8 campus between Feb. 4 and Feb. 10, 2020. The questionnaire was distributed by  
9  
10 online visiting to the undergraduate students in our university. All the subjects  
11  
12 participated in the questionnaire at their will. For the quality control of the  
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14 questionnaire, each online IP was only allowed to fill in one questionnaire. For the  
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16 privacy of the subjects, their privacy information was not presented in it. Upon  
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18 distribution of the questionnaire, automatic monitoring was performed to monitor the  
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20 time duration of each subject used on the questionnaire. Questionnaires accomplished  
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22 in less than 180 sec or in a long time were excluded from the subsequent analysis. The  
23  
24 inclusion criteria were as follows: (i) full-time undergraduate students; (ii) those  
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26 willing to participate in this survey; (iii) those with no psychological illness, or not  
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28 infected by COVID-19. Those with the following conditions were excluded from this  
29  
30 study: (i) those with severe psychological problems or diseases; (ii) infected by  
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32 COVID-19, or (iii) those with an internet position at Wuhan City (Hubei, China).  
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### 43 | **2.3 | Questionnaire**

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45 The questionnaire consisted of the following aspects. The generation information of  
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47 the students, including gender, age and profession.  
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51 Generalized anxiety disorder 7 (GAD-7) scale was used for the evaluation, which  
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53 was consisted of 7 items. A score range of 0-3 was set for each item, and the total  
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55 score was 21. A high score demonstrated an obvious anxiety state. A score of 5, 10  
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57 and 15 was considered the threshold score for the slight, moderate and severe anxiety,  
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4 respectively. In this study, the Chinese version of GAD-7 scale was used.<sup>12</sup> A total of  
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6 366 nursing students participated in the survey. The Cronbach  $\alpha$  coefficient was  
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8 0.858. In total, 380 non-nursing students participated in the survey, and the Cronbach  
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10  $\alpha$  coefficient was 0.904.  
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14 The patient health questionnaire-9 (PHQ-9) was consisted of 9 items with a score  
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16 range of 0-3 for each item (total score, 27). A higher score demonstrated a higher  
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18 depression state. A score of 5, 10 and 15 was considered the threshold score for the  
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20 slight, moderate and severe depression, respectively. The Chinese version of PHQ-9  
21  
22 version was adopted in this study.<sup>13, 14</sup> In total, 366 nursing students participated in  
23  
24 the survey, and the Cronbach  $\alpha$  coefficient was 0.880, while in the 380 non-nursing  
25  
26 students, the Cronbach  $\alpha$  coefficient was 0.894.  
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31 Emotion regulation questionnaire (ERQ) consisted of 10 items involving two rating  
32  
33 scale. The Chinese version of ERQ was adopted.<sup>15</sup> Among the 366 nursing students,  
34  
35 the Cronbach  $\alpha$  of the two dimensions of the ERQ scale was 0.849 and 0.764,  
36  
37 respectively. Among the 388 non-nursing students, the Cronbach  $\alpha$  of the two  
38  
39 dimensions of the ERQ scale was 0.890 and 0.812.  
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46 Simplified coping style questionnaire (SCSQ) initially proposed by Xie et al in  
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48 1998 consisted of 20 items. Both positive coping and negative coping were available  
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50 in the Chinese version of SCSQ.<sup>16</sup> The Cronbach  $\alpha$  of the two dimensions of the  
51  
52 SCSQ scale was 0.880 and 0.764 in the 366 nursing students, while those of the  
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54 non-nursing students were 0.886 and 0.739, respectively.  
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## 58 | **2.4 | Statistical analysis**

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SPSS Statistic 22.0 (SPSS Inc, IBM, USA) was used for the data analysis upon collection of the questionnaire. All the measurement data were presented as mean  $\pm$  standard error. Independent Sample t-test was used for the comparison of the GAD-7, PHQ-9, ERQ and SCSQ score between the nursing students and non-nursing students. The gender difference between the non-nursing students was compared using the independent Sample t-test. Pearson correlation analysis was conducted to analyze the correlation between anxiety, depression, regulatory strategy and coping methods.  $P < 0.05$  was statistically significant.

### 3 | RESULTS

#### 3.1 | Demographics and description of quarantined persons

In total, 746 (96.9%) questionnaires were obtained from the subjects, including 366 (96.3%) questionnaires collecting from nursing students and 380 (97.4%) from non-nursing students. Among the 366 nursing students, there were 20 male (5.5%) and 346 females (94.5%). The mean age for the respondents in the nursing students was  $22.4 \pm 1.5$  yrs. Among the 380 non-nursing students, there were 93 male (24.5%) and 287 females (75.5%). The mean age was  $22.1 \pm 1.2$  yrs.

The GAD-7 score for the students in the nursing profession was  $2.12 \pm 2.63$ . The PHQ-9 score was  $3.34 \pm 4.13$ . The ERQ score and SCSQ score was  $43.45 \pm 6.61$  and  $30.39 \pm 8.96$ , respectively. For the non-nursing students, the GAD-7 score was  $2.65 \pm 3.48$ , and the PHQ-9 score was  $3.74 \pm 4.79$ . The ERQ score and SCSQ score was  $44.10 \pm 7.59$  and  $31.00 \pm 9.41$ , respectively. Student's t-test indicated that the number of nursing students with a mean GAD-7 score and PHQ-9 score of 5 or more was

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4 significantly lower than those of the non-nursing students ( $t_1=-2.101$ ,  $p<0.01$ ;  
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6  $t_2=-1.372$ ,  $p<0.01$ ). Moreover, no statistical differences were noticed in the GAD-7  
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8 score and PHQ-9 score in the nursing students and non-nursing students with mild,  
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10 moderate and severe anxiety or depression, respectively (Table 1,  $p>0.05$ ). Student's  
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12 t-test revealed the cognition reevaluation score in the nursing students was  
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14 significantly lower than that of the non-nursing students ( $t=-0.117$ ,  $p<0.05$ ). For the  
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16 comparison of SCSQ between the non-nursing students and nursing students, no  
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18 statistical differences were noticed between them ( $p>0.05$ , Table 2).

### 24 25 **3.2 | Difference of non-nursing profession students of different genders in each** 26 27 **scale**

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29 For the non-nursing profession students, the score of anxiety and recognition  
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31 re-evaluation of the male students was significantly lower than that of the female  
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33 counterparts (anxiety:  $t_1=-3.494$ ;  $p<0.01$ ; recognition re-evaluation:  $t_2=-1.250$ ,  
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35  $p<0.05$ ). The expression inhibition in the male students was significantly higher than  
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37 that of the female counterparts ( $t=3.569$ ,  $p<0.05$ , Table 3). As the proportion of male  
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39 students in the nursing profession was very small, there was no correlation analysis  
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41 given before the nursing profession students.

### 42 43 **3.3 | Correlation between emotional state, regulatory strategy and coping style**

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45 Pearson regression analysis indicated a positive correlation between anxiety and  
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47 depression of the nursing profession students and the ERQ expression inhibition and  
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49 SCSQ negative coping ( $p<0.01$ ). Meanwhile, there was a negative correlation  
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51 between anxiety and depression of the nursing profession students and the positive  
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4 coping of SCSQ ( $p<0.05$ ). For the non-nursing profession students, the depression  
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6 was positively correlated with the expression inhibition of ERQ ( $p<0.01$ ). In addition,  
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8 the anxiety and depression were positively correlated with the negative coping style of  
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10 the SCSQ ( $p<0.01$ , Table 4).  
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#### 13 14 **4 | DISCUSSION**

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16 It has been well acknowledged that there is a significant increase in the anxiety and  
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18 depression than the normal conditions in the students of nursing profession or the  
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20 non-nursing students in the presence of severe stress events such as SARS and  
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22 COVID-19.<sup>17</sup> To date, little is known about the features of COVID-19. Anxiety is the  
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24 most common emotional stress. Compared to anxiety, depression is more apt to  
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26 induce social dysfunction. In this study, the incidence of anxiety and depression  
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28 among the nursing profession students was 15.3% and 27.6%, which were higher than  
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30 the incidence of the counterparts at normal conditions. In a previous study, Feng et al  
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32 indicated the detection rate of anxiety and depression based on the SAS and SDS  
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34 scale was 12.94% and 19.53%, respectively.<sup>18</sup> Meanwhile, in another study, the  
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36 incidence of depression in the nursing students was 21.22%.<sup>19</sup> In this study, the  
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38 detection rate of anxiety and depression among the non-nursing students was 18.9%  
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40 and 29.29%, respectively. The rates were significantly higher than that of the  
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42 detection rate for anxiety (10.2%) and depression (19.33%). These indicated that  
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44 severe stress events cause great threats to the psychological state of the nursing and  
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46 non-nursing students, respectively. In this study, 2.5% of the nursing students showed  
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48 moderate and severe anxiety, while 6.9% showed moderate and severe depression.  
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4 For the non-nursing students, 6.9% showed moderate and severe anxiety, and 7.4%  
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6 showed moderate and severe depression. For these students, further evaluation was  
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8 required, together with drugs and psychological interference. Particularly, there were  
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10 some students presented thoughts of suicide, and immediate interferences were  
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12 required. The campus is recommended to educate the students to adopt appropriate  
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14 emotional regulation strategy and coping methods in the presence of public crisis.  
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16 Besides, regular education on the COVID-19 related information including the onset,  
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18 progression, outcome and prevention. The students with mild and moderate anxiety  
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20 and depression should be educated to adapt to the anxiety and depression, together  
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22 with positive communication with the others and appropriate catharsis. Moreover, the  
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24 students are recommended to obtain support from the hotline of the psychological  
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26 stress, psychological counseling and training. These in a severe anxiety and  
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28 depression are recommended to receive treatment in hospitals.  
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38 Interestingly, unlike the non-stress condition, the anxiety and depression score and  
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40 incidence in the students of the nursing profession were significantly lower than that  
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42 of the non-nursing profession students. The decline in the incidence and depression  
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44 score may be related to the solid background of the nursing professions, which allow  
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46 them a better understanding on the infectious disease. Meanwhile, these students were  
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48 likely to receive education on the emotional management in campus, which  
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50 contributed to their adaptation reaction of the emotion in the presence of COVID-19.  
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56 This indeed is a positive feedback to the regulation of mental sources.<sup>20</sup>  
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58 The score of recognition re-evaluation in the nursing profession students and  
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4 non-nursing profession students was much higher than the expression inhibition score.  
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6 Besides, the recognition re-evaluation score in these students were similar, which  
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8 indicated that the under-graduate students showed a higher education level and a  
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10 positive physiological state. These contributed to the generation of a well adaptation  
11  
12 capacity to the COVID-19. As is known to all, a positive strategy for the recognition  
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14 reevaluation and a positive attitude towards the stress such as frequent handwashing  
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16 and wearing a mask are helpful to keep a healthy state. Re-evaluation on the stress  
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18 situation such as quarantine at home would promote the family relationship and  
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20 attempted to recover the negative emotion. On this basis, anxiety was considered as a  
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22 normal response to the crisis. In a previous study, Gross et al considered the  
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24 emotional regulation was an essential part for the internal psychological capital,  
25  
26 which meant the regulation involving multiple experiences, behaviors and  
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28 physiological system. Additionally, it was considered a functional reaction to the  
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30 generation time, experience and expressional emotion.<sup>21</sup> Individuals with recognition  
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32 re-evaluation were more intended to share their emotion, which obtained more social  
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34 support.<sup>22</sup> Despite the fact that quarantine at home limited the face-to-face  
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36 communication to some extent, the online communication contributed to the students  
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38 with a high recognition reevaluation as they could obtain social support through  
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40 communication via online system and/or telephone, which could attenuate the  
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42 psychological pressure.  
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56 The mean score for the SCSQ positive coping dimension in the nursing students  
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58 was similar with that of the non-nursing students, while the mean score for the  
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4 negative coping dimension was lower than that of the non-nursing students. When  
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6 facing the COVID-19, the positive coping included wearing a mask, frequent  
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8 handwashing and quarantine at home, together with obtaining social support. These  
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10 measures were highly associated with the effective management of the Chinese  
11  
12 government to face the COVID-19.<sup>23</sup> Since the epidemic spread of COVID-19, the  
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14 Chinese government acts rapidly and adopts immediate and effective measures for the  
15  
16 prevention and treatment to the civilians. In addition, the local authorities propose  
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18 accurate and effective education to the civilians about the COVID-19, and the disease  
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20 is under control in time.<sup>24</sup> Rare individuals showed negative coping and their patterns  
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22 were presented in an individual pattern. It is necessary to mention that there is no  
23  
24 definite boundary between positive coping and negative coping when facing a severe  
25  
26 public infection. Specially, there is indeed relation between positive coping and  
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28 negative coping. For the individuals placed in quarantine at home, their coping  
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30 behaviors are still limited.  
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40 The un-controllability and uncertainty of COVID-19 would lead to increase in the  
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42 powerless and feeling of helplessness. Compared to the other conditions involving the  
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44 utilization of positive coping to the specific issues, the supporting means from the  
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46 emotional aspects may provide more benefits to attenuate the pressure for the  
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48 individuals placed in quarantine at home. Self-comforting and accepting the reality  
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50 were not effective ways for positive coping, but it was an appropriate way for the  
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52 coping when facing the COVID-19.  
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58 There might be interactions between emotional state and regulatory strategy.<sup>25</sup>  
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4 The emotional state would affect the selection of the regulatory strategy, while the  
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6 regulate strategy would modulate the emotional state. In a previous study, the  
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8 individual responses to the emotional onset, experience and expression would play  
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10 important roles in the physical and mental health. Nursing students utilizing positive  
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12 recognition reevaluation strategy were more positive in their daily lives to the normal  
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14 affairs, and they were apt to alternate their emotional state based on their knowledge  
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16 to the emotional stress. This helped to the attenuation of negative emotion, which  
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18 would prevent the individuals from the depression and anxiety. In this study, there  
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20 was a positive correlation between the depression emotion and expression inhibition  
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22 of ERQ in the nursing students and non-nursing students ( $p<0.01$ ), especially the  
23  
24 nursing students. Those with obvious depression emotion were mainly featured by  
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26 sorrow and loneliness. They were not tended to express their feelings in cases of  
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28 negative emotion, and they would emerge in it. When evoked by the anxiety and  
29  
30 nervousness, the individuals willing to express their depression would attempt to  
31  
32 suppress the emotion. This would lead to negative effects to themselves and  
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34 experience on the negative feeling, which was harmful to the individuals. The  
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36 students not willing to express in the presence of high pressure were not apt to  
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38 acknowledge their anxiety and depression. They considered this as immoderate and  
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40 would not be accepted by the others even they expressed their feeling.  
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53 In a previous study, Ray et al proposed a risk of up to 43.3% for the  
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55 psychological issues for the individuals lacking effective coping methods in the  
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57 presence of high stress, which was about 2-fold higher to the normal counterparts.  
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4 Appropriate coping was effective for the management and attenuation of the  
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6 over-response and unhealthy psychological behaviors, which would alternate the  
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8 subjective knowledge of an individual. Subsequently, it would relieve the  
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10 psychological nervousness and maintain the psychological balance. In contrast, the  
11  
12 negative coping would lead to anxiety. In our survey, coping was correlated with the  
13  
14 anxiety. Besides, there was a positive correlation between anxiety, depression and  
15  
16 negative coping. Similar with the previous study,<sup>26</sup> those with high anxiety were  
17  
18 more likely to select a negative coping method, while those with lower anxiety were  
19  
20 more likely to select a positive coping.  
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27 In this survey, the male nursing students accounted for about 5.5%, and then no  
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29 differential analysis was conducted in views of gender. For the non-nursing students,  
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31 Student's t-test indicated statistical differences in the emotional states and regulatory  
32  
33 strategy between the male and female counterparts. The female students were more  
34  
35 sensitive in feeling and emotional experience than the male, which would easily bring  
36  
37 in negative effects in the presence of COVID-19. This indicated that the female was  
38  
39 more tended to utilize the emotion regulation than the male, however, it caused no  
40  
41 benefits to prevent the development of emotional problems. Instead, the female were  
42  
43 more likely to adopt maladjusted strategies, which may lead to more emotional  
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45 disorders easily.<sup>27</sup> Meanwhile, in a meta-analysis, although there were small  
46  
47 differences in the gender, there were large variations in the emotional expression.  
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49 Compared with the male, the female are more tended to express positive feeling and  
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51 negative feeling (e.g. sorrow and anxiety).<sup>28</sup> This was in line with the previous study,  
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4 in which the female was more likely to bear a larger stress and generate more  
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6 psychological nervousness upon seeing any information about the SARS (such as  
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8 infection rate, death, and other online information). On this basis, the male was  
9  
10 relatively lonely in the presence of COVID-19 even they were not infected. They  
11  
12 would not communicate with others and chose negative coping methods (e.g.  
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14 avoiding seeing or self-blame), which resulted in inadequate social support and  
15  
16 emotional help.  
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## 22 | **LIMITATIONS**

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24 This survey was performed in the epidemic stage of COVID-19, and it is really a  
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26 problem for the sample collection. Thus, convenient sampling was used, which  
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28 hampered the representativeness of the samples. Meanwhile, the online questionnaire  
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30 would be affected by the social network, which may lead to generation of bias in the  
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32 data collection. Furthermore, the number of male students in the nursing profession  
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34 was lower, which may lead to bias in the demographic information. Indeed, there are  
35  
36 really some aspects to be improved. We can further illustrate the stress pathway of the  
37  
38 nursing students in cases of severe public health events, and then establish a model for  
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40 the psychological health service. The data obtained in the setting of COVID-19 could  
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42 be applied in the specific conditions cautiously.  
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## 50 | **CONCLUSION**

51  
52 COVID-19 affected the emotional status of the nursing and non-nursing students. The  
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54 emotional status of the nursing students was less likely to be affected by COVID-19  
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56 compared with the non-nursing counterparts. The emotional status was closely related  
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4 to the emotional regulation and coping methods. Therefore, more attention should be  
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6 paid to the psychological status of the nursing and non-nursing students. For the  
7  
8 nursing students, staff involved in the nursing education should pay attention to the  
9  
10 psychological status of the nursing students and propose appropriate psychological  
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12 interference. For the non-nursing students, the staff should pay attention to the coping  
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14 of the public health events and the psychological health of the students, in order to  
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16 improve the psychological health through regulating the emotional regulation and  
17  
18 coping methods.  
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#### 24 **Acknowledgements**

25  
26  
27 Not applicable.  
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31  
32 This study was approved by the Ethical Committee of our University (No. 20190066).  
33  
34

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36  
37 Not applicable.  
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#### 40 **Competing interests**

41  
42 The authors declare that they have no competing interests.  
43  
44

#### 45 **Author's contribution**

46  
47 LX and XBY collected the questionnaire information; WXL analyzed the data; TSM  
48  
49 searched and reviewed the literature; MQF wrote the manuscript; LH revised the  
50  
51 manuscript.  
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#### 54 **Patient Consent form**

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57 Not applicable.  
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**Data sharing statement**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Word count**

3750

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**Table 1** Detection rates of anxiety and depression of different levels and comparisons of generalized anxiety disorder 7 (GAD-7) and patient health questionnaire-9 (PHQ-9) scores between the nursing students and non-nursing counterparts

	Nursing students (n=366)		Non-nursing students (n=380)		<i>t/z</i> value	<i>p</i> value
	Rate	Score	Rate	Score		
<b>Anxiety according to GAD-7</b>						
No anxiety	84.7%	1.21±1.28	81.1%	1.30±1.28	-0.864	0.472
Mild anxiety	12.8%	6.26±1.17	13.4%	6.24±1.18	0.084	0.926
Moderate anxiety	2.2%	11.50±1.51	3.4%	11.69±1.70	-0.270	0.388
Severe anxiety	0.3%	15.00±0.00	2.1%	17.13±1.90	-1.192	0.444
Anxiety overall	56 (15.3%)	7.16±2.45	72(18.9%)	8.43±3.97	-2.101	<0.001
<b>Depression according to PHQ-9</b>						
No depression	72.4%	1.25±1.40	70.8%	1.30±1.35	-0.408	0.423
Mild depression	18.8%	6.74±1.48	17.9%	6.40±1.28	1.445	0.119

<b>Moderate depression</b>	6.6%	11.50±1.22	5.8%	11.82±1.32	-1.009	0.888
<b>Severe depression</b>	2.2%	18.88±2.23	5.5%	18.05±3.55	-0.857	0.809
<b>Depression overall</b>	101 (27.6%)	8.83±3.87	111(29.2%)	9.68±4.96	-1.372	0.003

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**Table 2** Comparison of emotion regulation questionnaire (ERQ) and simplified coping style questionnaire (SCSQ)

	<b>Nursing students (n=366)</b>	<b>Non-nursing students (n=380)</b>	<b><i>t</i> value</b>	<b><i>p</i> value</b>
<b>Recognition reevaluation, ERQ</b>	29.58±5.13	29.65±5.77	-0.177	0.04
<b>Expression inhibition, ERQ</b>	13.87±3.89	14.45±4.21	-1.940	0.39
<b>Positive coping, SCSQ</b>	21.74±6.54	21.71±7.09	0.060	0.20
<b>Negative coping, SCSQ</b>	8.65±4.36	9.29±4.43	-1.984	0.97

**Table 3** Comparison of scale in different genders among the non-nursing students

Variable	Male (n=93)	Female (n=287)	t value	p value
Anxiety	1.57±2.47	3.00±3.67	-3.494	0.003
Depression	2.53±4.17	4.14±4.92	-3.093	0.052
Recognition reevaluation	29.00±6.70	29.86±5.44	-1.250	0.040
Expression inhibition	15.78±5.23	14.02±3.74	3.569	0.018
Positive coping	20.41±7.92	22.13±6.76	-1.887	0.135
Negative coping	9.05±4.68	9.37±4.36	-0.574	0.766

**Table 4** Correlation between anxiety, depression and regulatory strategy and coping methods

Variable	Nursing students (n=366)				Non-nursing students (n=180)			
	Recognition reevaluation	Expression inhibition	Positive coping	Negative coping	Recognition reevaluation	Expression inhibition	Positive coping	Negative coping
GAD-7	-0.067	0.153**	-0.127*	0.171**	-0.069	0.090	-0.055	0.252**
PHQ-9	-0.035	0.192**	-0.190**	0.176**	-0.065	0.145**	-0.077	0.248**

\* $p < 0.05$ ; \*\* $p < 0.01$

**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies***

Section/Topic	Item #	Recommendation	Reported on page #
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	9
		(b) Describe any methods used to examine subgroups and interactions	9
		(c) Explain how missing data were addressed	9
		(d) If applicable, describe analytical methods taking account of sampling strategy	9
		(e) Describe any sensitivity analyses	9
<b>Results</b>			9



Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	9
		(c) Consider use of a flow diagram	10
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10
		(b) Indicate number of participants with missing data for each variable of interest	10
Outcome data	15*	Report numbers of outcome events or summary measures	10
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10
		(b) Report category boundaries when continuous variables were categorized	10
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	10
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10
<b>Discussion</b>			11
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# BMJ Open

## Emotional states and coping methods in nursing and non-nursing students responding to COVID-19: a cross-sectional study in China

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<b>Primary Subject Heading</b>:	Nursing
Secondary Subject Heading:	Nursing
Keywords:	COVID-19, Infection control < INFECTIOUS DISEASES, MEDICAL ETHICS

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4 **Original article**  
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6 **Emotional states and coping methods in nursing and non-nursing students**  
7 **responding to COVID-19: a cross-sectional study in China**  
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11 **Running head:** Nursing students responding to COVID-19  
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## Abstract

**Objectives:** To evaluate the emotion, coping strategy, dealing methods and their correlation in the COVID-19 outbreak among the nursing and non-nursing students.

**Design and setting:** A cross-sectional online survey.

**Participants:** Full-time nursing and non-nursing undergraduate students.

**Main outcome measure:** The generalized anxiety disorder 7 (GAD-7) and patient health questionnaire-9 (PHQ-9) were utilized to determine the emotional status in the COVID-19 pandemic among the nursing and non-nursing students. Emotion regulation questionnaire (ERQ) was utilized to measure the emotion regulation strategies and the simplified coping style questionnaire (SCSQ) was used to evaluate the coping methods among the nursing and non-nursing students.

**Results:** In total, 746 students including 366 nursing students and 380 non-nursing students participated in the survey. Compared with the non-nursing students, significant decrease was noticed in GAD-7 score ( $P<0.01$ ) and PHQ-9 ( $P<0.01$ ) in the nursing students. The cognition reevaluation score in the nursing students was significantly lower than that of the non-nursing students ( $P<0.05$ ). In the nursing students, the score of anxiety was positively correlated with ERQ expression inhibition ( $P<0.01$ ) and SCSQ negative coping ( $P<0.01$ ), while the score of depression was also positively correlated with ERQ expression inhibition ( $P<0.01$ ) and SCSQ negative coping ( $P<0.01$ ). There was negative correlation between SCSQ and the scores of anxiety ( $P<0.05$ ) and depression ( $P<0.05$ ). In the non-nursing students, the anxiety score was positively correlated with the SCSQ negative coping ( $P<0.01$ ), while the depression score was positively correlated with the ERQ expression inhibition ( $P<0.01$ ) and

SCSQ negative coping ( $P<0.01$ ).

**Conclusions:** COVID-19 affected the emotional status of the nursing and non-nursing status.

The emotional status was correlated with the emotional regulation and coping methods. Staff involved in the nursing professionals should pay attention to the psychological status of the nursing and non-nursing students, and give moderate psychological interference in the presence of COVID-19.

**Keywords:** Coping methods, COVID-19, emotional state, nursing students, regulatory strategy

#### **Strengths and limitations of this study**

[1] This survey was performed at the early stage of COVID-19 pandemic, and it is really a challenge for the questionnaire collection.

[2] The number of male nursing students was lower, which may lead to bias in the demographic information.

[3] We can further illustrate the stress pathway of the nursing students in cases of severe public health events, and then establish a model for the psychological health service.

[4] The data obtained in the setting of COVID-19 could be applied in the specific conditions cautiously.

## 1 | INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a new type of acute respiratory syndrome that emerged in Wuhan City, Hubei Province in China in late December 2019. On January 30, 2020, COVID-19 was listed as the Public Health Emergency of International Concern by the WHO. <sup>1</sup> It has caused the outbreak of acute infectious pneumonia as it is highly epidemic, spreading to the southern Asia (India, Nepal, and Sri Lanka), eastern Asia (Japan and Korea), southeast Asia (Thailand, Singapore, Malaysia, Vietnam, Philippines, and Cambodia), western Asia (United Arab Emirates), Europe (Germany, France, Italy, UK, Russia, Finland, Spain, and Sweden), North America (USA and Canada), and Australia. <sup>2,3</sup> According to the survey, about 13% of the patients with confirmed 2019-nCoV infection were reported to present severe respiratory symptoms, among which 2% were died. <sup>4</sup> In a recent study, patients with COVID-19 usually present severe psychological stress, anxiety and depression. <sup>5</sup> Gupta et al proposed a novel emotion care scheme to analyze multimodal textual data contained in the real-time tweets related to COVID-19. Besides, the authors investigated 8-scale emotions (i.e. anger, anticipation, disgust, fear, joy, sadness, surprise and trust) induced by COVID-19. Adaptation reactions are helpful to the individuals when facing infectious diseases, which then contribute to the response to stress events. However, excessive emotional response may lead to somato-psychic disturbance in their daily lives.

In the presence of public health emergency, the doctors and nurses fulfilling the responsibility for helping the infected individuals by a certain disease are facing a huge physical and psychological stress. In a previous study investigated the effects of SARS on the psychosocial behaviors in Toronto in 2003, Nickell et al. focused on the respondents who

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4 were allied health care professionals, nurses and doctors serving as representatives of the  
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6 hospital staff population as a whole. <sup>6</sup> About 29% of the respondents reported SARS-related  
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8 concern for their own or their families' health, while that rate among nurses was up to 45%.  
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10 According to the report by the National Health Commission of the People's Republic of  
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12 China, more than 14,000 doctors and nurses were volunteered to manage the patients infected  
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14 by the COVID-19 from all over China. <sup>7</sup> They faced intensive treatment and nursing and  
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16 beard a heavy occupational and psychological pressure. Up to now, a total of 1,716 doctors  
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18 and nurses were infected by COVID-19, accounting for about 3.8% of the whole number of  
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20 infected patients. In a recent survey on the psychological state of 207 nurses working in the  
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22 COVID-19 designated hospital in Hangzhou, Zhang et al. reported that most of the nurses  
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24 (92.68%) showed psychological disorders. This should raise our attention on the  
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26 psychological state of the staff involved in the public health. COVID-19 could affect the  
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28 emotion of the staff involving in medical and nursing professionals, and their response  
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30 strategies would change under different emotions. <sup>8</sup> The adults with anger and fear are more  
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32 likely to respond positively to pressure events, while those with sorrow and depression were  
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34 more intended to choose negative response. <sup>9</sup> On this basis, more attention has been paid to  
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36 the investigation on the relationship between individual response and psychological health.  
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48 Since the outbreak of COVID-19, more attention has been paid to the psychological  
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50 health of the nursing students. As the major reserve force of nursing professionals, the  
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52 nursing students are at a learning stage of their fields. Their inadequate understanding on the  
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54 COVID-19 and a lack of clinical experiences would bring complex emotionas. Although they  
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56 have received professional nursing education and are well educated in the medical fields, they  
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4 are indeed affected by the emotions just like the non-nursing students.<sup>10</sup> In colleges, the  
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6 nursing students are more likely to be trained on how to manage the infection, which is  
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8 beneficial to the prevention of infectious diseases.<sup>11</sup> Patel et al showed that a complete  
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10 understanding on the cause, prevention and treatment of a certain disease would reduce the  
11  
12 fear to the disease. Nevertheless, in a study investigated the psychological state of nursing  
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14 students studying at a university located within the Wenchuan earthquake zone indicated that  
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16 nursing students in areas affected by the Wenchuan earthquake suffer from anxiety and  
17  
18 depression disorders. Participants most often employed basic problem solving approaches to  
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20 cope with psychological conflicts arising from their earthquake experience.<sup>12</sup> In a  
21  
22 cross-sectional study in Egypt, undergraduate university students were very prone to choose  
23  
24 the problem-focused coping strategies during the COVID-19 pandemic.<sup>13</sup> As the COVID-19  
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26 is sudden onset with a rapid infection rate and a high mortality coexisting with  
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28 unpredictability, little is known about the differences between the nursing students and  
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30 non-nursing counterparts in the emotional and coping strategies.  
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40 In this study, we aimed to investigate the emotion, coping strategy, dealing methods and  
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42 their correlation in nursing and non-nursing students during the COVID-19 pandemic. In  
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44 addition, we investigated the differences of the psychological status between the nursing and  
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46 non-nursing students, which contributed to the construction of psychological supporting  
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48 system and coping strategies during the COVID-19 pandemic.  
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## 53 | **2 | MATERIALS AND METHODS**

### 54 | **2.1 | Patient and Public Involvement**

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58 No patient involved.  
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## 2.2 | Subjects

Each subject was well informed about the questionnaire and signed the informed consent online. In this study, we distributed our questionnaire to 770 students in a full-time university located in Hangzhou (Zhejiang Province, China) between Feb. 4 and Feb. 10, 2020. The questionnaire was distributed by online visiting to the undergraduate students in our university. All the subjects participated in the questionnaire voluntarily. For the quality control of the questionnaire, each online IP was only allowed to fill in one questionnaire. For the privacy of the subjects, their privacy information was not presented in it. Upon distribution of the questionnaire, automatic monitoring was performed to monitor the time duration of each subject used on the questionnaire. Questionnaires accomplished in less than 180 sec or in a long time were excluded from the subsequent analysis. Before setting the items in the questionnaire, we needed to find out whether the subjects showed mental illness and COVID-19. In order to exclude the effects of COVID-19 pandemic on the psychological status, we excluded the subjects located in Wuhan City (Hubei Province, China). The inclusion criteria were as follows: (i) full-time undergraduate students; (ii) those willing to participate in this survey; (iii) those with no psychological illness, or not infected by COVID-19. Those with the following conditions were excluded from this study: (i) those with severe psychological problems or diseases; (ii) infected by COVID-19, or (iii) those with an internet position at Wuhan City (Hubei, China).

## 2.3 | Questionnaire

The questionnaire consisted of the following aspects. The generation information of the students, including gender, age and profession.

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4 Generalized anxiety disorder 7 (GAD-7) scale was used for the evaluation. A score range  
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6 of 0-3 was set for each item, and the total score was 21 for the 7 items. A score of 5, 10 and  
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8 15 was considered the threshold score for the slight, moderate and severe anxiety,  
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10 respectively. In this study, the Chinese version of GAD-7 scale was used.<sup>14</sup> A total of 366  
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12 nursing students participated in the survey. The Cronbach  $\alpha$  coefficient was 0.858. In total,  
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14 380 non-nursing students participated in the survey, and the Cronbach  $\alpha$  coefficient was  
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16 0.904.  
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22 The patient health questionnaire-9 (PHQ-9) was consisted of 9 items with a score range  
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24 of 0-3 for each item (total score, 27). A higher score demonstrated a higher depression state.  
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26 A score of 5, 10 and 15 was considered the threshold score for the slight, moderate and  
27  
28 severe depression, respectively. The Chinese PHQ-9 version was adopted in this study.<sup>15,16</sup>  
29  
30 In total, 366 nursing students participated in the survey, and the Cronbach  $\alpha$  coefficient was  
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32 0.880. The Cronbach  $\alpha$  coefficient was 0.894 in the 380 non-nursing students.  
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38 Emotion regulation questionnaire (ERQ) consisted of 10 items involving two rating  
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40 scale. The Chinese version of ERQ was adopted.<sup>17</sup> Among the 366 nursing students, the  
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42 Cronbach  $\alpha$  of the two dimensions of the ERQ scale was 0.849 and 0.764, respectively.  
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44 Among the 388 non-nursing students, the Cronbach  $\alpha$  of the two dimensions of the ERQ  
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46 scale was 0.890 and 0.812.  
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51 Simplified coping style questionnaire (SCSQ) initially proposed by Xie et al in 1998  
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53 consisted of 20 items. Positive and negative coping was available in the Chinese version of  
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55 SCSQ.<sup>18</sup> The Cronbach  $\alpha$  of the two dimensions of the SCSQ scale was 0.880 and 0.764 in  
56  
57 the 366 nursing students, and 0.886 and 0.739 in the non-nursing students, respectively.  
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## 2.4 | Statistical analysis

SPSS Statistic 22.0 (SPSS Inc, IBM, USA) was used for the data analysis upon collection of the questionnaire. All the measurement data were presented as mean  $\pm$  standard error. Independent Sample t-test was used for the comparison of the GAD-7, PHQ-9, ERQ and SCSQ score between the nursing and non-nursing students. The gender difference between the non-nursing students was compared using the independent Sample t-test. Pearson correlation analysis was conducted to analyze the correlation between anxiety, depression, regulatory strategy and coping methods.  $P < 0.05$  was considered to be statistically significant.

## 3 | RESULTS

### 3.1 | Demographics and description of quarantined persons

In total, we distributed 770 questionnaires, and 746 (96.9%) were finally collected, including 366 questionnaires collecting from nursing students and 380 from non-nursing students. Among the 366 nursing students, there were 20 male (5.5%) and 346 females (94.5%). The mean age for the respondents in the nursing students was  $22.4 \pm 1.5$  yrs. Among the 380 non-nursing students, there were 93 male (24.5%) and 287 females (75.5%). The mean age was  $22.1 \pm 1.2$  yrs.

The GAD-7 score for the students in the nursing profession was  $2.12 \pm 2.63$ . The PHQ-9 score was  $3.34 \pm 4.13$ . The ERQ score and SCSQ score was  $43.45 \pm 6.61$  and  $30.39 \pm 8.96$ , respectively. For the non-nursing students, the GAD-7 score was  $2.65 \pm 3.48$ , and the PHQ-9 score was  $3.74 \pm 4.79$ . The ERQ score and SCSQ score was  $44.10 \pm 7.59$  and  $31.00 \pm 9.41$ , respectively. Student's t-test indicated that the number of nursing students with a mean GAD-7 score and PHQ-9 score of 5 or more was significantly lower than those of the

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4 non-nursing students ( $t_1=-2.101$ ,  $P<0.01$ ;  $t_2=-1.372$ ,  $P<0.01$ ). Moreover, no statistical  
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6 differences were noticed in the GAD-7 score and PHQ-9 score in the nursing students and  
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8 non-nursing students with mild, moderate and severe anxiety or depression, respectively  
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10 (Table 1,  $P>0.05$ ). Student's t-test revealed the cognition reevaluation score in the nursing  
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12 students was significantly lower than that of the non-nursing students ( $t=-0.117$ ,  $P<0.05$ ). For  
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14 the comparison of SCSQ between the non-nursing students and nursing students, no  
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16 statistical differences were noticed between them ( $P>0.05$ , Table 2).

### 22 | **3.2 | Difference of non-nursing profession students of different genders in each scale**

23  
24 For the non-nursing profession students, the score of anxiety and recognition re-evaluation of  
25  
26 the male students was significantly lower than that of the female counterparts (anxiety:  
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28  $t_1=-3.494$ ;  $P<0.01$ ; recognition re-evaluation:  $t_2=-1.250$ ,  $P<0.05$ ). The expression inhibition  
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30 in the male students was significantly higher than that of the female counterparts ( $t=3.569$ ,  
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32  $P<0.05$ , Table 3). As the proportion of male students in the nursing profession was very  
33  
34 small, there was no correlation analysis before the nursing profession students.

### 40 | **3.3 | Correlation between emotion, regulatory strategy and coping style**

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42 Pearson regression analysis indicated a positive correlation between anxiety and depression  
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44 of the nursing profession students and the ERQ expression inhibition and SCSQ negative  
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46 coping ( $P<0.01$ ). Meanwhile, there was a negative correlation between anxiety and  
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48 depression of the nursing profession students and the positive coping of SCSQ ( $P<0.05$ ). For  
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50 the non-nursing profession students, the depression was positively correlated with the  
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52 expression inhibition of ERQ ( $P<0.01$ ). In addition, the anxiety and depression were  
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54 positively correlated with the negative coping style of the SCSQ ( $P<0.01$ , Table 4).  
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#### 4 | DISCUSSION

It has been well acknowledged that there is a significant increase in the anxiety and depression among nursing or the non-nursing students when facing severe stress events such as SARS and COVID-19.<sup>19</sup> Anxiety is the most common emotional stress. Compared to anxiety, depression is more likely to induce social dysfunction. In this study, the incidence of anxiety and depression among the nursing profession students was 15.3% and 27.6%, which were higher than the incidence of the counterparts at normal conditions. In a previous study, Feng et al indicated the detection rate of anxiety and depression based on the SAS and SDS scale was 12.94% and 19.53%, respectively.<sup>20</sup> Meanwhile, in another study, the incidence of depression in the nursing students was 21.22%.<sup>21</sup> In this study, the proportion of non-nursing students with anxiety and depression was 18.9% and 29.2%, which was significantly higher than the rate of anxiety (15.3%) and depression (27.6%) in the nursing students. These indicated that severe stress events cause great threats to the psychological state of the nursing and non-nursing students, respectively. In this study, 2.5% of the nursing students showed moderate and severe anxiety, while 6.9% showed moderate and severe depression. For the non-nursing students, 6.9% showed moderate and severe anxiety, and 7.4% showed moderate and severe depression. For these students, further evaluation was required, together with drugs and psychological interference. Particularly, there were some students presented thoughts of suicide, and immediate interferences were required. The campus is recommended to educate the students to adopt appropriate emotional regulation strategy and coping methods in the presence of public crisis. Besides, regular education on the COVID-19 related information including the onset, progression, outcome and prevention. The students with mild

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4 and moderate anxiety and depression should be educated to adapt to the anxiety and  
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6 depression, together with positive communication with the others and appropriate catharsis.  
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9 Moreover, the students are recommended to obtain support from the hotline of the  
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11 psychological stress, psychological counseling and training. These in a severe anxiety and  
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13 depression are recommended to receive treatment in hospitals.  
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17 Interestingly, unlike the non-stress condition, the anxiety and depression score and  
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19 incidence in the students of the nursing profession were significantly lower than that of the  
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21 non-nursing students. The decline in the incidence and depression score may be related to the  
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23 solid background of the nursing professions, which allow them a better understanding on the  
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25 infectious disease. Meanwhile, these students were likely to receive education on the  
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27 emotional management in campus, which contributed to their adaptation reaction of the  
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29 emotion in the presence of COVID-19. This indeed is a positive feedback to the regulation of  
30  
31 mental sources.<sup>22</sup>  
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38 The score of recognition re-evaluation in the nursing and non-nursing students was much  
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40 higher than the expression inhibition score. Besides, the recognition re-evaluation score in  
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42 these students were similar, which indicated that the under-graduate students showed a higher  
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44 education level and a positive psychological state. These contributed to the generation of a  
45  
46 well adaptation capacity to the COVID-19. As is known to all, a positive strategy for the  
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48 recognition reevaluation and a positive attitude towards the stress such as frequent  
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50 hand-washing and wearing a mask are helpful to keep a healthy state. Re-evaluation on the  
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52 stress situation such as quarantine at home would promote the family relationship and  
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54 attempted to recover the negative emotion. On this basis, anxiety was considered as a normal  
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4 response to the crisis. In a previous study, Gross et al considered the emotional regulation  
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6 was an essential part for the internal psychological capital, which meant the regulation  
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8 involving multiple experiences, behaviors and psychological system. Additionally, it was  
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10 considered a functional reaction to the generation time, experience and expressional emotion.  
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14 <sup>23</sup> Individuals with recognition re-evaluation were more intended to share their emotion,  
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16 which obtained more social support. <sup>24</sup> Despite the fact that quarantine at home limited the  
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18 face-to-face communication to some extent, the online communication contributed to the  
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20 students with a high recognition reevaluation as they could obtain social support through  
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22 communication via online system and/or telephone, which could attenuate the psychological  
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24 pressure.  
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30 The mean score for the SCSQ positive coping dimension in the nursing students was  
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32 similar with that of the non-nursing students, while the mean score for the negative coping  
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34 dimension was lower than that of the non-nursing students. When facing the COVID-19, the  
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36 positive coping included wearing a mask, frequent hand-washing and quarantine at home,  
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38 together with obtaining social support. These measures were highly associated with the  
39  
40 effective management of the Chinese government to face the COVID-19. <sup>25</sup> Since the  
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42 COVID-19 pandemic, the Chinese government acts rapidly and adopts immediate and  
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44 effective measures for the prevention and treatment to the civilians. In addition, the local  
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46 authorities propose accurate and effective education to the civilians about the COVID-19, and  
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48 the disease is under control in time. <sup>26</sup> Rare individuals showed negative coping and their  
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50 patterns were presented in an individual pattern, such as their coping methods for depression,  
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52 escape and self-blame. It is necessary to mention that there is no definite boundary between  
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4 positive coping and negative coping when facing a severe public infection. Specially, there is  
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6 indeed relation between positive coping and negative coping. For the individuals placed in  
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8 quarantine at home, their coping behaviors are still limited.  
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11 The un-controllability and uncertainty of COVID-19 would lead to increase in the  
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13 powerless and feeling of helplessness. Compared to the other conditions involving the  
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15 utilization of positive coping to the specific issues, the supporting means from the emotional  
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17 aspects may provide more benefits to attenuate the pressure for the individuals placed in  
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19 quarantine at home. Self-comforting and accepting the reality were not effective ways for  
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21 positive coping, but it was an effective coping strategy for COVID-19.  
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27 There might be interactions between emotional state and regulatory strategy.<sup>27</sup> The  
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29 emotional state would affect the selection of the regulatory strategy, while the regulate  
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31 strategy would modulate the emotional state. In a previous study, the individual responses to  
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33 the emotional onset, experience and expression would play important roles in the physical  
34  
35 and mental health. Nursing students utilizing positive recognition reevaluation strategy were  
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37 more positive in their daily lives to the normal affairs, and they were apt to alternate their  
38  
39 emotional state based on their knowledge to the emotional stress. This contributed to the  
40  
41 attenuation of negative emotion, which would prevent the individuals from the depression  
42  
43 and anxiety. In this study, there was a positive correlation between the depression emotion  
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45 and expression inhibition of ERQ in the nursing and non-nursing students ( $P<0.01$ ),  
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47 especially the nursing students. Those with obvious depression emotion were mainly featured  
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49 by sorrow and loneliness. They were not tended to express their feelings in cases of negative  
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51 emotion, and they would emerge in it. When evoked by the anxiety and nervousness, the  
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4 individuals willing to express their depression would attempt to suppress the emotion. This  
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6 would lead to negative effects to themselves and experience on the negative feeling, which  
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8 was harmful to the individuals. The students not willing to express their emotion under a high  
9  
10 pressure were not likely to acknowledge their anxiety and depression. They considered this as  
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12 immoderate and would not be accepted by the others even they expressed their feeling.  
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16  
17 In a previous study, Ray et al proposed a risk of up to 43.3% for the psychological issues  
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19 for the individuals lacking effective coping methods in the presence of high stress, which was  
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21 about 2-fold higher than that of the normal counterparts. Appropriate coping was effective for  
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23 the management and attenuation of the over-response and unhealthy psychological behaviors,  
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25 which would alternate the subjective knowledge of an individual. Subsequently, it would  
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27 relieve the psychological nervousness and maintain the psychological balance. In contrast,  
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29 the negative coping would lead to anxiety. In our survey, coping strategy was correlated with  
30  
31 the anxiety. Besides, there was a positive correlation between anxiety, depression and  
32  
33 negative coping. Similar with the previous study,<sup>28</sup> those with high anxiety were more likely  
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35 to select a negative coping method, while those with lower anxiety were more likely to select  
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37 a positive coping. This indicated that staff involved in the nursing education should pay  
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39 attention to the psychological status of the nursing students and propose appropriate  
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41 psychological interference, and integrate the systemic training on the outbreak of public  
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43 health events to the nursing education. For the staff involving in the education of non-nursing  
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45 students, attention should be paid to the psychological health of the students in cases of  
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47 emergency events, and improve the psychological health through regulating the emotion and  
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49 coping strategies. Additionally, the non-nursing students should be educated about the  
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4 emergency events, together with the prevention of the disease. In addition, measures should  
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6 be taken to protect the students from emergency events that may hamper the psychological  
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8 health in order to improve the psychological health through regulating the emotional  
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10 regulation and coping methods.  
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14 In this survey, the male nursing students accounted for about 5.5%, and then no  
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16 differential analysis was conducted in views of gender. For the non-nursing students,  
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18 Student's t-test indicated statistical differences in the emotional states and regulatory strategy  
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20 between the male and female counterparts. The female students were more sensitive in  
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22 feeling and emotional experience than the male, which would easily bring in negative effects  
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24 in the presence of COVID-19. This indicated that the female was more tended to utilize the  
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26 emotion regulation than the male, however, it triggered no benefits to prevent the  
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28 development of emotional problems. Instead, the female were more likely to adopt  
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30 maladjusted strategies, which may lead to more emotional disorders easily.<sup>29</sup> Meanwhile, in  
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32 a meta-analysis, although there were small differences in the gender, there were large  
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34 variations in the emotional expression. Compared with the male, the female are more tended  
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36 to express positive feeling and negative feeling (e.g. sorrow and anxiety).<sup>30</sup> This was in line  
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38 with the previous study, in which the female was more likely to bear a larger stress and  
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40 generate more psychological nervousness upon seeing any information about the SARS such  
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42 as infection rate, death, and other online information. On this basis, the male was relatively  
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44 lonely in the presence of COVID-19 even they were not infected. They would not  
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46 communicate with others and chose negative coping methods (e.g. avoiding seeing or  
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48 self-blame), which resulted in inadequate social and emotional support.  
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## 5 | LIMITATIONS

This survey was performed during the epidemic stage of COVID-19, and it is really a problem for the sample collection. Thus, convenient sampling was used, which hampered the representativeness of the samples. Meanwhile, the online questionnaire would be affected by the social network, which may lead to generation of bias in the data collection. Furthermore, the number of male students in the nursing profession was lower, which may lead to bias in the demographic information. Indeed, there are really some aspects to be improved. We can further illustrate the stress pathway of the nursing and non-nursing students in cases of severe public health events, and then establish a model for the psychological health service. The data obtained in the setting of COVID-19 could be applied in the specific conditions cautiously.

## 6 | CONCLUSION

COVID-19 affected the emotional status of the nursing and non-nursing students. The emotional status of the nursing students was less likely to be affected by COVID-19 compared with the non-nursing counterparts. The emotion status was closely related to the emotion regulation and coping methods. Therefore, more attention should be paid to the psychological status of the nursing and non-nursing students, together with appropriate psychological interference in the presence of COVID-19.

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Not applicable.

### **Ethics approval statement**

This study was approved by the Ethical Committee of Hangzhou Normal University (No.

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4 20190066).

5  
6 **Funding**

7  
8  
9 Not applicable.

10  
11 **Competing interests**

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14 The authors declare that they have no competing interests.

15  
16  
17 **Author's contribution**

18  
19 LX and XBY collected the questionnaire information; WXL analyzed the data; TSM  
20 searched and reviewed the literature; MQF wrote the manuscript; LH revised the manuscript.  
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24  
25 **Patient Consent form**

26  
27 Not applicable.

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30 **Data availability statement**

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32 Data are available upon reasonable request.

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35 **Word count**

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**Table 1** Detection rates of anxiety and depression of different levels and comparisons of generalized anxiety disorder 7 (GAD-7) and patient health questionnaire-9 (PHQ-9) scores between the nursing students and non-nursing counterparts

	Nursing students (n=366)		Non-nursing students (n=380)		t/z value	p value
	Rate	Score	Rate	Score		
<b>Anxiety according to GAD-7</b>						
No anxiety	84.7%	1.21±1.28	81.1%	1.30±1.28	-0.864	0.472
Mild anxiety	12.8%	6.26±1.17	13.4%	6.24±1.18	0.084	0.926
Moderate anxiety	2.2%	11.50±1.51	3.4%	11.69±1.70	-0.270	0.388
Severe anxiety	0.3%	15.00±0.00	2.1%	17.13±1.90	-1.192	0.444
Anxiety overall	56 (15.3%)	7.16±2.45	72(18.9%)	8.43±3.97	-2.101	<0.001
<b>Depression according to PHQ-9</b>						
No depression	72.4%	1.25±1.40	70.8%	1.30±1.35	-0.408	0.423
Mild depression	18.8%	6.74±1.48	17.9%	6.40±1.28	1.445	0.119

<b>Moderate depression</b>	6.6%	11.50±1.22	5.8%	11.82±1.32	-1.009	0.888
<b>Severe depression</b>	2.2%	18.88±2.23	5.5%	18.05±3.55	-0.857	0.809
<b>Depression overall</b>	101 (27.6%)	8.83±3.87	111(29.2%)	9.68±4.96	-1.372	0.003

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**Table 2** Comparison of emotion regulation questionnaire (ERQ) and simplified coping style questionnaire (SCSQ)

	<b>Nursing students (n=366)</b>	<b>Non-nursing students (n=380)</b>	<b><i>t</i> value</b>	<b><i>p</i> value</b>
<b>Recognition reevaluation, ERQ</b>	29.58±5.13	29.65±5.77	-0.177	0.04
<b>Expression inhibition, ERQ</b>	13.87±3.89	14.45±4.21	-1.940	0.39
<b>Positive coping, SCSQ</b>	21.74±6.54	21.71±7.09	0.060	0.20
<b>Negative coping, SCSQ</b>	8.65±4.36	9.29±4.43	-1.984	0.97

**Table 3** Comparison of scale in different genders among the non-nursing students

Variable	Male (n=93)	Female (n=287)	<i>t</i> value	<i>p</i> value
Anxiety	1.57±2.47	3.00±3.67	-3.494	0.003
Depression	2.53±4.17	4.14±4.92	-3.093	0.052
Recognition reevaluation	29.00±6.70	29.86±5.44	-1.250	0.040
Expression inhibition	15.78±5.23	14.02±3.74	3.569	0.018
Positive coping	20.41±7.92	22.13±6.76	-1.887	0.135
Negative coping	9.05±4.68	9.37±4.36	-0.574	0.766

**Table 4** Correlation between anxiety, depression and regulatory strategy and coping methods

Variable	Nursing students (n=366)				Non-nursing students (n=180)			
	Recognition reevaluation	Expression inhibition	Positive coping	Negative coping	Recognition reevaluation	Expression inhibition	Positive coping	Negative coping
GAD-7	-0.067	0.153**	-0.127*	0.171**	-0.069	0.090	-0.055	0.252**
PHQ-9	-0.035	0.192**	-0.190**	0.176**	-0.065	0.145**	-0.077	0.248**

\* $P < 0.05$ ; \*\* $P < 0.01$

**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies***

Section/Topic	Item #	Recommendation	Reported on page #
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-6
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	9
		(b) Describe any methods used to examine subgroups and interactions	9
		(c) Explain how missing data were addressed	9
		(d) If applicable, describe analytical methods taking account of sampling strategy	9
		(e) Describe any sensitivity analyses	9
<b>Results</b>			9-10

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9-10
		(b) Give reasons for non-participation at each stage	9-10
		(c) Consider use of a flow diagram	9-10
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10
		(b) Indicate number of participants with missing data for each variable of interest	10
Outcome data	15*	Report numbers of outcome events or summary measures	10
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10
		(b) Report category boundaries when continuous variables were categorized	10
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	10
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10
<b>Discussion</b>			11
Key results	18	Summarise key results with reference to study objectives	11-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).