



# The reverse buffering effects of social support on the relationships between stresses and mental health: a survey of Chinese adults during the COVID-19 lockdown

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## ABSTRACT

**Background:** People lived through different types of stresses during the COVID-19 pandemic, and stresses from different sources are believed to associate differently with mental health.

**Objectives:** The current study aims to examine the relationship between types of stresses and mental health among the general Chinese adult population, and further explore the moderating role of social support in these relationships.

**Methods:** This study was conducted from 1 to 10 February 2020, and 2441 participants were recruited through an online cross-sectional survey from 31 provinces in China. We used multiple linear regression analyses to examine the associations among stresses' types, social support, and mental health.

**Results:** The study revealed that all types of stresses were associated with more mental health symptoms. Stresses from lockdown policy presented stronger associations with mental health symptoms (Beta = 0.387 for depressive symptoms and Beta = 0.385 for post-traumatic stress symptoms (PTSS)) than stresses from pandemic fear (Beta = 0.195 for depressive symptoms and Beta = 0.221 for PTSS). Moreover, greater social support enhanced the positive associations between stresses and mental health symptoms.

**Conclusions:** Stresses from lockdown policies during the early stage of the COVID-19 epidemic are worthy of more attention. We urge more interventions are required to reduce the side-effect of lockdown policies, and also discuss implications for mental health promotion.

## Los efectos amortiguadores inversos del apoyo social en las relaciones entre el estrés y la salud mental: Un encuesta de adultos chinos durante el confinamiento de COVID-19

**Antecedentes:** Las personas vivieron diferentes tipos de estrés durante la pandemia de COVID-19, y se cree que el estrés de diferentes fuentes se asocia de manera diferente con la salud mental.

**Objetivos:** El presente estudio pretende examinar la relación entre los tipos de estrés y la salud mental entre la población general adulta china, y explorar además el papel moderador del apoyo social en estas relaciones.

**Métodos:** Este estudio se llevó a cabo del 1 al 10 de febrero de 2020, y 2441 participantes fueron reclutados a través de una encuesta transversal en línea de 31 provincias de China. Se utilizaron análisis de regresión lineal múltiple para examinar las asociaciones entre los tipos de estrés, el apoyo social y la salud mental.

**Resultados:** El estudio reveló que todos los tipos de estrés se asociaron con más síntomas de salud mental. El estrés derivado de la política de confinamiento presentó asociaciones más fuertes con los síntomas de salud mental (Beta=0,387 para los síntomas depresivos y Beta=0,385 para los síntomas de estrés postraumático (PTSS, en siglas en inglés)) que el estrés derivado del miedo a la pandemia (Beta=0,195 para los síntomas depresivos y Beta=0,221 para los PTSS). Además, un mayor apoyo social mejoró las asociaciones positivas entre el estrés y los síntomas de salud mental.

**Conclusiones:** El estrés provocado por las políticas de confinamiento durante la fase inicial de la epidemia de COVID-19 merece más atención. Instamos a que se realicen más intervenciones para reducir el efecto secundario de las políticas de confinamiento, y también discutimos las implicaciones para la promoción de la salud mental.

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## PALABRAS CLAVE

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## 关键词

压力; 社会支持; 抑郁; 创伤后应激症状; 新冠病毒

## HIGHLIGHTS

- Compared to virus-related stress, lockdown-related stress is more strongly related to adverse mental health.
- In addition, social support moderated the association between stress and mental health symptoms.

## 社会支持对压力与精神健康之间的反向调节作用: 基于新冠疫情期间中国人群的调查

**背景:** 新冠疫情下给人们带来各种各样的压力, 这些压力进而影响人们的精神健康状况。

**目的:** 本研究将探究疫情多重压力与个体精神健康之间的关系, 并进一步探究社会支持是否可以缓解压力对精神健康的影响。

**方法:** 2020年2月1-10日, 通过在线调查的方式, 纳入2441名参与者。通过多元线性回归方法检验压力, 社会支持及精神健康之间的关系。

**结果:** 研究发现, 所有的压力均显著影响精神健康结果, 隔离政策带来的压力比病毒本身带来的压力对个体精神健康的影响更大 (抑郁: $\beta=0.387$  VS  $0.195$ ; 创伤后应激症状: $\beta=0.385$  VS  $0.221$  for PTSS)。不合理的社会支持可能会增强压力与精神健康之间的关系。

**结论:** 隔离政策所带来的压力对人们精神健康的副作用需要被关注, 应该采取适宜的干预措施来减少隔离对人们精神健康的副作用。

### 1. Introduction

Stress is a common physical and psychological response to harmful stimuli (Wu et al., 2020). The persistence of stress may result in mental and physical disorders (Alzahem, Van Der Molen, Alaujan, Schmidt, & Zamakhshary, 2011). In the context of the COVID-19 outbreak, virus-related stresses including the spread, loss of control, and infection risk of the COVID-19 virus, which were naturally stimulated from the worries and fear of the COVID-19 virus itself, were associated with higher levels of mental health symptoms (González-Sanguino et al., 2020). Due to the highly infectious feature of the COVID-19 virus, together with its dramatically elevated morbidity and mortality, people in the pandemic context experienced great fear of being infected, and were easier to perceive a loss of control (Tang et al., 2020; Yan & Huang, 2020). To minimize virus transmission, many countries adopted lockdown policies, curtailing social and economic activities strictly. These lockdown policies alleviated the spread speed of the pandemic but also resulted in negative consequences like prevalent lockdown-related stresses (Lund, 2020). The stresses come from the negative effect of lockdown measures on individuals' life and work, containing the change in work, being isolated, and lack of material-like food, masks, and other supplies during the lockdown. All of these could promote mental health symptoms (Brooks et al., 2020; Gracia & Rubetta, 2020; Pacheco et al., 2020).

Specifically, the lockdown policies drastically changed multiple facets of peoples' daily life (De Haas, Faber, & Hamersma, 2020). According to Maslow's needs theory, lockdown policy is possible to associate with mental symptoms via unmet basic needs, intensive economic pressure, and social orientation (Henwood, Derejko, Couture, & Padgett, 2015; Maslow, 1943). Because public transportation was severely restricted and was specifically being used in controlling pandemic, inadequate supplies of water, food, masks, thermometers, and other such items were common during the lockdown. Unmet basic needs were examined to relate to more mental stresses by existing studies (Brooks et al., 2020). Besides, in the pandemic context

where economic recessions are prevalent, strict restrictions on social activities disrupted the working patterns of individuals, and thus job insecurities were imposed on people with intensive pressures (Pacheco et al., 2020; Zhou et al., 2020). Furthermore, being in isolation promoted mental health symptoms, as it did not meet humans' social needs such as visiting their non-co-residential relatives, friends, and family members especially during the Spring Festival, which is the most important time in China to reunite with family members, friends, and relatives (Gracia & Rubetta, 2020).

Previous studies believed that the side effects of lockdown policies overpassed that from the COVID-19 virus itself (Grigoletto et al., 2020). However, few studies have simultaneously investigated the virus-related and lockdown-related stresses, and compare the size of their effects on mental health with empirical evidence. Post-traumatic stress symptoms (PTSS) and depression are the results of intense or continuous stress which has not been managed (Hamouche, 2020). Previous pandemic research suggested that stresses related to the COVID-19 virus and lockdown could be prolonged traumatic stressors, which were difficult to cope with and easily induced post-traumatic stress symptoms (PTSS) and depressive symptoms (Kira et al., 2020; Ye et al., 2020). PTSS are severe mental health symptoms following traumatic occurrences outside the range of common human experience (Liu et al., 2020), and depression refers to a psychological state of low mood and aversion to activity (Stankovska, Memedi, & Dimitrovski, 2020). A systemic review revealed relatively high rates of PTSS (7% to 53.8%) and depressive symptoms (14.6% to 48.3%) were reported among the general public during the COVID-19 epidemic, which stressed the importance of estimating PTSS and depressive symptoms in the context of pandemic (Xiong et al., 2020). Therefore, we need to further explore how each stress source from the COVID-19 virus and lockdown correlated with PTSS and depressive symptoms. In addition, most studies related to stressors or sources of stress focused on medical personnel, giving minor attention to the general population. In reality, the general public has other substantial stress-related mental health problems, sometimes

to a higher degree than healthcare workers (Li et al., 2020a). Thus, studying the stresses related to the novel virus and lockdown and their associations with mental health symptoms among the general public is essential, and it will provide effective advice into preventive interventions.

Moreover, social support is possible to moderate the relationship between stress and mental health symptoms. As a psychological and material resource to cope with stress (Cohen, 2004), social support was believed to mitigate the adverse effect of stress sources on individuals' mental health by the stress-buffering model (Cohen & Wills, 1985). However, some researchers also indicated that there exists a 'reverse buffering effect.' Social support is possible to strengthen the associations between stresses and negative psychological outcomes (Kokoroko & Sanda, 2019) from two aspects. First, excessive social support threatens people's self-esteem and makes them feel dependent, which hurts their confidence in overcoming the stresses. Second, social support involves communication, where negative sharing could emphasize or exaggerate stressors (Tucker, Jimmieson, & Bordia, 2018). Thus, whether social support moderates the association from stress sources to mental health yet remains unclear and requires to be identified further.

In summary, the objectives of the present study were to evaluate the relationships between types of stresses and mental health and to further explore the moderation role of social support in the associations above. Based on the above pieces of literature, there were three hypotheses and one explorative question in this study. Our first hypothesis supposed that the virus-related stresses, including the spread of the virus, loss of control, and worries about the health of self and family, were associated with a higher degree of PTSS and depressive symptoms in the COVID-19 epidemic. Considering the adverse outcomes of lockdown measures, we proposed the second hypothesis that the lockdown-related stresses, such as the change in work, isolation, and lack of material, correlated with more mental health symptoms. Combining the two hypotheses and the views about the effect size of two kinds of stresses on mental health in the previous studies, we raise an explorative question whether there might be a stronger association between lockdown-related stresses and mental health than virus-related stresses. Lastly, two competing hypotheses were proposed that social support could strengthen or weaken the association from stressors to mental health.

## 2. Method

### 2.1. Study design

The cross-sectional survey was conducted in China from 1st to 10th February of 2020, by the Ethics

Committee of Peking University Medical Center. Before the survey, the Chinese government has announced a complete lockdown of Wuhan city on 23 January 2020. From 29th January, all provinces in China initiated the first-level emergency response to the public health emergencies and lockdown measures including stay-at-home orders, closure of business, and travel restrictions, etc. (The State Council Information Office of the People's Republic of China, 2020). To prevent the transmission of COVID-19 through contact or droplets, we collected data via a web-based platform (<https://www.wjx.cn/app/survey.aspx>). Two thousand nine hundred and ninety-three participants were recruited through the Quota sampling and convenience sampling method. In the process of Quota sampling, we recruited seven different occupational groups, including medical workers, non-professional employees, social service workers, teachers, students, workers, and farmers, as well as unemployed and others. Among them, some groups like workers, farmers, unemployed individuals and others with lower social economic status, may have more pressure of survival and less access to the internet in the COVID-19 lockdown. Other groups such as medical workers and social service workers with higher risks of infection, might confront huge virus-related stresses and have overload work and limited time to surf the internet during the COVID-19 outbreak. Therefore, the targeted recruitment of these specific occupational groups could reduce the underrepresentation of individuals with more stress and limited access to the internet, caused by the online survey, and thus enhancing the sample's representativeness. In the following, we present two steps of convenience sampling. First, several key contacts from different occupational groups were selected. Second, the key contacts share the questionnaire link to the group members and ask them to forward the link to their friends and colleague via WeChat, a Chinese APP for communication about work and life. All participants gave their informed consent after being informed about the study's purpose as well as their right to keep the information confidential.

Five hundred and fifty-two students were excluded. Because most of them do not have the change in work that our study focuses on, the stresses of them are more related to academic activities (Kapasia et al., 2020), and they have less economic stress caused by lockdown since they may not have the responsibility to earn money. Finally, a total of 2441 subjects from 31 provinces in China were included. Nearly half of the sample participants were male, and 70% were married. Only 9.42% of the respondents were over 50 years old, and less than 10% belonged to the minority ethnicity and had a religious belief. More than half of the respondents completed undergraduate studies and worked in the informal sector. Almost 90% of subjects

identified themselves as not poor. Subtle differences in these demographic characteristics existed among the participants with or without direct exposure (for details, see Table 1). In addition, missing data in Table 1 included seven non-students without age information. We used the list-wise approach in all statistical analyses to deal with missing data, which would delete cases incorporating missing values before data analysis (Aiello et al., 2011). Therefore, a final analytical sample of 2434 was included in all regression analyses.

## 2.2. Measurements

### 2.2.1. Depressive symptoms

For measuring the severity of depressive symptoms, the study used a Chinese version 20-item Center for Epidemiologic Studies Depression Scale (CESD). The self-report scale has been extensively used and validated (Radloff, 1977; Yang, Jia, & Qin, 2015). Respondents answered each item equivalent to the frequency of symptoms on a 4-point scale from 0

(less than one day) to 3 (5–7 days). These items were summed to yield a total score ranging from 0 to 60. The higher the score indicates the higher degree of depressive symptoms. The reliability coefficient (Cronbach's  $\alpha$ ) in the current study was 0.93.

### 2.2.2. PTSS symptoms

The 20-item self-report PCL-5 scale was employed to evaluate the level of DSM-5-related PTSS symptoms during the past month (Weathers et al., 2013). Participants rated the 20 items on a 5-point Likert scale from 0 (not at all) to 4 (extremely). A total score ranging from 0 to 80 was obtained by summing all the items. The higher the score the more severe symptoms of PTSS. The reliability coefficient (Cronbach's  $\alpha$ ) was 0.97 in this study.

### 2.2.3. Social support

The multidimensional scale of perceived social support (MSPSS) was employed to estimate the level of social support from family, friends, and other special people (Zimet, Dahlem, Zimet, & Farley, 1988). It is

**Table 1.** Descriptive analysis of sample characteristics.

	Direct exposure		No direct exposure		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Female	316	53.74	963	51.97	1279	52.40
Male	272	46.26	890	48.03	1162	47.60
Age						
Over 50	51	8.67	179	9.66	230	9.42
41–50	97	16.50	301	16.24	398	16.30
31–40	229	38.95	660	35.62	889	36.42
26–30	131	22.28	482	26.01	613	25.11
18–25	79	13.44	225	12.14	304	12.45
Missing	1	0.17	6	0.32	7	0.29
Ethnicity(else)	18	3.06	70	3.78	88	3.61
Marriage (No)	159	27.04	566	30.55	725	29.70
Religion (No)	528	89.80	1,656	89.37	2184	89.47
Education						
Junior high school and below	50	8.50	220	11.87	270	11.06
High school/Technical school	66	11.22	300	16.19	366	14.99
Junior College	97	16.50	356	19.21	453	18.56
Undergraduate	281	47.79	765	41.28	1046	42.85
Postgraduate and above	94	15.99	212	11.44	306	12.54
Job						
Formal sector	268	45.58	675	36.43	943	38.63
Informal sector	320	54.42	1178	63.57	1498	61.37
Income (Not poor)	525	89.29	1654	89.26	2179	89.27
Wuhan exposure (No)	418	71.09	1727	93.2	2145	87.87
Media exposure (Frequently)						
Very frequent	342	58.16	1061	57.26	1403	57.48
Often	153	26.02	474	25.58	627	25.69
Some	50	8.50	155	8.36	205	8.40
Almost none	43	7.31	163	8.80	206	8.44
Previous trauma (No)	451	76.70	1580	85.27	2031	83.20
Two weeks illness (No)	510	86.73	1775	95.79	2285	93.61
	Mean	SD	Mean	SD	Mean	SD
Depression	16.740	12.507	13.887	11.353	14.574	11.702
PTSS	20.412	18.781	16.614	17.52	17.529	17.901
Social support	57.051	15.249	56.974	16.206	56.992	15.978
Virus-related stress	2.340	0.709	1.974	0.696	2.062	0.716
Health of self	2.222	0.731	1.864	0.694	1.951	0.720
Health of family and others	2.370	0.723	2.093	0.744	2.159	0.748
Spread of virus	2.541	0.906	2.071	0.884	2.184	0.911
Vulnerability/loss of control	2.227	0.863	1.868	0.793	1.955	0.825
Lockdown -related stress	2.088	0.756	1.797	0.704	1.867	0.727
Changes in work	2.187	0.896	1.863	0.801	1.941	0.836
Being isolated	1.597	0.864	1.448	0.736	1.484	0.771
Lack of material	2.480	0.954	2.078	0.947	2.175	0.964



a 12-item self-report inventory rated on a 7-point Likert scale between 1 (strongly disagree) and 7 (strongly agree). Each item was summed to a total score ranging from 12 to 84, in which a higher score indicates more social support the respondents perceived. The Cronbach's Alpha reliability of social support was 0.96 in our study.

#### 2.2.4. Sources of stress

A 21-item self-administrated questionnaire was used to measure the sources of stress. We designed the scale based on the relevant literature of stress sources related to the COVID-19 and lockdown and the experience of the general population exposed to these stress sources (Wong et al., 2005; Wong, Gao, & Tam, 2007). The validity and comprehensibility of each item design were discussed and tested by our expert panel. The overall reliability of the whole scale was 0.95. The subjects were asked to rate how frequently they perceived each stress source according to a four-point Likert scale (1 = never; 4 = often). There were 21 statements on different stress sources that could be grouped into two main categories based on previous research (Chandola, Kumari, Booker, & Benzeval, 2020; Flaudias et al., 2020): 1) lockdown-related stress (Cronbach's  $\alpha = 0.80$ ) and 2) virus-related stress (Cronbach's  $\alpha = 0.91$ ). The first category included three subscales like change in work (Cronbach's  $\alpha = 0.78$ ), being isolated (Cronbach's  $\alpha = 0.87$ ) and lack of material (Cronbach's  $\alpha = 0.86$ ). However, latter contained four subscales such as health of self (Cronbach's  $\alpha = 0.83$ ), health of family (Cronbach's  $\alpha = 0.68$ ), the spread of virus (Cronbach's  $\alpha = 0.82$ ) and loss of control (Cronbach's  $\alpha = 0.88$ ). Confirmatory factor analysis (CFA) was conducted to evaluate the fit of the two expected subscales using *confa* command of STATA 16.0. The results indicated one stress factor explained the correlational structure of the two latent subscale factors (RMSEA = 0.148; CFI = 0.942; TLI = 0.906; RMSR = 0.035). There was less than 5% missing data on any variable. The scores for each variable are calculated as the mean of relevant items and range from 1 to 4. A higher mean score indicates that they perceived certain stress more frequently.

#### 2.2.5. Confounding variables

Similar to previous literature on mental health, the covariates in the current study covered the following three domains: demographic characteristics, the COVID-19 exposure situation, and health status (Boyras & Legros, 2020; Pirutinsky, Cherniak, & Rosmarin, 2020). Demographic characteristics consisted of gender (male, female), age (18–25, 26–30, 31–40, 41–50, over 50), ethnicity (Han, else), religion (yes, no), marital status (yes, no), educational level (Junior high school and below, High school/

Technical school Junior College, Undergraduate, Postgraduate and above), work in the formal sector (yes, no), and income (poor, not poor). The COVID-19 exposure situation contained direct exposure (yes, no), Wuhan exposure (yes, no), and media exposure (very frequent, often, some, almost none). Health status comprised physical health, that is, two-week illness (yes, no), and mental health, that is, previous traumatic experiences (yes, no).

#### 2.3. Statistical analysis

We adopted multiple linear regression analysis in this study since PTSS and depressive symptoms are continuous. Each regression analysis controlled the same confounding variables: gender, age, ethnicity, married, religion, education status, job, income, various exposure, and prior physical and mental health.

Firstly, several linear models were used to examine seven stress sources' associations with the depressive and PTSS symptoms, after controlling the covariates and social support. Secondly, the moderation role of social support on these relationships was tested by added interactive variables of each stress source and social support in corresponding models. Moreover, we estimated of what categories of stress sources [lockdown-related stressors including self-health, health of the family, the spread of virus and loss of control and virus-related stressors containing changes in work, being isolated and lack of material] were associated with more mental health symptoms by reporting and comparing their standardized regression coefficients. Finally, by separately introducing interactive variables of two categories of stresses and social support, we tested the moderating effects of social support on the relationship between lockdown-related stresses, virus-related stresses, and mental health. All analyses were performed using Stata version 16.0.

### 3. Results

The correlations between mental health symptoms, stresses, and social support, were presented in Table 2. PTSS and depressive symptoms were all significantly correlated with virus-related stress, lockdown-related stress, and their subscales. And social support was significantly associated with PTSS, depressive symptoms, and virus-related stress, but it was only remarkably associated with partial subscales of stress sources, such as self-health, the health of the family, the spread of the virus, being isolated, and lack of material.

Table 3 displays the results of the multiple linear regression for the relationship between each source of stress, social support, and mental health symptoms. Model 1 indicates that health of self ( $B = 5.796$ ,  $p < .001$ ), health of family and others ( $B = 4.212$ ,

**Table 2.** Correlation of mental health symptoms, stresses, and social support among Chinese generation population.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) PTSS	1.000											
(2) Depression	0.748***	1.000										
(3) Social support	-0.067***	-0.229***	1.000									
(4) Virus-related stress	0.536***	0.494***	0.102***	1.000								
(5) Lockdown-related stress	0.585***	0.557***	0.036	0.797***	1.000							
(6) Health of self	0.530***	0.497***	0.092***	0.895***	0.735***	1.000						
(7) Health of family	0.407***	0.354***	0.157***	0.862***	0.639***	0.769***	1.000					
(8) Spread of virus	0.423***	0.374***	0.094***	0.906***	0.683***	0.710***	0.673***	1.000				
(9) loss of control	0.563***	0.547***	0.029	0.912***	0.795***	0.756***	0.673***	0.813***	1.000			
(10) Changes in work	0.507***	0.480***	0.038	0.730***	0.883***	0.654***	0.575***	0.635***	0.744***	1.000		
(11) Being isolated	0.603***	0.612***	-0.043*	0.596***	0.803***	0.600***	0.472***	0.464***	0.607***	0.619***	1.000	
(12) Lack of material	0.401***	0.354***	0.825***	0.693***	0.855***	0.615***	0.568***	0.623***	0.667***	0.634***	0.480***	1.000

\* $p < 0.05$ , \*\*\* $p < 0.001$ .**Table 3.** Multiple linear regression for the relationship between seven sources of stress and mental health symptoms.

	Model 1 – Depressive symptoms			Model 2 – PTSS		
	B (95% CI)	SE	Beta	B	SE	Beta
Social support	-2.442	0.226	-0.210***	-0.931	0.353	-0.052**
Health of self	5.796	0.201	0.499***	9.139	0.313	0.514***
Health of family	4.212	0.217	0.360***	6.939	0.336	0.388***
Spread of virus	4.435	0.217	0.379***	7.365	0.335	0.412***
Loss of control	6.220	0.194	0.533***	9.640	0.304	0.541***
Changes in work	5.317	0.203	0.458***	8.447	0.315	0.475***
Being isolated	6.595	0.182	0.571***	9.929	0.290	0.562***
Lack of material	4.068	0.217	0.345***	6.782	0.336	0.376***

\*\* $p < 0.01$ , \*\*\* $p < 0.001$ . B represent Non-standardized coefficients. In Model 1 and Model 2, each of the independent variables were included separately to estimate their association with dependent variables, after controlling all confounding variables (gender, age, ethnicity, marital status, religion, education, job, income, various exposure, previous trauma, two week illness)

$p < .001$ ), spread of virus ( $B = 4.435$ ,  $p < .001$ ), loss of control ( $B = 6.220$ ,  $p < .001$ ), changes in work ( $B = 5.317$ ,  $p < .001$ ), being isolated ( $B = 6.595$ ,  $p < .001$ ), lack of material ( $B = 4.068$ ,  $p < .001$ ) strongly associated with more severe depressive symptoms, respectively. Besides, social support had a negative association with depressive symptoms ( $B = -2.442$ ,  $p < .001$ ). Model 2 also shows that all seven sources of stress were significantly positively associated with PTSS, and higher social support correlated with a low degree of PTSS.

Table 4 presents the results of the interaction of social support with seven stress sources on depressive symptoms and PTSS. When independent variable was depressive symptoms, we found social support had significant interaction effects with health of self ( $B = 0.66$ ,  $p < .001$ ), health of family and others ( $B = 0.52$ ,  $p < .01$ ), spread of virus ( $B = 0.51$ ,  $p < .01$ ), loss of control ( $B = 0.56$ ,  $p < .01$ ), changes in work ( $B = 0.52$ ,  $p < .01$ ), being isolated ( $B = 0.79$ ,  $p < .001$ ) on depressive

symptoms, separately. More social support would enhance the effects of the above six stress sources on the depressive symptoms (see, Figure 1(a-f)). However, it did not modify the correlation between lack of material and depressive symptoms. When PTSS was entered as the dependent variable, social support significantly positively moderated the association between seven sources of stress and PTSS, indicating individuals with greater stress sources and more social support would have a higher degree of PTSS (see, Figure 2(a-g)).

Table 5 reports the standardized regression coefficients of lockdown-related and virus-related stresses, to evaluate the strength of their correlations with mental health. Model 1 indicated that lockdown-related stress ( $Beta = 0.387$ ) had a stronger correlation with depressive symptoms than virus-related stress ( $Beta = 0.195$ ). Model 2 showed that lockdown-related stress ( $Beta = 0.385$ ) was more correlated with PTSS than virus-related stress ( $Beta = 0.221$ ). In Table 6, two interaction variables (social support\*virus-related stress and social support\*lockdown-related stress) were separately introduced into linear regression models. It demonstrated that whether PTSS or depressive symptoms was used as the dependent variable, both interaction variables' coefficient was significantly positive. And it indicated that participants who perceived more stress related to the virus itself and lockdown measures and high social support would suffer higher PTSS and depressive symptoms (see, Figure 3(a-d)).

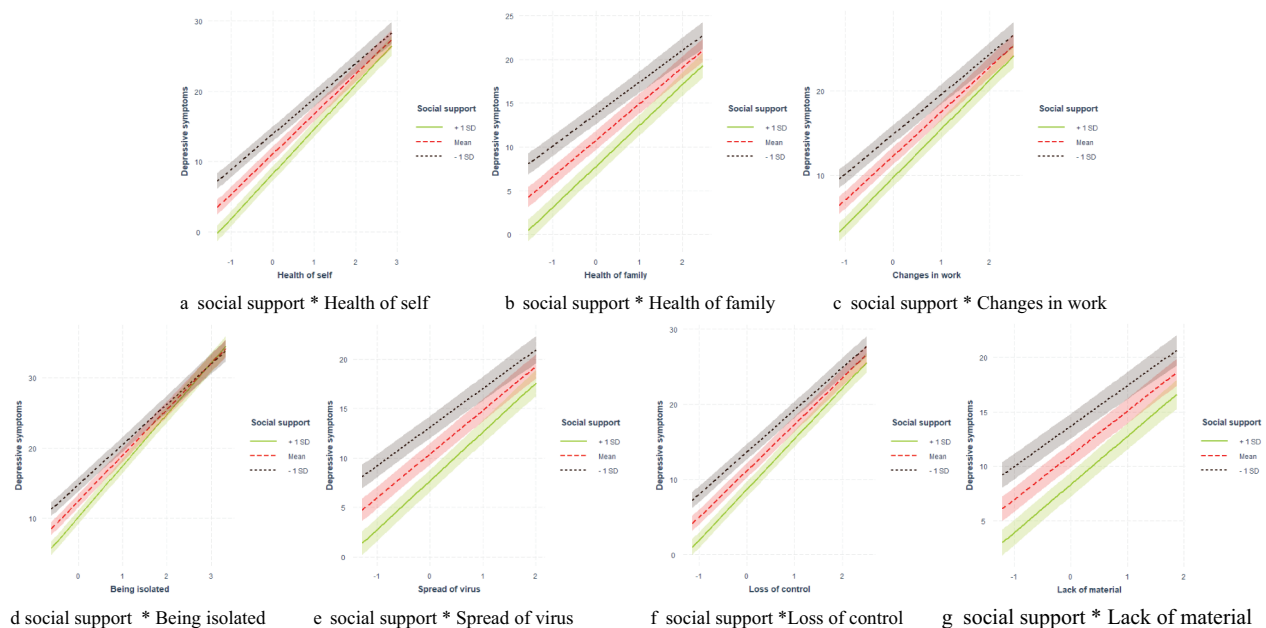
#### 4. Discussion

This study examines the relationships between seven types of stress and mental health symptoms and further compared the strength of the association of lockdown-related stresses and virus-related stresses with mental health while taking social support as a moderator. The study supports the first hypothesis that each source of stress is significantly associated with greater mental health symptoms among general Chinese populations during the COVID-19 outbreak. And we find that lockdown-related stress is more

**Table 4.** Multiple linear regression for the relationship between interactions (seven stress sources\* Social support) and mental health.

	Depressive symptoms				PTSS			
	B	SE	Beta	R-squared	B	SE	Beta	R-squared
Model 1				0.36				0.34
Social support (SS)	-2.80	0.20	-0.24***		-1.43	-0.31	-0.08***	
Health of self	5.70	0.20	0.49***		8.04	-0.31	0.50***	
SS* Health of self	0.66	0.18	0.06***		1.41	-0.27	0.09***	
Model 2				0.26				0.24
Social support (SS)	-2.95	0.22	-0.25***		-1.72	-0.33	-0.10***	
Health of family	4.17	0.22	0.36***		6.85	-0.34	0.38***	
SS* Health of family	0.52	0.18	0.05**		1.13	-0.29	0.07***	
Model 3				0.27				0.26
Social support (SS)	-2.69	0.21	-0.23***		-1.32	-0.32	-0.07***	
Spread of virus	4.40	0.22	0.38***		7.29	-0.33	0.41***	
SS* Spread of virus	0.51	0.19	0.05**		1.1	-0.29	0.07***	
Model 4				0.40				0.37
Social support (SS)	-2.47	0.19	-0.21***		-0.94	-0.30	-0.05**	
Vulnerability	6.18	0.19	0.53***		9.54	-0.30	0.53***	
SS* Vulnerability	0.56	0.17	0.05**		1.3	-0.27	0.08***	
Model 5				0.33				0.32
Social support (SS)	-2.55	0.20	-0.22***		-1.03	-0.31	-0.06***	
Changes in work	5.26	0.20	0.45***		8.29	-0.31	0.47***	
SS* Changes in work	0.52	0.18	0.05**		1.44	-0.28	0.09***	
Model 6				0.45				0.40
Social support (SS)	-2.28	0.18	-0.20***		-0.67	-0.29	-0.04*	
Being isolated	6.52	0.18	0.56***		9.76	-0.29	0.55***	
SS* Being isolated	0.79	0.17	0.07***		1.65	-0.27	0.10***	
Model 7				0.25				0.23
Social support (SS)	-2.65	0.21	0.21		-1.23	-0.33	-0.07***	
Lack of material	4.04	0.22	0.22		6.72	-0.34	0.37***	
SS* Lack of material	0.36	0.19	0.19		0.92	-0.30	0.06**	

B represents Non-standardized coefficients; SE represents standard error; Beta represents standardized coefficients. In Model 1 and Model 2, each of the interaction variables was included separately to estimate their association with dependent variables, after controlling all confounding variables (gender, age, ethnicity, marital status, religion, education, job, income, various exposure, previous trauma, two-week illness)

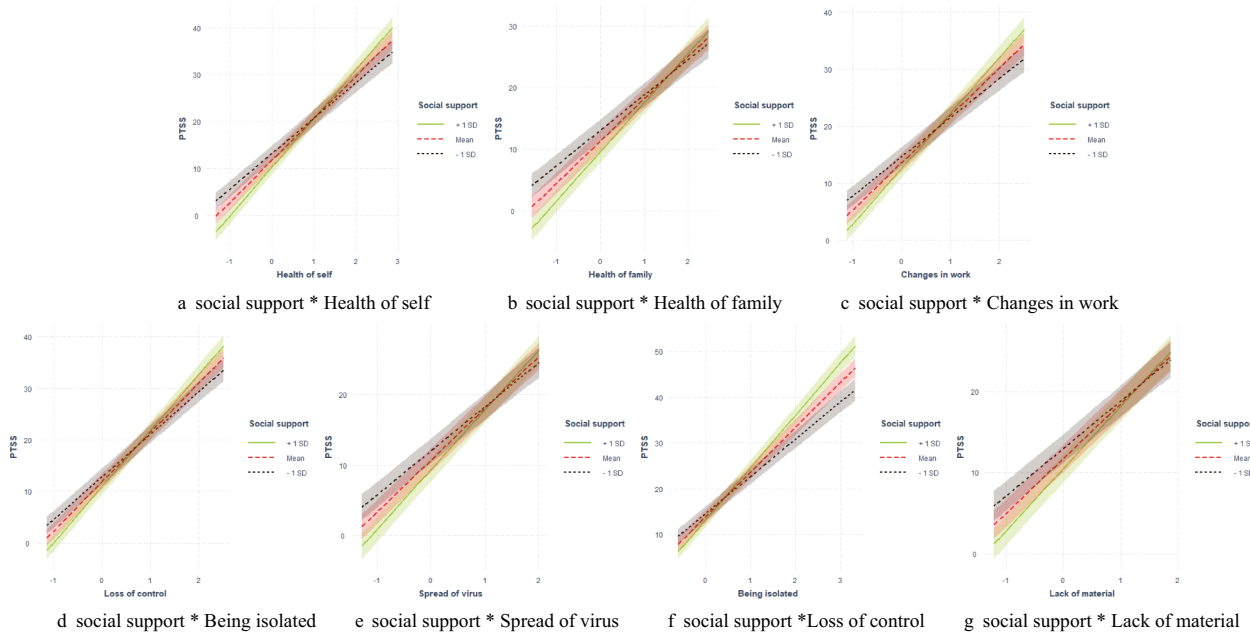


**Figure 1.** The interaction effect of seven sources of stress and social support on depressive symptoms.

strongly related to adverse mental health, compared to virus-related stress. Additionally, our results indicated that social support significantly moderated the association between various sources of stress and mental health symptoms. Our study empirically verifies the ‘reverse buffering effect’ of social support, namely that social support may enhance the negative effect of

various stress sources on mental health. The above findings may enlighten future psychological health interventions.

First, virus-related stress was visibly associated with a higher degree of PTSS and depressive symptoms. Among them, the spread and uncontrol of the novel virus come with more mental health symptoms. It



**Figure 2.** The interaction effect of seven sources of stress and social support on PTSS.

**Table 5.** Multiple linear regression for the relationship between two kinds of stresses, social support, and mental health symptoms.

	Model 1 – Depressive symptoms			Model 1 – PTSS		
	B	SE	Beta	B	SE	Beta
Social support	-2.785	0.305	-0.240***	-1.494	0.473	-0.084***
Virus-related stress	2.274	0.312	0.195***	3.938	0.484	0.221***
Lockdown-related stress	4.492	0.187	0.387***	6.830	0.291	0.385***
R-squared	0.414			0.398		

\*\*\* $p < 0.001$ . B represents Non-standardized coefficients; SE represents standard error; Beta represents Standardized coefficients. 95% confidence intervals in parentheses. All confounding variables (gender, age, ethnicity, marital status, religion, education, job, income, various exposure, previous trauma, two week illness) were controlled in above models.

could be explained by that people concerned the COVID-19 spread and uncontrol may receive more relevant misinformation caused panic and fear through social media and thus lead to lower mental health (Radwan & Radwan, 2020). A study recently demonstrated that increased uncontrollability and severity of COVID-19 individuals perceived correlated with more mental health symptoms (Li et al., 2020b). Besides, because of dramatically elevated morbidity and mortality of the COVID-19 disease around the world, individuals worry and fear that they and their family would get infected with the virus, the health of self and family are considered as more stressful events that may induce adverse mental health (Tang et al., 2020). In other words, poor health of self and family involves a higher risk for infection of the novel respiratory disease, lead to a high level of psychological distress (Kumar, Mehra, Sahoo, Nehra, & Grover,

2020). In sum, virus-related stresses, including the health of self, the health of family and others, spread of the virus, and loss of control are positively related to PTSS and depressive symptoms.

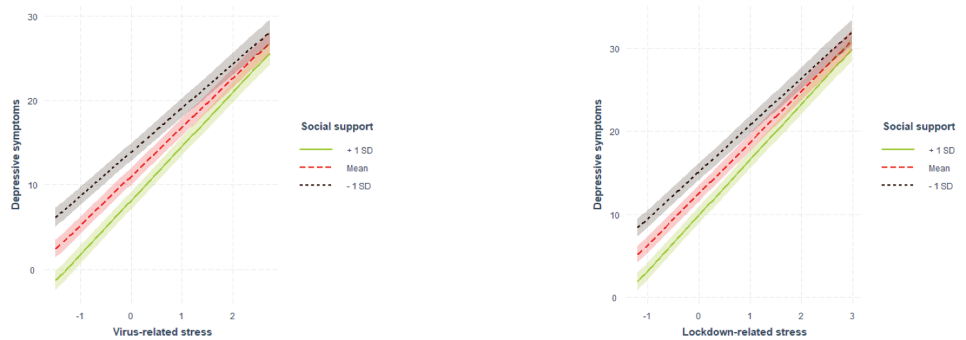
Besides, stress sources generated from the lockdown policy were positively correlated with more mental health symptoms. Among them, the work change caused by stay-at-home orders might bring risks of income reduction and job insecurity to people, which results in enormous financial stress that may induce severe mental health symptoms (Every-Palmer et al., 2020). Lack of medical protection supplies, in the period of COVID-19 pandemic, may increase the uncertainty and insecurity when they cannot meet people's safety needs (Liu et al., 2020). And lack of basic supplies would not meet the most basic human survival needs and lower individuals' quality of life (Bo et al., 2020; Henwood et al., 2015). Therefore, lack of materials in the public health emergency would induce negative emotions like anger, anxiety, and frustration, which may develop into PTSS and depressive symptoms (Jeong et al., 2016). Being isolated was strongly correlated with adverse mental health. Possible reasons are as follows: First, since quarantined participants might be blamed as potential 'sources of infection', they may be susceptible to stigma or discrimination that correlated with mental distress (Xin et al., 2020). Second, because the social isolation occurred during the Spring Festival, a principal time for family and friend reunion, several migrant workers stranded outside and could not visit their relatives on this important holiday, which induced chronic loneliness and boredom (Banerjee & Rai, 2020; Tang et al., 2020). It is obvious that the lockdown has affected more aspects of life than the covid-19 virus itself.



**Table 6.** Multiple linear regression for interaction effects between two categories of stresses and social support on mental health symptoms.

	Model 1 – Depressive symptoms			Model 2 – Depressive symptoms			Model 3 – PTSS			Model 4 – PTSS		
	B	SE	Beta	B	SE	Beta	B	SE	Beta	B	SE	Beta
Social support (SS)	-2.699	0.189	-0.233***	-2.722	0.188	-0.235***	-1.301	0.292	-0.073***	-1.331	0.291	-0.075***
Virus-related Stress	2.240	0.311	0.192***	2.247	0.312	0.193***	3.860	0.482	0.217***	3.867	0.482	0.217***
Lockdown-related Stress	4.471	0.304	0.386***	4.459	0.305	0.385***	6.782	0.471	0.382***	6.743	0.471	0.380***
SS * Virus-related Stress	0.549	0.165	0.872***				1.237	0.255	1.736***			
SS * Lockdown-related Stress				0.494	0.168	0.823**				1.285	0.259	1.794***
Male(female)	2.007	0.383	0.086***	2.035	0.383	0.087***	2.820	0.593	0.079***	2.868	0.592	0.080***
Age(over51)												
41–50	1.908	0.777	0.060*	1.922	0.777	0.061*	2.472	1.202	0.051*	2.508	1.202	0.052*
31–40	2.104	0.712	0.087**	2.102	0.713	0.087**	2.657	1.102	0.072*	2.655	1.102	0.072*
26–30	2.311	0.769	0.086**	2.309	0.769	0.086**	3.436	1.190	0.083**	3.423	1.189	0.083**
18–25	2.205	0.896	0.062*	2.139	0.896	0.061*	3.782	1.386	0.070**	3.626	1.386	0.067**
Ethnicity(else)	-0.118	0.988	-0.002	-0.117	0.989	-0.002	0.054	1.529	0.001	0.047	1.529	0.000
Marriage (No)	-0.006	0.500	0.000	-0.030	0.500	-0.001	2.665	0.773	0.068***	2.615	0.773	0.067***
Religion (No)	1.427	0.603	0.038*	1.430	0.603	0.038*	1.899	0.933	0.033*	1.892	0.932	0.033*
Education (Junior high school and below)												
Junior high school and below	0.502	0.754	0.015	0.534	0.754	0.016	2.270	1.166	0.045	2.360	1.166	0.047*
High school/Technical school	-0.085	0.749	-0.003	-0.072	0.749	-0.002	0.281	1.159	0.006	0.312	1.159	0.007
Junior College	-0.562	0.721	-0.024	-0.558	0.722	-0.024	-0.021	1.116	-0.001	0.000	1.116	0.000
Undergraduate	-1.571	0.881	-0.045	-1.626	0.881	-0.046	-1.712	1.362	-0.032	-1.814	1.361	-0.034
Formal sector (No)	-0.990	0.446	-0.041*	-0.966	0.446	-0.040*	-1.546	0.690	-0.042*	-1.495	0.690	-0.041*
Income (Not poor)	0.508	0.610	0.013	0.509	0.611	0.013	1.122	0.944	0.019	1.138	0.944	0.020
Direct exposure (No)	-0.195	0.462	-0.007	-0.192	0.462	-0.007	-0.771	0.714	-0.018	-0.743	0.714	-0.018
Wuhan exposure (No)	-0.276	0.595	-0.008	-0.257	0.595	-0.007	-1.379	0.921	-0.025	-1.339	0.920	-0.024
Media exposure (Frequently)												
Often	-0.091	0.440	-0.003	-0.122	0.441	-0.005	-1.975	0.681	-0.048**	-2.053	0.681	-0.050**
Some	0.534	0.682	0.013	0.492	0.682	0.012	-1.134	1.056	-0.018	-1.215	1.055	-0.019
Almost none	-0.124	0.694	-0.003	-0.161	0.694	-0.004	-2.079	1.074	-0.032	-2.162	1.073	-0.034*
Previous trauma (No)	1.901	0.497	0.061***	1.912	0.497	0.061***	0.873	0.768	0.018	0.914	0.768	0.019
Two weeks illness (No)	3.059	0.765	0.064***	3.064	0.766	0.064***	4.602	1.184	0.063***	4.569	1.184	0.063***
R-squared			0.417			0.416			0.403			0.404

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ . B represents Non-standardized coefficients; SE represents standard error; Beta represents Standardized coefficients. 95% confidence intervals in parentheses. All confounding variables (gender, age, ethnicity, marital status, religion, education, job, income, various exposure, previous trauma, two week illness) were controlled in above models.



a interaction of virus-related stress on depressive symptoms

b interaction of lockdown-related stress on depressive symptoms



c interaction of virus-related stress on PTSS

d interaction of lockdown-related stress on PTSS

**Figure 3.** The interaction effect of two types of stresses and social support on mental health.

The sources of stress interconnected with lockdown, for example, financial stress might have a long-term effect on individuals. In contrast, the stress sources about the COVID-19 virus may diminish over time, as perceived severity and probability of COVID-19 roughly followed an inverse U-shaped pattern (Glöckner et al., 2020 [pre-print]).

In addition, overall social support from family, friends, and relatives was negatively correlated with PTSS and depressive symptoms, which is consistent with prior research (Harandi, Taghinasab, & Nayeri, 2017; Simon, Roberts, Lewis, Van Gelderen, & Bisson, 2019). Although our results verified the main effect of social support protecting mental health in the COVID-19 pandemic, a reverse buffering effect of social support (Hobman, Restubog, Bordia, & Tang, 2009) was also observed in this study. This can be explained in the following situations. First, when recipients perceived excessive social support from peers in a stress process, they might tend to regard themselves as less competent than the support providers by increasing upward social comparison and lead to a reduction of self-efficacy, in coping with stress, which enhance the relationship between stresses and negative emotion (Bolger & Amarel, 2007). Second, people are required to admit some limitation of independent problem-solving capability when they obtain social support, according to the esteem enhancement theory (Batson & Powell, 2003; Nahum-Shani, Bamberger, & Bacharach, 2011). Therefore, receiving excessive social support, especially when support received exceeds support given, may undermine recipients' self-reliance and autonomy, and consequently damage the self-image of independence and competence, which is harmful to their physical and mental health (Nahum-Shani & Bamberger, 2011).

Moreover, in critical circumstances, social support may not protect individuals from stresses but exacerbate the negative effect of stresses on mental health, since talking about the stress sources, a part of emotional support, may represent an additional traumatic exposure in emergency (Setti, Lourel, & Argentero, 2016). And a study also found that people could reflexively suffer from the emotional pain experienced and communicated by other close group members (Johnstone, Jetten, Dingle, Parsell, & Walter, 2016). Particularly during the COVID-19 lockdown, people could only receive online support from their non-coresident family members, relatives, and friends via the internet or phone, which may involve much discussion about their stresses. In addition, under particular circumstances, group membership and identification guiding exchange of support, could become an additional source of stress and concerns and have negative repercussions for health (Kellezi, Bowe, Wakefield, McNamara, & Bosworth, 2019). Prior research interviewing immigrants detained in removal centres, found

that such concerns can consist of feelings of burdening close ones and increase respondents' distress, since they are mandatory to protect their loved ones against their detention experiences (Kellezi et al., 2019). Similarly, individuals, during the COVID-19 crisis, may confront many kinds of stressful events, and feel afraid of burdening their families, relatives and friends. Especially for individuals with high social support, they may have many family members, relatives, and friends to worry about, which may increase their distress. Therefore, social support could enhance the relationship between various sources of stress and mental health symptoms. It should also be noticed that social support could not modify the correlation between lack of material and mental health. This is because Chinese people have high household saving rates (Choi, Lugauer, & Mark, 2017), and they could not obtain any supplies from others due to social isolation and massive restrictions on transport.

#### 4.1. Limitations and implications

Our study results must be understood with caution due to some limitations. First, the study used a cross-sectional design limiting causal inference, therefore, we must exert caution in interpretations of our findings, and future research should employ longitudinal or experimental methods to provide stronger evidence to further explore the causality. Second, since our research sample was selected online using the voluntary sampling technique, there might be selection biases, for example, the correlation between the lack of material and mental health may be underestimated because of the underrepresentation of the poor population with no internet access. Besides, quota and convenience sampling we utilized is a non-probability sampling method, which may cause selective bias restricting the generalizability of our findings. Third, the existence of missing data may have impaired the statistical power of the study and lead to biased parameter estimates. Fourth, the assessment of core variables using self-report questionnaires may be accompanied by some related biases. Thus, it is necessary to confirm or negate the findings of the current study by measuring the objective aspects of stress sources and social support in future similar studies. In addition, because our study was conducted during the early period of the COVID-19 outbreak, the results may be sensitive to the time point chosen. Future research should continue to monitor the changes in the association between each stress source, social support, and mental health over time. Finally, results may differ across cultures and geographical areas. Our data was only collected from China; therefore, the current findings might not be generalized to other countries. Further research could explore the cultural difference in these results.

Despite these limitations, the research also yields several important implications. First and foremost, our study validated the idea that lockdown-related stresses correlated with more depressive symptoms and PTSS than virus-related stresses. Thus, more special attention should be paid to the stress sources from lockdown measures. For Chinese policymakers, they should provide psychological, financial, and material support to the general population, especially those who feel isolated, job insecure, and short of supplies during the COVID-19 lockdown (Brooks et al., 2020). Simultaneously, governments need to take notice of the virus-related stresses, including worries about the health of self and family, the spread of the virus, and loss of control. To reduce these stresses, it is essential to establish effective risk communication and psychological health programmes. For mental health practitioners, they could employ the assessment of stress sources in our study to identify the greatest stresses of individuals and provide the appropriate intervention to their clients with specific stresses in a targeted manner. For example, they could provide consultation of the correct information on preventing COVID-19 virus to reduce people's virus-related stress or help their clients to learn how to get benefit from lockdown policy and meet clients' basic survival, safety, and emotional needs to lower the lockdown-related stress. Also, our findings also inform that the general population should sufficiently utilize online psychoeducation interventions, including cognitive-behavioural techniques, stress management techniques, mindfulness-based stress reduction, and positive psychotherapy via the internet or the phone during the lockdown (Shaygan, Yazdani, & Valibeygi, 2021), which could mitigate stresses associated with PTSS and depressive symptoms.

Furthermore, people may benefit from proper social support, but excessive social support from family, friends, and relatives strengthens the positive association from stress sources to mental health symptoms, according to the moderation role of social support. Therefore, efforts must be made to improve the quality and effectiveness of social support in mental health interventions (Shang et al., 2020). To be more specific, due to the negative effect of excessive social support from informal groups on mental health, governments could increase the quantity and quality of social support from official and formal groups. The clinic or mental health intervention staff could guide people to decrease the negative information exchange and increase positive emotional communication in social interaction to improve the effectiveness of social support and thus relieving the adverse effect of stress on mental health. The general public should learn to selectively receive effective social support from informal groups, and seek more official or formal support from governments or mental health staff.

## 5. Conclusions

The study analyzes the association of virus-related stress and lockdown-related stress sources with the general Chinese public mental health in the context of wide-scale lockdown immediately after the global COVID-19 pandemic. The results show that various stress sources are correlated with high mental health symptoms. These findings highlight the importance of developing targeted interventions aimed at strengthening the population's capacity to manage stress. Because lockdown-related stress was more associated with mental health than virus-related stress, therefore, policymakers must pay close attention to the side-effect of lockdown. More importantly, these relationships are enhanced by social support. So programmes to elevate the general public's mental health should improve the quality and effectiveness of social support.

## Disclosure statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Ethics statement

The study was approved by the Ethics Committee of Peking University Medical Center.

## Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy reasons.

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## References

- Aiello, A., Khayeri, M. Y.-E., Raja, S., Peladeau, N., Romano, D., Leszcz, M., ... Schulman, R. B. (2011). Resilience training for hospital workers in anticipation of an influenza pandemic. *Journal of Continuing Education in the Health Professions*, 31(1), 15–20. doi:10.1002/chp.20096
- Alzahem, A. M., Van der Molen, H. T., Alaujan, A. H., Schmidt, H. G., & Zamakhshary, M. H. (2011). Stress amongst dental students: A systematic review. *European Journal of Dental Education*, 15(1), 8–18. doi:10.1111/j.1600-0579.2010.00640.x
- Banerjee, D., & Rai, M. (2020). Social isolation in Covid-19: The impact of loneliness. *International Journal of Social Psychiatry*, 66(6), 525–527. doi:10.1177/0020764020922269

- Batson, C. D., & Powell, A. A. (2003). Altruism and prosocial behavior. *Handbook of Psychology*, 463–484. doi:10.1002/0471264385.wei0519
- Bo, H. X., Li, W., Yang, Y., Wang, Y., Zhang, Q., Cheung, T., ... Xiang, Y. T. (2020). Posttraumatic stress symptoms and attitude toward crisis mental health services among clinically stable patients with COVID-19 in China. *Psychological Medicine*, 1–2. doi:10.1017/S0033291720000999
- Bolger, N., & Amarel, D. (2007). Effects of social support visibility on adjustment to stress: Experimental evidence. *Journal of Personality and Social Psychology*, 92(3), 458–475. doi:10.1037/0022-3514.92.3.458
- Boyraz, G., & Legros, D. N. (2020). Coronavirus disease (COVID-19) and traumatic stress: Probable risk factors and correlates of posttraumatic stress disorder. *Journal of Loss & Trauma*, 25(6–7), 503–522. doi:10.1080/15325024.2020.1763556
- Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet*, 395(10227), 912–920. doi:10.1016/S0140-6736(20)30460-8
- Chandola, T., Kumari, M., Booker, C., & Benzeval, M. (2020). The mental health impact of COVID-19 and pandemic related stressors among adults in the UK. *Psychological Medicine*, 1–10. doi:10.1101/2020.07.05.20146738
- Choi, H., Lugauer, S., & Mark, N. C. (2017). Precautionary saving of Chinese and U.S. households. *Journal of Money, Credit, and Banking*, 49(4), 635–661. doi:10.1111/jmcb.12393
- Cohen, S. (2004). Social relationships and health. *American Psychologist*, 59(8), 676–684. doi:10.1037/0003-066X.59.8.676
- Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, 98(2), 310–357. doi:10.1037/0033-2909.98.2.310
- De Haas, M., Faber, R., & Hamersma, M. (2020). How COVID-19 and the Dutch 'intelligent lockdown' change activities, work and travel behaviour: Evidence from longitudinal data in the Netherlands. *Transportation Research Interdisciplinary Perspectives*, 6, 100150. doi:10.1016/j.trip.2020.100150
- Every-Palmer, S., Jenkins, M., Gendall, P., Hoek, J., Beaglehole, B., Bell, C., ... Stanley, J. (2020). Psychological distress, anxiety, family violence, suicidality, and wellbeing in New Zealand during the COVID-19 lockdown: A cross-sectional study. *PLoS One*, 15(11), e0241658. doi:10.1371/journal.pone.0241658
- Flaudias, V., Iceta, S., Zerhouni, O., Rodgers, R. F., Billieux, J., Llorca, P.-M., ... Guillaume, S. (2020). COVID-19 pandemic lockdown and problematic eating behaviors in a student population. *Journal of Behavioral Addictions*, 9(3), 826–835. doi:10.1556/2006.2020.00053
- Glöckner, A., Dorrough, A. R., Wingen, T., & Dohle, S. (2020). The perception of infection risks during the early and later outbreak of COVID-19 in Germany: Consequences and recommendations. Preprint. doi:10.31234/osf.io/wdbgc
- González-Sanguino, C., Ausín, B., Castellanos, M. Á., Saiz, J., López-Gómez, A., Ugidos, C., & Muñoz, M. (2020). Mental health consequences during the initial stage of the 2020 Coronavirus pandemic (COVID-19) in Spain. *Brain, Behavior, and Immunity*, 87, 172–176. doi:10.1016/j.bbi.2020.05.040
- Gracia, D. R., & Rubetta, E. R. (2020). Literature review: Quarantine and lockdown during Covid19 outbreak impact on mental health problem. *Jurnal Kesehatan Lingkungan*, 12(1), 29. doi:10.20473/jkl.v12i1si.2020.29-37
- Grigoletto, V., Cognigni, M., Occhipinti, A. A., Abbracciavento, G., Carrozzi, M., Barbi, E., & Cozzi, G. (2020). Rebound of severe alcoholic intoxications in adolescents and young adults after CoViD-19 lockdown. *Journal of Adolescent Health*, 67(5), 727–729. doi:10.1016/j.jadohealth.2020.08.017
- Hamouche, S. (2020). COVID-19 and employees' mental health: Stressors, moderators and agenda for organizational actions. *Emerald Open Research*, 2, 15. doi:10.35241/emeraldopenres.13550.1
- Harandi, T. F., Taghinasab, M. M., & Nayeri, T. D. (2017). The correlation of social support with mental health: A meta-analysis. *Electronic Physician*, 9(9), 5212. doi:10.19082/5212
- Henwood, B. F., Derejko, K.-S., Couture, J., & Padgett, D. K. (2015). Maslow and mental health recovery: A comparative study of homeless programs for adults with serious mental illness. *Administration and Policy in Mental Health and Mental Health Services Research*, 42(2), 220–228. doi:10.1007/s10488-014-0542-8
- Hobman, E. V., Restubog, S. L. D., Bordia, P., Tang, R. L. (2009). Abusive supervision in advising relationships: Investigating the role of social support. *Applied Psychology*, 58(2), 233–256. doi:10.1111/j.1464-0597.2008.00330.x
- Jeong, H., Yim, H. W., Song, Y.-J., Ki, M., Min, J.-A., Cho, J., & Chae, J.-H. (2016). Mental health status of people isolated due to middle east respiratory syndrome. *Epidemiology and Health*, 38, e2016048. doi:10.4178/epih.e2016048
- Johnstone, M., Jettan, J., Dingle, G. A., Parsell, C., & Walter, Z. C. (2016). Enhancing well-being of homeless individuals by building group memberships. *Journal of Community & Applied Social Psychology*, 26(5), 421–438. doi:10.1002/casp.2272
- Kapasias, N., Paul, P., Roy, A., Saha, J., Zaveri, A., Mallick, R., ... Chouhan, P. (2020). Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal, India. *Children and Youth Services Review*, 116, 105194. doi:10.1016/j.childyouth.2020.105194
- Kellezi, B., Bowe, M., Wakefield, J. R. H., McNamara, N., & Bosworth, M. (2019). Understanding and coping with immigration detention: Social identity as cure and curse. *European Journal of Social Psychology*, 49(2), 333–351. doi:10.1002/ejsp.2543
- Kira, I. A., Shuwiekh, H. A. M., Rice, K. G., Ashby, J. S., Elwakeel, S. A., & Sous, M. S. F., ... Jamil, H. J. (2020). Measuring COVID-19 as traumatic stress: Initial psychometrics and validation. *Journal of Loss & Trauma*, 1–18. doi:10.1080/15325024.2020.1790160
- Kokoroko, E., & Sanda, M. A. (2019). Effect of workload on job stress of Ghanaian OPD nurses: The role of coworker support. *Safety and Health at Work*, 10(3), 341–346. doi:10.1016/j.shaw.2019.04.002
- Kumar, K., Mehra, A., Sahoo, S., Nehra, R., & Grover, S. (2020). The psychological impact of COVID-19 pandemic and lockdown on the migrant workers: A cross-sectional survey. *Asian Journal of Psychiatry*, 53, 102252. doi:10.1016/j.ajp.2020.102252
- Li, J.-B., Yang, A., Dou, K., Wang, L.-X., Zhang, M.-C., & Lin, X.-Q. (2020b). Chinese public's knowledge,



- perceived severity, and perceived controllability of COVID-19 and their associations with emotional and behavioural reactions, social participation, and precautionary behaviour: A national survey. *BMC Public Health*, 20(1), 1589. doi:10.1186/s12889-020-09695-1
- Li, Z., Ge, J., Yang, M., Feng, J., Qiao, M., Jiang, R., ... Yang, C. (2020a). Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. *Brain, Behavior, and Immunity*, 88, 916–919. doi:10.1016/j.bbi.2020.03.007
- Liu, N., Zhang, F., Wei, C., Jia, Y., Shang, Z., Sun, L., ... Liu, W. (2020). Prevalence and predictors of PTSS during COVID-19 outbreak in China hardest-hit areas: Gender differences matter. *Psychiatry Research*, 287, 112921. doi:10.1016/j.psychres.2020.112921
- Lund, E. M. (2020). Even more to handle: Additional sources of stress and trauma for clients from marginalized racial and ethnic groups in the USA during the COVID-19 pandemic. *Counselling Psychology Quarterly*, 1–10. doi:10.1080/09515070.2020.1766420
- Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50(4), 370–396. doi:10.1037/h0054346
- Nahum-Shani, I., & Bamberger, P. A. (2011). Explaining the variable effects of social support on work-based stressor-strain relations: The role of perceived pattern of support exchange. *Organizational Behavior and Human Decision Processes*, 114(1), 49–63. doi:10.1016/j.obhdp.2010.09.002
- Nahum-Shani, I., Bamberger, P. A., & Bacharach, S. B. (2011). Social support and employee well-being: The conditioning effect of perceived patterns of supportive exchange. *Journal of Health and Social Behavior*, 52(1), 123–139. doi:10.1177/0022146510395024
- Pacheco, T., Coulombe, S., Khalil, C., Meunier, S., Doucerain, M., Auger, É., & Cox, E. (2020). Job security and the promotion of workers' wellbeing in the midst of the covid-19 pandemic: A study with Canadian workers one to two weeks after the initiation of social distancing measures. *International Journal of Wellbeing*, 10(3), 58–76. doi:10.5502/ijw.v10i3.1321
- Pirutinsky, S., Cherniak, A. D., & Rosmarin, D. H. (2020). COVID-19, mental health, and religious coping among American Orthodox Jews. *Journal of Religion and Health*, 59(5), 2288–2301. doi:10.1007/s10943-020-01070-z
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1(3), 385–401. doi:10.1177/014662167700100306
- Radwan, E., & Radwan, A. (2020). The spread of the pandemic of social media panic during the COVID-19 outbreak. *European Journal of Environment and Public Health*, 4(2), em0044. doi:10.29333/ejeph/8277
- Setti, I., Lourel, M., & Argentero, P. (2016). The role of affective commitment and perceived social support in protecting emergency workers against burnout and vicarious traumatization. *Traumatology*, 22(4), 261–270. doi:10.1037/trm0000072
- Shang, F., Kaniasty, K., Cowlshaw, S., Wade, D., Ma, H., & Forbes, D. (2020). The impact of received social support on posttraumatic growth after disaster: The importance of both support quantity and quality. *Psychological Trauma: Theory, Research, Practice, and Policy*. doi:10.1037/tra0000541
- Shaygan, M., Yazdani, Z., & Valibeygi, A. (2021). The effect of online multimedia psychoeducational interventions on the resilience and perceived stress of hospitalized patients with COVID-19: A pilot cluster randomized parallel-controlled trial. *BMC Psychiatry*, 21(1), 93. doi:10.1186/s12888-021-03085-6
- Simon, N., Roberts, N. P., Lewis, C. E., Van Gelderen, M. J., & Bisson, J. I. (2019). Associations between perceived social support, posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD): Implications for treatment. *European Journal of Psychotraumatology*, 10(1), 1573129. doi:10.1080/20008198.2019.1573129
- Stankovska, G., Memedi, I., & Dimitrovski, D. (2020). Coronavirus COVID-19 disease, mental health and psychosocial support. *Society Register*, 4(2), 33–48. doi:10.14746/sr.2020.4.2.03
- Tang, W., Hu, T., Hu, B., Jin, C., Wang, G., Xie, C., ... Xu, J. (2020). Prevalence and correlates of PTSD and depressive symptoms one month after the outbreak of the COVID-19 epidemic in a sample of home-quarantined Chinese university students. *Journal of Affective Disorders*, 274, 1–7. doi:10.1016/j.jad.2020.05.009
- The State Council Information Office of the People's Republic of China. (2020, June 7). Fighting Covid-19: China in Action. Retrieved from <http://www.scio.gov.cn/m/zfbps/32832/Document/1681801/1681801.htm>
- Tucker, M. K., Jimmieson, N. L., & Bordia, P. (2018). Supervisor support as a double-edged sword: Supervisor emotion management accounts for the buffering and reverse-buffering effects of supervisor support. *International Journal of Stress Management*, 25(1), 14–34. doi:10.1037/str0000046
- Weathers, F. W., Litz, B. T., Keane, T. M., Palmieri, P. A., Marx, B. P., & Schnurr, P. P. (2013). The ptsd checklist for dsm-5 (pcl-5), 10. Scale available from the National Center for PTSD at Retrieved from <http://www.ptsd.va.gov>.
- Wong, T. W., Gao, Y., & Tam, W. W. S. (2007). Anxiety among university students during the SARS epidemic in Hong Kong. *Stress and Health*, 23(1), 31–35. doi:10.1002/smi.1116
- Wong, T. W., Yau, J. K. Y., Chan, C. L. W., Kwong, R. S. Y., Ho, S. M. Y., Lau, C. C., ... Lit, C. H. (2005). The psychological impact of severe acute respiratory syndrome outbreak on healthcare workers in emergency departments and how they cope. *European Journal of Emergency Medicine*, 12(1), 13–18. doi:10.1097/00063110-200502000-00005
- Wu, W., Zhang, Y., Wang, P., Zhang, L., Wang, G., Lei, G., ... Luo, M. (2020). Psychological stress of medical staffs during outbreak of COVID-19 and adjustment strategy. *Journal of Medical Virology*, 92(10), 1962–1970. doi:10.1002/jmv.25914
- Xin, M., Luo, S., She, R., Yu, Y., Wang, S., Tao, F., ... Lau, J. T. F. (2020). Negative cognitive and psychological correlates of mandatory quarantine during the initial COVID-19 outbreak in China. *American Psychologist*, 75(5), 607–617. doi:10.1037/amp0000692
- Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M. W., Gill, H., Phan, L., ... McIntyre, R. S. (2020). Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders*, 277, 55–64. doi:10.1016/j.jad.2020.08.001

- Yan, B., & Huang, Y. (2020). Prevalence and risk factors of psychological impacts among the quarantined population during the COVID-19 pandemic in China. *JAMA Netw Open*, 4(1), e2035487. doi:10.1001/jamanetworkopen.2020.35487
- Yang, L., Jia, C.-X., & Qin, P. (2015). Reliability and validity of the Center for Epidemiologic Studies Depression Scale (CES-D) among suicide attempters and comparison residents in rural China. *BMC Psychiatry*, 15(1), 76. doi:10.1186/s12888-015-0458-1
- Ye, B., Wu, D., Im, H., Liu, M., Wang, X., & Yang, Q. (2020). Stressors of COVID-19 and stress consequences: The mediating role of rumination and the moderating role of psychological support. *Children and Youth Services Review*, 118, 105466. doi:10.1016/j.childyouth.2020.105466
- Zhou, S.-J., Zhang, L.-G., Wang, -L.-L., Guo, Z.-C., Wang, J.-Q., Chen, J.-C., . . . Chen, J.-X. (2020). Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19. *European Child & Adolescent Psychiatry*, 29(6), 749–758. doi:10.1007/s00787-020-01541-4
- Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, 52(1), 30–41. doi:10.1207/s15327752jpa5201\_2