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ORIGINAL RESEARCH

Anxiety, Depression, Perceived Stress, and Burnout Among Chinese Researchers: A Cross-Sectional Nationwide Study

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Purpose: Depression and anxiety have a significant impact on an individuals' work and personal life alike. The mental health of researchers is a significant concern worldwide. This study investigated the mental health status of Chinese researchers specifically and explored the moderating effects of perceived stress on the influence of low self-accomplishment on anxiety and depression.

Methods: The online survey platform "Survey Star" was used to create a questionnaire to be distributed to researchers, with 949 questionnaires retrieved. The general information questionnaire, 10-item Perceived Stress Scale (PSS-10), Generalized Anxiety Disorder-7 (GAD-7), Patient Health Questionnaire-9 (PHQ-9), and Maslach Burnout Inventory General Survey (MBI-GS) were used for this investigation. Pearson's correlation analysis was performed to investigate correlations among the relevant variables. Model 8 of PROCESS 3.3 program was used to analyze the moderating effects of perceived stress.

Results: Among the 949 participants, 570 (60.1%) reported symptoms of depression and 431 (45.4%) had symptoms of anxiety, with about one in six reporting symptoms of self-harm or suicidal ideation. Perceived stress was found to moderate the effect of low self-accomplishment on depression and anxiety.

Conclusion: Here we show that researchers exhibit a high rate of depression and anxiety symptoms. Perceived stress is also shown to play a moderating role on the influence of low self-accomplishment on anxiety and depression. Thus, reducing perceived stress levels can help to improve the mental health of researchers.

Keywords: research personnel, mental health, burnout, accomplishment, stress, suicidal ideation

Introduction

As the two most prevalent mood disorders, depression and anxiety have a significant impact on an individual's work and personal life alike.[1] Scientists have performed a significant amount of research exploring the incidence, influencing factors, and coping strategies relating to depression and anxiety.[2–5]

A growing body of research in recent years has highlighted significant concerns about the mental health of researchers worldwide. A study in 2017 from Belgium found that 32% of 3659 PhD students surveyed were living with or at the risk of developing mental disorders, especially depression.[6] A survey in 2020 of over 15,000 graduate students at 9 universities in the United States showed that 39% of graduate students displayed high levels of anxiety, and 32% depression.[7]

The mental health status of Chinese researchers is also an area of significant concern. In 2019, *Nature*'s fifth doctoral survey revealed that 40% of the 690 Chinese doctoral students surveyed reported that they had sought help for depression and anxiety during their doctoral studies.[8] In March 2021, the research team of the Institute of Psychology, Chinese Academy of Sciences published their Report on the Development of China's National Mental Health (2019–2020).[9] A questionnaire-based survey of more than 10,000 scientific and technology workers indicated that approximately 25% of respondents had experienced some degree of depression, and that more than 50% exhibited symptoms of anxiety. In

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the same study, a survey of 12,992 graduate students determined that 35.5% of the respondents were likely to be experiencing some degree of depression, with 60.1% exhibiting symptoms of anxiety.

Stress is a commonly occurring phenomenon among researchers. First, researchers face pressure in finding jobs. Second, they encounter great pressure in their work, such as in receiving funding, publishing papers, and obtaining promotion.[10] The COVID-19 pandemic has exacerbated this problem, and has increased researchers' existing workload even further.[11,12] According to our research, in 2019, 60.8% of graduate students reported feeling major stress and 22.7% reported feeling highly stressed.[9] A mental health survey in 2020 of 13,000 researchers from more than 160 countries found that 38% of respondents often felt overwhelmed by their work environments.[13] Several studies have confirmed that perceived stress is positively correlated with the severity of emotional symptoms,[14–17] while others have suggested that stress is one of the independent risk factors for mental disorders such as anxiety and depression.[18,19] Research has established that 80% of depressed patients experience stressful events before their illness and also experience 2.5 times more stressors than non-depressed people.[20] If a person is constantly under stress, it can have severe long-term negative consequences for them.[21]

Stress is also associated with job burnout, which has gradually become an important mental health indicator worldwide.[22,23] In 2019, the World Health Organization recommended for the first time that "burnout" should be included in the International Classification of Diseases 11th Edition (ICD-11). Burnout could be interpreted as a "response to continuous emotional and interpersonal stressors".[24] The three key dimensions of this response are emotional exhaustion (which refers to the physical and mental exhaustion caused by the excessive consumption of individual emotional and physical resources), deindividuation (which refers to an individual's negative, callous or overly distant attitude towards the object of service), and the low self-accomplishment (which refers to the decrease of the individual's sense of competence and accomplishment in their work).[24] The initial research object of job burnout was individuals in industries that serve people. Although the Maslach Burnout Inventory has been gradually used in other occupational fields, it remains clear that there are still big differences between scientific research and service industries. Compared with the other two dimensions of emotional exhaustion and deindividuation, the dimension of low self-accomplishment seems to be more applicable to the scientific research field, so this study focuses only on this dimension.

Multiple studies have shown that there is a moderate to high correlation between job burnout, depression, and anxiety, and that job burnout can help predict the occurrence of depression.[25–27] However, burnout by itself cannot fully account for depressive symptomatology. Based on previous work by Cohen, people who are more prone to depression after experiencing negative life events seem to perceive greater levels of stress in life in general.[28] A number of studies have established high levels of job burnout among scientific research workers.[12,29] Given, as mentioned above, that researchers face many kinds of stress, this study aims to examine the current mental health of Chinese researchers, and to construct a moderating model to explore the moderating effect of perceived stress on the influence of low self-accomplishment on anxiety and depression.

Researchers' mental health problems can be associated with various forms of attrition – including absenteeism, intention to leave, and actual quitting.[30] For those who continue to stick with their work, it also affects their work efficiency, which in turn adversely affects the quality of the scientific research that they produce.[24] However, since the outbreak of the COVID-19 pandemic, there have been relatively few studies on the mental health of scientific researchers in China, with the respondents' surveyed coming from a single source.[31–33] Therefore, the findings of this study may provide some empirical support and theoretical guidance for improving researchers' mental health.

Materials and Methods

A snowball sampling strategy was adopted to conduct this anonymous cross-sectional survey of researchers through online questionnaires. Questionnaires were created using the online survey platform "Survey Star" and were forwarded to researchers via WeChat, one of the most used social media platforms in China. The questionnaire could only be completed once for each researcher. The recruitment period ran from August 26, 2022, to October 1, 2022.

Participants

Graduate students and researchers from universities, hospitals, research institutes, and other research institutions were selected from 31 Chinese provinces nationwide. 961 respondents were enrolled, with 12 unqualified questionnaires excluded due to incomplete data. Thus, 949 responses were finally declared valid.

Measurements

General Information Questionnaire

The demographic characteristics included in the questionnaire used in this study were as follows: age, sex, province, education level (undergraduate, graduate, doctoral, and postdoctoral), and school/vocational institution (universities, hospitals, research institutes and other research institutions).

Patient Health Questionnaire-9 (PHQ-9)

PHQ-9 is a 9-item instrument used for evaluating depressive symptoms. Each item is scored from 0 (never) to 3 (almost all the time), with the total score ranging from 0 to 27. Higher scores imply more severe depressive symptoms. Usually, scores within the range of 0–4 are classified as presenting no obvious depressive symptoms, 5–9 indicate mild depression, 10–14 moderate depression, 15–19 severe depression, with scores ≥ 20 indicating very severe depression.[34] In this study, total scores < 5 were classified as indicating no symptoms of depression, ≥ 5 as indicating depression, with scores ≥ 1 in Item 9, "It is better to die or hurt oneself in some way", indicating symptoms of self-injury or suicidal ideation.[35] The reliability and validity of the Chinese version of the scale has already been confirmed in previous studies.[36,37] Cronbach's alpha for the internal consistency reliability ranged from 0.77 to 0.91 in the research of Sun et al.[36] While Wang et al demonstrated that the PHQ-9 scale correlated positively with the self-rating depression scale ($r = 0.29$, $P < 0.001$), with a cutoff score of 7 or higher on the PHQ-9 having a sensitivity of 0.86 and a specificity of 0.86.[37]

Generalized Anxiety Scale-7 (GAD-7)

GAD-7 consists of 7 items with each item scored at 4 levels ranging from 0 (never) to 3 (almost all the time). The total score ranges are from 0 to 21. Higher scores imply severe anxiety symptoms. Usually, total scores ≤ 4 are classified as indicating no anxiety, 5–9 as mild anxiety, 10–14 as moderate anxiety, and 15–21 as severe anxiety.[38] In this study, total scores < 5 were classified as indicating no anxiety and ≥ 5 as indicating symptoms of anxiety. Based on previous studies, the Chinese version of the scale has shown satisfying reliability (Cronbach's alpha = 0.92[39]) and validity (The Pearson correlation coefficient between GAD-7 and the anxiety subscale of the Hospital Anxiety and Depression scale scores was 0.66.[40] At the optimal cutoff value of 10, a sensitivity of 86.2% and a specificity of 95.5% were calculated.[38]).

10-Item Perceived Stress Scale (PSS-10)

The original scale was compiled by Cohen et al in 1983.[28] In the present study, PSS-10 was used to measure perceived stress. This scale contains 10 items and includes two factors: Factor 1 (subjects' perception of stress) is made up of negatively phrased items (items 1, 2, 3, 6, 9, 10); and Factor 2 (ability to cope with stress) is made up of positively phrased items (items 4, 5, 7, 8). The scale uses the Likert 5-point rating method with scores ranging from 0 (never) to 4 (always). Higher scores imply greater perceived pressure on the participants. The Chinese version has previously shown good reliability (Cronbach's alpha = 0.81) according to the research of Sun et al.[41] A previous study conducted by Wang has also shown that the PSS-10 is significantly correlated with both the Revised Beck Depression Inventory and the Beck Anxiety Inventory, indicating an acceptable degree of concurrent validity.[42]

Maslach Burnout Inventory General Survey (MBI-GS)

In the present study, the MBI-GS scale translated and revised by Li et al was used, with a total of 15 items covering three dimensions: emotional exhaustion (5 items), deindividuation (4 items), and low self-accomplishment (6 items).[43] Each item was scored from 0 (never) to 6 (daily), with 7 levels in total. The higher the score, the stronger the sense of job burnout. The reliability and validity of the Chinese version of the MBI-GS has been confirmed.[44] The internal consistency coefficients of emotional exhaustion, deindividuation, and low self-accomplishment were 0.925, 0.895 and, 0.920 respectively.[45] According to the research of Sun, the Corrected Item-Total Correlation values of items 1–6

in the dimension of low self-accomplishment are 0.757, 0.799, 0.838, 0.741, 0.795, and 0.82, respectively.[46] The deletion of any item will not significantly increase the reliability coefficient, so it can be reasonably concluded that the six items in the dimension of low self-accomplishment are reasonably set and the data are reliable. This study focused only on the dimension of low self-accomplishment.

Ethical Consideration

This study was approved by the Medical Ethics Committee of Beijing Huilongguan Hospital, with each study participant having signed a written informed consent form. This study was conducted in accordance with the Declaration of Helsinki.

Analytic Strategy

Statistical Package for the Social Sciences (IBM SPSS Statistics) software (version 26.0; IBM Corp., Armonk, NY) was used to conduct all the statistical analyses in this study. The measurement data with a normal distribution is presented as (*mean* ± *SD*) in the following sections and independent sample *t*-tests were performed for inter-group comparisons. Enumeration data were tested using the chi-squared test. Pearson's correlation analysis was used to investigate correlations among the relevant variables. Model 8 of PROCESS 3.3 compiled by HAYES was used to analyze the moderating effect of perceived stress.[47] To explain the role of perceived stress with regard to low self-accomplishment, depression, and anxiety, a simple slope analysis was performed on perceived pressure scores, $M + SD$ was used for high perceived pressure and $M - SD$ for low perceived pressure. The significance level was set to 0.05.

Results

Sociodemographic Characteristics and Their Relationship with Symptoms of Depression and Anxiety

The mean age of the 949 participants was 31.94 ± 8.95 years. Table 1 presents the demographic data. Among the 949 participants, 570 (60.1%) reported symptoms of depression with 431 (45.4%) reporting symptoms of anxiety. The difference in the detection rates for the anxiety symptoms among researchers with various educational levels and practicing institutions was statistically significant. The detection rate for anxiety symptoms among researchers with a doctoral degree was higher than that among those with a bachelor's or master's degree. The detection rate for anxiety symptoms among researchers working in research institutions was higher than that among those working in universities. There was statistical difference in the detection rates for anxiety and depression among researchers of different ages, and

Table 1 Socio-Demographic Characteristics and Association with Depression and Anxiety Symptoms

Variables	*n*	%	Depression Symptoms			Anxiety Symptoms		
			n	%	*P*	*n*	%	*P*
Gender					0.986			0.917
Male	421	44.4	253	60.1		192	45.6	
Female	528	55.6	317	60.0		239	45.3	
Educational level					0.408			0.040
Bachelor's degree	134	14.1	72	53.7		54	40.3	
Master's degree	449	47.3	273	60.8		190	42.3	
Doctorate degree	265	27.9	165	62.3		138	52.1[a]	
Postdoctoral	101	10.6	60	59.4		49	48.5	
Vocational institutions					0.143			0.016
Colleges	460	48.5	259	56.3		186	40.4	
Hospitals	114	12.0	71	62.3		53	46.5	
Research institutes	233	24.6	148	63.5		123	52.8[b]	
Others	142	15.0	92	64.8		69	48.6	

Notes: [a]Compared with those with a bachelor's or a master's degree, $P < 0.05$; [b]Compared with those working in universities, $P < 0.05$.

the detection rates for depression and anxiety symptoms among researchers younger than 35 and aged between 35 and 45 were higher than for those aged over 45 (Table 1).

Incidence of Depression and Anxiety Symptoms of Differing Severity

While the majority of symptoms of depression and anxiety reported were mild to moderate, a total of 153 (16.1%) respondents reported experiencing thoughts relating to self-injury or suicidal ideation, among which 117 (12.3%), 22 (2.3%) and 14 (1.5%) answered "sometimes", "over half of the time", and "almost all the time", respectively. The overall detection rate for depression and anxiety was 42.6% (Table 2).

Relationship Among Low Self-Accomplishment, Perceived Stress, and Symptoms of Depression and Anxiety

Researchers with and without anxiety and depression symptoms showed statistically significant differences in their levels of reported low self-accomplishment, total perceived stress, subjective perceived stress, and ability to deal with stress. Compared with researchers without symptoms of anxiety and depression, those that reported symptoms had higher scores relating to low self-accomplishment, total perceived stress, and subjective perceived stress, and lower scores regarding the ability to deal with stress (Table 3).

Correlation Analysis of Low Self-Accomplishment, Perceived Stress, and Symptoms of Depression and Anxiety

Low self-accomplishment was positively correlated with total perceived stress, subjects' perception of stress, anxiety, and depression ($P < 0.05$), and negatively correlated with the ability to cope with stress ($P < 0.05$). Total perceived stress was positively correlated with subjects' perception of stress, anxiety, and depression, and negatively correlated with the

Table 2 The Rate of Different Severities of Depression and Anxiety Symptoms

Variables	Depression Symptoms		Anxiety Symptoms		Comorbid Depression and Anxiety Symptoms	
	n	%	*n*	%	*n*	%
None	379	39.9	518	54.6	545	57.4
Mild	360	37.9	282	29.7		
Moderate	118	12.4	83	8.7		
Moderately severe	58	6.1	–	–		
Severe	34	3.6	66	7.0		
Mild to severe	570	60.1	431	45.4		

Abbreviations: *n*, sample size; %, percentage.

Table 3 The Relationship Between Low Self-Accomplishment, Perceived Stress, Depression and Anxiety Symptoms

Variables	With Depression Symptoms *M (SD)*	Without Depression Symptoms *M (SD)*	*t*	*P*	With Anxiety Symptoms *M (SD)*	Without Anxiety Symptoms *M (SD)*	*t*	*P*
Low self-accomplishment	2.51(1.40)	1.60(1.61)	9.22	<0.001	2.69 (1.36)	1.71 (1.56)	10.28	<0.001
Total perceived stress	19.70 (6.57)	12.20 (4.63)	20.64	<0.001	21.48 (6.14)	12.73 (4.65)	24.37	<0.001
Subjects' perception of stress	10.11 (5.39)	3.72 (3.15)	23.01	<0.001	11.53(5.17)	4.24(3.28)	25.32	<0.001
Ability to cope with stress	10.41(3.09)	11.52(4.56)	–4.15	<0.001	10.05 (2.87)	11.52 (4.29)	–6.28	<0.001

Abbreviations: *M, mean; SD*, standard deviation.

ability to cope with stress. Subjects' perception of stress was positively correlated with anxiety and depression and negatively correlated with the ability to cope with stress. The ability to cope with stress was negatively correlated with anxiety and depression, while anxiety itself was positively correlated with depression (Figure 1).

The Moderating Effect of Perceived Stress on Low Self-Accomplishment, Depression and Anxiety Symptoms

Low self-accomplishment was significantly correlated with perceived stress, anxiety, and depression scores, which shows the need for further analysis of the moderating effects of perceived stress on the influence of low self-accomplishment on symptoms of anxiety and depression. Model 8 of the PROCESS program was used to test the moderating role of perceived stress. Low self-accomplishment scores were processed as independent variables; anxiety and depression scores were processed as dependent variables; and perceived stress scores were processed as moderating variables. As Table 4 reveals, the interaction between low self-accomplishment and perceived stress significantly predicted symptoms of both depression ($\beta = 0.11$, $P < 0.01$) and anxiety ($\beta = 0.14$, $P < 0.01$), thus indicating that perceived stress moderated the effect of low self-accomplishment on depression and anxiety. A simple slope analysis was conducted to explain this moderating effect. It showed that the effects of self-accomplishment on depression and anxiety differed among individuals with diverse levels of perceived stress. When perceived stress was high, self-accomplishment had a positive moderating effect on depression, but the moderating effect of self-accomplishment on anxiety was not affected. When perceived stress was low, self-accomplishment had a negative moderating effect on both depression and anxiety (Figures 2 and 3, respectively).

Discussion

Main Findings and Interpretation of Findings

In this study, the detection rates for depression and anxiety recorded were 60.1% and 45.4% respectively, which were significantly higher than those of the general population (21.9% and 15.5%, respectively),[48] and also higher than those of

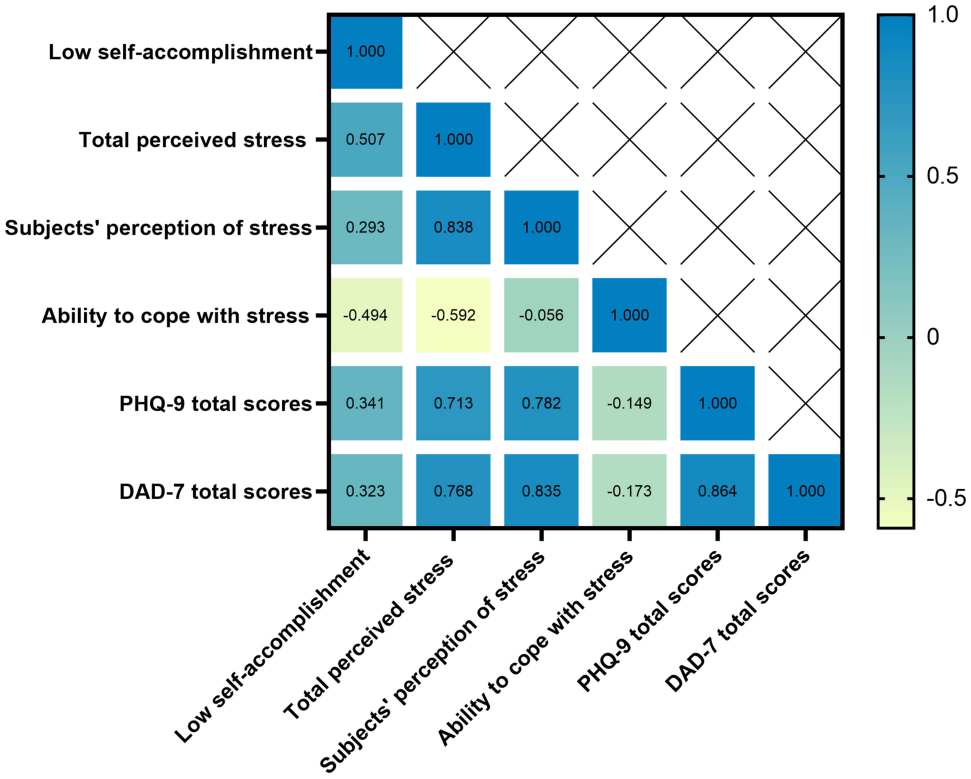

Figure 1 The correlation analysis between low self-accomplishment, perceived stress, depression and anxiety symptoms.

Table 4 The Moderating Effect of Perceived Stress on Low Self-Accomplishment, Depression and Anxiety Symptoms

Variable	Model 1 (PHQ-9 Total Score)		Model 1 (GAD-7 Total Score)	
	β	t	*β*	t
Constant	-	44.43[a]	-	38.68[a]
Low self-accomplishment	–0.03	–1.17	–0.09	–3.97[a]
Total perceived stress	0.72	27.4[a]	0.80	34.16[a]
Low self-accomplishment × Total perceived stress	0.11	4.92[a]	0.14	7.09[a]
R^2	0.52		0.62	
F	342.60[a]		504.95[a]	

Note: [a]P < 0.01.

Chinese residents during the COVID-19 pandemic (53.5% and 44.6%, respectively).[49] The proportion of researchers with moderate to severe depression (22.1%) was also even higher than that of health care workers during the early stages of the pandemic (18.29%).[50] Although depression and anxiety symptoms were mainly shown to be mild to moderate, the

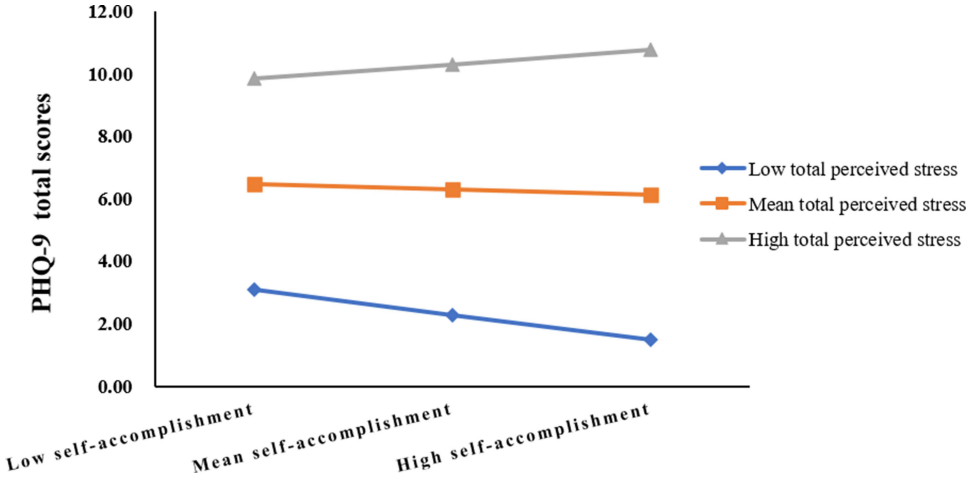

Figure 2 The moderating effect of perceived stress on low self-accomplishment and depression symptoms.

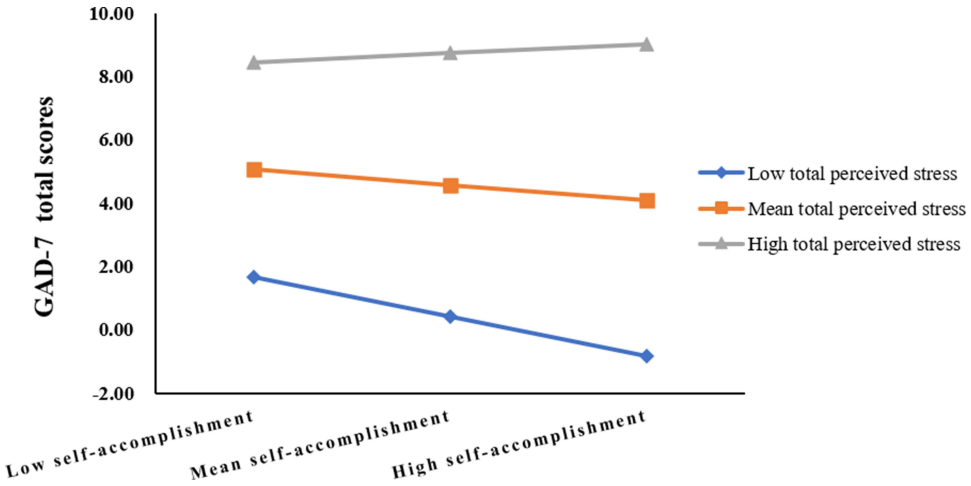

Figure 3 The moderating effect of perceived stress on low self-accomplishment and anxiety symptoms.

detection rate for concurrent symptoms of anxiety and depression was 42.6%. Research showed that people with high comorbidities may have higher risks of attempting suicide.[51] Notably, 153 researchers (16.1%) in this study reported experiencing thoughts relating to self-injury or suicidal ideation, including 36 (3.7%) who answered "over half the time" or "almost all the time" in response to the statement "It is better to die or hurt oneself in some way". Suicidal ideation can potentially develop into suicide attempts and behaviors, with fatal and irreversible consequences.[52] These findings suggest that some researchers may be psychologically vulnerable. Relatively low-cost web-based screening tools may help to effectively reach high-risk researchers who are in need of help.[53] Furthermore, if the web-based screening tools are designed to combine both prevention and intervention based services, suicidal thoughts and behaviors might be more effectively reduced.[51]

The results of this study also indicate that researchers with doctoral degrees experience a higher rate of anxiety symptoms. Similarly, the University of California–Berkeley's 2014 *Report on Graduate Physical and Mental Health* revealed that doctoral students reported lower life satisfaction than academic and professional master's students.[54] For doctoral students, along with academic pressure, mentoring relationships, lack of support, discrimination, and harassment, career uncertainty is regarded as the most worrying problem.[30,55,56] Levecque demonstrated that career prospects were a decisive factor regarding the mental health problems facing doctoral students.[6] According to a study published in *Nature* in 2014, the number of academic positions for those who graduate with a PhD after many years of study, and at great expense was decreasing, with the associated glory of obtaining a PhD also being less than it used to be.[57] Even PhD holders who are successfully employed in industry are faced with increasing competition for jobs, and lack of practical industrial experience compared to undergraduate and master's students who enter the workforce earlier, adding to the anxiety experienced.[58]

In the present study, researchers younger than 45 reported higher rates of depression and anxiety symptoms. This finding is similar to those of a large Chinese survey implemented in 2019, which suggested that depression levels decreased with age, with the highest rate of depression reported among researchers under the age of 30 (27.8%) and the lowest rate reported among those over 50 (14.4%).[9] Researchers aged 40 and under also reported higher levels of anxiety. These findings demonstrate that greater stress at work is keenly associated with higher levels of depression and anxiety. In the face of increasing difficulties faced with regard to promotion and more strict assessment standards, to obtain a place in the competitive workplace, researchers at the beginning of their career spare no time or effort in winning funding, publishing papers, and completing projects. They work for long hours while caring little for their life outside of their research work.[10] Most people have to simultaneously deal with many changes in their personal lives that coincide with their early career progression, such as entering into marriage and raising children.[59] These challenges may in turn contribute further to the higher degree of anxiety and depression symptoms experienced by researchers.

Another important and unexpected finding was that researchers working in research institutions reported severe anxiety symptoms than those working in universities. This is probably because researchers in research institutions are faced with challenges such as fewer opportunities for promotion and more strict evaluation criteria. We will explore this issue further in the future.

As is consistent with the conclusions of many previous studies,[18,60,61] our research found a positive correlation among low self-accomplishment, perceived stress, anxiety, and depression. Although the relationship between job burnout and depression has been debated,[62–64] Glass et al have previously pointed out that depression can occur after job burnout.[26] The latest research of Parker et al has also stated that the two phenomena are "categorically distinct".[65] Therefore, in this study, we adopted these theoretical viewpoints to explore the influence of low self-accomplishment on anxiety and depression. Furthermore, because of the ubiquity and persistence of stress, we analyzed the moderating effect of perceived stress on that influence. The results obtained indicated that the influence of self-accomplishment on depression and anxiety symptoms was moderated by perceived stress: regardless of the level of perceived pressure, the lower the individual's sense of self-accomplishment, the higher the degree of depression and anxiety experienced. However, when perceived stress was higher, the anxiety and depression scores caused by low self-accomplishment were also higher. As self-accomplishment increased, symptoms of depression became more serious, but the increase had little effect on anxiety. Individuals who have a high sense of self-accomplishment may have a higher sense of competence and accomplishment in their work, and may subsequently find greater significance in work. However, long-term high pressure

may erode their sense of personal control and subsequently weaken their sense of self-worth.[66] According to Selye's stress theory,[67] stress with a high level or a long duration will consume the physical resources and psychological energy of individuals until they enter the stage of exhaustion. Then, their abilities to find coping resources will be severely weakened, and it will be difficult for them to continue to resist the pressure. Therefore, their anxiety level will no longer increase and the person will become helpless and incompetent, and thus fall into a state of depression. Therefore, the results of this study suggest that effectively reducing researchers' perceived stress levels can improve their mental health.

In view of the findings highlighted above, to improve the mental health of researchers, we propose the following suggestions: Researchers should face up to their mental health status, try to obtain social support, seek professional help when necessary, and reduce their stress levels through daily exercise, meditation and other proven methods. More importantly, universities and research centers should take measures to create a more inclusive environment that can ensure a good work-life balance for researchers. Such provisions might include allowing for more flexible working and vacation time, providing daycare services, and so on. Career development programs can also be offered to help junior researchers enhance their communication skills, as well as their ability to engage in conflict resolution and entrepreneurship. Accessible mental health services can also be provided to help researchers relieve stress and better maintain their mental health.

To the best of our knowledge, this is the first such large-scale survey of the mental health status of scientific researchers in China since the outbreak of the COVID-19 pandemic. This study reveals the significant mental health challenges faced by Chinese researchers, and provides a new theoretical perspective for how the mental health of researchers can be improved by exploring the relationship between depression, anxiety, stress, and low self- accomplishment.

Limitations

This survey was conducted online using the snowball sampling strategy. The survey itself suffered from uncertainty with regard to the communication directions, which affected the representativeness of the sample. Furthermore, a volunteer bias may have been present among the survey respondents. In the future, further expanding the sample size and conducting interview-style surveys targeted at specific groups can help obtain more accurate and in-depth data.

Conclusion

In summary, our results show that researchers have a high detection rate for depression and anxiety symptoms, with approximately one in six reporting symptoms of self-harm or suicidal ideation. Researchers with doctoral degrees or working in research institutions exhibited higher rates of anxiety symptoms, with younger researchers also reporting higher rates of depression and anxiety. Perceived stress was found to be a moderating factor with regard to the influence of low self-accomplishment on anxiety and depression. Thus, reducing the perceived stress levels of researchers can improve their mental health.

The findings of this study confirm the results of previous studies, suggesting once again that the mental health of researchers is worth paying particular attention to. Furthermore, the study results also revealed the modulating role of perceived stress, which provides a new perspective for improving the mental health of researchers. Similar recent studies have also focused on the impact of stress on the mental health of doctoral and undergraduate students during the course of the COVID-19 pandemic, with particular reference to cumulative stressful educational events, and the relationship between stress and insomnia.[68,69] More detailed and multi-dimensional studies focused on exploring the mental health of researchers are important, and our follow-up studies will continue to work in this area.

Data Accessibility Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement

This study was approved by the Medical Ethics Committee of Beijing Huilongguan Hospital and we made sure that each participant had signed written informed consent. This study was conducted in accordance with the Declaration of Helsinki.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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