

The impact of the COVID-19 pandemic on the mental health of young people: A comparison between China and the United Kingdom

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Abstract:

Objects: As COVID-19 spreads globally, affecting people's health, there are concerns about the possible psychological impact that the pandemic and its containment may have on young people. This psychological impact might vary in different countries, so we compared the self-reported prevalence of psychological distress, loneliness and post-traumatic stress symptoms (PTSS) among young people in the United Kingdom (UK) and China at the start of the COVID-19 pandemic.

Methods: Data for this study came from two sources. One source was the first wave of Understanding Society COVID-19 Study, a special wave of the UK Household Longitudinal Study, which provided high-quality, nationally representative panel data from English households. The sample comprised 1,054 young people. The other source of data was an online survey on the mental health of 1033 Chinese young people from Shanghai, a highly developed area in China. The questionnaires included questions on the prevalence of common mental disorders, loneliness and potential PTSS.

Results: 34.4% of the UK sample and 14.1% of the Chinese sample had self-reported scores indicative of psychological distress (total GHQ-12 score ≥ 4), and the difference between the two groups was statistically significant ($p < .001$). Additionally, 57.1% among the English and 46.7% among the Chinese reported feeling lonely sometimes or often, a statistically significant difference ($p < .001$). A regression analysis on the whole sample showed that country, sex, use of psychotherapy, and loneliness were significant predictors of GHQ-12 scores, while age and living alone were not. Significant predictors of self-reported loneliness were country, sex, age, living alone, and use of psychotherapy. In China, 123 (12.3%) young people, 49 men (11.3%), and 74 women (13.0%), met the criteria of PTSS symptoms (PCL-5 scores ≥ 33 . These scores were only collected in China).

Conclusions: This evidence suggests that young people's self-reported mental health and loneliness were lower in China than in the UK during the studied period. More research is needed to understand these differences. If differential negative psychological impact is confirmed country-specific measures of prevention and intervention should be adopted to improve the mental health of young people under the ongoing impact of the pandemic.

Keywords: COVID-19; mental health; young people; GHQ; loneliness; PTSS

1. Introduction

As the COVID-19 outbreak began in the end of 2019 and spread around the world, the World Health Organization (WHO) declared it a public health emergency of international concern (PHEIC)

on 30th January¹ and a global pandemic on 11th March². The number of confirmed cases and deaths from the outbreak continues to grow rapidly³. As of November 2, 45,942,902 cases and 1,192,644 related deaths have been confirmed³. Not only can the threat of coronavirus itself have a huge impact on people, but anti-epidemic measures⁴ such as mask wearing, social distancing, prohibition of group gatherings, lockdowns, quarantines, curfews, business closures, working from home, online learning, etc., have greatly changed people's daily life. There are reports that the pandemic and the measures to prevent it are significantly affecting people's mental health⁵⁻⁷. According to *the Diagnostic and Statistical Manual, 5th version* (DSM-5, American Psychiatric Association, 2013), the definition of trauma requires "actual or threatened death, serious injury, or sexual violence". The COVID-19 pandemic can be seen as meeting this criterion, for those who are the most seriously affected.

Evidence shows that widespread epidemics of major infectious diseases often also have significant potential for psychological "contagion", typically resulting in widespread fear, anxiety, and a variety of psychological problems, as well as stigmatizing patients with the disease, their relatives, health workers and even residents in epidemic areas^{9,10}. Spreading all over the world, COVID-19 followed this pattern of reports of extensive and significant psychological distress, and psychological disorders, including phobias, avoidance and compulsive behaviour, generalized anxiety disorder¹¹, depression¹², insomnia^{13,14}, and post-traumatic stress symptoms (PTSS)¹⁵, and physical symptoms and loss of social functioning¹⁶, during the pandemic. Reports of common psychological disorders (encompassing psychological distress, depression, and anxiety) have been higher than that of specific psychiatric disorders (e.g., psychotic disorders)¹⁷⁻¹⁹. There have been further reports that young people have been more affected by the impact of the pandemic because of their life stage, as their ability to study, work, and social life are more affected by the pandemic. Previous studies have found that the pandemic had a greater psychological impact on young people than on other age groups^{6,7,19}, therefore, this study focuses on young people. It aims to explore the reported psychological impact on young people in China and the UK.

The COVID-19 pandemic has been shown to increase social isolation and loneliness^{20,21}, and studies have shown that loneliness is strongly associated with psychological disorders^{22,23}. Previous studies have found that younger people were more likely to report loneliness than older people¹⁹, therefore, this study also explores how young people report the impact of loneliness during the epidemic.

The COVID-19 outbreak began in December 2019, and most populations are either being affected by the pandemic, or at risk from it. Studies have confirmed that some people suffer from PTSS to varying degrees as a result of the impact of this epidemic^{15,24-26} and the condition of some PTSS patients worsened²⁷. Given the reported level of potential trauma caused by COVID-19, in this study we explored the incidence and predictors of PTSS in young people.

Different countries around the world have adopted diverse measures to prevent infection and respond to the pandemic. Cultural and socio-political responses as well as differences in health systems, health care provision, and different levels of epidemic development, may all have impacted the mental health of young people. An additional aim of this study was to investigate the differences in the reported prevalence of common mental health issues and loneliness among young people in the UK and China during the global COVID-19 pandemic.

2. Methods

2.1. Data

Data for this study comes from two sources. One source is the first wave of Understanding Society COVID-19 Study, a special wave of the UK Household Longitudinal Study, which provides high-quality, nationally representative panel data from English households²⁸. The sample comprises 1,054 young people (23.30 ± 3.82). The other source of data is an online survey on the mental health of 1,003 young Chinese people (23.18 ± 1.74) from Shanghai, a highly developed city in China. The ages of the two groups of young people ranged from 17 to 32 year old. The Shanghai sample was matched with the UK sample for age and sex.

2.2. Procedures

In the survey of young people in Shanghai, China, a mental health questionnaire was released to young people through the Internet (www.wjx.cn), and promoted through the researchers' social media network on the Chinese platform "Wechat", from June 23th to July 14th 2020. Volunteer participants aged 18-32 were recruited. They were asked to log on to a page on the Wechat website and to complete the questionnaire, without any monetary compensation or incentive. At the time of the survey, the COVID-19 epidemic had not been completely controlled in the Xinfadi area of Beijing, China, and many people feared that it would break out again in the whole of China.

A main difference is that in the UK study, participants were recruited using stratified and clustered sampling before the start of the COVID-19 pandemic. The survey consisted of an online questionnaire but those without internet access were interviewed through telephone by trained professionals. The survey was sent out and completed from June 25th to July 1st, 2020, and the research data was published on the UK Data Service website on July 31st. Participants were not paid for completing the survey. By June 25th, 2020, there had been 281,486 confirmed COVID-19 cases and 40,429 associated deaths in the UK (Public Health England, 2020). More details of the procedures can be found in the Understanding Society COVID-19 Study User Guide²⁸.

2.3. Measures

The prevalence of self-reported psychological distress was measured using the 12-item General Health Questionnaire (GHQ-12), a validated scale for measuring psychological distress widely used in the non-clinical settings^{6,29}. Researchers³⁰ showed that the Chinese version of GHQ-12 had good reliability and validity, and can serve as a screening tool to detect anxiety and psychological disorders. The Chinese version of GHQ-12 has satisfactory reliability in this study, Cronbach's alpha reliability is 0.924. GHQ-12 has 12 questions about respondents' depressive and anxiety symptoms, confidence, and overall happiness etc., which are measured on a four-point scale (from 1 to 4, 1='less than usual', and 4='much more than usual'). A GHQ-12 score of 4 or more indicates possible caseness of common mental disorders³¹. Hence, we used this dichotomous indicator to estimate the self-reported prevalence of psychological distress, which may indicate a common mental disorder.

Reporting of loneliness was measured using one question adapted from English Longitudinal Study on Ageing (ELSA), which translated to Chinese for Shanghai participants. Respondents were asked "In the last 4 weeks, how often did you feel lonely?" with three options: "hardly ever or never", "some of the time", and "often".

Reports of PTSS were assessed using the PTSD Checklist for DSM-5 (PCL-5)³², for the participants from Shanghai only. The PCL-5 is a self-report measure, consisting of 20 items that

correspond directly to the DSM-5 PTSD. Each item reflects the severity of a particular symptom, rated on a five-point Likert scale from 0 (not at all) to 4 (extremely) during the previous month. PTSS reported severity (total symptoms) was defined as the sum of the scores of all PCL-5 symptoms. The Chinese version of the original PCL-5 has been psychometrically validated and is widely used in trauma-related research and practice in China³³. This scale was not present in the UK sample, it was solely used in the Chinese survey.

In the Chinese questionnaire, additional questions were added about the potential impact of COVID-19 on participants recruited in Shanghai, China. The items were as follows: fear of COVID-19, fear of contacting with recovered patients, fear of people from risk area, impact of COVID-19 on family, impact of COVID-19 on intimate relationships, and impact of COVID-19 on work or study. These questions were rated on a five-point Likert scale from 1(not at all) to 5(extremely). In addition, a number of socio-demographic characteristics, including whether they lived alone, and the use and availability of psychotherapy were investigated. These questions were assessed as “yes” or “no”.

2.4. Statistical analyses

Firstly, the socio-demographic data of the participants from England and Shanghai was compared (t-test and chi-squared tests). Secondly, univariable analyses were conducted to test the differences in the self-reported prevalence of psychological distress and loneliness between the two groups. Thirdly, multivariable logistic regression analyses were run to explore the predictors of psychological distress and loneliness among all the young people from England and Shanghai. All the regression models were built using the Enter method with all covariates being entered into models at the same time. Missing values were handled by listwise deletion. Last, a logistic regression model was used to identify independent variables associated with PTSS among Chinese young people.

3. Results

3.1 Differences in responses between Chinese and UK young people

Table 1 compared the characteristics of our samples. There were no statistically significant differences in gender or age between Chinese and English young people. Chinese young people were significantly more likely to live alone and demand for psychotherapy than English young people. There were no significant differences in psychotherapy availability.

Table 1 Characteristics of UK and China samples.

Variables	England, UK	Shanghai, China	χ^2/t	<i>p</i>
<i>N</i>	1054	1003		
Age (<i>Mean±SD</i>)	23.30±3.821	23.18±1.744	.942	.347
Sex			2.453	.117
Male	420 (39.8%)	435 (43.4%)		
Female	631 (59.9%)	568 (56.5%)		
No report	3 (0.3%)			
Living alone			44.443	<.001
Yes	65 (6.2%)	148 (14.8%)		

No	989 (93.8%)	821 (81.9%)		
No report		34 (3.3%)		
Demand for psychotherapy			78.023	<.001
Yes	39 (3.7%)	150 (15.0%)		
No	1015 (96.3%)	853 (85.0%)		
Psychotherapy availability			0.972	.324
Yes	25 (64.1%)	83 (55.3%)		
No	14 (35.9%)	67 (44.7%)		

3.2 Differences in psychological distress and loneliness

Table 2. Differences in psychological distress and loneliness between UK and China samples.

Variables	England, UK	Shanghai, China	χ^2 /Mann-Whitney <i>U</i>	<i>p</i>
Common mental disorder*				
Yes	363 (34.4%)	141 (14.1%)	115.42	<.001
No	691 (65.6%)	862 (85.9%)		
Loneliness				
Hardly ever or never	452 (42.9%)	535 (53.3%)	467838.00	<.001
Some of the time	481 (45.7%)	392 (39.1%)		
Often	120 (11.4%)	76 (7.6%)		
Not reporting	1 (0.0%)			

Note: * GHQ-12 scores exceeding threshold indicative of clinically significant levels of mental distress (4 or more points).

Table 2 shows the self-reported prevalence of psychological distress and loneliness among the young people from England, UK and Shanghai, China, and reports results of *Chi-squared tests* or *Mann-Whitney U test* to compare the prevalence between the two groups. Firstly, we found that 34.4% of the population of the UK and 14.1% of Chinese samples had self-reported scores indicative of common mental disorders (total score of GHQ-12 ≥ 4), and the difference between the two groups was statistically significant ($\chi^2=115.42$, $p<.001$). Secondly, 57.1% of the sample population of the UK and 46.7% of Chinese sample reported feeling lonely sometimes or often, and the difference was significant statistically ($U=467838.00$, $p<.001$). In other words, at the time of the survey during the epidemic, young people in England reported feeling lonely significantly more often than their peers in Shanghai, China. Furthermore, English young people had a significantly higher reported prevalence than Chinese young people of all the 12 symptoms of common mental disorders measured by the GHQ-12. For more details about the comparisons of the 12 symptoms of GHQ-12, see table S1.

3.3 Predictors of psychological distress and loneliness

The results of the regression analysis are presented in table 3. Multivariable regression analyses were used to explore whether country, sex, age, living alone, use of psychotherapy, and loneliness can predict self-reported psychological distress; and to explore whether country, sex, age, living alone, and use of psychotherapy predict the feeling of loneliness. Both model *t*-values and *F*-values were statistically significant ($p < .001$), suggesting that the fitness of the two models are significantly

better than null (constant only) model.

Firstly, the results of the regression analysis for the whole sample showed that country, sex, use of psychotherapy, and loneliness were the significant predictors of psychological distress, while age and living alone were not. English participants were at significantly higher odds of psychological distress than Chinese, and females were at significantly higher odds of psychological distress than males. The young people who did not report needing psychotherapy had significantly higher odds of self-reported psychological distress than those who reported needing psychotherapy. The young people who reported feeling lonely had significantly higher odds of self-reported psychological distress than those who expressed lower levels of loneliness. Among English young people, demand for psychotherapy and reporting loneliness significantly predicted self-reported psychological distress. For Chinese participants, sex, demand for psychotherapy, and loneliness significantly predicted psychological distress.

Second, the results of the regression analysis on reported loneliness for the whole sample showed that country, sex, age, living alone, and use of psychotherapy were significant predictors of loneliness (table 3). English participants had significantly higher odds of experiencing loneliness than Chinese. Females had significantly higher odds of experiencing loneliness than males. Older respondents expressed relatively less loneliness than the younger ones. Respondents who lived alone had significantly higher odds of loneliness than those who lived with others. Respondents who did not report needing psychotherapy had significantly lower odds of loneliness than those who stated a need to access psychotherapy. For the English group, age and no use of psychotherapy were not predictors of loneliness, and for the Chinese group, sex, age, and use of psychotherapy were not predictors of loneliness.

These regression analyses have showed that living alone can predict self-reported loneliness, and feelings of loneliness can predict self-reported psychological distress, but living alone was not predictor of psychological distress. Loneliness may play a mediating role between living alone and mental distress (See Figure S1).

Table 3 Predictors of psychological distress and loneliness in the English and Shanghai samples during COVID-19.

Model	Variables	Total (n=2019)			England (n=1050)			Shanghai (n=969)		
		OR	[95% CI]	p	OR	[95% CI]	p	OR	[95% CI]	p
1^a	Country (Ref. = Shanghai, China)	3.943	3.035,5.123	<.001						
GHQ	Sex (Ref. = female)	.717	.562,.915	.007	.735	.539,1.003	.052	.669	.445,1.005	.053
	Age	.994	.958,1.031	.730	1.009	.969,1.050	.681	.915	.814,1.029	.137
	Living alone (Ref. = no)	1.094	.749,1.597	.643	.733	.401,1.338	.311	1.415	.872,2.296	.160
	Demand for psychotherapy (Ref. = no)	3.882	2.319,6.501	<.001	3.597	1.021,12.667	.046	4.121	2.339,7.261	<.001
	Psychotherapy availability (Ref. = no)	.830	.427,1.611	.581	.823	.175,3.870	.805	.762	.362,1.606	.475
	Loneliness (Ref. = no)	6.622	5.050,8.685	<.001	7.426	5.322,10.363	<.001	5.369	3.361,8.579	<.001
2^b Loneliness	Country (Ref. = Shanghai, China)	1.769	1.470,2.129	<.001						
	Sex (Ref. = female)	.672	.558,.808	<.001	.517	.396,.674	<.001	.895	.688,1.164	.407
	Age	.965	.936,.995	.022	.968	.935,1.003	.070	.988	.916,1.065	.750
	Living alone (Ref. = no)	1.676	1.236,2.272	.001	1.932	1.101,3.390	.022	1.662	1.155,2.392	.006
	Demand for psychotherapy (Ref. = no)	5.872	3.185,10.826	<.001	3.928	.865,17.830	.076	6.129	3.152,11.916	<.001
	Psychotherapy availability (Ref. = no)	.279	.136,.571	<.001	1.014	.158,6.489	.989	.211	.096,.462	<.001

Note: OR = odds ratio, 95% CI = 95% confidence interval. Model 1 and Model 2 used logistic regression. Missing values were handled by listwise deletion. ^a The dependent variable of Model 1 is psychological distress. GHQ-12 (12-item General Health Questionnaire) scores exceeding threshold indicative of a clinically significant level of general psychiatric disorders (4 or more). ^b The dependent variable of Model 2 is loneliness. Participants who chose “hardly ever” or “never” were considered not to have a sense of loneliness. Participants who chose “some of the time” or “often” were considered to have a sense of loneliness.

3.4 Predictors of the prevalence of post-traumatic stress symptoms in Chinese young people

In total, 123 (12.26%) young people, 49 men (11.26%), and 74 women (13.03%), met the criteria of PTSS symptoms (PCL-5 scores ≥ 33). Table 4 shows the results of the regression analysis on PTSS symptoms among Chinese young people from Shanghai. Reported use of psychotherapy, loneliness, fear of COVID-19, and impact of COVID-19 on work or study, could all significantly predict self-reported presence of PTSS among Chinese young people in the sample.

Table 4 Predictors of post-traumatic stress symptoms in the Chinese sample (n=969) during COVID-19.

Variables	OR	[95% CI]	<i>p</i>
Sex (Ref. = female)	.760	.466,1.237	.269
Age	.935	.814,1.074	.342
Living alone (Ref. = no)	1.218	.665,2.230	.523
Demand for psychotherapy (Ref. = no)	4.021	2.098,7.708	<.001
Psychotherapy availability (Ref. = no)	.856	.356,2.059	.729
Loneliness ^a (Ref. = no)	2.986	1.677,5.318	.000
Fear of COVID-19	2.779	2.172,3.555	<.001
Fear of recovered patients	1.148	.827,1.594	.409
Fear of people from the affected area	.841	.597,1.186	.324
Impact of COVID-19 on family	.993	.767,1.286	.957
Impact of COVID-19 on intimate relationship	1.171	.922,1.488	.196
Impact of COVID-19 on work or study	1.277	1.031,1.583	.025

Note: Model used logistic regression. The dependent variable is whether the severity of post-traumatic stress symptoms has clinical significance. PCL-5 scores exceeding threshold indicative of a clinically significant level of post-traumatic stress symptoms (33 or more). ^a Participants who chose “hardly ever” or “never” were considered not to have reported a sense of loneliness. Participants who chose “some of the time” or “often” were considered to have reported a sense of loneliness.

4. Discussion

Although studies on the prevalence of specific psychiatric disorders during COVID-19 have been extensive, the results of existing research vary widely due to differences in sample sources, ages of participants, and the development stage of the epidemic in participants' countries. This study compared the self-reported prevalence and predictors of psychological distress and loneliness between samples of young people from England and Shanghai, two developed but culturally distinct regions of the world, during the COVID-19 pandemic. The samples had a similar age and gender ratio, but the self-selected Chinese sample was not nationally representative.

When Pierce et al. ⁶used the GHQ scale to assess changes in the mental health of the population they study pre-dating the COVID-19 epidemic to the subsequent quarantine period, they found an overall increase in mental disorders in the UK 16-44 years old group compared to the previous year. Our study also documented the higher prevalence rate of self-reported psychological distress (34.1%) in England, which was higher than the self-reported prevalence in the Shanghai sample (14.1%), during the period surveyed of the COVID-19 pandemic. There are many potential reasons for these differences. Prevalence levels might have been different prior to the pandemic. The result could also

be related to the different reported severity of the epidemic faced by the population of both countries. According to WHO³⁴, on July 1, 2020, when the UK sample completed its survey, there were 167,150 cumulative cases and 4,729 new cases, while on July 1, when the Chinese sample completed its survey, there were 85,245 cumulative cases and 5 new cases. The reported severity of the outbreak was different in scale in the two countries. If the UK young people felt more vulnerable to the epidemic, perhaps this impacted on their self-reported stress levels. It is not possible to prove correlation, but there might be cultural markers that influence cultural expressions of distress display. It might be that a Chinese culture that encourages self-reliance discourages reporting of demand to change external environment. Influenced by Confucian culture, traditional Chinese mental health concepts encourage Chinese people to restrain their emotions, avoid interpersonal conflict, and suppress their individual rights in order to maintain harmony with others and conform to the laws of nature³⁵. Inspired by these traditional cultures, Chinese young people might be influenced in expressing positive meaning from epidemic prevention measures (e.g. social distancing).

Our study also showed the prevalence rate of reported loneliness of young people in Shanghai (46.7%) was significantly lower than the UK (57.1%). Studies have found that higher collectivism is associated with lower reports of loneliness, and higher report of individualism is associated with higher report of loneliness^{36,37}. According to the Hofstede's Individualism Index, China is a typical collectivist culture, while the UK is an individualistic culture. Compared with individualistic culture, collectivist culture reports a closer social network pattern and a closer connection between people³⁸. Regardless, young people in both countries reported high rates of loneliness. In China, although the epidemic itself was not being reported as severe as that in the UK, prevention measures such as social distancing, lockdown, and quarantine, had not been eliminated, and face-to-face social interactions were still limited or affected.

Findings showed that reported loneliness, but not living alone, predicted psychological distress, although living alone was a significant risk factor of loneliness. In other words, during the period surveyed during the COVID-19 pandemic, living alone was not directly influence psychological distress. Those who lived alone seemed more prone to reporting psychological distress only if they felt lonely. Previous studies have shown that loneliness is positively associated with common mental disorders such as depression^{18,23}. Additionally, some researchers have found that socially isolated and lonely participants had higher mortality rates^{18,23}. After adjusting for demographic factors and baseline health, social isolation remained statistically significantly associated with mortality³⁹. Thus, during the epidemic, we need to pay more attention to young people's feeling of loneliness, which could be explored in clinical assessments. In addition, long-term interventions and methods need to be developed to help individuals maintain the necessary social contact and sense of belonging in the community and to maintain people's mental health. In addition to the significant prediction effect of the nationality on young people's psychological distress, sex and no use of psychotherapy, by contrast, predicted psychological distress among young people in China, but not in the UK.

We also found that country of residence, gender, and use of psychotherapy are significant predictors of self-reported psychological distress and loneliness under the impact of the epidemic. Females, living in England, and reporting to require but not be able to access psychotherapy showed a higher risk of reporting mental health problems.

We have found that PTSS symptoms were self-reported in the Chinese sample, which consistent with some other studies^{14,15,24–26,40}. PTSS self-reports was significantly correlated with use of psychotherapy, reported loneliness, fear of COVID-19, and impact of COVID-19 on work or study.

During the epidemic prevention and control period, measures aimed at improving the availability of psychological services, reducing people's loneliness and fear of the epidemic, and making efforts to reduce the barriers to study or work, could be helpful to prevent and reduce the prevalence of PTSS.

A limitation of the study is that we cannot make a clear causal claim. Because there are large differences in the epidemic situation between the two countries, and no pre-pandemic sample to compare results, the differences in mental health status cannot be attributable to the predictors that we selected. We only used one question to measure loneliness, rather than a psychometrically validated loneliness scale, so these results should be interpreted with caution. Another limitation is that the PTSS measurements were not included in the UK data, so we were unable to make a comparison between China and the UK. Further research should consider comparing PTSS or PTSD between different countries or cultures, and study the impact of culture on willingness to self-report psychological distress.

5. Conclusion

During the studied period of the COVID-19 pandemic, possibly due to the differences policies on epidemic prevention or control, the cultural norms regarding self-disclosing and reporting feelings, and the epidemic development situations between China and the UK, the mental health of young people in the two countries has been significantly different in terms of the self-reported psychological distress, loneliness, and other aspects. More country- or culture-specific measures of prevention and intervention should be adopted to improve the mental health of the public under the ongoing impact of the pandemic.

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Ethics approval and consent to participate

This study was approved by the ethics committees of Naval Medical University.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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Authors' contributions

ML, ZS contributed to the writing of this article and the statistical analysis of this article. GD, JG, contributed to the writing. ML, GD, ZS are co-first authors. LW leaded the whole study, including putting forward this study, carrying out the study, and was the corresponding author. CX, JZ contributed to the investigation and collection of all data.

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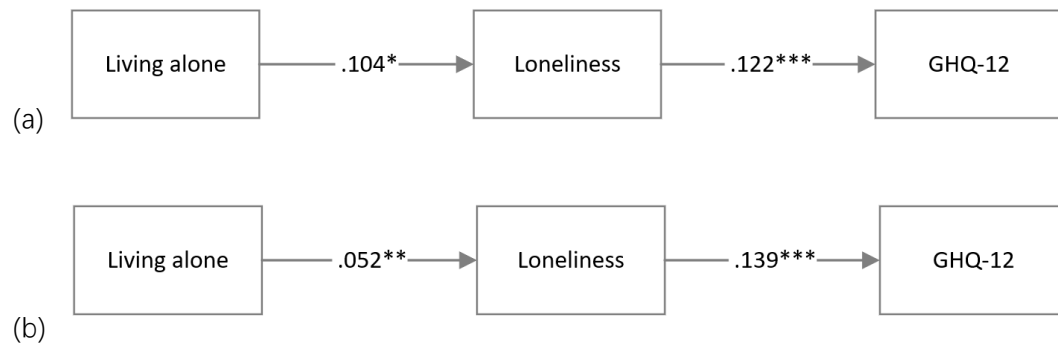
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Supplementary materials

Table S1 Differences between groups of GHQ-12 symptoms.

Variables	England, UK	Shanghai, China	χ^2 /Mann-Whitney U	p
GHQ: concentration				
Yes	363 (34.3%)	65 (6.5%)	242.589	<.001
No	692 (65.7%)	938 (93.5%)		
GHQ: loss of sleep				
Yes	265 (25.1%)	308 (30.7%)	7.921	.005
No	789 (74.9%)	695 (69.3%)		
GHQ: playing a useful role				
Yes	301 (28.6%)	84 (8.4%)	137.610	<.001
No	753 (71.4%)	919 (91.6%)		
GHQ: capable of making decisions				
Yes	212 (20.1%)	87 (8.7%)	54.141	<.001
No	842 (79.9%)	916 (91.3%)		
GHQ: constantly under strain				
Yes	334 (31.7%)	120 (12.0%)	116.254	<.001
No	720 (68.3%)	883 (88.0%)		
GHQ: problem overcoming difficulties				
Yes	246 (23.3%)	102 (10.2%)	63.422	<.001
No	808 (76.7%)	901 (89.8%)		
GHQ: enjoy day-to-day activities				
Yes	370 (35.1%)	61 (6.1%)	261.367	<.001
No	684 (64.9%)	942 (93.9%)		
GHQ: ability to face problems				
Yes	210 (19.9%)	58 (5.8%)	90.702	<.001
No	844 (80.1%)	945 (94.2%)		
GHQ: unhappy or depressed				
Yes	321 (30.5%)	177 (17.6%)	45.950	<.001
No	733 (69.5%)	826 (82.4%)		
GHQ: losing confidence				
Yes	295 (28.0%)	99 (9.9%)	108.948	<.001
No	759 (72.0%)	904 (90.1%)		
GHQ: believe worthless				
Yes	201 (19.1%)	99 (9.9%)	34.917	<.001
No	853 (80.9%)	904 (90.1%)		
GHQ: general happiness				
Yes	252 (23.9%)	188 (18.7%)	8.154	.004
No	802 (76.1%)	815 (81.3%)		

Note: GHQ-12 = 12-item General Health Questionnaire.



Note: (a) Sample of England region. (b) Sample of Shanghai, China region.

Figure S1 Loneliness mediates the association between living alone and psychological distress

Table S2 Bivariate correlations between study variables.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Sex	-												
2. Age	-.177**	-											
3. Living alone	-.008	-.109**	-										
4. Required psychotherapy	.005	.018	.092**	-									
5. Psychotherapy available	.136	.078	-.073	-	-								
6. Loneliness ^a	-.108**	.056*	.064**	.107**	-.283**	-							
7. PCL-5 score ^b	.082**	-.026	-.062	-.302**	.199*	-.444**	-						
8. GHQ-12 score	.120**	-.030	-.006	-.140**	.097	-.401**	.726**	-					
9. Feeling the fear of COVID-19 ^b	.036	-.004	-.049	-.188**	.213**	-.394**	.580**	.555**	-				
10. Feeling the fear of recovered patients ^b	.004	.067*	-.033	-.081*	.032	-.124**	.241**	.138**	.124**	-			
11. Feeling of fear of people from the affected area ^b	.038	.075*	-.010	-.080*	.029	-.116**	.259**	.139**	.125**	.737**	-		
12. Impact of COVID-19 on families ^b	.007	.099**	-.053	-.090**	.061	-.188**	.233**	.145**	.142**	.313**	.348**	-	
13. Impact of COVID-19 on intimate relationships ^b	-.101**	.078*	-.039	-.153**	-.112	-.225**	.281**	.197**	.176**	.338**	.393**	.459**	-
14. Impact of COVID-19 on work or study ^b	0.012	0.051	-0.02	-.119**	0.062	-.263**	.337**	.233**	.243**	.257**	.291**	.426**	.403**

Note: * $p < .05$, ** $p < .01$. ^a Participants who chose “hardly ever” or “never” were considered not to have a sense of loneliness. Participants who chose “some of the time” or “often” were considered to have a sense of loneliness. ^b Correlation is only within the group of Shanghai, China. PCL-5 = PTSD Checklist for DSM-5. GHQ-12 = 12-item General Health Questionnaire.