

Evaluation of psychological stress in scientific researchers during the COVID-19 outbreak in China

Xueyan Zhang^{1,2*}, Xinyu Li^{1,2*}, Zhenxin Liao^{3*}, Mingyi Zhao⁴, Quan Zhuang^{1,5}

¹ Transplantation Center, The 3rd Xiangya Hospital of Central South University, Changsha, Hunan, China.

² Xiangya School of Medicine of Central South University, Changsha, Hunan, China

³ Xiangya School of Public Health of Central South University, Changsha, Hunan, China

⁴ Department of Pediatrics, The 3rd Xiangya Hospital of Central South University, Changsha, Hunan, China

⁵ Research Center of National Health Ministry on Transplantation Medicine, Changsha, Hunan, China

Corresponding Author:

Mingyi Zhao and Quan Zhuang

138 Tongzipo Rd, Changsha, Hunan, 410013, China

Email address: 36163773@qq.com and zhuangquansteven@csu.edu.cn

*These authors contributed equally to this article

16 **Abstract**

17 **Background:** Beginning in December 2019, coronavirus disease 2019 (COVID-19) caused an
18 outbreak of infectious pneumonia. The Chinese government introduced a series of grounding
19 measures to prevent the spread of COVID-19. The living and working patterns of many scientific
20 researchers also underwent significant changes during this period.

21 **Methods:** An opportunity sample (n = 251) was obtained in China using a questionnaire with 42
22 questions on scientific research progress and psychological stress during the COVID-19 epidemic.

23 **Results:** Of the 251 participants, 76.9% indicated that their research was affected by the COVID-
24 19 outbreak, and participants who were affected by the outbreak had higher stress levels than those
25 who were not affected. Participants who conducted COVID-19 research and indicated concern that
26 they would fail to finish the research on time were more likely to indicate high levels of stress.

27 Respondents indicated that extending deadlines (64.1%), receiving support from superiors for
28 research (51.8%), and increasing benefits for researchers (51.0%) would likely relieve outbreak-
29 related stress.

30 **Conclusion:** The COVID-19 outbreak had a major impact on the experiments of researchers in
31 the life sciences, especially in basic and clinical medicine. It has also caused high levels of
32 psychological stress in these populations. Measures should be taken to relieve psychological
33 pressure on basic medical researchers who have a great influence on experimental research and
34 students who will soon complete their degrees (e.g., Master's and PhD candidates in graduation
35 years).

Deleted: Governments C

Deleted: around the world

Deleted: We surveyed 251

Deleted: s

Deleted: selected

Deleted: researchers

Formatted: Font: Not Bold

Formatted: Font: (Default) Times New Roman, 12 pt

Deleted: wererandomly

Deleted: 89

Deleted: 4

Deleted: 79

Deleted: 0

Deleted: the

Deleted: are

Deleted: ing

52 Introduction

53 The outbreak of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory
54 syndrome coronavirus 2 (SARS-CoV-2), originated in Wuhan, China and quickly spread from
55 human to human in December 2019 (Lai et al. 2020). On January 30, 2020, the World Health
56 Organization declared the COVID-19 epidemic a public health emergency of international
57 concern. As of February 23, 2020, China has confirmed 77,150 new coronavirus infections and
58 2,592 deaths (Pediatric Committee et al. 2020). (Martinez 2020). Because of the increasing number
59 of confirmed cases and deaths, negative emotions continue to spread (Zhou 2020). Previous studies
60 have indicated that (Hull 2005; Wu et al. 2005a; Wu et al. 2005b) we must examine the extent of
61 the psychological stress associated with the current epidemic and focus attention on those people
62 most vulnerable to this psychological stress (Shigemura et al. 2020). Recent studies have focused
63 on the psychological stress of the medical staff involved in epidemic prevention in China (Xiao et
64 al. 2020). However, few studies have examined the impact of severe infectious disease outbreaks
65 on the psychological state of researchers. The rise of stressors and strains in academic life have
66 been widely reported (Kinman 2001). Heavy workload and time and resource constraints have
67 been highlighted as major work stressors in researchers. The work-home imbalance and role
68 conflict and overload also have potential impact on academic stress level (Gmelch et al. 1984;
69 Kinman 2008; Tytherleigh * et al. 2005). At the same time, stress from the dissatisfaction with pay
70 and benefits has been reported (Tytherleigh * et al. 2005). Management and leadership styles,
71 pressured higher education climate, and unhealthy competition, also cause harmful stress
72 (Wellcome 2020).

73 To avoid further transmission of the COVID-19, many industries were forced to shut down
74 temporarily, and scientific and social research and education activities were paused in China

Deleted: SARS-CoV-2 is a novel coronavirus strain never before found in humans, and to date, no specific treatment has been identified for its infection

Deleted: .

Deleted: there is a strong relationship between acute infectious diseases (e.g., SARS) and anxiety, depression, stress, and post-traumatic stress disorder (PTSD)

Deleted: . Therefore,

Deleted: . However, few studies have examined the impact of severe infectious disease outbreaks on the psychological state of researchers.

Deleted: s

Deleted: were

Deleted: ing

89 (ScienceMag.org 2020b). Furthermore, animal centers and practical labs were closed, and many
90 scientific and social congresses and symposiums were cancelled, leaving postgraduates and
91 scientific workers confined to their homes (ScienceMag.org 2020a). Therefore, many researchers'
92 experimental progress was hindered (e.g., loss of samples and funds) (ScienceMag.org 2020a;
93 Tencent 2020a; Tencent 2020b), which undoubtedly increased the psychological stress of
94 academic and research staff. In addition, the stagnation of science education activities may cause
95 an increase in students' graduation pressure, and even the delay of graduation (Tencent 2020a).

Deleted: and may have negatively affected the psychological state of those researchers.

96 In the current research, we propose the following hypotheses: (1) the COVID-19 outbreak
97 aggravated psychological stress in researchers; (2) the stress levels and stressors in diverse
98 populations would be different; (3) the demands for reducing stress in diverse populations would
99 be different. We included 42 related questions in the questionnaire to test the above hypotheses.
100 Respondents were categorized by research field, research degree, and affiliation, etc.

Deleted: In the current study, we explored the perceived stressors of researchers in diverse populations and assessed factors that might help reduce pressure on researchers during disease outbreaks.

Deleted: made

Deleted: the

Deleted:

101 In light of the current global concerns about the spread of COVID-19 and other infectious
102 diseases, our study will help to identify the extent of researchers' psychological stress during the
103 current outbreak and identify effective solutions for psychological stress during the current or
104 future infectious disease outbreaks.

105 **Materials & Methods**

106 *Study participants*

107 A questionnaire was distributed to researchers in China by opportunity, and all respondents
108 were asked to answer each question on their own. The targets of the questionnaire were identified
109 as "scientific researchers", which requires the respondents to be involved in at least one research
110 project in past 12 months. Questionnaires were distributed to research institution staff, university
111 researchers and students participating in the research. They were all researchers with a confirmed

Formatted: Font colour: Accent 1

Deleted: randomly

Deleted: objects

Formatted: Font colour: Accent 1

Deleted: e

Deleted:

Deleted: researchers from the

Deleted: s

127 scientific experience or the authors had collaborated with before. Some respondents will have
128 passed on the questionnaire to other qualified people to fill in. A total of 251 questionnaires were
129 received. Two similar questions were separately set in the questionnaire, and the validity of the
130 questionnaire was judged by comparing the consistency of the respondents' answers. All
131 participants provided written informed consent, and subjects were anonymous. The study protocol
132 was reviewed and approved by the institutional review board (Ethics Committee) of the 3rd
133 Xiangya Hospital, Central South University.

Deleted: whom

Deleted: or had a confirmed actual scientific experience

Formatted: Font colour: Accent 1

Formatted: Font colour: Accent 1

Deleted: with valid responses

138 *Questionnaire*

139 We included 42 related questions in the questionnaire to acquire a comprehensive
140 understanding of the progress of research projects and the current psychological stress level of
141 researchers. The survey consisted of 24 questions assessing the subject's psychological stress (i.e.,
142 stress scale). The questionnaire incorporated modified questions from the stress response
143 questionnaire (SRQ) and the Pittsburgh sleep quality index scale (PSQI) (Pilz et al. 2018) and
144 considered the current COVID-19 epidemic (i.e., emotional state, somatic responses, sleep quality
145 and behavior). The stress scale consisted of five self-evaluation options: (1) not at all, (2)
146 occasionally, (3) sometimes, (4) often, and (5) always. A score of 5 represented the highest level
147 of stress.

148 We also assessed participants' research areas (e.g., whether they conduct research related
149 to the novel coronavirus) and potential stagnation of research projects, including questions rated
150 to (1) delay in scientific research projects, (2) sample or funding losses due to the current epidemic,
151 and (3) disruption of academic exchange activities. At the conclusion of the questionnaire, subjects
152 were invited to make some suggestions and appeals based on the status of scientific research in
153 China, including extending deadlines for project conclusion, providing partial financial subsidies
154 for scientific research losses, assigning professional personnel to guide and support scientific
155 research projects, and prioritizing the return of researchers to work.

156 *Statistical analysis*

157 Questionnaire results were summarized from the imported Excel file and analyzed using
158 SPSS version 18.0 software (IBM Corp., Armonk, NY, USA). Quantitative variables were
159 expressed as an average with a standard deviation (SD). Qualitative variables were expressed as
160 numbers and percentages. Chi-squared (χ^2) tests and analysis of variance (ANOVA) tests were

Deleted: 3

Formatted: Font colour: Accent 1

Commented [A1]: propose solutions

Deleted: the

163 used to compare psychological factors across social roles and age groups. A P value less than or
164 equal to 0.05 was considered statistically significant.

165 **Results**

166 *Participant demographics*

167 Participants included scholars in the fields of life science (e.g., medicine, biology),
168 engineering science (e.g., mechanical engineering, physiology, chemistry), and humanities, and
169 social sciences (e.g., law, literature). The gender ratio of the respondents was approximately 1:1.
170 The average age of participants was 28.91±8.65, most of whom were from colleges or university
171 affiliated hospitals (Table. 1). Participants consisted of seven groups of people: undergraduate
172 students, Master's degree candidates (non-graduation year), Master's degree candidates
173 (graduation year), PhD candidates (non-graduation year), PhD candidates (graduation year), basic
174 research staff (including postdoctoral), and clinical medical staff (including postdoctoral). Many
175 participants were undergraduates and clinical medical staff without advanced degrees, who
176 comprise the majority of researchers in China and are therefore the most vulnerable to research-
177 related psychological stress from infectious disease outbreaks.

178 *Impact of epidemic-related scientific delays on stress levels*

179 Of the 251 researchers surveyed, the average score of the population's stress level was
180 46.99±20.84 points (full mark: 120 points). The median score was 43 points, the lowest score 24
181 points, and the highest score 120 points (Table. 2). Participants whose progress was affected by
182 the outbreak had higher levels of stress than participants who were not affected by the outbreak.
183 Participants who indicated that they were affected by the epidemic expressed higher stress in
184 emotional states, somatic responses, and behavior than participants who indicated they were not
185 affected by the epidemic (Table. 3).

- Formatted: Font colour: Accent 1
- Deleted: M
- Deleted: XXX, XXX
- Deleted: ,
- Deleted: (e.g., law, literatureXXX, XXX),
- Deleted: (e.g., XXX, XXX)
- Deleted: Most subjects were between t
- Deleted: s
- Deleted: 18 to 39
- Deleted: is
- Formatted: Font colour: Accent 1
- Formatted: Font: 12 pt, Font colour: Accent 1
- Deleted: and
- Formatted: Font colour: Accent 1
- Deleted: Table
- Formatted: Font colour: Accent 1
- Deleted: which
- Formatted: Font colour: Accent 1
- Deleted: 81.26
- Deleted: 36.76
- Deleted: 39
- Deleted: 15
- Deleted: ,
- Deleted: 74
- Deleted: was 41
- Deleted: was
- Deleted: 205
- Deleted: s
- Formatted: Font colour: Accent 1
- Deleted: a
- Deleted: Tables
- Deleted: s
- Deleted: 2a-b

212 We identified 14 possible factors of high stress in researchers during COVID-19 outbreak
 213 and conducted a regression analysis with stress levels. As a result of the outbreak, researchers who
 214 were required to change or reduce experimental projects indicated they were under more pressure
 215 than those who did not have to change or reduce their experimental project. In addition, researchers
 216 affected by peer pressure that their colleagues have been reporting on new coronavirus-related
 217 research (Table 4). As for the correlation between research stress and influencing factors in
 218 different research disciplines, a separate analysis is not reported due to the limited sample size.
 219 Responses regarding condition improvement for scientific researches

220 Nine detailed appeals were voted by researchers to possibly ease their stress (Fig 1). The
 221 top appeal is prolonging of the deadline for experimental projects, with 161 of 251 (64.14%)
 222 respondents regarding it effective. Receiving encouragements from superiors (51.79%) and
 223 improving the welfare of researchers (51.00%) follows. Academic cooperation (27.49%) and
 224 meetings (21.91%) became less regarded during this period of time. These demands varied
 225 statistically between clinical staff and basic medical researchers, as well as between master's and
 226 doctoral students (Table 5 and Table 6).

227 COVID-19 affects research progress differently across researcher identities

228 As a result of the COVID-19 outbreak, 47.11% of researchers in the field of science
 229 indicated their research programs were halted, and 32.00% of researchers indicated their programs,
 230 while ongoing, were slower than before the epidemic began. However, the COVID-19 epidemic
 231 has had relatively little impact on researchers in the field of humanities, with most social science
 232 researchers indicating a slower pace of research (6 out of 12) or a lack of impact of COVID-19 on
 233 their research (5 out of 12). Of the 77 professors and lecturers surveyed, 43 (55.84%) indicated
 234 that their experiment was at a standstill, while 8 (10.39%) indicated that their experiment was not

Formatted: Font colour: Accent 1

Deleted: causes...actors of high stress in researchers during COVID-19 outbreak and conducted a regression analysis with stress levels (Table 3a)... As a result of the outbreak, researchers who were required to change or reduce experimental projects indicated they were under more pressure than those who did not have to change or reduce their experimental project. In addition, researchers affected by peer pressure that their colleagues have been reporting on new coronavirus-related research. When assessed the data from participants who indicated they were "clinical researchers", three factors contributed to stress. In addition to the two factors mentioned above, clinical researchers indicated that the COVID-19 outbreak reduced the timeliness and innovation of their research and reduced the value of their research achievements. This was associated with increased anxiety. Furthermore, foundational researchers indicated that their experiments suffered or would likely suffer from a major loss because of the COVID-19 outbreak, accounting for the increasing stress level...Table...able. 3...4b.... As for the correlation between consistency of...research stress and influencing factors of...personnel...n different research directions ... [1]

Deleted: For the factors affecting the pressure of people in different research directions,...a separate analysis is eliminated ... [2]

Formatted: Font colour: Accent 1

Formatted

Commented [A2]: I think "proposed solutions" would be clearer than "appeal"

Formatted: Font colour: Accent 1

Deleted: pressure on researchers...Fig 1). The top demand...ppeal was...s for...an extension...rolonging of the deadline for experimental projects, with 161 of 251 (64.14%) respondents(64.14%) ... [4]

Formatted: Font colour: Accent 1

Formatted

Deleted: ed... Academic cooperation (27.49%) and meetings (21.91%) became less regarded during this period of time. ¶ We found that 62.03% of undergraduates and 66.67% of Master's degree candidates in their graduation year consider it unnecessary to improve the welfare of researchers temporarily, whereas 51.3557.14% of non-graduating Master's degree candidates, 65.1265.00% of PhD, PhD candidates, 64.52% of foundation research staff, and 50.82% of clinical medical staff indicated that greater funding and... [6]

Formatted: Font colour: Accent 1

Deleted: clinical...linical staff and basic medical researchers, and...s well as between master's and doctoral students, respectively....Table.4ab-b...5 and Table. 6c ... [7]

Formatted: Font colour: Accent 1

Deleted: 6... of researchers in the life...field of ...ciences...indicated their research programs were halted, and 32.00% of researchers indicated their programs, while... [8]

456 affected. However, the responses of researchers without professional titles varied, with 43.82% of
457 researchers indicating stagnated experiments, and 23.11% indicating unaffected projects
458 respectively (Table 7 and Table. 8).

459

460 Discussion

461 There may be many subjective or objective factors preventing the achievement of
462 motivating factors like job achievement, income, respect, reputation, work pride, promotion
463 opportunities, etc. Hinder scientific research progress may lead to reduced salaries and promotion
464 opportunities and could delay job achievement. This might also discourage many researchers who
465 had family or other social responsibilities. The resulting stress might be internalized and cause
466 adverse psychological consequences (Kinman 2008; Liu et al. 2019). The results showed
467 participants whose progress was affected by the outbreak had higher levels of stress. This is
468 consistent with the study that work interruption is a common source of stress for researchers
469 (Gmelch et al. 1984). We explored that researchers who reported needing to change their original
470 research programs often faced more pressure. This indicated the change of work content in a short
471 time may make it difficult for researchers to deal with (Kinman 2001). Participants who indicated
472 pessimism about halted or slowed research progress also had higher levels of stress than
473 participants who were optimistic. These data provide evidence that we should promote the
474 importance of psychological and mental health in researchers and provide intervention guidance
475 during times such as infectious disease outbreaks (Jiang et al. 2020). In addition, previous research
476 has described that most researchers faced unhealthy competition and high levels of competitive
477 pressure at work (Randall et al. 2019; Wellcome 2020). In our study, researchers whose colleagues
478 were conducting related research on COVID-19 showed increased stress levels. This suggested

Deleted: associate professors and lecturers reported that the epidemic impacted their experimental progress, and 63.64% and 59.09% of experiments have been forced into stagnation for associate professors and lecturers, respectively.

Deleted: T

Deleted: 38

Deleted: .51

Deleted: , 32.76%,

Deleted: 8

Deleted: 74

Deleted: of researchesresearchers indicating stagnated experiments, delay in experimental progress, and

Deleted: 5a–b

Formatted: Font colour: Accent 1

Deleted: es

Deleted: ve

494 that with the full efforts of researchers to study COVID-19, the stress of scientific research
495 competition also intensified.

Commented [A3]: Not sure of this point – possibly “increased” rather than “full”?

496 To help determine interventions to reduce researchers’ stress, we asked researchers to
497 provide suggestions regarding how to the demands for reducing research pressure. The top appeal
498 is extending the deadline for experimental projects. That's because the delay of experimental
499 progress often damaged their original research plan, such as funding applications and students'
500 graduation. The results showed that “receiving encouragements from superiors” would also help
501 to reduce stress. In previous study, many respondents believed that their workplace put
502 overwhelming expectations on them and that the superiors' blame led to an increase in staff
503 dissatisfaction. In contrast, “respect” and “caring for others” were considered positive leadership
504 styles (Kobulnicky 1997; Merrill 2015; Morsiani et al. 2017; Wellcome 2020). In addition,
505 inadequate salary and slow career advancement have been considered as stressors for researchers
506 (Gmelch et al. 1984; Kinman 2001). This explains the requirement to improve the welfare of
507 researchers.

Deleted: prolonging

508 Importantly, with graduation deadlines approaching, many students may have felt pressure
509 to complete the necessary science educational. The lack of science educational activities during
510 the pandemic may even cause graduation delay. Furthermore, perceived stress is correlated with
511 the academic level: the stress increased with a higher academic level (Fadhel & Adawi 2020). And
512 the uncertainty around doctoral students and post-doctoral researchers’ careers may have made
513 them more vulnerable to publication stress (Frandsen et al. 2019). So PhD students showed a
514 stronger willingness to be prioritized the return of researches to work than masters students in our
515 study.

Commented [A4]: Not clear? “to complete their science education” or “to complete their qualifications”?

Commented [A5]: I think this is referring to students not those with Masters or PhD qualifications completed

Deleted:

The researchers in the life sciences and engineering indicated that their scientific research was more severely hindered than researchers in the social sciences and other fields. Most life sciences and engineering fields rely on experimental facilities to complete their research, the closure of those facilities during the epidemic created a great obstacle for completing their research (ScienceMag.org 2020a; Tencent 2020a; Tencent 2020b). However, researchers in the social sciences and other fields could often still conduct research activities during the outbreak.

This study has several limitations. The sample size small and therefore smaller population-level sample comparisons than anticipated. Further, because this study took place one month after the outbreak began, psychological stress may not have occurred yet. Long-term psychological impacts of infectious disease outbreaks on scientific researches, such as PTSD, should be investigated in future studies. Finally, we did not compare researcher stress between Hubei (the initial and severe outbreak location) and non-Hubei because of few respondents from Hubei.

Conclusions

Research progress was hindered by the COVID-19 outbreak, especially for researchers in the life sciences (e.g., basic medicine and clinical medicine). Researchers who were affected by the outbreak indicated higher psychological stress levels, especially emotional states, somatic responses, and behaviors. Our investigation suggests that the pressure placed on researchers during an epidemic comes mainly from lack of experimental progress and competition among peers. Additionally, clinical medicine researchers were also concerned that the value of their experimental results would be reduced because of delays in progress. The majority of respondents indicated that effective ways to relieve stress include extending deadlines, receiving research support from superiors, and increasing benefits for researchers. The results of this investigation

540 suggest that in addition to focusing on restoring normal order of the laboratory after the novel
541 coronavirus pneumonia (NCP), it is also important to improve researchers' psychological state.

542 **Acknowledgements**

543 This study was supported by grants from the National Natural Science Foundation of China
544 (81700658 and 81970248).

545 References

- 546 Fadhel SeB, and Adawi TRT. 2020. Perceived stress and coping strategies among university students. . *European*
547 *Journal of Research in Medical Sciences*8 (1), 19-25.
- 548 Frandsen TF, Jacobsen RH, Nicolaisen J, and Ousager J. 2019. Pressure to publish: a bibliometric study of PhD
549 students (1993-2009). *Information Research-an International Electronic Journal* 24:12.
- 550 Gmelch WH, Lovrich NP, and Wilke PK. 1984. Sources of Stress in Academe: A National Perspective. *Research*
551 *in Higher Education* 20:477-490.
- 552 Hull HF. 2005. SARS control and psychological effects of quarantine, Toronto, Canada. *Emerg Infect Dis* 11:354;
553 author reply 354-355. 10.3201/eid1102.040760
- 554 Jiang X, Deng L, Zhu Y, Ji H, Tao L, Liu L, Yang D, and Ji W. 2020. Psychological crisis intervention during the
555 outbreak period of new coronavirus pneumonia from experience in Shanghai. *Psychiatry Res*
556 286:112903. 10.1016/j.psychres.2020.112903
- 557 Kinman G. 2001. Pressure Points: A review of research on stressors and strains in UK academics. *Educational*
558 *Psychology* 21:473-492. 10.1080/01443410120090849
- 559 Kinman G. 2008. Work stressors, health and sense of coherence in UK academic employees. *Educational*
560 *Psychology* 28:823-835. 10.1080/01443410802366298
- 561 Kobulnicky PJ. 1997. Commitment in the workplace: Theory, research and application - by John P. Meyer, John
562 P. and Natalie J. Allen. Thousand Oaks, CA: Sage, 1997. 150p. \$34.00 (cloth). ISBN 0-7619-0104-3.
563 \$15.95(paper). ISBN 0-7619-0105-1. *Journal of Academic Librarianship* 24:175.
- 564 Lai CC, Shih TP, Ko WC, Tang HJ, and Hsueh PR. 2020. Severe acute respiratory syndrome coronavirus 2 (SARS-
565 CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. *Int J Antimicrob*
566 *Agents* 105924. 10.1016/j.ijantimicag.2020.105924
- 567 Liu Y, Zhang J, Hennessy DA, Zhao S, and Ji H. 2019. Psychological strains, depressive symptoms, and suicidal
568 ideation among medical and non-medical staff in urban china. *J Affect Disord* 245:22-27.
569 10.1016/j.jad.2018.10.111
- 570 Martinez MA. 2020. Compounds with therapeutic potential against novel respiratory 2019 coronavirus.
571 *Antimicrob Agents Chemother*. 10.1128/aac.00399-20
- 572 Merrill KC. 2015. Leadership style and patient safety: implications for nurse managers. *J Nurs Adm* 45:319-324.
573 10.1097/nna.0000000000000207
- 574 Morsiani G, Bagnasco A, and Sasso L. 2017. How staff nurses perceive the impact of nurse managers' leadership
575 style in terms of job satisfaction: a mixed method study. *J Nurs Manag* 25:119-128.
576 10.1111/jonm.12448
- 577 Pediatric Committee MAoCPL, Army, and Editorial Committee of Chinese Journal of Contemporary P. 2020.
578 Emergency response plan for the neonatal intensive care unit during epidemic of 2019 novel
579 coronavirus. *Zhongguo dang dai er ke za zhi = Chinese journal of contemporary pediatrics* 22:91-95.
- 580 Pilz LK, Keller LK, Lenssen D, and Roenneberg T. 2018. Time to rethink sleep quality: PSQI scores reflect sleep
581 quality on workdays. *Sleep* 41. 10.1093/sleep/zsy029
- 582 Randall ET, Shapiro JB, Smith KR, Jervis KN, and Logan DE. 2019. Under Pressure to Perform: Impact of
583 Academic Goal Orientation, School Motivational Climate, and School Engagement on Pain and
584 Somatic Symptoms in Adolescents. *Clin J Pain* 35:967-974. 10.1097/ajp.0000000000000765
- 585 ScienceMag.org. 2020a. 'The disruption is enormous.' Coronavirus epidemic snarls science worldwide.
586 Available at [https://www.sciencemag.org/news/2020/02/disruption-enormous-coronavirus-](https://www.sciencemag.org/news/2020/02/disruption-enormous-coronavirus-epidemic-snarls-science-worldwide)
587 *epidemic-snarls-science-worldwide*.
- 588 ScienceMag.org. 2020b. Does closing schools slow the spread of coronavirus? Past outbreaks provide clues.
- 589 Shigemura J, Ursano RJ, Morganstein JC, Kurosawa M, and Benedek DM. 2020. Public responses to the novel
590 2019 coronavirus (2019-nCoV) in Japan: Mental health consequences and target populations.

591 *Psychiatry Clin Neurosci*. 10.1111/pcn.12988
 592 Tencent. 2020a. Laboratory in the epidemic: closed, delayed graduation, stagnant project ... Available at
 593 <http://zhishifenzi.com/depth/depth/8426.html>.
 594 Tencent. 2020b. Scientific research work in many places has "stagnation" . How much has the academic
 595 community been affected by the epidemic? . Available at
 596 <https://xw.qq.com/cmsid/20200222A08EHD00>.
 597 Tytherleigh * MY, Webb C, Cooper CL, and Ricketts C. 2005. Occupational stress in UK higher education
 598 institutions: a comparative study of all staff categories. *Higher Education Research & Development*
 599 24:41-61. 10.1080/0729436052000318569
 600 Wellcome. 2020. What researchers think about the culture they work in. Available at
 601 <https://wellcome.ac.uk/reports/what-researchers-think-about-research-culture>.
 602 Wu KK, Chan SK, and Ma TM. 2005a. Posttraumatic stress after SARS. *Emerg Infect Dis* 11:1297-1300.
 603 10.3201/eid1108.041083
 604 Wu KK, Chan SK, and Ma TM. 2005b. Posttraumatic stress, anxiety, and depression in survivors of severe acute
 605 respiratory syndrome (SARS). *J Trauma Stress* 18:39-42. 10.1002/jts.20004
 606 Xiao H, Zhang Y, Kong D, Li S, and Yang N. 2020. The Effects of Social Support on Sleep Quality of Medical
 607 Staff Treating Patients with Coronavirus Disease 2019 (COVID-19) in January and February 2020 in
 608 China. *Med Sci Monit* 26:e923549. 10.12659/msm.923549
 609 Zhou X. 2020. Psychological crisis interventions in Sichuan Province during the 2019 novel coronavirus
 610 outbreak. *Psychiatry Res* 286:112895. 10.1016/j.psychres.2020.112895
 611

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [1] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [2] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [2] Deleted	Author
---------------------	--------

x.....

▲.....

Page 8: [3] Formatted	Author
-----------------------	--------

Font colour: Accent 1

▲
Page 8: [3] Formatted

Author

Font colour: Accent 1

▲
Page 8: [3] Formatted

Author

Font colour: Accent 1

▲
Page 8: [4] Deleted

Author

✖.....

▲
Page 8: [4] Deleted

Author

✖.....

▲
Page 8: [4] Deleted

Author

✖.....

▲
Page 8: [4] Deleted

Author

✖.....

▲
Page 8: [4] Deleted

Author

✖.....

▲
Page 8: [4] Deleted

Author

✖.....

▲
Page 8: [5] Formatted

Author

Font: (Default) Times New Roman, 12 pt, Font colour: Accent 1

▲
Page 8: [5] Formatted

Author

Font: (Default) Times New Roman, 12 pt, Font colour: Accent 1

▲
Page 8: [6] Deleted

Author

✖.....

▲
Page 8: [6] Deleted

Author

✖.....

▲
Page 8: [7] Deleted

Author

✖.....

▲
Page 8: [7] Deleted

Author

Page 8: [7] Deleted

Author

Page 8: [7] Deleted

Author

Page 8: [7] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author

Page 8: [8] Deleted

Author