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ABSTRACT

Introduction The COVID-19 pandemic has led to the implementation of social distancing measures on an unprecedented scale, but their impacts on the mental health of the general public, especially in places with strict and prolonged restrictions, are not well understood. This study explored the Hong Kong public's views on social distancing measures that were implemented approximately two years into the pandemic and examined how these perceptions influence their stay-at-home motivation and mental health based on Protection Motivation Theory (PMT).

Design A two-phase sequential exploratory mixed-methods study was conducted.

Setting Data were collected as part of a larger study of a universal online public health campaign in Hong Kong.

Participants First, qualitative interviews with 26 participants from diverse backgrounds explored their views on COVID-19 and social distancing measures.

Subsequently, a quantitative online survey of 1025 participants from the general population examined the relationship between PMT constructs, stay-at-home motivation, and mental health.

Outcome measures Mental health and PMT constructs, including protective motivation, perceived severity, perceived vulnerability, self-efficacy, response cost, and response efficacy.

Results The qualitative results identified three themes: 'the inescapable and unpredictable nature of COVID-19', 'stay-at-home impacts all facets of life', and 'the realities and challenges of social distancing during a pandemic'. Subsequently, quantitative findings showed that most PMT constructs, such as perceived severity ($\beta=0.21$, 95% CI=0.15–0.27), perceived vulnerability ($\beta=0.24$, 95% CI=0.18–0.30), self-efficacy ($\beta=0.27$, 95% CI=0.20–0.34) and response efficacy ($\beta=0.09$, 95% CI=0.02–0.15), were associated with stay-at-home motivation (all $p<0.01$), except for response cost. Higher perceived severity ($\beta=1.42$ –1.74), perceived vulnerability ($\beta=0.93$ –1.36), and response cost ($\beta=1.29$ –1.64) were associated with poorer mental health.

Conclusion This study examined the public perceptions and experiences of strict and prolonged social distancing measures two years into a global pandemic. The findings highlighted the significance of using the PMT model to understand the factors influencing stay-at-home intentions

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ A sequential exploratory mixed-methods design was used, combining qualitative interviews and quantitative surveys to explore the Hong Kong public's views on social distancing measures two years into the pandemic.
- ⇒ The Protection Motivation Theory framework was adopted to explore the determinant factors influencing protective motivation of stay-at-home in a culturally relevant context.
- ⇒ A diverse sample of participants was recruited to capture a wide range of perspectives and survey responses from the general public, but convenient sampling may limit generalisability.
- ⇒ Data were collected during the ongoing fifth wave of the pandemic, which may have affected participants' perception towards the perceived severity and vulnerability.

and their mental health during the pandemic. The findings provide valuable insights to guide the development and implementation of future public health interventions.

INTRODUCTION

The COVID-19 pandemic significantly challenged global public health systems, leading to widespread implementation of containment measures, such as local quarantines, social distancing, and travel restrictions, in an effort to curb community-based transmissions.^{1,2} Despite their necessity, these measures caused substantial disruptions to daily life and adversely affected mental health. Early qualitative studies highlighted negative impacts, such as feelings of worry, anxiety, and fear stemming from health concerns, pandemic uncertainty, lockdowns, social isolation, financial stress, remote work, and difficulties in accessing information.^{3–6} However, these studies mostly focused on specific subsets of the population, including frontline health-care professionals,^{7,8} parents,⁹ students,¹⁰



elderly,^{6 11} and pregnant women.¹² A substantial gap remains in understanding how the pandemic has affected the general public at-large, especially in geographical areas with prolonged social distancing requirements.

Social distancing and its impacts

Social distancing, a crucial non-pharmacological strategy against COVID-19 transmission, involves avoiding non-necessary outings, restricting gatherings, and maintaining physical distance.^{1 13 14} Among different social distancing measures, the most efficacious approach is government-imposed stay-at-home order, but it is also the most restrictive, economically disruptive, and difficult to enforce. Alternatively, the public's voluntary commitment to reduce non-essential outings and stay-at-home has shown to reduce the risk of community transmissions. In fact, an analysis of mobility data from 130 countries before the availability of COVID-19 vaccines showed that a weekly increase in stay-at-home by just 1% at the population level can prevent 70 weekly cases and 7 weekly deaths on average across countries.¹⁵ However, stay-at-home disrupts social interactions and daily routines, and has been found to negatively impact psychological and social well-being.^{16–19} These impacts were particularly pronounced among vulnerable groups, such as the elderly, socially disadvantaged individuals, those with mental health issues, and frontline healthcare professionals.^{20–24}

Furthermore, social distancing inevitably increases social isolation and decreases social connections, which directly impacts people's ability to cope with pandemic-related stresses.^{25 26} Qualitative studies conducted in the early phases of the pandemic corroborate these findings, as exemplified by common themes such as psychological and emotional problems, loneliness/isolation, strained relationships at home, and widely perceived losses (eg, loss of income and social interactions).^{6 27–30} Extended periods of stay-at-home have also been associated with increased depressive symptoms.³¹ However, the longer-term impacts of prolonged social distancing and home-based isolation remain less well understood, given that these restrictions were lifted within two years of the pandemic in most countries.

Cultural differences in social distancing measures

Existing studies exploring perceptions of social distancing measures during COVID-19 were primarily conducted in Western settings. In particular, the stark contrast between the restrictions imposed in China compared with Western nations underscores significant cultural differences in attitudes and behaviours towards pandemic response. Approaches to COVID-19 containment and restriction measures adopted in Western countries were guided by different factors, such as vaccination rates, economic considerations, and infection rates. Conversely, China has followed a 'zero-COVID' policy since the beginning of the pandemic.^{32–34} Hong Kong, a densely populated Chinese city, also maintained stringent and prolonged restriction measures encompassing border control,

home quarantine, active case findings, work-from-home arrangements, closure of schools and leisure facilities, and mandatory self-quarantine policies.³⁵ In fact, compulsory travel quarantine on arrival to Hong Kong continued until September 2022, and isolation requirements for COVID-19 patients were enforced for approximately three years since the start of the pandemic and ended in January 2023. In contrast to the policies and responses in Western countries, the prolonged social distancing approaches adopted in Chinese cities likely resulted in vastly different experiences and perceptions about the pandemic and its responses. Therefore, examining public views and mental health in this unique context offers important insights into the perceptions, challenges, and potential impacts of adopting conservative approaches to pandemic control in the future.

Protection Motivation Theory

Previous research has highlighted the importance of using health behaviour theories to understand public perceptions and behaviours during pandemics, which is crucial for developing effective public health interventions in the future against the adverse impacts of the outbreak.³⁶ Protection Motivation Theory (PMT) is a widely used theoretical framework for understanding the underlying motivations that drive health protective behaviours,³⁷ particularly in the context of threats related to environmental or health situations. The COVID-19 pandemic emphasised the importance of effective health communication to the general public as adherence to social distancing measures is crucial for mitigating the transmission of COVID-19.³⁸ PMT has been widely applied in such public health communications during pandemics,³⁶ which posits that environmental or intrapersonal sources of information about a health threat, such as communication campaigns, verbal persuasions, and the media, initiate the two cognitive processes which predicted the motivation and intention to adopt a health protective behaviour in response to a health threat. These two cognitive processes include (1) threat appraisal and (2) coping appraisal.^{39 40} In this model, threat appraisal evaluates the perceived severity and perceived vulnerability tied to the health threat. Perceived severity refers to the assessment of negative consequences from the health threat, while perceived vulnerability refers to the assessment of risks posed by the health threat. Alternatively, coping appraisal involves an individual's appraisal of their perceived ability to perform a health protective behaviour (self-efficacy), perceived potential benefits or rewards of performing such behaviour (response efficacy), and perceived potential losses associated with performing such behaviour (response cost).³⁹

Numerous studies have employed PMT to investigate health protective behaviours, particularly in the context of social distancing during the COVID-19 pandemic.^{41–47} In fact, a comprehensive meta-analysis of 65 studies demonstrated positive associations between perceived severity, perceived vulnerability, response efficacy, and

self-efficacy with the likelihood of engaging in health protective behaviours during the pandemic⁴¹; factors related to coping appraisal, such as response efficacy and self-efficacy, were also more predictive of engaging in protective behaviours compared with factors related to threat appraisal. However, with regards to stay-at-home, Okuhara *et al*⁴⁴ found that among a sample of 1980 individuals in Japan, only perceived severity and self-efficacy predicted stay-at-home during COVID-19. These findings highlight the need for more research in understanding drivers or obstacles towards specific pandemic response behaviours in unique cultural contexts.

Protection motivation and mental health

The escalating prevalence of mental health issues globally amid the COVID-19 pandemic is evident.^{48–49} Numerous studies have underscored the relationship between COVID-19 risk perception and mental health.^{50–54} For example, research showed frontline healthcare workers experienced heightened stress due to higher perceived vulnerability, and individuals with less resources (eg, financial insecurity, low socio-economic status) or who were parenting reported more distress due to higher perceived risks and lower perceived ability to protect themselves against COVID-19.^{16–24} These findings underscored how risk perception and perceived utility of adopting health protective behaviours are likely driven by immediate personal circumstances as well as wider social and structural factors. Furthermore, Hong Kong's unique socio-ecological characteristics, such as dense living spaces and populated areas, further posed additional challenges in social distancing,⁵⁵ which may further affect their threat and coping appraisals and mental health outcomes. Therefore, it is important to apply the PMT model in a manner that is matched with locally and culturally relevant perceptions of threat and coping. Further, examining how different PMT constructs are associated with mental health has the potential to inform future public health messaging and education that target different health protective behaviours across different populations.

The present study

The stringent and prolonged social distancing measures in Hong Kong in response to COVID-19 present a unique opportunity to conduct a detailed examination of the perceptions and experiences of such control measures, and how they associate with the mental well-being of the general public two years into the pandemic. Guided by PMT, this study employed a sequential exploratory mixed-methods design to (1) explore the perceptions and views about COVID-19 and its control measures among Hong Kong citizens who experienced social distancing for an extended period, and (2) assess whether and how their perceptions about COVID-19 and social distancing influence their intention to stay-at-home and mental health. The insights generated from this study were expected to inform and enhance the design and implementation of

future public health interventions more effectively, aiding in responding to future pandemic events.

METHODS

Study design

This two-phase study adopted a sequential exploratory mixed-methods design. In Phase I, in-depth, semistructured qualitative interviews with 26 participants from diverse backgrounds were conducted to explore their views on COVID-19 and the stringent containment measures during the pandemic. In Phase II, a cross-sectional online survey was employed to assess the associations between PMT constructs with health protective practices, motivation for stay-at-home, and mental health.

Participants and setting

In Phase I, a purposive sample of 26 Hong Kong adult residents was recruited from five key informant groups: university students, older people, parents with young children, individuals who underwent government-mandated quarantine, and frontline workers. These participants were recruited through social media and snowball sampling, and participated in focus group or individual interviews via telephone or Zoom based on their preference. Eligibility criteria included being aged 18 years or older, being a permanent Hong Kong resident, and being able to speak in Cantonese. Verbal consent was obtained from all participants prior to the interviews. The interview questions were designed to be open-ended and broad, allowing participants the flexibility to share their views and experiences during the pandemic. The interview questions were guided by the PMT model (see online supplemental material 1), and probes were used to delve into four key areas: (1) perceived severity and vulnerability to COVID-19 infection, (2) general view toward social distancing and stay-at-home, (3) impact of stay-at-home during COVID-19, and (4) perceived challenges and benefits of social distancing. Interviews were conducted by two experienced research assistants who received a 3-hour training between February and March of 2021. The interviews lasted between 35 and 100 minutes; all interviews were audio-recorded and transcribed verbatim by a research assistant and cross-checked by another study team member. Recruitment and data collection continued until saturation was achieved such that no new information emerged in the last three interviews.⁵⁶

In Phase II, Hong Kong residents aged 18 years or older and able to read Chinese were recruited to complete an online survey. The data were collected as a part of a broader study of a universal online public health campaign aimed at promoting health awareness and social distancing during COVID-19.⁵⁷ A convenience sample of 1025 Hong Kong residents (65.27% female; mean age=33.32, SD=13.18) participated in the campaign and completed the online surveys between November 2022 and March 2023. Participation in the survey served

as implied consent to voluntarily participate in this research.

Study measures

The online survey comprised two main parts: (1) stay-at-home protective motivation, threat appraisals, and coping appraisals based on the PMT model in the context of COVID-19; and (2) current mental health (ie, depression, anxiety and stress) (see online supplemental material 2). Socio-demographic characteristics include age, gender, education level, employment status, type of living quarter, number of household members, and whether they currently live with someone aged 4 and below or above 60. These variables were selected based on prior literature that suggested different age groups,^{31 46} being female,^{31 44} higher educational background,^{31 44 46} non-full-time employment status,³¹ household characteristics³¹ and living with vulnerable populations such as children⁵⁸ and elderly⁵⁹ were associated with varying intentions to social distancing measures during the pandemic.

PMT constructs

On the basis of prior studies using PMT to examine stay-at-home during COVID-19^{37 41 44} and findings from the qualitative interviews in Phase I, a 14-item questionnaire was developed to measure six PMT constructs: protection motivation (five items), perceived severity (one item), perceived vulnerability (one item), response efficacy (two items), self-efficacy (four items), and response cost (one item). Online supplemental table S1 presents the items and their corresponding PMT construct. Participants rated their level of agreement with each item on a five-point Likert scale. Mean scores for each construct were calculated, with higher scores indicating a stronger endorsement of the PMT construct. Moreover, participants were invited to indicate the factors that promote or hinder their intention to stay-at-home during COVID-19. The 14-item PMT questionnaire in the current sample demonstrated excellent internal reliability with a Cronbach's alpha coefficient of .90 for the full scale.

Mental health

The 21-item Depression, Anxiety, and Stress Scale (DASS-21) was used to measure symptoms of depression, anxiety, and stress.⁶⁰ Each mental health outcome was measured by seven items and scored on a four-point Likert scale, ranging from '0=did not apply to me at all' to '3=applied to me very much or most of the time'. Subscale scores were summed and multiplied by two, with a higher score indicating greater severity. The resulting total subscale scores were then categorised into five different levels of severity: normal, mild, moderate, severe and extremely severe. The Chinese version of the DASS-21 in the current sample demonstrated excellent internal reliability with subscale alphas ranging from .91 to .92.

Patient and public involvement

In this sequential exploratory mixed-methods study, interviews were conducted with members of the general

public to understand perceptions of COVID-19 and social distancing within the PMT framework to inform the subsequent design of the quantitative measures to ensure items are locally relevant to the Hong Kong context. Patients and the public were not otherwise involved in the design, conduct, reporting, or dissemination plans of this study.

Data analysis

Qualitative interviews

Interview transcripts were transcribed and analysed following the six steps of thematic analysis as described by Braun and Clarke.⁶¹ In step 1, two research team members read all transcripts and listened to the interview audio recording to become familiar with the data. In step 2, two research team members highlighted all meaningful and pertinent quotes (n=411) and developed an initial codebook of 50 codes reviewed by the study team. In step 3, the codes with shared meanings were organised and collapsed into themes. Eight themes were initially generated: (1) changes imposed on daily life, (2) changes imposed on work, (3) strategies to reduce risk, (4) pandemic severity, (5) challenges on social distancing/stay-at-home, (6) social distancing/stay-at-home is safe and useful, (7) fear and concern of contracting COVID-19, and (8) things to do while staying home. In steps 4 and 5, initial themes were reviewed by the study team to refine and further collapse as necessary. For example, 'changes imposed on daily life' and 'changes imposed on work' were collapsed into a single theme: 'stay-at-home impacts all facets of life'. All team members reviewed and provided a detailed analysis of the thematic framework. Finally, a total of three themes were named and identified; each theme was presented in relation to the research aim and the PMT model. In the final step, illustrative quotes were selected and translated from Chinese to English by a bilingual study team member and checked for consensus by all team members.

Quantitative survey

Descriptive statistics were used to summarise socio-demographic data, PMT constructs, and mental health subscales. Pearson's correlations were calculated to examine the bivariate associations between each PMT construct and mental health variable. Separate multiple linear regression analysis was conducted, regressing protection motivation and each mental health outcome on PMT constructs (perceived severity, perceived vulnerability, response efficacy, self-efficacy, and response cost) in separate models. Gender, age group, education level, employment status, and living with children and elders were included as control variables in all regression models. All assumptions of the regression models were met except homoscedasticity (all $p>.05$), and robust SE estimation was used. Data were analysed using STATA BE17, with statistical significance set at a two-tailed p value $<.05$.

RESULTS

Phase I: Findings of qualitative interviews

A total of 26 Hong Kong residents participated in individual or focus group interviews between February and March 2021. Individual interviews lasted between 25 and 40 minutes; focus group interviews ranged from 35 to 100 minutes. Participants represented five key informant groups, as described in online supplemental table S2. Their ages range from 18 to 70; 14 were females (53.85%). Three key themes emerged from the interviews, encapsulating participants' perceptions of COVID-19, the impact of stay-at-home, and the benefits and challenges associated with social distancing. Notably, these interviews were conducted during Hong Kong's fifth and most severe wave of COVID-19.

Theme 1: The inescapable and unpredictable nature of COVID-19

Most participants conveyed a heightened perceived risk of contracting COVID-19, portraying it as an unavoidable and unpredictable part of their lives. Many discussed the seemingly inescapable eventuality due to numerous positive cases among family members and neighbours. Compounded by Hong Kong's densely populated environment, there was a prevailing sentiment that staying at home no longer guaranteed safety:

Because the virus is everywhere now, so I think even if I stay at home, you don't know if the wind can bring the virus in through a vent because it's all over the building. (#23)

The reliance of Hong Kong residents on public transportation and high levels of community mobility contributed to the difficulty in maintaining safe social distances, making encounters with COVID-19 seemingly unavoidable. For individuals in service and frontline industries, such as health and social care professionals, the feasibility of adhering to stay-at-home measures was further constrained. As articulated by a participant who was a taxi driver:

Hong Kong is still very mobile right now. Although the government has limited our interactions and contact, but the public still needs to move around through trains and buses. It's in the air, even if you wear a mask. (#25)

Some participants questioned the reported case numbers because they speculated that individuals infected or in close contact with cases were not self-quarantining, leading to untraceable community-based transmission chains. These concerns further emphasised the unpredictability of COVID-19 in daily life:

I'm sure many people have it right now. The problem is they don't isolate, and maybe their family members already caught it but they still need to go out and buy essential items. It's very difficult, I know I will catch it. (#44)

Given the ongoing two-year pandemic at the time of the interviews, participants expressed a sense of adaptation, acknowledging COVID-19 had become a routine part of life. While concerns of contracting the virus persisted, they appeared to have adapted to this new normal and felt more prepared to respond to future pandemics:

At the beginning I did not know anything about it and I had a lot of fears. I was scared even when I was at home. But at this stage, after knowing more about it and how to protect myself, although many people say they feel tired of it, I actually think I have entered a new living mode and have even thought about how to respond if another new virus comes along. (#14)

Theme 2: Stay-at-home impacts all facets of life

Despite perceiving COVID-19 as unavoidable, participants strived to adhere to the government's stay-at-home directives. Nonetheless, the implications of prolonged home confinement were far-reaching, impacting all facets of life including their physical, mental, social, and financial health. Physical well-being deteriorated due to restricted physical activity, disruptions in daily routines, and altered eating and sleep patterns. Some participants noted weight gain during this period. Parents with young children also expressed concerns about their children's physical development and social interaction:

They can't go to playgroup or explore the outside world. In the past year, they have to stay at home because they don't know how to protect themselves, like handwashing. Without social contact, it really impacts their body and development. (#31)

The prolonged stay-at-home orders also significantly impacted mental health, leading to boredom, diminished social connections, and increased stress and conflict within households. While a few participants viewed this period as a chance for family bonding, the overall consensus was that stay-at-home was stressful and challenging, especially for parents with young children.

All of us are feeling stressed and emotional. We get upset easily and we stop communicating at home sometimes. The adults get angry with their children or with each other. We take our emotions out on each other often. (#32)

There is no 'me time' because all of us are here all the time. From day to night, there's a lot of pressure to take care of everyone. It's been really difficult, a lot of stress. (#11)

For younger individuals, the impacts were primarily related to hindrances in establishing healthy social connections as restrictions precluded in-person gatherings with friends. Similar concerns were raised about the elders, particularly those living alone and incapable of communicating through online means:

The elders won't know how to use online video conferencing to chat. They can talk on the phone, but it's not the same. Sometimes you only say some things face-to-face, so it really limited communication. (#23)

Moreover, the impacts of stay-at-home extended into work, studies, and livelihoods. Participants expressed economic and financial losses due to lockdowns and isolation policies, particularly among frontline and service industry workers who felt compelled to risk their lives to sustain a living.

Those who must work to sustain their living are failing to do so. (#11)

Many people can't keep up, and many in the same industry (taxi-driver) felt compelled to work, because it is better to earn two or three hundred dollars than nothing. (#25)

Theme 3: The realities and challenges of social distancing during a pandemic

Although the interviews were conducted two years into the pandemic, participants continued to acknowledge the importance of social distancing and stay-at-home. All participants agreed that these measures can reduce the risk of contracting the virus, especially during surges in case numbers. They perceived it not only as a personal protection measure but also as a sense of civic responsibility and concern for protecting themselves, their families, and the broader community.

I think there are a lot of children and elders in Hong Kong. I think if I catch it, I will be able to recover in a week or two, but I don't know for certain other family members or older people can, so I feel I should protect them. (#42)

Participants acknowledged the necessity of these measures, but highlighted their impracticality at times, particularly in a densely populated area like Hong Kong. Small living spaces posed a significant challenge to stay-at-home for an extended duration:

Those living in a subdivided flat must be difficult if they can't go out. (#11)

For the first one to two months, we think we could handle the boredom. We could still manage it if we can meet at the rooftop. But some are not possible. Because as seen on TV, many people are living in poor condition. (#13)

Participants also highlighted the difficulty of practising social distancing, especially in crowded places like public transportation or dining out. The city's high population density and social mobility further magnified these difficulties:

It is sometimes challenging for us to maintain social distancing when going out. How could we possibly keep social distancing on the MTR (subway)? (#13)

In terms of social distancing, it is quite challenging to maintain such 1.5-meter distancing, especially in Hong Kong with high population density. We often being shoulder-to-shoulder. Thus, it is not easy when I take them (the kids) out to maintain social distance. I would find less crowded areas in the suburbs to keep it. (#35)

Participants stressed the inevitability of going out for purchasing daily essentials. The necessity of buying groceries or performing other activities outside the home required to maintain daily lives made complete isolation impossible:

We often don't want to go out. But sometimes there is an urgency to go out, such as buying meals, shopping for daily necessities. It's impossible to not go out. (#44)

Phase II: Findings of quantitative survey

The final sample of survey participants consisted of 1025 Hong Kong adults (65.27% female, M age=33.32 years, SD=13.18). Their socio-demographic characteristics, mental health outcomes and PMT constructs are described in online supplemental table S3. Most of the participants were aged 18–29 years (47.51%), completed secondary education or higher (75.51%), were full-time employees (52.29%), living without family members aged 0–4 (91.22%), and living with family members aged 60 or above (59.71%).

For mental health outcomes, participants reported a mild level of depression (M=11.26, SD=10.55), moderate level of anxiety (M=10.18, SD=10.04) and mild level of stress (M=13.20, SD=10.05) on average.

For PMT constructs, the mean score for protective motivation to stay-at-home was 2.67 (SD=1.11). The mean score for perceived severity was 3.25 (SD=1.07) and for perceived vulnerability was 2.96 (SD=1.14). In comparison, factors related to coping appraisal generally had higher mean scores (response efficacy=3.34, self-efficacy=3.36 and response cost=3.26).

Pearson correlations were conducted to examine bivariate relationships between PMT constructs and mental health variables (see online supplemental table S4). The results showed that protective motivation was significantly positively correlated with all PMT constructs ($r=.09-.47$) and mental health outcomes ($r=.23-.26$). Significant positive correlations were also observed among all PMT constructs. However, response efficacy and self-efficacy of stay-at-home were not correlated with any mental health outcomes.

Relationships between PMT and mental health

Results of multiple linear regression analysis are presented in online supplemental table S5. The overall regression model for protective motivation was statistically significant ($F(15, 1009) = 54.20, p<.01; \text{adj } R^2=.3849$). In particular, motivation to stay-at-home was significantly associated with perceived severity ($\beta=0.21, p<.01, 95\%$

CI=0.15–0.27), perceived vulnerability ($\beta=0.24$, $p<.01$, 95% CI=0.18–0.30), response efficacy ($\beta=0.09$, $p<.01$, 95% CI=0.02–0.15), and self-efficacy ($\beta=0.27$, $p<.01$, 95% CI=0.20–0.34). Being male ($\beta=0.19$, $p<.01$, 95% CI=0.07–0.30) and living with family members aged 0–4 ($\beta=0.23$, $p=.02$, 95% CI=0.04–0.42) were also significant predictors of higher levels of protective motivation. In contrast, being students predicted lower levels of protective motivation ($\beta=-0.19$, $p=0.2$, 95% CI=-0.35 to -0.03).

All PMT constructs statistically significantly predicted all mental health variables, such as depression ($F(15, 1009) = 9.25$, $p<.01$; adj $R^2=.1275$), anxiety ($F(15, 1009) = 10.57$, $p<.01$; adj $R^2=.1463$), and stress ($F(15, 1009) = 12.33$, $p<.01$; adj $R^2=.1492$). All mental health outcomes were significantly associated with perceived severity ($\beta=1.42-1.74$), perceived vulnerability ($\beta=0.93-1.36$), and response cost ($\beta=1.29-1.64$). Being male ($\beta=1.70-2.66$) also significantly predicted poorer mental health across all outcomes. In contrast, being a student ($\beta=-2.60$ to -3.56), aged 40–49 ($\beta=-3.35$ to -5.02), and aged 60 or above ($\beta=-8.12$ to -8.89) predicted lower levels of mental distress across all outcomes.

DISCUSSION

The present study employed a sequential exploratory mixed-methods approach to capture a fuller understanding of how the Hong Kong public perceived the situation and responded to challenges posed by COVID-19 two years into the pandemic. The qualitative results uncovered three main themes. Theme 1 highlighted the inescapable and unpredictable presence of COVID-19, which aligned with threat appraisals of perceived severity and perceived vulnerability with PMT. However, contrary to a cross-sectional study conducted in Hong Kong,⁶² which showed high perceived vulnerability and severity during the early phase of the pandemic, our quantitative data suggest that perceived severity and vulnerability in the present sample were moderate. It is possible that participants had become more accustomed to and informed about COVID-19, and they thus perceived the virus as a lesser threat. However, it is also possible that participants had become complacent and fatigued two years into the pandemic. Theme 2 revealed the extensive impacts of stay-at-home, such as mental health, physical health, social interactions, and work-related concerns. Similar to existing qualitative studies, the impacts are pervasive and span across all facets of life.^{62–29} The quantitative results on response cost provide further support for our qualitative findings. Theme 3 highlighted the realities and challenges of prolonged social distancing and provided locally relevant representations of self-efficacy and response efficacy of the PMT coping appraisal process. These challenges included constraints related to limited living space, difficulties in maintaining social distancing, and the necessity of going outside for daily supplies in densely populated areas like Hong Kong. In our quantitative results, approximately half of the participants

identified boredom, social gatherings, and the necessity to purchase daily supplies as the top three challenges linked with stay-at-home.

The relationships between PMT constructs found in this study were generally consistent with those described in a meta-analysis of 65 studies that adopted PMT to examine health protective behaviours during COVID-19.⁴¹ Consistent with findings from this meta-analysis, our results also showed self-efficacy as the strongest predictor of protective behaviours against COVID-19. Indeed, previous studies have highlighted the importance of self-efficacy in eliciting positive emotions in the context of health threats and its importance in promoting health protective behaviours.^{63–64} Despite Hong Kong's unique socio-ecological characteristics, particularly its dense population and small living areas, which presented significant challenges during the pandemic,⁶⁵ we did not find a significant relationship between response cost and stay-at-home motivation in the present sample. Nonetheless, as mentioned by Yu *et al*,⁴⁶ Hong Kong exhibited a remarkably high compliance rate with social distancing measures, especially when contrasted with the lower compliance rates reported in the USA.⁶⁶ We surmise that a clear 'zero-COVID' policy, in conjunction with the collectivistic and harmony-focused nature of Chinese societies, might translate into a general propensity and motivation to stay-at-home despite the cost associated with social isolation from outside the home. For example, in contrast to individualism in Western societies, individuals in the context of collectivist cultures like Hong Kong may prioritise collective well-being over personal inconvenience.⁴⁶ This finding suggests more conservation approaches to pandemic control are feasible in certain contexts, but more research is needed to support this assertion.

Lastly, our results highlighted the significant role of threat appraisals (ie, perceived severity and perceived vulnerability) and response costs in relation to mental health. The extant literature has underscored the relationships between perceived vulnerability and perceived severity of COVID-19 with adult mental health.^{50–54} Indeed, perceiving events as threatening and having a negative appraisal of the events can result in heightened negative emotions.⁶⁷ When individuals perceive both high vulnerability and more severe outcomes associated with COVID-19, their mental health is more adversely affected due to the compounded fears and stress associated with both aspects.⁶⁸ These perceptions can also lead to behavioural changes, such as increased social isolation, avoidance behaviours, and excessive hygiene practices, all of which can further contribute to psychological distress and worsened mental health.⁶⁹ While response cost did not influence individuals' motivation to stay-at-home, it was associated with poorer mental health. The response cost associated with prolonged and stringent health protective measures, such as stay-at-home, reduced social interaction, and disruptions to daily routines can lead to feelings of loneliness, disconnection, and a lack of social support, all of which are known risk factors



for poorer mental health.^{70 71} The continued demands from risk assessments, making decisions about protective behaviours, and constantly monitoring the surrounding environment can further contribute to mental exhaustion and compromised psychological well-being. In particular, our qualitative findings showed that densely populated urban environments with limited spaces, such as Hong Kong, can magnify the negative outcomes. In contrast, we did not find significant relationships between self-efficacy and response efficacy with mental health outcomes. Studies have previously noted shifts in public attitudes, adherence to preventive measures, and mental health responses over the course of the COVID-19 pandemic.^{72 73} At the time of the survey, Hong Kong had experienced five waves of COVID-19. Thus, it is likely that general citizens had already acclimated to maintaining social distancing and were sufficiently informed of the importance and utility of stay-at-home. Longitudinal investigations are needed to understand the longer-term mental health sequelae of threat and coping appraisals in the post-pandemic era.

This study offers insights crucial for informing public health policies during pandemics. First, our results indicated that threat and coping appraisals are significant predictors of stay-at-home motivation. Therefore, our findings support the adoption of future public health interventions that target these appraisals to motivate individuals to engage in protective behaviours during the pandemic. For example, building trust in government may enhance perceived response efficacy of social distancing measures.⁴⁶ However, our findings also highlighted the relationship between threat appraisals and poorer mental health outcomes. Therefore, it is essential to balance the implementation of interventions to promote these appraisals while simultaneously addressing the potential mental health impacts of such efforts. For instance, public health professionals can collaborate with the media to provide accurate, useful information and resources to avoid inadvertently inducing unnecessary mental distress.⁴⁴ Furthermore, our findings also highlighted the importance of considering the contextual and cultural factors when implementing prolonged and strict social distancing measures. Our findings indicated that the response costs associated with stay-at-home measures were associated with poorer mental health, possibly due to the locally specific challenges of adhering to social distancing measures within densely populated and crowded households in Hong Kong.⁶⁵ Therefore, ongoing support for public mental health is important to mitigate the longer-term impacts of prolonged social distancing measures. Additionally, effective public health communication should be both culturally and contextually relevant. In collectivist societies like Hong Kong, it is crucial to frame health messages around communal responsibility and collective well-being, rather than merely highlighting individual inconveniences. Prior research suggested that using the heuristic rule of social norms may increase perceived self-efficacy to stay-at-home, particularly in

collectivistic societies,⁴⁴ where communicating narratives of people who spend meaningful time at home may be more palatable and effective for this cultural group. Incorporating these practical strategies into public health responses to promote stay-at-home has the potential to reduce the negative mental health impacts of prolonged social distancing in future pandemics.

Limitations

Several study limitations were noted. First, qualitative data were collected during the ongoing fifth wave of the pandemic, which may have influenced participants' perceptions of severity and vulnerability. Second, voluntary participation in the online survey might introduce self-selection bias. Third, reliance on self-reported behaviours in the survey could entail recall or social desirability bias. Fourth, the skewed survey sample towards females and younger individuals may restrict the generalisability of findings to the wider Hong Kong population. Fifth, the measures in the study have not been validated, potentially stemming variations in the perceptions of preventive behaviours and attitudes. Last, unlike some previous studies, fear was not included in the present study. Future studies can consider integrating fear into the PMT model to enrich the understanding of the relationship between appraisal processes and protection motivation in the pandemic context.

CONCLUSIONS

This sequential exploratory mixed-methods study explored the perceptions and experiences of stringent and prolonged social distancing measures among diverse segments of the general public two years into the COVID-19 pandemic. Quantitative findings indicate that all PMT constructs, except response cost, are associated with stay-at-home motivation. However, higher levels of threat appraisals and response cost are associated with poorer mental health. The application of PMT in this context demonstrated that it is an effective model for understanding how individuals respond to health threats and coping strategies. Further, our results support enhancing perceived severity, perceived vulnerability, response efficacy, and self-efficacy to motivate individuals to engage in protective behaviours during a pandemic. In tandem, public health messaging to promote these appraisals must also be accurate, timely, and conducted in a balanced manner that does not inadvertently lead to unnecessary mental distress. The findings in this study provide culture- and context-specific insights on applying more conservative approaches to pandemic control in future public health emergencies.

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