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Managing Uncertainty and Loneliness: Protective and Risk Factors Impacting on Older People's Mental Health in Hong Kong

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ABSTRACT

This study investigated the roles of loneliness and prospective intolerance of uncertainty (IU-P) on mental health, and identified the sources of stress and joy during the COVID-19 in Hong Kong. Two thousand two hundred and fifty-eight older adults completed the survey. Older adults who had higher levels of loneliness and IU-P were more likely to have poor mental health. IU-P was found to partially and positively mediate the relationship between loneliness and mental health. Top stressors were contracting the virus, uncertainty about the future, and loneliness; while family/friends, peace of mind, and hobbies were identified as protective factors.

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Introduction

The COVID-19 pandemic in Hong Kong

The coronavirus disease 2019 (COVID-19) pandemic severely affected the mental health of older adults. In Hong Kong, psychogeriatric admissions increased by 21.4% after the initial outbreak (A. T. C. Lee et al., 2020). Local older adults experienced both loneliness and depression during the early waves of the pandemic (Cheung et al., 2022; Sit et al., 2022). In March 2022, the pandemic situation in Hong Kong was deteriorating rapidly and the highest number of COVID-19 cases in a single day was recorded (76,991 on March 3; Hong Kong SAR Government, 2022). Approximately 300,000 people were under quarantine. Older adults were affected the most: more than 90% of deaths during this period occurred in people aged 65 years or above (Hong Kong SAR Government, 2022). In response to the rising number of COVID-19 cases, local governments implemented different policies to prevent

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the spread of the virus. Studies around the world, however, have shown that these preventive measures had complex and sometimes unintended outcomes, such as spreading fear of COVID-19 (Pakpour et al., 2021), an increase in daily cases and mortality during lockdown (Prasiska et al., 2022), and the inevitable social isolation due to social distancing.

Loneliness, intolerance of uncertainty, and mental health

Due to the negative psychological impacts of COVID-19, numerous studies have been undertaken to understand the specific factors affecting the mental health of older adults during the pandemic (e.g., Greenblatt-Kimron et al., 2021; Manalang Vicerra, 2022; Mistry et al., 2021). Among these, studies on Chinese older adults have found that sociodemographic factors, such as gender and household income, may have affected depression or anxiety during the pandemic (Lu et al., 2023; Zhou et al., 2021). However, a review of mental health correlates during the pandemic concluded that the effects of some sociodemographic factors, such as age, are inconsistent in the literature (Vindegaard & Benros, 2020). Besides exploring the impacts of sociodemographic variables, many of these studies have focused on the role of loneliness, a state of subjective social isolation (Hawkley & Cacioppo, 2010), and its influence on the mental health of older adults during the social distancing measures and lockdowns. A review by Bhutani and Greenwald (2021) reported that many longitudinal studies found an increased level of loneliness in older adults during the pandemic. This was consistent with a study conducted in Hong Kong (Wong et al., 2020) that reported that older adults from primary care settings experienced an increased level of loneliness after the pandemic outbreak. In addition, studies of loneliness in older adults have demonstrated its negative impacts on their mental health, with outcomes such as depression, anxiety (Creese et al., 2021), and hypochondriasis (Barnett et al., 2019). Given the detrimental effects of loneliness on mental health, the elevated levels of loneliness found during the pandemic were concerning.

In addition, an increasing number of studies have investigated the role of intolerance of uncertainty (IU) in mental health. IU, defined as "fear of the unknown," has traditionally been regarded as a prominent risk factor for general anxiety disorder (Carleton, 2012, p. 937). According to Carleton et al. (2007), IU consists of two dimensions: prospective anxiety, which reflects individuals' worry about the future, and inhibitory anxiety, which reflects the behavioral paralysis experienced when confronted with uncertainty. Recent developments in IU research have revealed its transdiagnostic role for a wide range of mental disorders, including posttraumatic stress disorder (Oglesby et al., 2016) and depression (Carleton et al., 2012). A study in Hungary discovered that the level of IU had a negative impact on the mental health of older adults during the pandemic, increasing their anxiety and depression and

reducing their well-being (Lábadi et al., 2022). Similarly in Greece, Parlapani et al. (2020) demonstrated the positive association between IU and loneliness in older adults.

Although loneliness, IU, and mental health appear to be related, only a few studies have examined the co-occurring relationship between these three variables. Barnett et al. (2019) found that IU acted as a mediator of the relationship between loneliness and hypochondriasis in older adults (n = 280) prior to the pandemic. During the pandemic, Gu et al. (2021) proposed a similar mediation model in which both IU and sleep quality mediated the relationship between loneliness and mental health, as measured by levels of depression, anxiety, and stress. The proposed model was supported by the data collected from participants mostly aged between 18 and 30 years (n = 302). Both of the latter studies stated that loneliness might activate the threat response system, which further impairs individuals' ability to tolerate uncertainty. The increased IU could then contribute to the heightened risk of mental disorders (i.e., hypochondriasis; Barnett et al., 2019) and more negative mental health symptoms (Gu et al., 2021).

The mechanism by which loneliness indirectly leads to poor mental health through IU is in line with the Transactional Model of Stress and Coping (TMSC; Lazarus & Folkman, 1984). The TMSC emphasizes the roles of cognitive appraisal and coping in the interpretation of stressors. Lonely individuals, who have few coping resources due to the lack of perceived high-quality relationships, are prone to developing cognitive biases, such as IU. In other words, the lack of coping resources in lonely individuals intensifies their fear of the unknown. Consequently, increased IU could lead to a heightened appraisal of stress and, eventually, worsened mental health. However, the mediating role of IU in the relationship between loneliness and mental health has not been tested in a large sample of older adults.

Sources of stress and Joy

Besides the roles of loneliness and IU in mental health, understanding both the sources of stress and joy and their impacts on older adults' mental health is important to inform targeted mental health interventions. According to the TMSC (Lazarus & Folkman, 1984), the perceived stress level is the product of both environmental stressors and individual coping. Several studies conducted during the pandemic revealed that older adults encounter different types of stressors in addition to loneliness (Heid et al., 2021; Whitehead & Torossian, 2021; Zhang et al., 2022). In Hong Kong, Zhang et al. (2022) measured eight COVID-19-related stressors experienced by older adults during the most severe wave of the pandemic. They found that the main stressors were related to fear of infection and to the focus on the well-being of others, e.g., fear that their own infection would affect family members and concern about their

families and friends becoming infected. Although Zhang et al. (2022) provided insights into the major stressors experienced by older adults, these stressors were limited by the use of a scale with only eight items, and the resilience factors in this population were overlooked. A study conducted in Hong Kong after the SARS epidemic revealed some positive changes that protected individuals from SARS-related stress, such as caring more about the feelings of family members (Lau et al., 2006).

Guided by the TMSC framework, a mixed method study by Whitehead and Torossian (2021) explored the sources of both stress and joy among older adults in the U.S. during the rise of the pandemic. The qualitative findings revealed that the most frequently reported stressors were all pandemic-related, and the most frequently reported sources of joy were from the social interaction and distraction categories. The authors recommended adopting mindfulness practices to alleviate the distress induced by physical restrictions and noted that digital communication would help to reduce feelings of loneliness. Nevertheless, these findings may not be directly applicable to practice in Hong Kong, as what are considered stressors and joys may vary across individuals and cultural contexts. A timely investigation of sources of stress and joy in Hong Kong is thus required to guide the implementation of mental health interventions in the local context.

Practice-based research to inform social work practice

The rapid increase in COVID-19 cases in March 2022 prompted a local nongovernmental organization (NGO), the Hong Kong Lutheran Social Service, to collaborate with the university to generate updated mental health profiles of the older adult service users to measure their mental health and the impact of the pandemic on their overall well-being. This is an example of what Dodd and Epstein (2012) referred to as practice research, where social work practitioners collaborate with researchers to understand more about a phenomenon or process that is taking place in a practice setting. The ultimate goal of practice-based research is to inform social work professionals about possible solutions to the problems encountered in a practice setting (Dodd & Epstein, 2012). This collaboration allowed a large number of community-dwelling older adults to participate in a research project that would document the mental health of older adults in Hong Kong. In the present study, we aimed to understand the mental health situation of older adults in Hong Kong; clarify the relationship between mental health, IU, and loneliness; and explore the roles of sociodemographic factors in this context. We were also interested in identifying stressors and protective factors among older people in Hong Kong and their impacts on mental health.

Specifically, as the literature has repeatedly reported the negative effects of IU and loneliness on the mental health of older adults (e.g., Barnett

et al., 2019; Creese et al., 2021), we hypothesized that (1) IU and loneliness would predict poor mental health. Even more importantly, as loneliness have been found to activate the threat response system and impair individuals' ability to tolerate uncertainty (Barnett et al., 2019; Gu et al., 2021), we hypothesized that (2) IU would mediate the relationship between loneliness and mental health. Finally, following the TMSC framework, we hypothesized that (3) the identified stressors and coping strategies would be positively and negatively associated, respectively, with mental health problems in older adults.

Materials and methods

Participants

The planned sample size was 2,000 older adults, as this would provide reliable results within a 3% margin of error at a 95% confidence interval for the older adult population in Hong Kong (2,065,316 adults aged 60 years or above; Census and Statistics Department, 2022). The Institutional Review Board of the authors' university granted ethical approval for this study (approval number: HSEARS20220131001).

To reach a large number of older adults during the pandemic, data were collected via a telephone survey by a local NGO. The telephone survey method allowed us to overcome the barriers imposed by social distancing policies and obtain valuable responses during a turbulent wave of the pandemic without the risk of infection. The collaborating NGO offers comprehensive services to various populations. Its Elderly Centre Division collected the data for this project. This NGO aims to provide holistic elderly services for people aged 60 or above, their caregivers, and the community at large. These services include the provision of information and referrals, volunteer programs, counseling, and social and recreational activities. Members must be 60 years old or above. In May 2022, the NGO had 3,504 members, and the participants for this project were selected from this pool of members. As of May 2024, this NGO had 4,215 members. Qualified caseworkers at the NGO invited its members to participate in the current research during their membership renewal. Verbal informed consent for participation and use of their data for research was obtained at the beginning of the telephone survey.

The inclusion criteria were as follows: aged 60 years or above, able to speak Cantonese, and able to provide verbal informed consent. Data were collected between March 10 and May 31, 2022. We approached 3,035 individuals, of whom 2,258 met the inclusion criteria and gave informed consent for their data to be used for research (74% response rate).

Measurements

Brief psychiatric symptom rating scale (BSRS-5)

The participants' mental health condition was assessed using the BSRS-5, which includes six questions. The first five items examine psychiatric symptoms, namely depression, anxiety, hostility, interpersonal sensitivity, and sleep disturbance, and are scored from 0 (*not at all*) to 4 (*extremely*). The last item is an additional risk-assessment question for case management and was therefore not included in the official scoring of this scale. In this study, the total score was computed by summing up the individual scores for the first five items. A score of 6 or above indicated poor mental health (W.-J. Chen et al., 2009; M. B. Lee et al., 2003). The BSRS-5 has been demonstrated to have good reliability (Cronbach's alpha = .84; H. C. Chen et al., 2005) and concurrent validity (validity coefficients = .87 to .95; M. B. Lee et al., 2003). Its brevity and original development in Traditional Chinese suited the current sample and study. Cronbach's alpha for the BSRS-5 in the present study was .76.

Sources of stress and Joy

The sources of stress and joy were assessed using two open-ended questions:

(1) What did you find most challenging or stressful this week?
(2) What brought you joy or comfort this week?

Prospective intolerance of uncertainty (IU-P)

The prospective component of IU was assessed using a single item (i.e., "Do you worry about the future?") and rated on a 4-point Likert scale from 0 (*never*) to 3 (*always*) (Rosen & Knäuper, 2009).

Loneliness

Loneliness was assessed using a single question (i.e., "Do you feel lonely?") and rated on a 4-point Likert scale from 0 (*never*) to 3 (*always*) (Iecovich, 2013). This single-item measurement of loneliness has been found to be as reliable and valid as multi-item scales (Mund et al., 2023).

Other variables

Demographic information on gender, age, marital status, education level, occupation, income, and receipt of social security assistance (i.e., receipt of means-tested benefits such as assistance from the Comprehensive Social Security Assistance Scheme and Old Age Living Allowance) was also collected at the end of the survey.

Data analysis

SPSS (version 26) was used to perform the data analysis. Descriptive statistics were computed to understand the participants' mental health condition, as well as their stress and joy (in terms of the nature and number of their sources). A cutoff score ≥ 6 for the BSRS-5 total score was considered to indicate poor mental health and scores < 6 indicated good mental health. The BSRS-5 outcome was then treated as a dichotomous variable when testing the hypotheses. For hypothesis 1, logistic regression analysis was performed to examine the effects of loneliness and IU-P on the BSRS-5 outcome (good/poor mental health). The roles of sociodemographic factors were also entered as predictors to explore their potential effects. To test hypothesis 2, mediation analysis was performed using PROCESS macro (Hayes, 2022) Model 4 with 5,000 bootstrap estimates to study the mediating role of IU-P in the relationship between loneliness and the BSRS-5 outcome (good/poor mental health). Consistent with the logistic regression analysis, the outcome variable (BSRS-5) was treated as the dichotomous variable in the mediation analysis. Finally, to test hypothesis 3, a logistic regression analysis was performed to study the association of sources of stress and joy with the BSRS-5 outcome (good/poor mental health).

Codes for sources of stress and joy were determined based on the categories from a recent qualitative study on older adults' experiences of the pandemic (Whitehead & Torossian, 2021, e.g., sources of stress: concern for others; sources of joy: contact with family/friends). The data collectors (i.e., the NGO caseworkers) received onsite training in coding and supervision from the researchers DKSK, WWYL, and KKSC. When there was any doubt about the categorization, the "others" option was chosen by the data collector and the participant's verbal response was transcribed verbatim. The whole process was trialed during a pilot stage before the official data collection for this project commenced. The quotations in the "others" category were then coded by a research assistant, and the coding was cross-checked by ZCKT and YC. Discrepancies were resolved through discussions between ZCKT and YC. YC has a degree in social sciences and has managed and published other studies on COVID-19 experiences, including a qualitative paper on aging (Siu et al., 2022).

Results

Participants

The demographic characteristics of the 2,258 participants were as follows: 42.4% were aged 70–79 years ($M = 74.8$, $SD = 8.09$); 78.7% were female; 53.4% were married or living together; 56.9% had an education level of primary or below; 84.1% were retired, unemployed, or students; 54.2% had social security assistance; and 68.7% had a monthly income in the range of HK

$1–$10,000. In addition, 14.2% had a BSRS-5 score of 6 or above, indicating poor mental health (Table 1).

Table 1. Demographic and state of mental health (total $N = 2,258$).

		M	*SD*	*n*	% (of valid cases only)
Age		74.8	8.09		
	60-69			646	28.8
	70-79			950	42.4
	80-89			554	24.7
	90-100			93	4.1
	Missing			15	–
Gender					
	Male			480	21.3
	Female			1771	78.7
	Missing			7	–
Marital status					
	Married, or living together			1197	53.7
	Single, widowed, or divorced/ separated			1031	46.3
	Missing			30	–
Education					
	Primary school or below			1280	57.4
	Secondary school			815	36.6
	College or above			134	6.0
	Missing			29	–
Social Security Assistant					
	Yes			1204	54.2
	No			1019	45.8
	Missing			35	–
Occupation					
	Full-time, part-time, or self-employed			92	4.1
	Retired, unemployed, or student			1886	84.1
	Housemaker			265	11.8
	Missing			15	–
Monthly income					
	No income			571	26.6
	$1 -10,000			1475	68.7
	$10,001 or above			100	4.7
	Missing			112	–
BSRS-5		2.69	2.86		
	Good			1916	85.8
	Poor			316	14.2
	Missing			26	–
Loneliness		0.58	0.87	2250	
Prospective Intolerance of Uncertainty		0.46	0.78	2251	

BSRS-5 = Brief Symptom Rating Scale.

IU-P

Logistic regression (Table 2, $n = 2,038$) was performed to investigate the potential predictive effects of sociodemographic factors, loneliness, and IU-P on the BSRS-5 outcome (good/poor mental health). Assumption

Table 2. Logistic Regression on BSRS-5 score (7 demographic variables, loneliness, and prospective intolerance of uncertainty as predictors, $N = 2{,}038$).

						95% C.I. for OR	
		Wald	*df*	*p*	OR	Lower	Upper
Age		1.979	1	0.160	0.986	0.967	1.006
Gender	**Female (vs. Male)**	**3.838**	**1**	**0.050**	**1.493**	**1.000**	**2.230**
Education		3.963	2	0.138			
	Secondary school (vs. primary school or below)	3.962	1	0.047	0.718	0.519	0.995
	College or above (vs. primary school or below)	0.262	1	0.609	0.837	0.423	1.655
Marital Status	**Married, or living together (vs. single, widowed, or divorced/separated)**	**5.459**	**1**	**0.019**	**1.445**	**1.061**	**1.967**
Work Status		5.343	2	0.069			
	Retired, unemployed, or student (vs. full-time, part-time, or self-employed)	0.826	1	0.364	1.541	0.606	3.918
	Housemaker (vs. full-time, part-time, or self-employed)	2.787	1	0.095	2.327	0.863	6.272
Income		1.111	2	0.574			
	$1 10,000 (vs. no personal income)	0.478	1	0.489	1.137	0.790	1.635
	$10,001 or above (vs. no personal income)	0.375	1	0.540	0.768	0.330	1.788
Social Security Assistant	Yes (vs. no)	0.105	1	0.746	1.055	0.761	1.464
Loneliness		**94.658**	**1**	**<0.001**	**2.149**	**1.842**	**2.507**
Prospective Intolerance of Uncertainty		**47.017**	**1**	**<0.001**	**1.763**	**1.499**	**2.074**
Constant		7.314	1	0.007	0.092		

BSRS-5 = Brief Symptom Rating Scale.

tests, including tests of multicollinearity and linearity of the logit, were performed and indicated no concern. The results of the logistic regression indicated that the model was statistically significant, $\chi^2(12) = 296.64$, $p < .001$, Nagelkerke $R^2 = .242$. The Hosmer and Lemeshow test result was nonsignificant, $\chi^2\ (8) = 14.57$, $p > .05$, which indicated a good model fit.

The results supported our first hypothesis. Feeling lonely (OR = 2.149, $p < .001$), and having a higher level of IU-P (for every one unit increase in IU-P, OR = 1.763, $p < .001$) were associated with poor mental health. In addition, as an exploration into possible effects of demographic factors, it was also found that being female (vs. male, OR = 1.493, $p = .05$), being married or living together (vs. single, widowed, or divorced/separated, OR = 1.445, $p = .019$) were associated with poor mental health.

IU-P as a mediator of the relationship between loneliness and poor mental health

Table 3 shows the results of the mediation analysis. As depicted in Figure 1, loneliness was directly and significantly associated with an increased likelihood of poor mental health (path c': $B = 0.71$, $p < .001$, 95% CI [0.57, 0.85]).

Table 3. The mediation effect of IU on the relationship between loneliness and poor mental health.

		Bootstrap Estimate				95% C.I. of *B*	
Pathway		*B*	*SE*	*t or z*	*p*	Lower	Upper
Outcome: BSRS-5 (Binary)							
c′	(Direct effect)	.71	.07	9.78	<.001	0.57	0.85
a	(loneliness ➔ IU-P)	.43	.02	25.96	<.001	0.40	0.47
b	(IU-P ➔ BSRS-5)	.58	.08	7.57	<.001	0.43	0.73
ab	(Indirect effect)	.25	.04			0.18	0.33

Note. BSRS-5 = Brief Symptom Rating Scale. *B* = unstandardized coefficient.

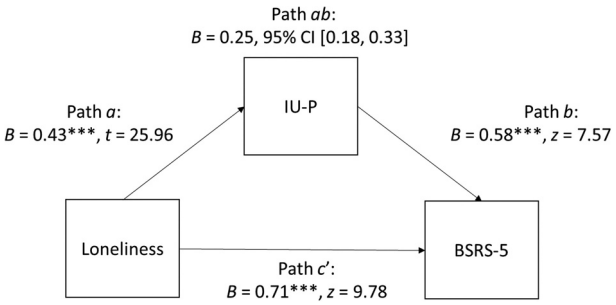

Figure 1. The mediation model of prospective intolerance of uncertainty on the relationship between loneliness and poor mental health. Note. IU-P = Prospective Intolerance of Uncertainty. BSRS-5 = Brief Symptom Rating Scale (Binary: Good/Poor mental health). *B* = unstandardized coefficient. IU-P partially mediated the relationship between loneliness and poor mental health. *** $p < .001$

Additionally, loneliness had an indirect effect on poor mental health through IU-P (path *ab*: $B = 0.25$, 95% CI [0.18, 0.33], does not include zero, suggesting a significant effect). In other words, IU-P partially mediated the relationship between loneliness and poor mental health, supporting our second hypothesis. To ensure that the results of the mediation analysis were not attributable to the dichotomous coding of the BSRS-5 outcome, the same analysis was performed using the BSRS-5 outcome as a continuous variable, and similar relationships were observed.

Sources of stress and Joy

Sources of Stress

Of the total participants, 78.3% reported at least one source of stress, and the majority of them (54.6%) reported multiple stressors. The most frequently reported sources of stress were restriction/confinement (35.8%; e.g., "can't go out for tea with friends" and "can't travel"), concerns for others (35.8%; e.g., "worried about family's health" and "concerned about hospitalized husband"), getting/preventing virus (32.7%; e.g., "worried about getting infected" and "physical condition weakened because of post-infection sequelae"), an

unknown future (26.7%; e.g., "when will the pandemic end" and "uncertain when we will be able to live a normal life"), and isolation/loneliness (25.5%, "living alone" and "no social interaction").

Sources of Joy

Regarding the sources of joy, 92.9% of the participants had at least one source of joy. The most frequently reported sources of joy were family/friends (57.8%; e.g., "children call every day to show their care" and "having a husband's company"), peace of mind (45.1%; e.g., "feeling calm and peaceful at home" and "feeling grateful that children can go to work normally"), hobbies/entertainment (36.7%; e.g., "surfing the Internet" and "watching TV"), nature (28.1%; e.g., "hiking" and "going to the park"), and digital interaction (15.1%; e.g., "social media, e-mail, and text messages"). Notably, 7.1% of the participants indicated that they had no source of joy.

Correlates of psychiatric symptoms: sources of stress and Joy

A logistic regression (Table 4, $n = 2{,}232$) was performed using the five most frequently reported sources of stress (restriction/confinement, concerns for others, getting/preventing virus, unknown future, and isolation/loneliness) and joy (family/friends, peace of mind, hobbies/entertainment, nature, and digital interaction) to predict the BSRS-5 outcome (good/poor). Multicollinearity was not a concern, as indicated by its assumption test. The logistic model was significant, χ^2 (10) = 179.02, $p < .001$, Nagelkerke $R^2 = .138$. The Hosmer and Lemeshow test result was non-significant, χ^2 (8) = 7.089, $p = .527 > .05$, indicating a good model fit.

The results supported our third hypothesis. The participants who reported the stressors – getting/preventing virus (OR = 2.549, $p < .001$), unknown future (OR = 1.883, $p < .001$), and isolation/loneliness (OR = 2.111, $p < .001$) – were

Table 4. Logistic regression on BSRS-5 (top 5 sources of stress and joy as predictors, $N = 2{,}232$).

					95% C.I. for OR	
	Wald	*df*	*p*	OR	Lower	Upper
Top 5 Sources of Stress						
1. Restrictions/Confinement	0.521	1	.470	1.110	0.837	1.472
2. Concerns for others	1.546	1	.214	1.193	0.903	1.575
3. Getting/Preventing Virus	**46.348**	**1**	**<.001**	**2.549**	**1.947**	**3.337**
4. Unknown Future	**17.737**	**1**	**<.001**	**1.883**	**1.403**	**2.528**
5. Isolation/Loneliness	**25.018**	**1**	**<.001**	**2.111**	**1.575**	**2.829**
Top 5 Sources of Joy						
1. Family/Friends	**9.998**	**1**	**.002**	**0.660**	**0.510**	**0.854**
2. Peace of Mind	**50.291**	**1**	**<.001**	**0.362**	**0.273**	**0.479**
3. Hobbies/Entertainment	**6.554**	**1**	**.010**	**0.700**	**0.533**	**0.920**
4. Nature	0.220	1	.639	0.932	0.695	1.250
5. Digital Interaction	0.030	1	.862	1.032	0.726	1.466
(Constant)	228.040	1	<.001	0.142		

Reference category: those who did not report that given source of stress/joy.

more likely to have poor mental health than those who did not report these stressors. In contrast, the participants who reported the sources of joy – family/friends (OR = 0.660, $p = .002$), peace of mind (OR = 0.362, $p < .001$), and hobbies/entertainment (OR = 0.700, $p = .010$) – were less likely to have poor mental health than those who did not report these sources of joy.

Discussion

The discussion is guided by the TMSC framework (Lazarus & Folkman, 1984) and is divided into two parts. The first part focuses on the participants' mental health and how it was affected by loneliness and IU. The second part examines the top five sources of stress and joy among older adults in Hong Kong, as well as their impacts on the mental health of older adults.

Loneliness, IU, and state of mental health

The prevalence of poor mental health as measured by the BSRS-5 in the current sample was found to be 14.2%. Because of the lack of pre-pandemic BSRS-5 measurements of older adults in Hong Kong, a direct comparison of mental health profiles between the current study and the pre-pandemic situation may be limited. Nevertheless, a large-scale cohort study of older adults in Taiwan in 2012 revealed that the prevalence of poor mental health measured using the BSRS-5 ranged between 7% and 9.2% across 12 districts (Tseng et al., 2019). In Hong Kong, pre-pandemic data obtained by another local NGO during 2017–2018 using a different mental health instrument (two-item Patient Health Questionnaire, cutoff score of 3) showed that approximately 5.9% of local older adults suffered from poor mental health (Lou, 2019). While these findings may not be the most optimal for comparison, it is worth noting that the prevalence of poor mental health found in the current study was higher than these two pre-pandemic rates.

In the current sample, we found that being female and being married or living together were significant risk factors for poor mental health. In terms of the gender effect, our results were consistent with the finding of a systematic review during the pandemic that females were more likely than males to exhibit psychiatric symptoms (Vindegaard & Benros, 2020). Interestingly, with regard to marital status, we found that older adults who were married or living with their partners were more likely to have poor mental health than their counterparts. In the literature, no consensus has been reached on the effects of marital status on mental health during the pandemic. Marriage has been shown to be both protective of (Gualano et al., 2020) and a risk factor for (Fu et al., 2020) mental health in different studies. These contradictory findings may be explained by differences in marital quality, which Pieh et al. (2020) found to play a more critical role in

mental health than just marital status. It should, however, be noted that while these sociodemographic factors allowed us to identify at-risk individuals, the findings should be interpreted cautiously due to the skewed gender ratio in the current sample and the inconclusive findings on marital status in the literature.

In terms of the relationship between loneliness, IU, and mental health, the results of this study showed that older adults who had higher levels of loneliness and IU-P had a higher chance of having poor mental health than those who reported no such issues. To further clarify the roles of loneliness and IU in older adults' mental health, a mediation analysis was performed, and the results supported our hypothesis 1 and 2. Loneliness negatively affected mental health, and this relationship was partially mediated by the level of IU-P. To elaborate on the mediation pathway, a higher level of loneliness in older adults was found to be associated with a higher level of IU-P, which then resulted in a greater likelihood of psychiatric symptoms.

The proposed mediation mechanism of IU-P is consistent with the TMSC framework (Lazarus & Folkman, 1984) and the findings of previous literature. It has been argued that a heightened state of loneliness would trigger the threat response system, resulting in hypervigilance toward threats, such as uncertainty about the future in our case (Barnett et al., 2019; Hawkley & Cacioppo, 2010). Increased IU could be interpreted as a negative cognitive bias that influences the perception of stress in older adults (Lazarus & Folkman, 1984), eventually putting them at risk of poor mental health.

Because of the social distancing policies imposed during the pandemic, understanding the effects of loneliness and IU on mental health is important to inform social service practices. The results of the mediation analysis highlight the need to reduce loneliness and uncertainty to improve the mental health of older adults.

Sources of stress and Joy

Apart from clarifying the roles of loneliness, IU, and mental health, the third objective of this study was to identify sources of stress and joy among older adults in Hong Kong and examine their impacts on the older adults' mental health. Our results support the TMSC proposition (Lazarus & Folkman, 1984). Both environmental stressors and individuals' sources of joy were found to significantly affect the mental health of older adults.

Sources of stress

In the current study, the top five stressors for older adults were restriction/confinement, concerns for others, getting/preventing the virus, the unknown future, and isolation/loneliness. All of these stressors were pandemic-related. Among these stressors, getting/preventing the virus, the

unknown future, and isolation/loneliness were associated with an increased risk of poor mental health. This aligns with the quantitative findings discussed above and again highlights the urgent need to address these issues among older adults. Frontline professionals could consider attempting to strengthen the social connectedness of older adults, as well as reducing their perceived uncertainty and perceived lack of ability to manage the challenges of their lives, both during and after the COVID-19 pandemic.

While the top five stressors found in the current study closely resembled patterns found in the U.S (Whitehead & Torossian, 2021). one of the stressors most frequently reported in our study – getting/preventing the virus – seemed to be more predominant in our Hong Kong sample. In contrast, getting infected with the virus was minimally reported as a stressor by older adults in the U.S. in the studies by Whitehead and Torossian (2021) and Heid et al. (2021).

Qualitative studies of older adults in Asian settings, such as Japan, Korea, and mainland China, have discovered that infection not only implies a threat to an individual's health but also involves social elements, such as being criticized by others for exposing other group members to the virus (Kim et al., 2021; Takashima et al., 2020; Yang et al., 2021). In contrast, themes extracted from interviews on similar topic with older adults in the U.K. tended to emphasize individual aspects, such as their mortality and loss of normality (McKinlay et al., 2021). Besides qualitative research, a quantitative study also found that the degree of collectivism was positively correlated with fear of infection during the COVID-19 pandemic (Ahuja et al., 2021). As a result, the potential cultural differences, in terms of getting/preventing the virus, found between this study and Western studies might be attributable to the differences in collectivism. More studies, however, are needed to verify this relationship and explore its underlying mechanism for better prevention and management of future epidemics/pandemics. Frontline professionals should consider how health messages are conveyed to ensure that their intended purpose is achieved; for example, messages encouraging people to participate in early identification or treatment could highlight the indirect potential benefit of protecting other family members and friends. Professionals could also consider proactively conveying understanding of and empathy with the dilemma faced by older adults and carefully dispelling any misperceptions that the older adults may have, such as being a "burden" to family members if they become ill.

Sources of Joy

We found that the top five sources of joy reported by older adults were family/friends, peace of mind, hobbies/entertainment, nature, and digital interaction.

In particular, family/friends, peace of mind, and hobbies/entertainment were found to be protective factors against poor mental health among older adults.

The finding that family/friends can function as a protective factor supports the previous emphasis on social connections in older adults. Additionally, it extends previous results by revealing the specific kind of social connections preferred by older adults. This has important implications for social service providers amid the worst waves of pandemics/epidemics, when resources are particularly limited. For instance, providers are advised to prioritize resources that strengthen social connections between older adults and their family and friends, instead of other kinds of social interactions that have yet to be proven effective. Besides the role of family/friends, social service providers could help older adults to develop new hobbies at home, so that they can find joy without the risk of infection.

In the current study, achieving peace of mind, such as a sense of internal calmness and feeling grateful about different aspects of one's life, was associated with a lower risk of poor mental health in older adults. The examples of peace of mind reported in this study echo the definition of peace of mind reported by Y.-C. Lee et al. (2013): "an internal state of peacefulness and harmony" (p. 571). As a result, we believe that interventions that help restore peace of mind could help Chinese older adults to cope with stress and should therefore be implemented. For example, the literature has suggested that peace of mind is closely related to gratitude (Liang et al., 2020; Whitehead & Torossian, 2021). Gratitude training, such as the Brief Gratitude Writing Intervention implemented by Fekete and Deichert (2022), could amplify positive thoughts while diminishing negative thoughts and eventually help to restore individuals' peace of mind (Watkins, 2014). According to the TMSC framework, gratitude training, which usually involves perspective-changing strategies, is a type of emotion-focused coping strategy that is believed to be useful when environmental stressors, such as the unpredictable pandemic situation, are uncontrollable (Lazarus & Folkman, 1984).

Interestingly, when comparing the top five sources of joy in the current sample with those in the U.S. sample reported by Whitehead and Torossian (2021), there appears to be a difference in the importance of achieving peace of mind. In particular, we found that peace of mind was the second most reported source of joy among older adults in Hong Kong (unlike those in the U.S., among whom peace of mind was ranked eighth; Whitehead & Torossian, 2021). A cultural study demonstrated that Chinese individuals considered calm as their ideal affect state, whereas Western individuals regarded high arousal and positive affect as more desirable (Tsai et al., 2006). This cultural difference in the ideal affect state may help explain why there was a stronger preference for peace of mind as a way of coping in Hong Kong than in the U.S. Yet, more studies are needed to confirm this proposition, as peace of mind appears to be a less studied construct in cross-

cultural comparisons. Nonetheless, the results of the current study highlight the importance of cultural differences and suggest that social service providers could provide gratitude training or similar emotion-focused interventions to build older adults' resilience in uncertain pandemic situations.

Beyond the COVID-19 pandemic and practical implications

Although the data were collected during the COVID-19 pandemic, we believe that the findings also have implications for the post-pandemic era. The current study adds to the emerging evidence that IU is a significant risk factor for poor mental health among older adults. We therefore call for more attention from researchers and practitioners to this issue, beyond only working with other known risk factors such as loneliness and demographic factors.

In terms of suggestions for practice, social service providers could consider different routes of building and maintaining connections for older adults to help reduce their loneliness. In addition to traditional face-to-face contact through elderly centers, online platforms, social media, and telephone calls could be used to provide more regular and frequent contacts. The partial mediating role of IU in the relationship between loneliness and poor mental health suggests that loneliness and IU combine to cause mental health problems among older adults; older adults may feel vulnerable both emotionally and in terms of resources when their social connectedness is weakened, and they may therefore become anxious when they imagine having to deal with sudden changes in their life. Therefore, beyond providing regular contact to reduce loneliness, effort should also be made to reduce IU. First, uncertainty can be reduced through accurate information provided by frontline workers to dispel misperceptions that are common in the community and help older adults to objectively evaluate the likelihood of them experiencing a possible negative event. In addition, because IU is also a subjective state of a perceived lack of ability to deal with a situation, professionals may want to empower older adults to confidently make decisions to cope with a negative situation when it arises. This can involve recalling previous successes in overcoming challenges and learning emotion regulation strategies to manage anxiety arising during the decision-making process.

Strengths and limitations

To increase the feasibility of collecting data from older adults, the telephone survey had to be kept short. In particular, the levels of loneliness and IU-P were captured using a single item, which may have led to measurement errors. Similarly, the results for the relationship between loneliness, IU, and mental health should be interpreted with caution, as identification of the causal relationship between these constructs was constrained by the cross-sectional

design of this study. Therefore, future studies that examine loneliness and IU using more in-depth measurements are warranted to validate the findings of this study. Second, older adults were recruited by the elderly centers of one NGO through telephone. This group of participants may have shared some characteristics that the nonmembers did not. For example, the gender ratio of the current sample skewed toward female (78.7% vs 53% in the local population aged 65 years or above; Census and Statistics Department, 2022), and the participants tended to be socially active. Therefore, our findings may not be generalizable to the entire older adult population in Hong Kong. Nevertheless, the current study recruited a large number of older adults (n = 2,258) from five of the 18 districts in Hong Kong. The sociodemographic characteristics of the participants, such as their age distribution and education level, were also comparable to those of the local older adult population. Despite the above limitations, this study contributes to the literature by clarifying the relationship between loneliness, IU, and mental health in older adults. Additionally, the study revealed both the stressors and coping strategies adopted by Chinese older adults and how these factors were related to their mental health during the most severe wave of COVID-19 in Hong Kong.

Conclusions

The current study provides social workers with insights into specific strategies to enhance the mental health of older adults. The findings indicate that the mental health of older adults is negatively affected directly by loneliness and indirectly via IU-P, which could be understood as a cognitive bias that affects individuals' appraisal of stress. Thus, social service providers should be encouraged to strengthen the social relationships of older adults and adopt strategies to reduce the uncertainty of the pandemic.

Moreover, three of the top five sources of stress – getting/preventing virus, an unknown future, and isolation/loneliness – were associated with an increased likelihood of poor mental health. In contrast, three of the top five sources of joy – family/friends, peace of mind, and hobbies/entertainment – were associated with a decreased risk of psychiatric symptoms in older adults. These results can provide guidance for social workers to develop suitable interventions that target these specific stressors to facilitate effective coping.

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Data availability statement

Due to ethical and confidentiality concerns, data collected from the participants are not made publicly available.

Ethical statement

The Hong Kong Polytechnic University's Institutional Review Board granted ethical approval (approval number: HSEARS20220131001).

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