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Coping resources mediate the prospective associations between disrupted daily routines and persistent psychiatric symptoms: A population-based cohort study

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ABSTRACT

This study examined the mediating effects of coping resources in the prospective associations between daily routine disruptions in the acute phase of COVID-19 and persistent probable anxiety and depression. A prospective, population-representative cohort of 1318 Hong Kong Chinese respondents completed a baseline survey between February and July 2020 (T1) and a 1-year follow-up survey between March and August 2021 (T2). Respondents reported demographics and disruptions to primary and secondary daily routines at T1, coping resources (i.e., self-efficacy and meaning making) at T2, and anxiety and depressive symptoms at T1 and T2. We found that 8.1% and 10.0% of respondents reached cutoff scores for probable anxiety and depression respectively at both T1 and T2. Logistic regression showed that T1 daily routine disruptions were positively associated with heightened risk of persistent probable anxiety and depression amid COVID-19. Path analysis showed that 15.3% and 13.1% of the associations of daily routine disruptions with persistent probable anxiety and depression were explained by coping resources, respectively, while the direct routine-outcome associations remained significant. Daily routine disruptions predict higher odds of persistent probable anxiety and depression directly and partially through reducing coping resources. Sustainment of regular daily routines should be advocated and fostered to enhance coping resources and reduce the risk of poorer adjustment among the affected populations amid public health crises.

1. Introduction

Large scale disasters could have huge impact on affected populations through significant mental health tolls and behavioral changes (Beaglehole et al., 2018; Clay and Greer, 2019; Parks et al., 2018). The COVID-19 pandemic drastically changed the world populations' daily routines under a variety of infection control measures, such as lockdown, quarantine, and social distancing, while high prevalence of mental health problems was consistently reported (Vindegaard and Benros, 2020). Stressful events could threaten the basic livelihoods and alter daily living of people, these disruptions resemble functional impairment that is common among persons with mental disorders such as depression and consequentially heighten the risk of poorer

adjustment (ÜstünKennedy, 2009). Building a resourceful environment is essential for psychological resilience in the face of trauma and chronic stress (Schwartz et al., 2017), whereas everyday life can be seen as the fundamental context for resilience through active engagement in important life tasks (Hou et al., 2018). In the sections that follow, first, we will outline the growing evidence on the associations between disrupted daily routines and mental health amid large-scale disasters. The importance of considering cognitive coping resources, especially self-efficacy and meaning making will then be explained, followed by proposing the nature of associations among daily routine disruptions, coping resources, and mental health.

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1.1. Daily routine disruptions

Traumatic events trigger an on-set of exposure-related disturbance in daily activities (Clay and Greer, 2019; Miller and Rasmussen, 2010). Negative changes in basic livelihood after traumatic events, such as chronic displacement among refugees predicted higher odds of subsequent mental health problems over and beyond the effects of trauma exposure (Silove et al., 2017). For example, among Rohingya refugees in refugee camp in Bangladesh, depressive symptoms were significantly associated with everyday food problem rather than prior trauma exposure (Riley et al., 2017). In a similar vein, restoration of pre-disaster daily routines was associated with lower psychological distress (Parks et al., 2018). During this unprecedented COVID-19 pandemic, growing evidence suggests that mental health is positively linked to sustainment of daily routines among different populations across the globe. Greater odds of clinically significant anxiety and depressive symptoms were found to be associated with greater difficulties in sustaining activities and maintaining valued connections with family and friends among a US sample (Sherman et al., 2020). Disruption to regular exercise routines has been found to be inversely associated with psychological health and well-being among an Italian population (Maugeri et al., 2020). University students in China who reported disruptions in circadian rhythms such as diet and sleep were more likely to demonstrate higher anxiety and depressive symptoms during lockdown (Tao et al., 2021). Both regular primary and secondary routines were inversely associated with the risks of anxiety and depression across different population-representative samples of Hong Kong Chinese (Hou et al., 2021a).

Existing evidence is consistent with the Social Zeitgeber theory, which proposed that daily activities as social cues help maintain internal biological rhythms. Daily routine disruptions reflect part of biological and social dysfunctions that may give rise to somatic symptoms, which contribute to higher odds of mental disorders (Boland et al., 2019). Circadian dysregulation, including irregular social rhythms, sleep/wake and activity patterns, and social rhythm disruptions by life events were known as stable trait markers and risk factors of different mood disorders (Walker et al., 2020). Drive to Thrive (DTT) theory further contextualized how regularity of daily routines could be considered as the process through which psychological adaptation and resilience emerge over time (Hou et al., 2018). Everyday routines could be parsed into primary and secondary routines according to their degree of necessity (Hou et al., 2018, 2019). Primary routines (i.e., healthy eating, sleep, hygiene, maintaining a house) are essential behaviors that fulfill survival or biological needs, whereas secondary routines are optional behaviors that we perform based on our preferences and motivations, including socializing, exercising, leisure, and work/study. During ongoing stress, daily routines will either be disrupted or terminated because stress could restrict individuals from engaging in regular daily activities (Hou et al., 2018). Disrupted socializing and terminated work as a result of the COVID-19 outbreak have been associated with heightened risk of persistent probable depression throughout one year's time during the COVID-19 pandemic (Ettman et al., 2022). Compared with those of low symptom severity, people who had persistent probable anxiety and depression across four months during the COVID-19 pandemic were more likely to report that they had less regular face-to-face socializing prior to the pandemic (Saunders et al., 2021). Keeping up with these regular daily routines buffers the adverse mental health impact of major stressors (Miller and Rasmussen, 2010).

1.2. Coping resources

Apart from behavioral adjustment, coping resources could also have an important role in mental health during public health crises like COVID-19 (Benight and Bandura, 2004; Milman et al., 2020). Conservation of resources (COR) theory emphasized that personal, social, and material resources loss are key determinants of poorer psychological

adjustment in stress adaptation (Hobfoll, 2010). Specifically, adaptive personal coping resources have been suggested to lie within enhanced self-perceptions and positive changes in life perspectives (Zeidner and Saklofske, 1996). Self-efficacy and meaning making are known personal resources that buffer individuals of the adverse mental health impact of stressors (Blackburn and Owens, 2015). Self-efficacy refers to the belief in one's ability to handle difficult task (Bandura, 1992). Perceived ability to deal with stressful situations was consistently associated with lower odds of mental disorders across different samples and traumatic events (Schäfer et al., 2019). Previous evidence indicated that high perceived self-efficacy was associated with lower anxiety, depressive, and PTSD symptomatology among victims of sexual abuse (Guerra et al., 2018), lower severity of PTSD and depressive symptoms among veterans (Blackburn and Owens, 2015), and lower severe psychological distress among college students during COVID-19 pandemic (Yan et al., 2021).

Individuals' capability of reappraising stressors and assigning meanings to them can be seen as another important coping resource (Folkman and Moskowitz, 2007). Global meaning refers to beliefs that the individuals normally held on value and views about themselves and the world, whereas situational meaning refers to individuals' appraisal of the recent stressful event in relation to their proximal goal and well-being (Park and George, 2013). Psychological distress will be reduced if individuals could make a new situational meaning that matches with their global meaning (Park and George, 2013). Previous studies showed that meaning making efforts predicted better subsequent emotional and social well-being among cancer patients (Boehmer et al., 2007). Following the 9/11 terrorist attack, meaning making efforts were found to be positively associated with posttraumatic growth among residents in the United States ($n = 1004$) (Park et al., 2012). Meaning making was also associated with higher positive affect and lower negative affect among a German sample ($n = 665$) during widespread lockdown for COVID-19 (Saalwirth and Leipold, 2021).

1.3. Routines, resources, and mental health

Prior studies have indeed explored the links between daily livelihood, cognitive coping resources, and mental health (Lambert et al., 2019). Daily stressors have been found to reduce self-efficacy, which in turn, was associated with poorer mental health among a German population sample (Schönfeld et al., 2016). Performing leisure activity has also been shown to predict higher sense of coherence and lower depressive symptoms among a sample of 155 community-dwelling adults with a history of depression (Nagata et al., 2020). Involvement in social leisure activities has demonstrated a protective role against probable depression by inducing higher sense of time structure among individuals who were unemployed ($n = 406$) (Goodman et al., 2016). More specifically, the interrelations between regularizing daily routines and consolidating coping resources have been conceptualized and the potential role of regularizing daily routines in enhancing coping resources has been demonstrated across populations facing different forms of trauma (Hou et al., 2018). Addressing the importance of regularity, regular daily activities (e.g., eating and socializing) have been inversely associated with depressive symptoms through their positive association with sleep self-efficacy among a convenience U.S. sample ($n = 3284$) (Sabet et al., 2021). Giving the massive impact of COVID-19 on the lives of populations across the globe, there is a need for more robust empirical evidence on how daily routine disruptions impact coping resources and mental health over time.

1.4. The present study

This prospective cohort study aims to examine the nature of associations among daily routine disruptions, coping resources, and persistent probable mental disorders in a population-representative sample amid the COVID-19 pandemic. We hypothesized that daily routine disruptions in the acute phase of the pandemic will be associated with lower

subsequent coping resources and higher subsequent risk of persistent probable anxiety and depression. Coping resources will mediate the prospective associations between daily routine disruptions and persistent probable mental disorders, such that disrupted daily routines will predict lower self-efficacy and meaning making, which, in turn, will be associated with higher risk of persistent probable anxiety and depression (Fig. 1).

2. Material and methods

2.1. Respondents and procedure

This longitudinal study consisted of data collected between February and July 2020 (T1) and between March and August 2021 (T2). Telephone surveys ($n = 8063$) were conducted among Hong Kong Chinese (aged ≥ 15 years) at T1 (Supplementary Material 1). Respondents at T1 were randomly selected and contacted to participate in the 1-year follow-up survey (T2). Written or verbal informed consent was obtained at the beginning of the surveys and this study was approved by the Ethics Committee of the Education University of Hong Kong. Sampling procedure complied closely with another large-scale local prospective cohort study (Leung et al., 2017; Ni et al., 2017, 2020). The follow-up surveys were conducted online or through telephone interviews. Respondents received supermarket coupons with face value HKD100 (\approx USD13) for their participation. Differences in sociodemographic characteristics between T2 respondents and non-invited respondents were small. Detailed sampling information at T2 was summarized in Supplementary Material 2. The cooperation rate (completed/eligible respondents that were invited) and response rate (complied with prevailing accepted standards) of the T2 survey were 91.7% and 76.5%, respectively.

2.2. Measures

2.2.1. Daily routine disruptions

The levels of primary and secondary routine disruptions at T1 were measured using two items, one on healthy eating and sleep (primary routines) and one on socializing and leisure (secondary routines) from

the Sustainability of Living Inventory (SOLI) (Hou et al., 2019). Respondents rated each item on an 11-point scale ranging from 0 (no disruption) to 10 (high level of disruptions) based on their experiences during the past two weeks (Lai et al., 2020). In all statistical analyses, the levels of primary and secondary routine disruptions were recoded into high = 1 and low = 0 based on a median split (median scores: primary = 3 and secondary = 4.5).

2.2.2. Self-efficacy

The Chinese version of the short form, six-item General Self-Efficacy Scale (GSE-6) was used to assess respondents' belief about their ability in controlling stressful environment by taking adaptive action at T2 (Romppel et al., 2013). The items were extracted from the original 10-item version that has been validated and used with good reliability and validity among Chinese (Zeng et al., 2020; Zhang and Schwarzer, 1995). Respondents rated the six items on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree) by referring to their experience in the past month. Higher summed scores indicated higher levels of self-efficacy (range = 0–24). Alpha was 0.88 at T2 administration.

2.2.3. Meaning making

Meaning making at T2 was assessed using a combination of positive reinterpretation and growth subscale from the COPE (Carver et al., 1989; Yang, 2021) and emotional processing scale (Stanton et al., 2002; Tse et al., 2020) during the past month prior to the interview, which was frequently used in prior studies of meaning making (Park and George, 2013). The positive reinterpretation and growth subscale comprised four items on attempts to see the situation in a more positive way ($\alpha = 0.85$). The emotional processing subscale comprised four items referring to attempts to understand one's emotional reactions to situations ($\alpha = 0.90$). Respondents rated the eight items on a 4-point Likert scale ranging from 1 (not at all) to 4 (always). Higher summed scores indicated higher levels of meaning making. Alpha of the combined measure was 0.88 at current administration.

2.2.4. Persistent probable anxiety

Anxiety symptoms at T1 and T2 were assessed using the Chinese

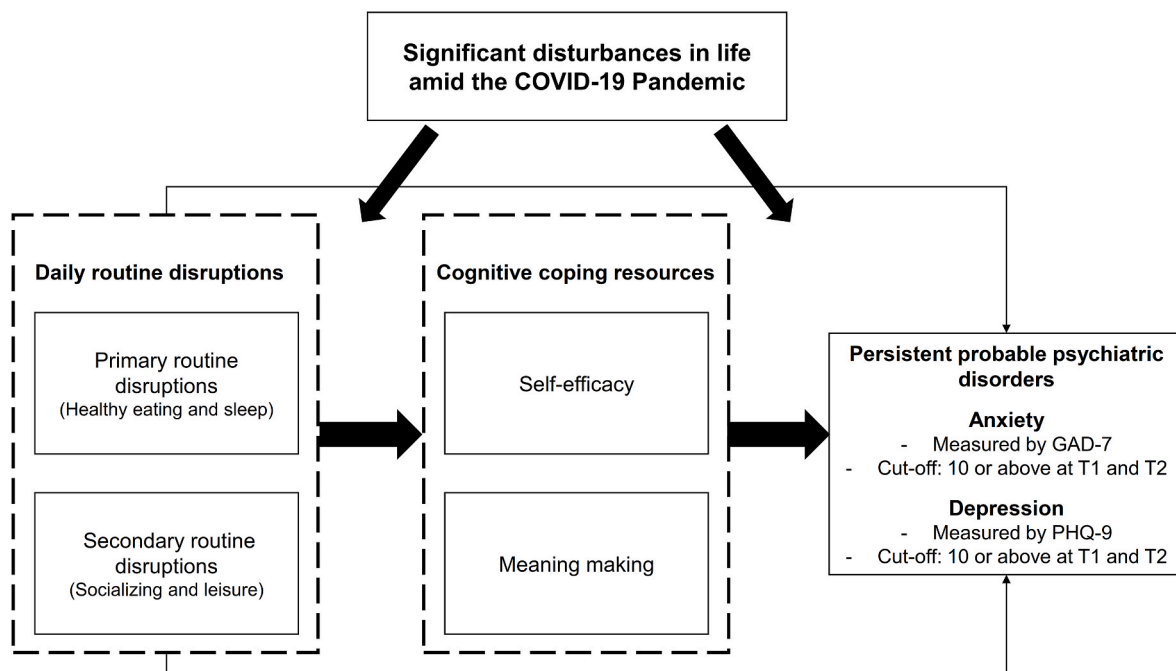


Fig. 1. Proposed mediation model of daily routine disruptions, cognitive coping resources, and persistent probable psychiatric disorders.

version of the 7-item Generalized Anxiety Disorder scale (GAD-7) (Huang and Zhao, 2020; Spitzer et al., 2006). Respondents rated each item on a 4-point Likert scale (0 = not at all, 1 = on several days, 2 = on more than half of the days, 3 = nearly every day) based on their experiences in the past two weeks. Higher summed scores indicated greater severity of anxiety symptoms (range = 0–21). The scores were recoded into 0 (scores = 0–9) or 1 (score = 10–21), with 1 indicating probable anxiety (Plummer et al., 2016). Persistent probable anxiety referred to the presence of probable anxiety at both T1 and T2. The measure showed high internal consistency (T1: $\alpha = 0.92$, T2: $\alpha = 0.94$) in the current sample and was found to be inversely correlated with self-rated physical and mental health across diverse populations (Spitzer et al., 2006).

2.2.5. Persistent probable depression

Depressive symptoms at T1 and T2 were assessed using the Chinese 9-item Patient Health Questionnaire (PHQ-9) (Yeung et al., 2008; Yu et al., 2012) on the same 4-point Likert scale and timeframe as GAD-7. Higher summed score (0–27) indicated greater severity of depressive symptoms. The total scores were recoded into 0 (scores = 0–9) or 1 (scores = 10–27), with 1 indicating probable depression (Levis et al., 2019). Persistent probable depression referred to the presence of probable depression at both timepoints. Alphas were 0.83 and 0.89 at T1 and T2, respectively. Considering the similarity in the items on daily activities in SOLI and PHQ-9, we have conducted sensitivity analyses by replicating all analyses with probable depression defined by the first two items of PHQ-9 (i.e., PHQ-2) with a validated cutoff score of 3 (Staples et al., 2019).

2.2.6. COVID-19 stress

COVID-19 stress was measured by six validated items addressing health and financial stress at T2 (Hou et al., 2021b). Respondents rated three items on perceived threat of life, long-term ill health, and treatment side-effect if they were infected with COVID-19 and three items on financial strain, income loss, and savings loss due to the pandemic on a 4-point Likert scale ranging from 1 (Strongly disagree) to 4 (Strongly agree). The summed scores of the six items ($\alpha = 0.81$) were recoded into high = 1 and low = 0 by median split (median score: 17).

2.2.7. Demographics

A standardized proforma was used to record respondents' age in years, gender, marital status, education level, employment status, and monthly household income.

2.3. Statistical analyses

All missing values (<1%) were replaced by multiple imputations. Logistic regression analysis was conducted to examine the associations of demographics, daily routine disruptions, and coping resources (i.e., self-efficacy and meaning making) with persistent probable anxiety (GAD-7 scores ≥ 10 at T1 and T2) and persistent probable depression (PHQ-9 scores ≥ 10 at T1 and T2). Three models for each outcome were constructed: (1) sociodemographics only, (2) demographics and daily routine disruptions, and (3) demographics, routine disruptions, and coping resources. Comparisons were made between the second and third models to examine any changes (typically attenuation) of ORs associated with daily routine disruptions that might suggest the potential mediating effects of coping resources on the associations between daily routine disruptions and the outcomes.

Path analysis was conducted to examine the mediating effects of coping resources in the associations between daily routine disruptions and persistent probable anxiety and depression, controlling for the effect of COVID-19 stress and the effects of the demographics that were correlated with the outcomes in the logistic regression. The 'lavaan' package in the R software environment was used with diagonally weighted least squares estimator. Model goodness-of-fit was assessed based on comparative fit index (CFI), Tucker-Lewis index (TLI),

standardized root mean square residual (SRMR), and root-mean-square error of approximation (RMSEA).

3. Results

3.1. Sample and prevalence

Demographic characteristics of the respondents ($n = 1318$) are summarized in Table 1. The prevalence of persistent probable anxiety (GAD-7) was 8.1% (95% CI = 6.6%–9.6%) and persistent probable depression (PHQ-9) was 10.0% (95% CI = 8.4%–11.6%) at two timepoints, one year apart, during the COVID-19 pandemic.

3.2. Logistic regressions

3.2.1. Persistent probable anxiety

Logistic regression showed that female (compared to male) was associated with 67.7% increased odds of persistent probable anxiety. Compared with respondents aged 15–24, ages 55 or above were associated with 67.6%–87.7% reduced odds of persistent probable anxiety. After including daily routine disruptions to the model, primary and secondary routines disruptions were associated with 231% and 206% increased odds of persistent probable anxiety respectively. After adding coping resources to the model, the effects of primary and secondary routine disruptions were slightly weakened but remained significant. A one-point increase in self-efficacy and meaning making was associated with 16.9% and 6.5% reduced risk of persistent probable anxiety. The results are summarized in Table 2. No sociodemographic factor was associated with persistent probable anxiety in Model 3. Therefore, no sociodemographic factor was included as covariates in subsequent path analyses.

3.2.2. Persistent probable depression

Logistic regression analysis showed that female (compared to male)

Table 1
Descriptive statistics of the current sample during March and August 2021 (T2) ($n = 1318$).

Variable	1 year follow-up (T2), March and August 2021 ($n = 1318$)	
	n	%
Gender		
Male	682	51.7
Female	636	48.3
Age		
15–24	216	16.4
25–34	296	22.5
35–44	259	19.7
45–54	186	14.1
55–65	167	12.7
65 or above	194	14.7
Marital status		
Married	649	49.2
Unmarried/divorced/widowed	669	50.8
Education level		
Tertiary or above	768	58.3
Secondary	467	35.4
Primary or below	83	6.3
Employment		
Employed	879	66.7
Dependent/Unemployed	439	33.3
Monthly household income (HK\$)^a		
\$80,000 or above	177	13.4
\$60,000–\$79,999	142	10.8
\$40,000–\$59,999	254	19.3
\$20,000–\$39,999	377	28.6
\$19,999 or below	368	27.9

^a US\$1 \approx HK\$7.80.

Table 2
Logistic regression examining the associations of daily routine disruptions, coping resources with persistent probable anxiety and depression.

Variable	Persistent probable anxiety ^a			Persistent probable depression ^b		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Gender						
Male	1.0	1.0	1.0	1.0	1.0	1.0
Female	1.68 (1.10–2.55)*	1.55 (1.01–2.38)*	1.47 (0.94–2.29)	1.71 (1.16–2.52)**	1.61 (1.08–2.40)*	1.47 (0.97–2.24)
Age						
15–24	1.0	1.0	1.0	1.0	1.0	1.0
25–34	1.07 (0.57–2.01)	1.07 (0.55–2.05)	0.93 (0.47–1.82)	1.11 (0.62–1.97)	1.16 (0.64–2.10)	1.03 (0.55–1.92)
35–44	1.00 (0.48–2.07)	1.13 (0.53–2.41)	1.07 (0.48–2.35)	1.01 (0.52–1.95)	1.18 (0.59–2.35)	1.11 (0.54–2.30)
45–54	0.54 (0.22–1.30)	0.78 (0.31–1.95)	0.70 (0.27–1.81)	0.43 (0.19–0.98)*	0.62 (0.26–1.48)	0.53 (0.21–1.31)
55–65	0.32 (0.12–0.86)*	0.46 (0.17–1.24)	0.46 (0.16–1.29)	0.16 (0.06–0.45)***	0.23 (0.08–0.64)**	0.22 (0.08–0.65)***
65 or above	0.12 (0.03–0.44)**	0.22 (0.06–0.81)*	0.27 (0.07–1.03)	0.09 (0.03–0.28)***	0.17 (0.05–0.55)**	0.20 (0.06–0.69)**
Marital status						
Married	1.0	1.0	1.0	1.0	1.0	1.0
Unmarried/divorced/widowed	1.03 (0.61–1.73)	0.96 (0.56–1.64)	0.83 (0.47–1.45)	1.37 (0.84–2.21)	1.29 (0.78–2.12)	1.12 (0.67–1.90)
Education level						
Tertiary or above	1.0	1.0	1.0	1.0	1.0	1.0
Secondary	1.07 (0.65–1.76)	0.97 (0.58–1.63)	0.91 (0.53–1.56)	1.91 (1.22–3.00)**	1.83 (1.13–2.95)**	1.82 (1.10–3.00)*
Primary or below	1.74 (0.49–6.19)	1.17 (0.32–4.24)	1.22 (0.32–4.59)	4.72 (1.55–14.36)**	3.35 (1.07–10.52)*	3.90 (1.19–12.80)*
Employment						
Employed	1.0	1.0	1.0	1.0	1.0	1.0
Dependent/unemployed	1.06 (0.63–1.77)	1.09 (0.64–1.86)	1.01 (0.58–1.76)	1.08 (0.67–1.74)	1.09 (0.66–1.80)	1.01 (0.60–1.71)
Monthly household income (HK\$)^c						
\$80,000 or above	1.0	1.0	1.0	1.0	1.0	1.0
\$60,000–\$79,999	0.66 (0.28–1.58)	0.64 (0.26–1.55)	0.67 (0.27–1.66)	0.60 (0.28–1.28)	0.59 (0.27–1.27)	0.62 (0.27–1.39)
\$40,000–\$59,999	1.04 (0.55–1.97)	0.97 (0.50–1.86)	0.91 (0.47–1.79)	0.60 (0.33–1.10)	0.55 (0.29–1.03)	0.51 (0.27–0.98)*
\$20,000–\$39,999	1.07 (0.57–1.99)	0.94 (0.50–1.79)	0.80 (0.41–1.54)	0.73 (0.42–1.28)	0.63 (0.35–1.12)	0.51 (0.28–0.95)*
\$19,999 or below	1.44 (0.68–3.01)	1.12 (0.52–2.39)	0.89 (0.40–1.96)	1.06 (0.55–2.06)	0.80 (0.40–1.60)	0.63 (0.30–1.31)
Daily routine disruptions						
Low primary routine disruptions	"	1.0	1.0	"	1.0	1.0
High primary routine disruptions	"	3.31 (1.80–6.07)***	2.92 (1.57–5.43)***	"	4.26 (2.35–7.72)***	3.87 (2.10–7.13)***
Low secondary routine disruptions	"	1.0	1.0	"	1.0	1.0
High secondary routine disruptions	"	3.06 (1.80–5.20)***	2.67 (1.55–4.60)***	"	2.56 (1.61–4.09)***	2.24 (1.38–3.65)**
Coping resources						
Self-efficacy	"	"	0.83 (0.77–0.89)***	"	"	0.79 (0.74–0.85)***
Meaning making	"	"	0.94 (0.88–0.99)*	"	"	0.97 (0.92–1.02)

Note: *p* values are 2 sided, **p* < 0.05, ***p* < 0.01, ****p* < 0.001.

Abbreviation: aOR: adjusted odds ratio; CI: confidence interval.

^a Persistent probable anxiety referred to scores of 10 or above in the 7-item Generalized Anxiety Disorder scale (GAD-7) in February and July 2020 (T1) and March and August 2021 (T2).

^b Persistent probable depression referred to scores of 10 or above in the 9-item Patient Health Questionnaire (PHQ-9) in February and July 2020 (T1) and March and August 2021 (T2).

^c US\$1 ≈ HK\$7.80.

was associated with 71.0% increased odds of persistent probable depression. Compared with respondents aged 15–24, ages 45 or above were associated with 57.0%–91.0% reduced odds of persistent probable depression. Having primary education and secondary education (compared with having tertiary education) were associated with 372% and 91% increased odds of persistent probable depression respectively. After including daily routine disruptions to the model, primary and secondary routine disruptions were associated with 326% and 156% increased odds of persistent probable depression. After adding coping resources to the model, the effects of primary and secondary routine disruptions were slightly weakened but remained significant. A one-point increase in self-efficacy scores were associated with 20.7% reduced risk of persistent probable depression. The results are summarized in Table 2.

Among all sociodemographics, age group, education level, and household income were significantly associated with persistent probable depression in Model 3. Therefore, age group, education level, and household income were included as covariates in subsequent path analyses.

3.3. Path analyses

The results of the path analyses are summarized in Table 3. The path model with the mediating effect of coping resources on the associations

between daily routine disruptions and persistent probable anxiety showed excellent goodness-of-fit (Fig. 2a). The effect of T1 primary routine disruptions on persistent probable anxiety was partially mediated by decreased self-efficacy at T2. The effect of T1 secondary routine disruptions on persistent probable anxiety was partially mediated by decreased self-efficacy. The direct effect from primary and secondary routine disruptions to persistent probable anxiety remained significant after controlling for self-efficacy and meaning making. Based on this model, 15.3% of the effects of T1 daily routine disruptions (all indirect paths) on persistent probable anxiety was mediated by T2 decreased coping resources.

In addressing persistent probable depression, another path model also achieved excellent goodness-of-fit (Fig. 2b). The effect of T1 primary routine disruptions on persistent probable depression was partially mediated by decreased self-efficacy at T2. The effect of T1 secondary routine disruptions on persistent probable depression was partially mediated by decreased self-efficacy and at T2. The direct effect from primary and secondary routine disruptions to persistent probable depression remained significant after controlling for self-efficacy and meaning making. Based on this model, 13.1% of the effects of T1 daily routine disruptions on persistent probable depression was mediated by decreased T2 coping resources.

Logistic regression and path analysis addressing persistent probable depression were replicated by using PHQ-2 (≥3), which shows high

Table 3

Path analysis examining the association of daily routine disruptions with persistent probable anxiety and depression mediated by coping resources.

Outcome	Direct/Indirect effect	Direct/Indirect effect β (95% CI)
Persistent probable anxiety ^a	Primary routine disruptions	0.218 (0.107, 0.329) ***
	Secondary routine disruptions	0.200 (0.094, 0.307) ***
	Primary routine disruptions → Self-efficacy	0.034 (0.014, 0.054) **
	Primary routine disruptions → Meaning making	0.010 (−0.004, 0.023)
	Secondary routine disruptions → Self-efficacy	0.028 (0.009, 0.046) **
	Secondary routine disruptions → Meaning making	0.005 (−0.003, 0.012)
	Primary routine disruptions	0.253 (0.146, 0.360) ***
Persistent probable depression ^b	Secondary routine disruptions	0.167 (0.070, 0.265) **
	Primary routine disruptions → Self-efficacy	0.024 (0.005, 0.043)*
	Primary routine disruptions → Meaning making	0.004 (−0.006, 0.014)
	Secondary routine disruptions → Self-efficacy	0.033 (0.013, 0.052) **
	Secondary routine disruptions → Meaning making	0.002 (−0.003, 0.008)

Note: *p* values are 2 sided, **p* < 0.05, ***p* < 0.01, ****p* < 0.001.

Abbreviation: CI: confidence interval.

^a Persistent probable anxiety referred to scores of 10 or above in the 7-item Generalized Anxiety Disorder scale (GAD-7) in February and July 2020 (T1) and March and August 2021 (T2).

^b Persistent probable depression referred to scores of 10 or above in the 9-item Patient Health Questionnaire (PHQ-9) in February and July 2020 (T1) and March and August 2021 (T2).

consistency with the main findings of PHQ-9 (Supplementary Material 3–5).

4. Discussion

This study examined the associations of daily routine disruptions, coping resources, and persistent probable anxiety and depression amid COVID-19. Consistent with our expectation, daily routine disruptions in the acute phase of the pandemic (T1) predicted lower coping resources at 12-month follow-up (T2) and higher risk of persistent probable anxiety and depression at two time points during the pandemic. Path analyses further showed that primary and secondary routines were associated with persistent probable anxiety and depression directly and indirectly through reducing self-efficacy.

The prevalence of persistent probable anxiety (8.1%) and depression (10.0%) in this study was comparable to the prevalence (anxiety: 10.3%, depression: 13.3%) documented in a 6-month longitudinal study conducted among 437 Austrian people between April 2020 and September 2020 (Pieh et al., 2021). The larger sample size and 1-year follow-up interval in the current study may capture a reliable condition on persistent probable psychiatric disorders in a longer span amid the ongoing COVID-19 pandemic in Hong Kong. Our prevalence of persistent probable depression was relatively lower than the 20.3% documented in a 1-year longitudinal study conducted among 1139 U.S. adults in Spring 2020 and Spring 2021 (Ettman et al., 2022). Hong Kong had remained stable and low incidence rates during the surveys period, showing possibly less adverse impact from COVID-19 pandemic on mental health conditions.

Our analyses suggest that sustenance of regular daily routines could have potential benefits on enhancing cognitive adaptation, particularly increase self-efficacy and meaning making, and in turn contribute to adaptive adjustment, supplementing previous studies that could be

limited by the focus on specific routines (e.g., leisure or exercising), generic difficulties in daily life and/or convenient samples. We assessed validated categories of primary routines (i.e., eating and sleeping) and secondary routines (i.e., socializing and leisure activities), and more specifically disruptions to the regularities of them. Our findings were generated from a prospective population-representative cohort, which aids inference of the predictive utility of daily routine disruptions on cognitive dimensions of coping resources and persistent probable psychiatric conditions, and were contextualized within the current COVID-19 pandemic, which is affecting the lives of most if not all populations around the world.

COVID-19-related quarantine and social distancing policies prevent most of us from performing usual day-to-day tasks as simple as shopping for groceries, meeting family and friends, and going to work (Vindgaard and Benros, 2020). Previous studies have found that persons who attempted to keep daily routines during the lockdown reported lower levels of stress, depressive symptoms (Lau et al., 2021), but relatively less is known about whether different types of daily routines are differentially related to coping and mental health. The current findings on the links between primary routine disruptions in the acute phase of COVID-19 and subsequent poorer adjustment were consistent with previous theoretical and empirical evidence on the detrimental impact of circadian rhythm disruptions on both physical and mental health (Hepsomali and Groeger, 2021). In addition, our findings point to the important role of sustaining regular secondary daily routines (i.e., socializing and leisure), consistent with empirical evidence on the benefit of participating in social and leisure activities on lowering stress levels and promoting health across different populations in the current pandemic (Ellis et al., 2020; Meier et al., 2021). The current findings are also relevant for predicting other short-term psychiatric conditions such as adjustment disorder, which could be closely related to the daily living of populations affected by large-scale disasters (Liang et al., 2021).

A large body of evidence is available to show that psychological resilience amid stressful conditions could be attributable to the links between different resources and mental health outcomes (Hobfoll, 2010). Initial resource change will also predict future resources gain or loss, with which resource loss could result in a downward spiral of resources and associated mental health problems (Hobfoll, 2010). In line with previous studies (Saalwirth and Leipold, 2021; Schäfer et al., 2019), we found that personal coping resources, namely self-efficacy and meaning making, were associated with better behavioral and psychological functioning.

More importantly, the present study is among some of the first to examine the potential mediating effect of cognitive coping resources between different daily activities and mental health (Goodman et al., 2016; Nagata et al., 2020; Sabet et al., 2021; White et al., 2009). Traumatic and stressful life events could change individuals' ordinary assumptions of the world, and the way of life that they were pursuing prior to the disaster will be violated and altered (Antonovsky, 1987; Janoff-Bulman, 1992). The loss of predictability and control over everyday life events could be one of the significant factors that predispose poorer psychological functioning in face of traumatic events (Zautra et al., 1990). Structured daily routines can be linked to individuals' perceived abilities and their effective time management in life, and these factors are associated with better mental health (White et al., 2009). There is evidence showing that individuals with psychiatric histories perceive their lives as predictable, ordered, and controllable when they are able to maintain regular daily routines or structures, resulting in better psychological well-being and life satisfaction (Eklund et al., 2010). Taken together with the current findings, we suggest that sustenance of daily routines could minimize discrepancies between individuals' assumptions of the world and their personal experiences and make life more predictable, ordered, and controllable during COVID-19. Such positive cognitive adaptation was reflected in higher self-efficacy and meaning making, which also contribute to lower risk of persistent psychiatric conditions.

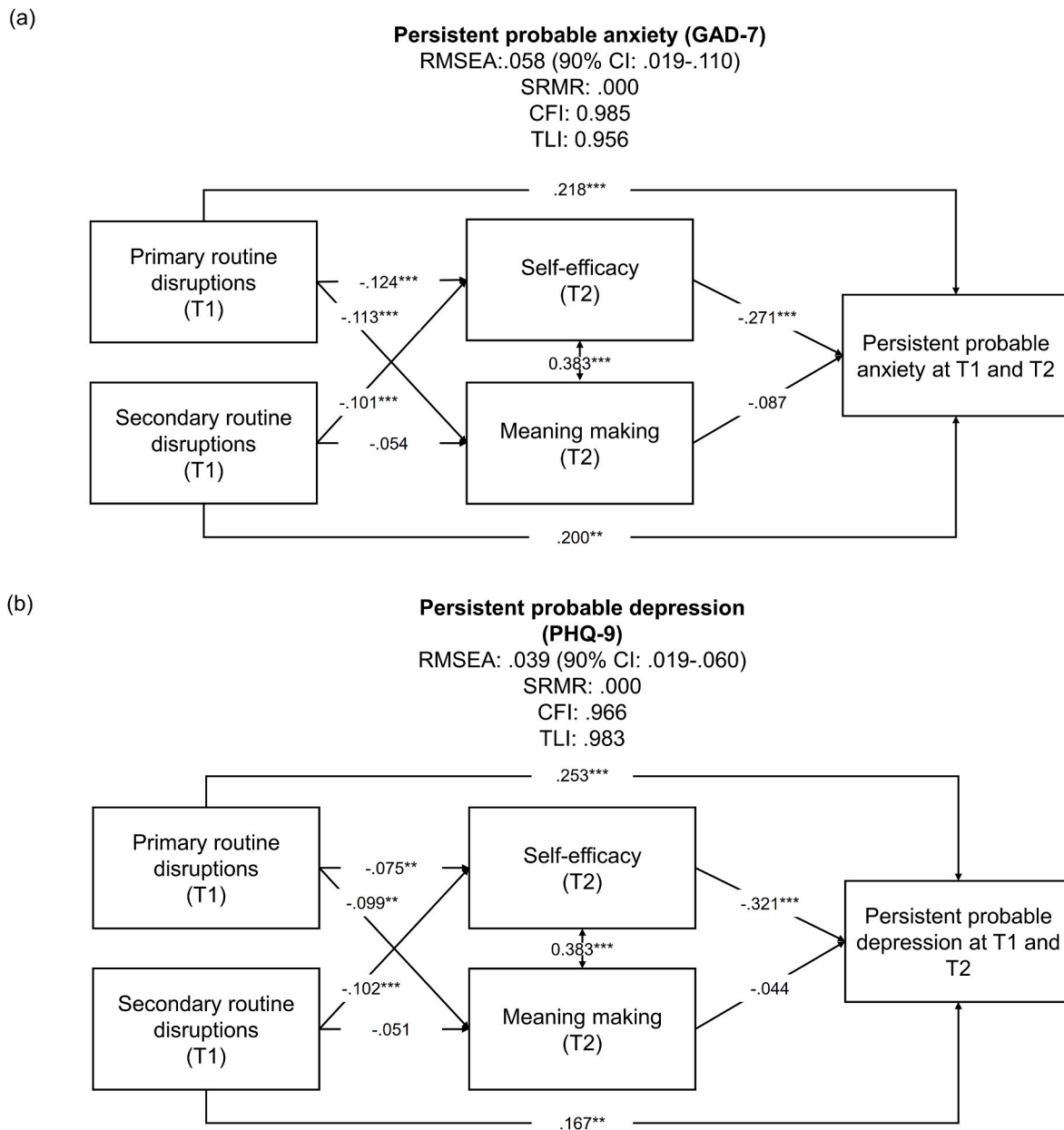


Fig. 2. Path models illustrating the mediation processes of daily routine disruptions on persistent probable (a) anxiety (GAD-7) and (b) depression (PHQ-9) through lesser cognitive coping resources amid the COVID-19 pandemic. Note: *p* values are 2 sided, **p* < 0.05, ***p* < 0.01, ****p* < 0.001.

Several limitations warranted cautions. First, we used self-report instruments instead of a diagnostic clinical interview to assess persistent clinical anxiety and depression, due to the fact that clinical interview for a large population sample is not feasible during the pandemic. GAD-7 and PHQ-9 have been well-validated and widely used in different Chinese populations and thus could provide acceptable accuracy for initial population screening (Levis et al., 2019; Plummer et al., 2016). Second, there are other resources (i.e., social and material resources) that could be closely related to daily routine disruptions and mental health outcomes, but due to the current research focus we only assessed personal resources. Third, coping resources and persistent probable mental disorders were assessed at the same time point (T2) with a theoretically determined direction of association from resources to outcomes. However, it seems less likely that anxiety and depressive symptoms could drive or limit exposure to resources (Hobfoll, 2010).

Our study offers some of the first prospective findings on the interrelations between daily routine disruptions, coping resources, and

persistent probable psychiatric disorders during COVID-19 pandemic. Major stressful events could induce huge societal uncertainties and result in massive mental health tolls in the population. Behavioral adjustment interventions have been found to cultivate more coping resources and alleviate symptomatology among psychiatric patients (Goldin et al., 2012; Marco et al., 2021). We suggest that population-based intervention is needed to foster sustainment of regular daily routines with the ultimate goals of reducing clinically significant mental health problems and restoring meaningful and efficacious living amid public health crises.

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Author statement

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jpsychires.2022.05.033>.

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