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ORIGINAL RESEARCH

Could the Associations of Changes in Living Arrangement with Mental Disorders Be Moderated or Mediated During COVID-19 Pandemic?

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Purpose: Changes in living arrangement was one of the most well-established risk factors for mental disorders, but little evidence came from moderating or mediating effect during COVID-19 pandemic. This study aimed to determine whether associations of changes in living arrangement with mental disorders could be moderated or mediated during COVID-19 pandemic.

Methods: Data were a cross-sectional and international population-based survey data collected as part of theCOVID-19 pandemic. Participants included nationally representative general population probability samples of adults (≥18 years) during COVID-19 pandemic (N=16,784). Main mental measures were reflected by loneliness assessed by UCLA Loneliness Scale Version 3, anxiety assessed by Generalised Anxiety Disorder 2-item, and depressed mood assessed by The Patient Health Questionnaire-2 in the survey. With control variables, all the mediation models were conducted by Stata mode. Potential influencing effects of social contact and social support as moderators were analyzed using Hayes's PROCESS macro.

Results: Among the participants, prevalence of mental disorders was high. Logistic regression indicated that changes in living arrangement had significant associations with anxiety (AOR=1.127, 95% CI: 1.018–1.249) and depression (AOR =1.142, 95% CI: 1.027–1.269). Mediation models indicated that indirect, direct, and total effects of changes in living arrangement on mental disorders through COVID-symptoms; change in alcohol use; and social contact were significant. Indirect, direct, and total effects of changes in living arrangement on loneliness and depression through social support were significant. Moderation analysis indicated that moderation model 1 in AF Hayes Process procedure was accepted.

Conclusion: This study indicated that associations of changes in living arrangement with mental disorders could be mediated by COVID-symptoms, changes in alcohol use, social contact, and social support and moderated by social support during COVID-19 pandemic. The finding in this study might provide better understanding of the mechanisms by which social support might contribute to the resolving mental disorders.

Keywords: changes in living arrangement, change in alcohol use, moderators, mediators, mental disorders

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Introduction

In order to contain the transmission of the virus, a number of restrictive and effective measures changed the living arrangement of the general public. Many persons died of COVID-19, which also might change living arrangement of family

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members.[1] In order to reduce the person-to-person transmission risk of COVID-19, physical distancing,[2] population flow,[3] close contact,[4] and family cluster[5–7] were controlled and changed the living arrangement of the acquaintances. Simultaneously, those public health interventions including traffic restriction, home confinement, and centralized quarantine[8] were certain to change living arrangement in a family.

A substantial body of studies indicated changes in living arrangement including containment measures (isolation and quarantine) could lead to mental disorders.[9] Studies showed effects of containment measures (physical distancing and isolation) and lockdown[10] driven by COVID-19 on mental health of the general population.[11] Additionally, depression and probably anxiety,[12] suicidal thoughts,[13] intimate partner violence,[14] anxiety disorders,[15] depressive symptoms,[16,17] and psychotic relapse[18] during COVID-19 quarantine were reported. In particular, first psychotic episodes reactive to stress in both general population[19] and healthcare professionals[20] were also reported. Speculatively, association between changes in living arrangement and mental disorders could be mediated by COVID-19 factors in the general public.

Currently, COVID-19 outbreak was leading to mental crisis globally.[21,22] Mental disorders driven by COVID-19 in China,[23] Turkey,[24] Spain,[25] and America[26] were reported. Additionally, multiple cross-sectional studies indicated COVID-19 pandemic had a great psychological impact on the general public[27–29] and healthcare professionals.[30,31] A review reported psychological symptoms due to the COVID-19 pandemic may be associated with disturbed sleep.[32] Another review reported that COVID-19 pandemic led to the direct neuropsychiatric consequences and the indirect effects on mental health.[33] Several current studies indicated social support could reduce psychological impact due to COVID-19.[34–37] Speculatively, social contact and support could moderate or mediate the association between changes in living arrangement and mental disorders in the general public.

The purpose of this pilot study was to explore whether the associations of changes in living arrangement with mental disorders were moderated or mediated during COVID-19 pandemic. First, associations of changes in living arrangement with loneliness, anxiety, and depression could be confirmed. Second, mediating effects of COVID-19 test, COVID-symptoms, and change in alcohol use, social contact, and social support on the associations need to be demonstrated. Finally, this study would explore the moderating effects of the targeted associations by social contact and social support. The mechanism with those associations was important for the general public to assess the performance of COVID-19 management.

Methods

Data Source

Data employed in this study were from COVID-19 Survey in Five National Longitudinal Studies. COVID-19 Survey in Five National Longitudinal Studies was an online survey of the participants of five national longitudinal cohort studies in May 2020.[38] The survey was sent to participants of all five of the national longitudinal cohort studies run at CLS and the LHA unit. The following studies were included: Millennium Cohort Study (born 2000–02) both cohort members and parents (MCS), Next Steps (born 1989–1990) (NS), 1970 British Cohort Study (BCS70), 1958 National Child Development Study (NCDS), and MRC National Survey of Health and Development (NSHD, 1946 British birth cohort). The questionnaire was programmed in Qualtrics by the CLS Survey Management Team. The issued sample and response rates were distributed by 8943 and 57.9% in NCDS, 10,458 and 40.4% in BCS70, 9380 and 20.3% in Next Steps, 9946 and 26.6% in MCS (Cohort Members), 9909 and 28.6% in MCS (Parent), 1843 and 68.0% in NSHD, and 50,479 and 35.7% in total sample.

Main Variables

Exposures

Changes in living arrangement and COVID-symptoms.

Changes in Living Arrangement

Changes in living arrangement were measured by the question: "Have there been any changes to the people you are living with since the Coronavirus outbreak?" Its response options were yes (=1) and no (=0).

COVID-19 Test

COVID-19 test was measured by the question: "Have you been tested for Coronavirus?" Its response options were yes (=1) and no (=0).

COVID-Symptoms

Personal experience of COVID-symptoms was measured by the question: "Have you experienced any of the following symptoms in the past 2 weeks?" Number of COVID-symptoms experienced was obtained by summing up all the response options including fever, cough-dry, cough-mucus or phlegm, sore throat, chest tightness, shortness of breath, runny nose, nasal congestion, sneezing, muscle

or body aches, fatigue, unusual loose motions or diarrhea, vomiting, loss of smell, loss of taste, skin rash, headaches, and others. Thus, response options of COVID-symptoms experienced were defined as yes (=1) and no (=0).

Change in Alcohol Use

Alcohol use was defined by Alcohol Use Disorders Identification Test (AUDIT).[39] In the questionnaire, alcohol use before COVID-19 and alcohol use since COVID-19 were defined with the first two questions and the subsequent five questions. As for the first question: "In the month before the Coronavirus outbreak, how often did you have a drink containing alcohol?", its response options included "4 or more times a week (=1)", "2–3 times a week (=2)", "2–4 times per month (=3)", "Monthly or less (=4)", and "Never (=5)" and were recoded reversely. Likewise, the third question was: "Since the start of the Coronavirus outbreak, how often have you had a drink containing alcohol?" Its response options included "4 or more times a week (=1)", "2–3 times a week (=2)", "2–4 times per month (=3)", "Monthly or less (=4)", and "Never (=5)" and were recoded reversely. Similarly, regarding the final question: "Since the start of the Coronavirus outbreak, has a relative, friend, doctor or health worker been concerned about your drinking or advised you to cut down? ", its response options "yes (=1)" and "no (=2)" were recoded reversely. Thus, the total score of alcohol use since COVID-19 was obtained by summing the scores for seven items with the total score ranging from 7 to 32. After standardization, the difference between standardized score of alcohol use since COVID-19 and standardized score of alcohol use before COVID-19 referred to change in alcohol use, in which positive values denoted changed alcohol use.

Social Contact

Social contact was reflected by the five questions: "In the last seven days, on how many days did you meet up in person with any of your family or friends who do not live with you?", "In the last seven days, on how many days did you talk to family or friends you do not live with via phone or video calls?", "In the last seven days, on how many days did you keep in contact with family or friends you do not live with by email or text or other electronic messaging?"

> In the last seven days, on how many days did you take part in an online community activity, e.g. an online community group, online chat group, street or neighbourhood social media group?

And "In the last seven days, on how many days did you give help to people outside of your household affected by Coronavirus or the current restrictions?" Their response options were "every day (=1)", "4–6 days (=2)", "2–3 days (=3)", "1 day (=4)", and "never (=5)". Then, social contact score was defined by summing the score for each of the 5 items with the total score ranging from 5 to 25. Furthermore, social contact was divided by yes (total score ≥16) and no (total score <16).

Social Support

Social support was defined by Short Social Provisions Scale (3-items).[40] The Social Provisions Scale was measured by the three questions: "I have family and friends who help me feel safe, secure and happy", "There is someone I trust whom I would turn to for advice if I were having problems", and "There is no one I feel close to." Their response options were "very true (=1)", "partly true (=2)", and "not true at all (=3)". Before scoring, the response options of the third question were recoded reversely. Consequently, the total score of social support was obtained by summing the score for each of the three items with the total score ranging from 3 to 9. Social support was divided by yes (total score ≥ median=6) and no (total score <median=6).

Outcomes

Loneliness, anxiety and depression.

Loneliness

Loneliness was assessed by UCLA Loneliness Scale Version 3.[41] Four items from the 20-item UCLA loneliness scale were asked of all cohort members. UCLA Loneliness Scale was measured by the four questions: "How often do you feel that you lack companionship?", "How often do you feel left out?", "How often do you feel isolated from others?", and "How often do you feel lonely?" Their response options were "hardly ever (=1)", "some of the time (=2)", and "often (=3)". Consequently, the total score of loneliness was obtained by summing the score for each of the three items with the total score ranging from 4 to 12. Loneliness was divided by yes (total score ≥median=8) and no (total score <median=8).

Anxiety

Anxiety was assessed by Generalised Anxiety Disorder 2-item.[42] The Generalized Anxiety Disorder was measured by the two questions: "Feeling nervous, anxious or on edge" and "Not being able to stop or control worrying". Their

response options were "not at all (=1)", "several days (=2)", "more than half the days (=3)", and "nearly every day (=4)". Consequently, the total score of anxiety was obtained by summing the score for each of the two items with the total score ranging from 2 to 8. Anxiety was divided by yes (total score ≥median=5) and no (total score <median=5).

Depression

The secondary outcome of this study was depression. Depressed mood was assessed by The Patient Health Questionnaire-2.[43] Patient Health Questionnaire 2-item (PHQ-2) was measured by two questions: "Little interest or pleasure in doing things" and "Feeling down, depressed or hopeless". Their response options were "not at all (=1)", "several days (=2)", "more than half the days (=3)", and "nearly every day (=4)". Consequently, the total score of depression was obtained by summing the score for each of the two items with the total score ranging from 2 to 8. Depression was divided by yes (total score <median=5) and no (total score ≥median=5).

Statistical Analysis

In the dataset, the response options with "Not applicable" and "No information" were cleaned as missing values using the listwise deletion method.[44] Descriptive statistics for the sample were calculated on the basis of chi-square test. The significant comparison difference was conducted between genders. Subsequently, associations of gender, changes in living arrangement, COVID-symptoms, social contact, and social support with mental state were conducted with logistic regressions.

Due to dichotomous variables, all the mediation models were conducted by STATA mode ldecomp.[45] Here, changes in living arrangement had an indirect effect on loneliness, anxiety, and depression through COVID-19 test (model 1), COVID-symptoms (model 2), change in alcohol use (model 3), social contact (model 4), and social support (model 5), respectively. Control variables in model 1 were gender, change in alcohol use, COVID-symptoms, social contact, and social support. Control variables in model 2 were exchange in alcohol use, COVID-19 test, social contact, and social support. Control variables in model 3 were gender, COVID-19 test, COVID-symptoms, social contact, and social support. Control variables in model 4 were gender, COVID-19 test, COVID-symptoms, change in alcohol use, and social support. Control variables in model 5 were gender, COVID-19 test, COVID-symptoms, change in alcohol use, and social contact.

In Figures 1–Figures 3, the moderation analysis only could be performed by models 1, 2, and 3 in AF Hayes's PROCESS macro (SPSS version 3.0) for IBM SPSS version 24.0 (www.afhayes.com; www.guilford.com/p/hayes3) in the case of binary variables. On the basis of permutation and combination knowledge, model 1 had six conceptual diagrams. Six and 18 conceptual diagrams were constructed in models 2 and 3, respectively. All the conceptual diagrams could be seen in Supplemental File. Here, mental state was loneliness, anxiety, and depression. Moderators were COVID-19 test, COVID-symptoms, change in alcohol use, social contact, and social support. Statistical analyses with p values <0.1 were considered significant.

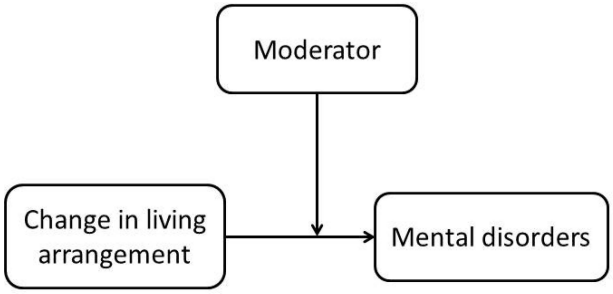

Figure 1 Conceptual diagram of model 1.

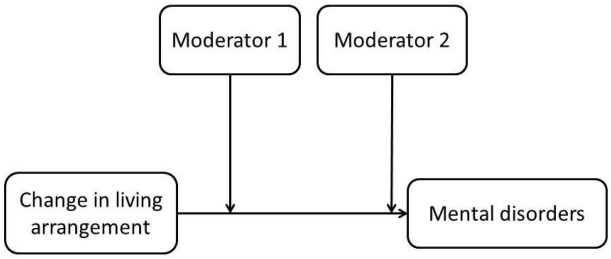

Figure 2 Conceptual diagram of model 2.

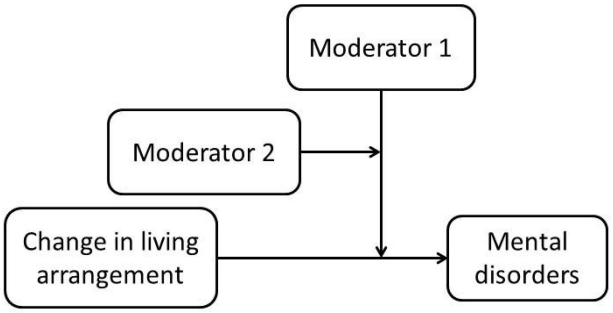

Figure 3 Conceptual diagram of model 3.

Results

Descriptive Analysis

Demographic characteristics of the 16,784 participants are shown in Table 1. The majority of the sample was female (61.04%). The percentages of COVID-19 test (2.66%), changes in living arrangement (17.20%), change in alcohol use (44.67%), social contact (32.53%), and social support (36.90%) were low. Notably, the prevalence of COVID-symptoms (51.89%), loneliness (70.38%), anxiety (80.05%), and depression (81.09%) was high. There were significant gender differences among COVID-19 test, changes in living arrangement, change in alcohol use, COVID-symptoms, social contact, social support, loneliness, anxiety, and depression.

Logistic Regression

In Table 2, of the covariates which had a significant positive association with loneliness, the odds ratio for social contact (AOR=2.274, 95% CI: 2.112–2.449, p=0.000) was highest, followed by social support (AOR=1.605, 95% CI: 1.498–1.721, p=0.000), gender (AOR=1.348, 95% CI: 1.265–1.436, p=0.000), COVID-symptoms (AOR=1.244, 95% CI: 1.171–1.323, p=0.000), and COVID-19 test (AOR=1.230, 95% CI: 0.986–1.534, p=0.067).

Gender (AOR=1.557, 95% CI: 1.453–1.669, p=0.000), COVID-19 test (AOR=1.350, 95% CI: 1.041–1.753, p=0.024), changes in living arrangement (AOR=1.127, 95% CI: 1.018–1.249, p=0.022), Change in alcohol use (AOR=1.104, 95% CI: 1.029–1.186, p=0.006), COVID-symptoms (AOR=1.747, 95% CI: 1.633–1.869, p=0.000), social contact (AOR=2.761, 95% CI: 2.531–3.012, p=0.000), and social support (AOR=1.781, 95% CI: 1.647–1.926, p=0.000) had a significant positive association with anxiety.

Gender (AOR=1.777, 95% CI: 1.655–1.908, p=0.000), COVID-19 test (AOR=1.280, 95% CI: 0.981–1.669, p=0.069), changes in living arrangement (AOR=1.142, 95% CI: 1.027–1.269, p=0.014), COVID-symptoms (AOR=1.760, 95% CI: 1.642–1.887, p=0.000), social contact (AOR=3.225, 95% CI: 2.938–3.539, p=0.000), and social support (AOR=1.952, 95% CI: 1.799–2.118, p=0.000) had a significant positive association with depression.

But, no significant association of changes in living arrangement with loneliness and association of change in alcohol use with depression were observed.

Mediation Analysis

In Table 3, statistical outcomes of direct and indirect effects in logit models were reported. In model 1, changes in living arrangement had significantly negative total and direct effects and insignificant zero indirect effects on loneliness, anxiety, and depression through COVID-19 test. In model 2, changes in living arrangement had significantly negative total, direct, indirect and effects on loneliness, anxiety, and depression through COVID-symptoms. In model 3, changes in living arrangement had significantly negative total and direct effects and significant positive indirect effects on loneliness, anxiety, and depression through change in alcohol use. In model 4, changes in living arrangement had significantly negative total and direct effects and significant positive indirect effects on loneliness, anxiety, and depression through social contact. In model 5, changes in living arrangement had significantly negative total and direct effects and significant positive indirect effects on loneliness and depression through social support. Simultaneously, changes in living arrangement had significantly negative total and direct effects and insignificant positive indirect effects on anxiety through social support.

Moderation Analysis

With the "PROCESS Macro for SPSS", detailed calculations were seen in Supplemental File. Among them, only empirical outcomes of conceptual diagram 5 exhibited significance (in Table 4). Thus, social support moderated the relationship between changes in living arrangement and anxiety. In the other empirical outcome of conceptual diagrams, there were not co-occurring significances of covariates and interactions. Accordingly, models 2 and 3 were rejected.

Discussion

Main Findings

The primary finding of this study was associations of changes in living arrangement with mental disorders could be mediated and moderated during COVID-19 pandemic. Logistic regression indicated associations of gender, changes in living arrangement, COVID-symptoms, social contact, social support with mental disorders. Regarding mediation analysis, indirect effects of changes in living arrangement on mental disorders through COVID-19 test were not significant. Indirect effects of changes in living arrangement on anxiety through social

Table 1 Sample Characteristics by Gender

	Male	Female	Chi-Square	p	Significance
COVID-19 test (N=16,720)			6.0581	0.014	**
No	38.07	59.28			
Yes	0.89	1.77			
Changes in living arrangement (N=16,228)			38.7041	0.000	***
No	33.19	49.61			
Yes	5.81	11.39			
Change in alcohol use (N=16,784)			245.5683	0.000	***
No	24.49	30.84			
Yes	14.47	30.20			
COVID-symptoms (N=16,594)			76.1782	0.000	***
No	20.42	27.68			
Yes	18.60	33.30			
Social contact (N=16,784)			271.6536	0.000	***
No	29.19	38.28			
Yes	9.77	22.76			
Social support (N=16,784)			271.3247	0.000	***
No	27.57	35.52			
Yes	11.39	25.52			
Loneliness (N=16,784)			95.3664	0.000	***
No	9.86	19.76			
Yes	29.10	41.28			
Anxiety (N=16,784)			157.0372	0.000	***
No	5.89	14.06			
Yes	33.07	46.98			
Depression (N=16,784)			63.1370	0.000	***
No	6.20	12.71			
Yes	32.76	48.33			

Note: ***and **Indicated 1% and 5% significance level, respectively.

support were not significant. Indirect, direct, and total effects of changes in living arrangement on mental disorders through COVID-symptoms, change in alcohol use, and social contact were significant. Indirect, direct, and total effects of changes in living arrangement on loneliness and depression through social support were significant. Regarding moderation analysis, this study indicated that the relationship the effect of changes in living arrangement on anxiety was moderated by social support. These associations provided hints for rethinking over COVID-19 management among the surveyed sample.

The outcomes of logistic regressions were in line with early studies. With respect to gender, a substantial body of studies reported the same results.[46,47] Regarding the role of living arrangement in mental disorders, the research outcomes were in line with several prior studies. For example, living arrangement was found to be associated with loneliness among older adults[48] and depressive symptoms in children.[49] A study in Malaysia revealed that living arrangement directly, and indirectly through social support function, predicted life satisfaction for older adults.[50] This was in line with the result from an Oregon study that confirmed an association between respiratory symptoms and mental disorders among youth in the community.[51] Regarding social contact, this study was congruent with early studies that social contact could predict[52] and be related to[53] mental health. To my best knowledge, this was the first study to report the relationship between COVID-symptoms and mental disorders during COVID-19 pandemic. Till now, there was little knowledge to explain the relationship. It may

Table 2 Associations of Gender, Changes in Living Arrangement, COVID-Symptoms, Social Contact, Social Support with Mental Disorders

	Loneliness		Anxiety		Depression	
	Odds Ratio	**95% CI**	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Gender						
Male	Reference		Reference		Reference	
Female	1.348***	1.265–1.436	1.557***	1.453–1.669	1.777***	1.655–1.908
COVID-19 test						
No	Reference		Reference		Reference	
Yes	1.230*	0.986–1.534	1.350**	1.041–1.753	1.280*	0.981–1.669
Changes in living arrangement						
No	Reference		Reference		Reference	
Yes	1.025	0.937–1.122	1.127**	1.018–1.249	1.142**	1.027–1.269
Change in alcohol use						
No	Reference		Reference		Reference	
Yes	0.860***	0.807–0.917	1.104***	1.029–1.186	0.976	0.908–1.050
COVID-symptoms						
No	Reference		Reference		Reference	
Yes	1.244***	1.171–1.323	1.747***	1.633–1.869	1.760***	1.642–1.887
Social contact						
No	Reference		Reference		Reference	
Yes	2.274***	2.112–2.449	2.761***	2.531–3.012	3.225***	2.938–3.539
Social support						
No	Reference		Reference		Reference	
Yes	1.605***	1.498–1.721	1.781***	1.647–1.926	1.952***	1.799–2.118

Note: ***, ** and *Indicated 1%, 5%, and 10% significance level, respectively.

be possible that the COVID-symptoms are important hints of risk for COVID-19 infection which was exposed to mental disorders.

Regarding mediation analysis, the research outcome could be explained partially by early studies. For example, a Chinese study indicated that the effect of social support on mental health could be partially mediated by resilience and moderated by age group.[54] Furthermore, a recent Israelis study demonstrated that young subjective age might weaken the COVID-19-related loneliness-psychiatric symptoms association among older adults during the COVID-19 pandemic.[55]

Regarding moderation analysis, this study indicated that the effect of changes in living arrangement on anxiety was moderated by social support. This could be explained by a study that social support could help people be adapted to COVID-specific needs of a prolonged isolation and postisolation.[56] To my best knowledge, the finding in this study enriched the knowledge of moderating effects of social support. Some early studies reported social support moderated the impact of neuroticism and extraversion on mental wellbeing,[57] associations among discrimination, mental health, and sociality,[58] and direct association between workplace bullying and mental distress.[59]

With regard to the current policy effectiveness, the findings in this study indicated that "Psychological First Aid" technique initiated by the World Health Organization[60] seemly achieved no good results. But, a longitudinal study in China reported that there was a statistically significant longitudinal reduction in the psychological impact of general population during the COVID-19 epidemic.[61] Thus, effective methods could be learned.

Theoretical Contributions

Regarding academic contributions, this study provided fresh insights into the fields of COVID-19 management, changes in living arrangement, and mental disorders. First,

Table 3 Indirect Effects of Changes in Living Arrangement on Mental Disorders Through COVID-19 Test, COVID-Symptoms, Change in Alcohol Use, Social Contact, and Social Support

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Loneliness										
Total	−0.25***	−0.35, −0.16	−0.27***	−0.37, −0.17	−0.23***	−0.33, −0.13	−0.23***	−0.32, −0.14	−0.24***	−0.32, −0.15
Indirect1	0.00	0.00, 0.00	−0.02***	−0.03, −0.01	0.02**	0.00, 0.03	0.02***	0.01, 0.03	0.02***	0.00, 0.03
Direct1	−0.26***	−0.35, −0.16	−0.25***	−0.35, −0.16	−0.25***	−0.35, −0.15	−0.25***	−0.34, −0.16	−0.26***	−0.34, −0.17
Indirect2	0.00	0.00, 0.00	−0.02***	−0.03, −0.01	0.02**	0.00, 0.03	0.02***	0.01, 0.03	0.02***	0.00, 0.03
Direct2	−0.26***	−0.35, −0.16	−0.25***	−0.35, −0.16	−0.25***	−0.35, −0.15	−0.25***	−0.34, −0.16	−0.26***	−0.34, −0.17
Anxiety										
Total	−0.32***	−0.43, −0.21	−0.34***	−0.44, −0.23	−0.30***	−0.41, −0.19	−0.30***	−0.42, −0.18	−0.32***	−0.41, −0.23
Indirect1	0.00	0.00, 0.00	−0.01***	−0.02, −0.01	0.02**	0.00, 0.04	0.02***	0.01, 0.03	0.01	−0.01, 0.02
Direct1	−0.32***	−0.43, −0.21	−0.32***	−0.43, −0.21	−0.32***	−0.43, −0.20	−0.32***	−0.44, −0.20	−0.32***	−0.41, −0.24
Indirect2	0.00	0.00, 0.00	−0.01***	−0.02, −0.01	0.02**	0.00, 0.04	0.02***	0.01, 0.03	0.01	−0.01, 0.02
Direct2	−0.32***	−0.43, −0.21	−0.32***	−0.43, −0.21	−0.32***	−0.43, −0.20	−0.32***	−0.44, −0.20	−0.32***	−0.41, −0.24
Depression										
Total	−0.32***	−0.43, −0.21	−0.33***	−0.45, −0.21	−0.29***	−0.40, −0.17	−0.29***	−0.39, −0.18	−0.29***	−0.40, −0.19
Indirect1	0.00	0.00, 0.00	−0.01***	−0.02, −0.01	0.02**	0.01, 0.04	0.03***	0.02, 0.04	0.02***	0.01, 0.03
Direct1	−0.32***	−0.43, −0.21	−0.32***	−0.44, −0.20	−0.31***	−0.43, −0.19	−0.31***	−0.42, −0.21	−0.32***	−0.42, −0.21
Indirect2	0.00	0.00, 0.00	−0.01***	−0.02, −0.01	0.02**	0.01, 0.04	0.03***	0.02, 0.04	0.02***	0.01, 0.03
Direct2	−0.32***	−0.43, −0.21	−0.32***	−0.44, −0.20	−0.31***	−0.43, −0.19	−0.31***	−0.42, −0.21	−0.32***	−0.42, −0.21

Note: *** and **Indicated 1% and 5% significance level, respectively.

Table 4 Logistic Regression Summary of Empirical Outcome of Conceptual Diagram 5 (Sample Size=16,228)

Outcome Variable	−2LL	Model LL	McFadden	Cox–Snell	Nagelkerke
Anxiety	15,029.9496	42.7527	0.0028	0.0026	0.0043
	Coeff.	**se**	***p***	**LLCI**	**ULCI**
Constant	1.6430	0.0291	0.0000	1.5860	1.7000
Social support	−0.1076	0.0479	0.0247	−0.2015	−0.0137
Changes in living arrangement	−0.4384	0.0710	0.0000	−0.5775	−0.2993
Changes in living arrangement×social support	0.2962	0.1040	0.0044	0.0923	0.5001

Abbreviations: SE, standardised errors; LLCI, lower limit confidence interval; ULCI, upper limit confidence interval.

this study revealed mental disorders from COVID-19 management and preventions during the COVID-19 pandemic. Thus, changes of behaviors and lifestyle driven by COVID-19 control possibly influenced the mental state among the general public. Second, this study contributed to the literature with respect to living arrangement. Possibly, this was the first study to link changes of behaviors and mental state during the COVID-19 pandemic. Finally, this study contributed to the literature of mental disorders by exploring the mediating and moderating effects. The mediators and moderators in this study indicated that future research could employ structural equation models to analyze the interacting mechanisms of COVID-19 pandemic control and influencing factors.

Clinical Implications

This empirical study did provide recommendations as well as clinical considerations for managing adverse events. The COVID-19 pandemic still represented one of the most stressful events of recent times. The general public was vulnerable to adverse mental health impacts of changes in living arrangement. Thus, the prevalence of mental disorders and associated factors during COVID-19 pandemic should be highlighted. Clinically, healthcare

professionals should treat changes in living arrangement as the psychological determinant and concern posttraumatic stress symptoms. The current findings identified the increase in social support could reduce anxiety state in the general public during COVID-19 pandemic.

Strengths and Limitations

There were two main strengths in the present study. First, a large multinational sample allowed sufficient statistical power to draw conclusions. Second, two statistical softwares with a number of possible mediating and moderating models were employed to explore the targeted associations. There were three main limitations in this study. First, the findings from a cross-sectional data could not produce causal relationships. Second, the analysis of data across five countries yielded regional research outcomes which could not reflect global generalization. Third, this study did not use standardized scales to evaluate the changes in lifestyle caused by the pandemic, such as the Short Multidimensional Inventory Lifestyle Evaluation–Confinement,[62] which could worsen the research rigor of this study.

Conclusion

In conclusion, this study reported the association between changes in living arrangement and anxiety moderated by social support and medicated by COVID-symptoms, change in alcohol use, and social contact during COVID-19 pandemic. This study found that social support was not associated with anxiety or depression. Further research was needed to clarify the causative factors underlying these differential relationships during COVID-19 pandemic.

Data Sharing Statement

Data can be obtained via https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=8658.

Ethics Approval and Consent to Participate

This study used publicly available dataset. So, it is unnecessary to be proved by ethics committee.

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Disclosure

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