Original Article

Analysis of mental health status before and after psychological intervention in response to public health emergencies by medical students: a prospective single-arm clinical trial

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Background: Many human mobility restrictions have been adopted during the novel 2019 coronavirus disease (COVID-19) pandemic. Here we explored the effects of psychological interventions on the mental health status of medical students under the regular prevention and control of the pandemic.

Methods: By voluntarily participating in interest groups, 121 third-year medical undergraduate students in a university in Jiangsu Province underwent psychological interventions for 1 year. Their mental status was assessed by using Zung's Self-rating Anxiety Scale (SAS), Self-rating Depression Scale (SDS), and Somatic Self-rating Scale (SSS) before and after the interventions. Psychological coping styles were compared by using the trait coping style questionnaire (TCSQ). Each assessment scale is evaluated every 3 months, with the first survey results as the baseline data and compared with the last results. The resulting data was passed by SPSS 23 0 for normal testing and Analysis of Variance (ANOVA).

Results: During the regular response to the COVID-19 pandemic, the prevalence of anxiety, depression, and somatization symptoms was 25.62% *vs.* 7.44%, 28.93% *vs.* 18.18%, and 21.49% *vs.* 9.92%, respectively, before and after psychological interventions (all P<0.05). The positive (31.73±4.26 *vs.* 38.26±3.72) and negative (27.69±3.19 *vs.* 20.73±2.8) coping styles significantly differed before and after intervention (both P<0.05).

Conclusions: Varying degrees of anxiety, depression, and somatization symptoms can occur in medical students during the regular response to COVID-19 pandemic, highlighting the impact of public health emergencies on college students. Interest group–based psychological intervention, along with individual mental health counseling, can positively promote the mental health of college students and effectively improve their anxiety.

Keywords: Medical students; psychological intervention; mental health

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Introduction

The 2019 coronavirus disease (COVID-19) first emerged in late 2019 and has spread worldwide since then. It was later declared by the World Health Organization (WHO) to be a public health emergency of international concern (PHEIC). A significant increase of 25% in the global prevalence of anxiety and depression in 2020 has been reported, and the literature shows a significant impact in adolescents and children (1). The social isolation caused by the pandemic has created unprecedented stress, limiting

students' ability to learn, seek support from loved ones, and participate in community activities. In addition, loneliness, fear of infection, distress, and death for oneself and loved ones are also stressors that lead to anxiety and depression. However, due to the complex situations in China and abroad, the measures to target both imported cases and possible domestic epidemic rebound have necessitated repeated implementations which may still remain for a long period of time, presenting a serious strain on daily life. College students are more susceptible to mental problems during a public health emergency (2,3), medical students are more likely to have psychological cues and empathetic responses to the environment. This study is a phased observation effect during the epidemic and aims to provide a reference for further study design. In our current study, we provided appropriate psychological intervention on the mental state and coping styles of medical students during the regular prevention and control of the COVID-19 pandemic and observed the impact of this intervention on mental health, with an attempt to inform future efforts to strengthen psychological intervention and promote mental health among medical students. Using the combination of group intervention and individual psychological counseling, a personalized response plan is designed for the individual, which provides systematic, regular and continuous psychological intervention for medical students, and achieves results. We present the following article in accordance with the SURGE reporting checklist (available at https://tp.amegroups.com/article/view/10.21037/tp-23-120/rc).

Highlight box

Key findings

- Systematic psychological intervention is effective for improving the mental health of medical students.

What is known and what is new?

- Our present study revealed college students. The social harm caused their negative emotions. The combined application of group-based interventions and individual psychological counseling in psychological interest groups offered systematic, regular, and continuous psychological interventions to medical students, with good results. Meanwhile, the coping styles also changed dramatically.
- Different from traditional individual psychological counseling, team-based counseling can be applied for systematic psychological intervention, which can produce psychological empathy and form positive psychological suggestion. One-on-one psychological counseling and behavioral suggestion, can prevent the occurrence of unexpected events.

What is the implication, and what should change now?

- Psychosocial counseling and interventions are essential during the regular PHER. For special populations (e.g., medical students), systematic and continuous interventions should be offered by professional teams. Populations showing signs of psychological tendencies should be traced on a case-by-case basis, which is particularly important during PHER.

Methods

Participants

From March 30, 2021, to March 31, 2022, a questionnaire-based survey and interventions were carried out in interest groups on a voluntary basis, and those quarantined due to the pandemic completed their learning and psychological assessments online. The inclusion criteria were as follows: (I) A third-year undergraduate students in a medical school in Jiangsu Province and (II) offering informed consent for the participation and training of interest groups. The exclusion criteria included the following: (I) with serious physical and/or mental disorders precluding participation in learning activities and (II) part-time undergraduate students. A total of 125 students were enrolled, among whom 4 withdrew due to transfer of subject major or physical reasons. Finally, 121 students (96.80%) completed the whole course of interest group activities, received psychological intervention, and participated in psychological tests. There were 45 males and 76 females, with an average age of (20.3±2.18) years.

Survey tools

Basic information

A self-made questionnaire was used to collect basic information on gender, age, major, hobbies and specialties, major events, learning conditions, and activities. Informed consent concerning collection of data on the participants' activities was obtained from each participant and filed in the student work office. Each assessment scale is evaluated every 3 months, with the first survey results as the baseline data and compared with the last results. Considering the psychological characteristics of medical students during the epidemic, this study used more concise SAS, SDS, SSS and TCSQ assessment scales to improve participants' compliance. This topic is a study of conventional and special teaching methods, which meets the requirements for exemption from ethical review. The study was conducted in

accordance with the Declaration of Helsinki (as revised in 2013).

Self-rating scales for anxiety, depression, and somatization

Zung's Self-rating Anxiety Scale (SAS) (4-6) is a 20-item measure, with each item rated on a 4-point scale (1–4 points, except for the 5th, 9th, 13th, 17th, and 19th items, which are rated on a scale of 4–1). The anxiety index numbers are interpreted as follows: less than 50, normal range; 50–59, mild anxiety; 60–69, moderate anxiety; and 70 or higher, severe anxiety. The Cronbach's α coefficient of SAS is 0.89.

Zung's Self-rating Depression Scale (SDS) (4-6) is a 20-item measure, with each item rated on a 4-point scale (1–4 points, except for the 2nd, 5th, 6th, 11th, 12th, 14th, 16th, 17th, 18th, and 20th, which are rated on a scale of 4–1). The depression index numbers are interpreted as follows: less than 53, normal range; 50–59, mild depression; 60–69, moderate depression; and 70 or higher, severe depression. The raw score of either SAS or SDS is the sum of the scores of each item, and the index score is the integer part of the raw score ×1.25.

The Somatic Self-rating Scale (SSS) (7) consists of 20 items that are rated on a scale from 1 to 4 as follows: 1= none or not at all, 1= several days per month and/or endurable, 2= more than half the days per month and/or hoping to ease up; and 3= nearly every day and/or unendurable. The results are interpreted as follows: ≤29, normal range; 30–40, mild; 40–60, moderate; and ≥60: severe.

Trait coping style questionnaire

The trait coping style questionnaire (TCSQ) consists of 20 items, including 10 items for the positive coping (PC) style and 10 items for the negative coping (NC) style, and is rated on a 5-point Likert scale. Coping tendency was calculated using the following formula: coping tendency = PC style score – NC style score. A positive coping tendency value indicated that PC was the predominant style, while a negative value indicated that NC was the predominant style, with 0 representing a neutral response style. PC is mostly problem-focused and manifests as an individual's effort to solve practical problems; in contrast, NC is mostly emotion-focused and manifests as individuals reducing their own bad emotions through coping strategies, such as avoidance and denial (8). The Cronbach's α coefficients of the total scale and the positive and negative coping subscales were 0.694, 0.722, and 0.783, respectively.

Psychological interventions

Design psychological intervention programs in accordance with the National Health Commission's Guidelines for Intervention in Epidemic Emergency Psychological Crisis. A team composed of student counselors, psychological counselors, psychotherapists, and members of student clubs conducted systematic psychological intervention for the participants, including team-based psychological interventions and individual-level psychological interventions. Team-based psychological interventions included mental health education, group psychological training, and relaxation training, whereas individual-level psychological interventions included music therapy, sleep therapy, and psychological counseling.

Team-based psychological interventions

Mental health education, using the results of group psychological tests as the baseline data and with its content focusing on COVID-19 pandemic, was conducted bi-weekly either online or offline. The main content of the education included lifestyle change and its adjustments during the pandemic, self-adjustment for common psychological problems, and self-management of stress in isolation facilities and at home.

Group psychological training on public health emergency response (PHER)

Group psychological training and relaxation training focusing on PHER were offered, with a combination of scenarios and real-world exercises being used. The specific content included environmental adaptation, teamwork, communication, and stress relief during a public health emergency. Progressive relaxation training included music therapy, psychological suggestion, breathing/muscle relaxation therapy, and sleep therapy, which was arranged on a monthly basis. Online simulation was conducted during holidays and quarantine periods.

Individual psychological counseling and behavioral suggestions

Mental health files were created for each participant. Based on the results of psychological tests, one-on-one psychological counseling and behavioral suggestion were provided to students with obvious mental problems in the interest groups. The individual students received support in small teams, along with the individual psychological counseling and follow-up interventions from the teachers. Students who were mentally active and optimistic

Table 1 Zung's Self-rating Anxiety Scale (SAS) scores before and after psychological interventions

Group	Anxiety, n (%)			
	Light	Moderate	Heavy	Total
Before interventions	23 (19.01)	6 (4.96)	2 (1.65)	31 (25.62)
After interventions	6 (4.96)	3 (2.48)	0 (0)	9 (7.44)
t value				3.911
P value				<0.05

Table 2 Zung's Self-rating Depression Scale (SDS) scores before and after psychological interventions

Group	Depression, n (%)			
	Light	Moderate	Heavy	Total
Before interventions	20 (16.53)	12 (9.92)	3 (2.48)	35 (28.93)
After interventions	14 (11.57)	7 (5.79)	1 (0.83)	22 (18.18)
t value				1.977
P value				<0.05

offered demonstrations, and the teams established close relationships with the students with psychological problems.

Statistical analysis

Statistical analysis was performed using SPSS 23.0 software (IBM Corp.). The measurement data are presented as mean ± standard deviation (SD), and the means were compared using the paired-samples *t*-test. The numeration data are presented as number and percentages. Univariate analysis was based on the chi-squared test. A P value of <0.05 was considered significantly different.

Results

SAS scores before and after psychological interventions

In the interest group, the prevalence of anxiety was 25.62% before interventions and significantly decreased to 7.44% after interventions (P<0.05), and the declines were particularly obvious for moderate and severe anxiety (*Table 1*).

SDS scores before and after psychological interventions

In the interest group, the prevalence of depression was 28.93% before interventions and significantly decreased to 18.18% after interventions (P<0.05), and the declines were particularly obvious for moderate and severe depression (*Table 2*).

SSS scores before and after psychological interventions

In the interest group, the prevalence of somatization was 21.49% before interventions and significantly decreased to 9.92% after interventions (P<0.05; *Table 3*).

Comparisons of anxiety, depression, and somatization scores before and after psychological interventions

In the interest group, the anxiety, depression, and somatization scores significantly decreased after interventions (P<0.05), suggesting notable improvements in the anxiety, depression, and somatization levels (*Table 4*).

Comparison TCSQ scores before and after psychological intervention

In the interest group, the PC style scores significantly increased and the NC style scores significantly decreased after interventions (both P<0.05; *Table 5*).

Discussion

PHER is an integral part of social governance and also

Table 3 Somatic Self-rating Scale (SSS) scores before and after psychological interventions

Group	Somatization, n (%)			
	Light	Moderate	Heavy	Total
Before interventions	19 (15.70)	6 (4.96)	1 (0.83)	26 (21.49)
After interventions	10 (8.26)	2 (1.65)	0 (0)	12 (9.92)
t value				2.495
P value				<0.05

Table 4 Comparisons of anxiety, depression, and somatization scores before and after psychological interventions

Group	SAS	SDS	SSS
Before interventions	56.73±3.75	47.46±3.09	35.59±3.96
After interventions	34.65±3.16	38.75±4.37	27.43±4.80
t value	49.528	17.908	14.429
P value	<0.05	<0.05	<0.05

Data are shown as mean ± standard deviation. SAS, Self-rating Anxiety Scale; SDS, Self-rating Depression Scale; SSS, Somatic Self-rating Scale.

Table 5 Comparison of trait coping styles before and after psychological intervention

Group	NC style score	PC style score
Before interventions	27.69±3.19	31.73±4.26
After interventions	20.73±2.80	38.26±3.72
t value	18.056	–12.691
P value	<0.05	<0.05

Data are shown as mean ± standard deviation. NC, negative coping; PC, positive coping.

reflects the comprehensive emergency response capacity of a society. Emergency rescue systems for public health emergencies as well sociopsychological interventions for trauma have become global concerns. From the severe acute respiratory syndrome (SARS) epidemic in 2003 to the Wenchuan earthquake in 2008, China has accumulated rich experience in PHER. In particular, the quick and effective responses of the Chinese government toward the sudden crisis of COVID-19 at the end of 2019 was reported as follows: "In the face of an unknown virus, China has taken the bravest, most flexible, and most active prevention and control measures in history" (9).

In the early stage of the COVID-19 pandemic, the National Health Commission of China issued the *Guidelines for Emergency Psychological Crisis Intervention for People Affected by COVID-19*, emphasizing the values of sociopsychological interventions during public health emergencies. Despite the regular prevention and control of COVID-19 in China, COVID-19 clusters and outbreaks still challenge the country's efforts in preventing imported cases and local infections and have constantly impaired the mental status of the general public. Many college students are emotionally fragile and vulnerable to external environments. In particular, medical students are more susceptible to the psychological problems during the COVID-19 pandemic due to poor knowledge of the diseases and fear of close contact with infected patients after future employment. It has been reported that 45% of college students had acute stress, depression, or anxiety, and 6.3% of college students had all 3 of these (10). Lasheras *et al.* (11) conducted a meta-analysis of the prevalence of anxiety among global medical students during the COVID-19 pandemic and found that the prevalence of anxiety was 28%. Zhang *et al.* (12) found the prevalence of anxiety to be significantly higher in college students confined to campuses during COVID-19 than in in the general public in China. As shown in our current study, during the regular response to the COVID-19 pandemic, the prevalence of anxiety, depression, and somatization symptoms was 25.62%, 28.93%, and 21.49%, respectively, among medical students,

which is higher than that reported in the literature (13-16). Therefore, during the regular PHER, individuals' judgment and expectations can be impaired due to the prolonged pandemic and the lack of effective medication. Chronic stress can induce a series of mental problems including anxiety, depression, insomnia, and helplessness, leading to both physical and mental injuries. These negative emotions cause more serious damage to the human immune system, leading to a decline of physical function, which further impairs memory, behavior, judgment, and attention. The interactions among anxiety, depression, and somatization symptoms produce comorbidities, as already described in the literature (17,18). Our present study revealed that the scores of anxiety, depression, and somatization in medical students were higher than the national average in college students, which may be explained by the specific characteristics of medical students. First, medical students have certain medical knowledge but lack a deep understanding of diseases; when a public health emergency exceeds their knowledge, they may become less confident in medicine and even have many doubts, which can easily result in emotional dysregulation. Second, medical students are facing increasingly high learning pressure. Medical education is a combination of academic and clinical skills. Due to the needs of the epidemic control, many medical students are confined to the campus or have to learn online. The lack of training in clinical settings results in learning panic and is followed by a worry regarding future practice. Third, medical students have a more intimate connection with the human experience, particularly as it relates to human diseases, suffering, disasters, and injuries, for whose victims they develop a high level of sympathy. Their concerns about the social harm caused by public health emergencies can aggravate their negative emotions. Studies have shown that stressful events, especially catastrophic events, increase the severity of individual anxiety, the risk of recurrence of generalized social anxiety and phobias (19), and depression severity and suicide risk (20). Therefore, education on mental health for college students, especially medical students, during the regular response to the COVID-19 pandemic, is particularly important.

Effective psychological interventions and mental health education have become indispensable. According to the *Guidelines for Emergency Psychological Crisis Intervention for People Affected by COVID-19*, the Chinese Society of Psychiatry has established psychological crisis intervention department (21), and many institutions in China have also carried out different forms of psychological intervention, with good results. However, since psychological crisis is a relatively new research field in China, the models for the implementation and management of psychological crisis intervention remain immature. There is still a lack of well-trained personnel, well-designed departments, and/or high-quality textbooks and courses. Jiang (22) believes that the construction of a sociopsychological service system requires collaborative governance with contributions from multiple stakeholders, and a whole-process psychological service system composed of "prevention-early warning-intervention" will enable the effective interactions among platforms, individuals, and mechanisms. In our present study, the combined application of group-based interventions and individual counseling in psychological interest groups offered systematic, regular, and continuous psychological interventions to medical students, with good results. After the interventions, the prevalence of anxiety, depression, and somatization symptoms significantly decreased to 7.44%, 18.18%, and 9.92%, respectively (all $P<0.05$). Meanwhile, the coping styles also changed dramatically, with the PC styles being significantly enhanced and the NC styles being significantly reduced (both $P<0.05$). These results have demonstrated that college students can obtain effective psychological support and interpersonal support through systematic psychological interventions. According to the literature, catastrophic events are stressful scenarios for groups and individuals, and research on social support and coping styles can inform further intervention (23). Loneliness and lack of perceived social support will lead to depression and other mental problems (24). Sociopsychological support plays an important role in maintaining an individual's mental health (25), as it can exert a positive effect on the emotional reactions of college students during PHER (26). Therefore, systematic, continuous, and well-planned psychological intervention and counseling in the forms of mutual support and interest groups is one of the effective strategies to alleviate anxiety, depression, and somatization for college students, especially medical students, after the occurrence of public health emergencies and during the regular implementation of epidemic prevention and control measures.

Despite these positive findings, our current study was limited by its small sample size. In addition, our research on the impacts of public health emergencies on the mental status of medical students and the possible interventions were sufficiently deep. Finally, the psychological impacts of regular COVID-19 prevention and control measures on the mental health of college students and the underlying

mechanisms of anxiety, depression, and somatization also require further investigations. It is expected that a national basic data model, with inputs gathered from multiple centers, will be established to guide and promote the development of psychological crisis intervention in China and promote capacity-building in PHER.

Conclusions

Systematic psychological intervention is effective for improving the mental health of medical students.

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Footnote

Reporting Checklist: The authors have completed the SURGE reporting checklist. Available at https://tp.amegroups.com/article/view/10.21037/tp-23-120/rc

Data Sharing Statement: Available at https://tp.amegroups.com/article/view/10.21037/tp-23-120/dss

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Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at https://tp.amegroups.com/article/view/10.21037/tp-23-120/coif). Both authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Informed consent concerning collection of data on the participants' activities was obtained from each participant and filed in the student work office. This topic is a study of conventional and special teaching methods, which meets the requirements for exemption from ethical review. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013).

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