

# Mask-wearing intention after the removal of the mandatory mask-wearing requirement in Hong Kong: application of the protection motivation theory and the theory of planned behaviour

Tommy KC Ng \*, Ben YF Fong, Vincent TS Law, Pimtong Tavitiyaman, WK Chiu

## ABSTRACT

**Introduction:** The mandatory mask-wearing requirement, which had been in place for nearly 1000 days in Hong Kong, was lifted on 1 March 2023. Little is known about the intention to continue wearing a mask after the removal of the mandate in the city. This study aimed to examine predictors of mask-wearing intention after the mandate was lifted, using the protection motivation theory (PMT) and the theory of planned behaviour (TPB).

**Methods:** A conceptual model was developed to depict the relationships between the constructs of PMT and TPB in predicting continued mask-wearing intention after the removal of the mandate. A cross-sectional study was conducted using an online questionnaire from 8 to 20 March 2023. Partial least squares structural equation modelling was utilised to examine relationships between the constructs.

**Results:** In total, 483 responses were included in the data analysis. Perceived severity ( $\beta=0.089$ ;  $P=0.017$ ), perceived self-efficacy ( $\beta=0.253$ ;  $P<0.001$ ), subjective norms ( $\beta=0.289$ ;  $P<0.001$ ), and attitude ( $\beta=0.325$ ;  $P<0.001$ ) had significant positive effects on the intention to continue wearing a mask. In contrast, the perceived reward of maladaptive behaviours had a significant negative effect on mask-wearing intention ( $\beta=-0.071$ ;  $P=0.012$ ). Perceived vulnerability, perceived response efficacy, perceived

response cost, and perceived behavioural control were not significantly associated with mask-wearing intention.

**Conclusion:** The findings indicate that attitude towards continued mask-wearing was the strongest predictor of mask-wearing intention, followed by subjective norms and perceived self-efficacy. Insights from this study may inform public health policymaking regarding mask-wearing practices in future health crises.

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## New knowledge added by this study

- More than half of the respondents (53.6%) consistently wore a mask after the mandatory mask-wearing requirement had been lifted in Hong Kong.
- Attitude towards continued mask-wearing was the strongest predictor of mask-wearing intention, followed by subjective norms and perceived self-efficacy.

## Implications for clinical practice or policy

- A high frequency of mask-wearing was observed after the mandatory mask-wearing requirement had been lifted. The progress of Hong Kong citizens in returning to pre-pandemic norms requires further evaluation.
- The positive attitude towards mask-wearing among Hong Kong citizens suggests that they are prepared for future health crises.

## Introduction

The coronavirus disease 2019 (COVID-19) pandemic has had extensive global social and health impacts. It triggered an international health and economic crisis that has profoundly altered people's lives, perceptions, and behaviours. As of 13 March 2025,

about 778 million confirmed cases of COVID-19 had caused around 7.1 million deaths worldwide.<sup>1</sup> Various levels of non-pharmaceutical interventions, including frequent handwashing, mask-wearing, and social distancing, were implemented in most countries.<sup>2</sup> These interventions played important

## 香港撤銷強制佩戴口罩要求後的戴口罩意圖： 保護動機理論與計劃行為理論的應用

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**引言：**香港強制佩戴口罩要求在實施近1000天後於2023年3月1日撤銷。對於香港人在強制要求撤銷後繼續佩戴口罩的意圖了解甚少。本研究旨在使用保護動機理論和計劃行為理論來找出相關意圖的預測因素。

**方法：**我們使用保護動機理論和計劃行為理論預測在撤銷強制要求後繼續佩戴口罩的意圖。本研究開發了一個概念模型，描述這兩個理論的建構之間的關係。我們在2023年3月8日至20日期間使用網上問卷調查進行了一項橫斷面研究，並利用偏最小二乘結構方程模型來找出概念模型之間的關係。

**結果：**本研究共納入483份回應進行數據分析。感知嚴重性 ( $\beta=0.089$ ;  $P=0.017$ )、感知自我效能 ( $\beta=0.253$ ;  $P<0.001$ )、主觀規範 ( $\beta=0.289$ ;  $P<0.001$ ) 和態度 ( $\beta=0.325$ ;  $P<0.001$ ) 對繼續佩戴口罩的意圖有顯著的正向影響。相反，感知適應不良行為獎勵對佩戴口罩意圖有顯著的負向影響 ( $\beta=-0.071$ ;  $P=0.012$ )。感知脆弱性、感知反應效能、感知反應成本和感知行為控制與佩戴口罩意圖無顯著關聯。

**結論：**研究結果表明，繼續佩戴口罩的態度是佩戴口罩意圖的最強預測因素，其次是主觀規範和感知自我效能。這項研究的見解可能會為未來健康危機中的公共衛生政策制定提供有關佩戴口罩做法的參考。

roles in reducing community transmission of COVID-19.<sup>3</sup> However, the stringent measures also led to negative consequences, such as economic slowdown, disrupted education, and increased social isolation and psychological stress.<sup>4,5</sup> Many countries lifted non-pharmaceutical interventions while the number of cases was still increasing. In England, all COVID-19-related restrictions were lifted on 22 February 2022 under the 'Living with COVID' strategy,<sup>6</sup> although the number of cases increased in subsequent months. Australia, Singapore, and Hong Kong adopted a 'Zero-COVID' strategy.<sup>7</sup> In Australia, all mandatory mask-wearing requirements on public transport were lifted in mid-September 2022.<sup>8</sup> Singapore also lifted such requirements on 9 February 2023.<sup>9</sup> Hong Kong, a leading international business and financial centre, finally lifted all mandatory mask-wearing requirements on 1 March 2023,<sup>10</sup> nearly 1000 days after the start of the pandemic in 2020. Since then, the city has been transitioning towards the post-COVID-19 era.

During the COVID-19 pandemic, many governments mandated mask-wearing in public areas. Mask-wearing behaviour was largely a response to legal restrictions and requirements. Obedience, as a form of social influence, played a role in mask adherence; individuals sought to avoid social punishment, including fines or imprisonment. Additionally, normative social influence emerged as a means of curbing the spread of COVID-19. A

positive correlation was observed between social norms regarding mask-wearing and mask uptake, such that individuals were more likely to wear a mask if their friends and relatives did so.<sup>11</sup> Furthermore, individuals' beliefs about engaging in the right behaviour were associated with their behavioural intentions. Personal norms regarding mask-wearing were significantly associated with mask-wearing intention.<sup>12</sup> In the post-COVID-19 era, individuals may continue mask-wearing even after governments have lifted mandatory requirements, potentially due to self-motivation for health protection. This study aimed to identify predictors of mask-wearing intentions and practices after the mandatory mask-wearing requirement had been lifted in Hong Kong by integrating the protection motivation theory (PMT) with the theory of planned behaviour (TPB). This integration provides a comprehensive framework for evaluating mask-wearing intentions by examining key factors influencing health behaviours, including perceived severity, perceived vulnerability, attitudes, and subjective norms. This approach may offer a nuanced understanding of predictors of mask-wearing intentions after the mandatory mask-wearing requirement had been lifted.

### Protection motivation theory

Protection motivation theory has been widely used as a framework for predicting the adoption of health-protective behaviours.<sup>13</sup> This theory assumes that the adoption of protective behaviour against health threats depends on personal motivation for self-protection. Rooted in expectancy-value theory, PMT explains the social and cognitive processes underlying protective behaviours. The theory is based on the premise that the decision to counteract a health threat is determined by threat and coping appraisal processes.<sup>14</sup> According to PMT, two primary processes—threat appraisal and coping appraisal—determine behavioural intention. Threat appraisal consists of three components: perceived vulnerability, perceived severity, and the perceived reward of maladaptive behaviours. Perceived vulnerability refers to an individual's assessment of the likelihood of experiencing a health threat or developing a health condition. Perceived severity concerns the perceived seriousness of potential consequences associated with the condition. Therefore, perceptions of COVID-19 severity and vulnerability to disease would significantly predict adherence to protective measures.<sup>15</sup> Perceived reward of maladaptive behaviours refers to beliefs regarding the benefits associated with engaging in risky behaviours. Patients with COVID-19 may experience long COVID symptoms, including increased fatigue, depressive symptoms, and reduced mental acuity.<sup>16</sup> In this context, individuals may continue wearing masks due to concerns about long-COVID severity.

Thus, perceived vulnerability and perceived severity are expected to be positively associated with the intention to continue wearing a mask in the post-COVID-19 era, whereas the perceived reward of maladaptive behaviours is expected to be negatively associated with this behaviour. Three hypotheses were proposed in relation to these elements (H1 to H3 in the online supplementary Table).

Coping appraisal comprises perceived response efficacy, perceived self-efficacy, and perceived response cost. Perceived response efficacy refers to belief in the effectiveness of the recommended behaviour with respect to mitigating or preventing potential harm.<sup>17</sup> Perceived self-efficacy denotes an individual's confidence in overcoming barriers to implementing the recommended behaviour.<sup>18</sup> Perceived response cost refers to perceived costs associated with the behaviour. Perceived response efficacy has been positively associated with social distancing behaviours, a non-pharmaceutical intervention for COVID-19, among Hong Kong adults.<sup>19</sup> Three hypotheses were derived in relation to these elements (H4 to H6 in the online supplementary Table).

### Theory of planned behaviour

The TPB is a well-established model for explaining health-related behavioural intentions, which are influenced by subjective norms (perceived expectations from significant others regarding the behaviour), attitude (personal feelings and beliefs about the behaviour), and perceived behavioural control (perceived ability to perform the behaviour). Individuals with a more positive attitude towards non-pharmaceutical interventions exhibit a greater intention to implement such interventions.<sup>20</sup> Similarly, subjective norms and perceived behavioural control have demonstrated positive associations with the intention to adopt interventions against COVID-19.<sup>20</sup> Five hypotheses were formulated in relation to these elements (H7 to H11 in the online supplementary Table).

### Integration of protection motivation theory and theory of planned behaviour

The integration of PMT and TPB has been utilised to predict behavioural intention in various research contexts, such as adherence to COVID-19 behavioural guidelines,<sup>21</sup> behavioural intention towards COVID-19 booster vaccination,<sup>22</sup> and factors affecting preventive behaviours during the COVID-19 pandemic.<sup>23</sup> In this study, the attitude component of TPB was used to assess an individual's attitude towards continuing to wear a mask. Attitudes may be influenced by an individual's protection motivation. A meta-analysis identified perceived importance, perceived benefits, perceived effectiveness, and perceived barriers to preventive

behaviour as key attitudinal factors influencing such behaviour.<sup>24</sup> Therefore, a conceptual model was developed to illustrate relationships between the constructs of PMT and TPB in predicting continued mask-wearing after the announcement that all mandatory mask-wearing requirements had been lifted. Fourteen hypotheses were formulated in relation to these elements (H12 to H25 in the online supplementary Table).

## Methods

### Participant recruitment

This cross-sectional study was conducted using an online questionnaire between 8 and 20 March 2023. Participants were recruited through a non-probability snowball sampling method that had been used in a previous study.<sup>3</sup> The target sample size was determined based on the requirement that it should be 10 times the maximum number of measurement items associated with a single construct in the partial least squares path model.<sup>25</sup> In this study, 37 items measured ten constructs, resulting in a target sample size of 370 (10 × 37). The online questionnaire was distributed via email and WhatsApp, a widely used social media platform in Hong Kong. Using the researchers' personal social networks, eligible individuals of various ages and educational backgrounds were invited to participate. They were also encouraged to share the questionnaire link with suitable colleagues and friends. Additionally, the researchers contacted the heads of local community colleges to seek collaboration and support. Upon receiving approval from directors or presidents, the researchers sent the online questionnaire to those leaders for recruitment of eligible participants. Individuals were included in this study if they were Hong Kong residents aged ≥18 years and had access to the internet via a smartphone or computer. Participants read a statement on the survey's background, anonymity, and participation agreement before providing consent. To prevent duplicate submissions, the prefix and first three digits of the Hong Kong Identity Card were collected and later removed prior to data analysis.

### Measures within the questionnaire

The questionnaire, consisting of four sections, was designed to assess perceived vulnerability, perceived severity, perceived reward of maladaptive behaviours, perceived response efficacy, perceived self-efficacy, perceived response cost, attitude, perceived behavioural control, subjective norms, and intention to continue wearing a mask after the mandatory mask-wearing requirement had been lifted. The first section included two questions focused on mask-wearing frequency after the mandatory requirement had been lifted and on

verification of Hong Kong residency. The second section examined respondents' adoption of health-protective behaviours, based on PMT.<sup>26,27</sup> The third section measured variables related to respondents' intention to continue wearing a mask, based on TPB.<sup>3,27</sup> All items in the second and third sections were assessed using a five-point Likert scale (1=strongly disagree to 5=strongly agree). The final section collected demographic information, such as age, gender, education level, economic status, and self-reported health status, through close-ended questions.

## Data analysis

Partial least squares structural equation modelling was utilised to examine the conceptual framework in this study. The SmartPLS 3.0 statistical software (SmartPLS GmbH, Bönningstedt, Germany) was used to assess both the reflective measurement model and the structural model. Study reliability and validity were evaluated by assessing internal consistency and convergent validity in the reflective measurement model.<sup>25</sup> Convergent validity was considered acceptable if the outer loadings of the measurement items exceeded 0.5 and the average variance extracted for each construct was >0.5.<sup>25,28</sup> Internal reliability was evaluated using composite reliability, which was recommended to exceed 0.708, and Cronbach's alpha, which should be >0.6.<sup>25</sup> Path coefficients were assessed within the structural model. A P value <0.05 was considered significant.

## Results

### Participant characteristics

In total, 483 valid responses were included in the data analysis. Table 1 presents the participants' demographic characteristics. The largest proportion of respondents belonged to the 18-25 age-group (28.2%), followed by the 56-65 (18.4%), the 66-75 (13.7%), and the 36-45 (13.0%) age-groups. The mean age was 43.56 years. Among the participants, 269 (55.7%) were men and 214 (44.3%) were women. Most respondents (59.0%) had attained a degree-level education or higher; more than two-fifths of respondents were employed. Additionally, approximately half of the respondents (46.6%) rated their health status as good. More than half of the respondents (53.6%) reported always wearing a mask after the mandatory mask-wearing requirement had been lifted. The median number of COVID-19 vaccine doses received was three (interquartile range=1).

### Measurement model

Table 2 presents the model reliability. Loadings >0.7 indicate a satisfactory level of item reliability.<sup>25,29</sup> The outer loadings of all items exceeded 0.7, except for

TABLE 1. Participant demographic characteristics (n=483)

	No. (%)
Age-group, y	
18-25	136 (28.2%)
26-35	60 (12.4%)
36-45	63 (13.0%)
46-55	62 (12.8%)
56-65	89 (18.4%)
66-75	66 (13.7%)
≥76	7 (1.4%)
Gender	
Male	269 (55.7%)
Female	214 (44.3%)
Education level	
Primary or below	3 (0.6%)
Secondary	60 (12.4%)
Post-secondary	135 (28.0%)
Degree	144 (29.8%)
Postgraduate or above	141 (29.2%)
Employment status	
Student	127 (26.3%)
Employed	201 (41.6%)
Self-employed	46 (9.5%)
Unemployed	13 (2.7%)
Retired	96 (19.9%)
Monthly income, HK\$	
≤8000	175 (36.2%)
8001-16 000	39 (8.1%)
16 001-24 000	51 (10.6%)
24 001-32 000	52 (10.8%)
32 001-40 000	34 (7.0%)
40 001-48 000	15 (3.1%)
48 001-56 000	21 (4.3%)
>56 000	96 (19.9%)
Self-rated health status	
Poor	18 (3.7%)
Fair	136 (28.2%)
Good	225 (46.6%)
Very good	74 (15.3%)
Excellent	30 (6.2%)
No. of COVID-19 vaccine doses, median	
0	11 (2.3%)
1	9 (1.9%)
2	49 (10.1%)
3	291 (60.2%)
4	123 (25.5%)
Mask-wearing frequency after mandatory mask-wearing requirement was lifted	
Always	259 (53.6%)
Often	149 (30.8%)
Never	75 (15.5%)

Abbreviations: COVID-19 = coronavirus disease 2019; HK\$ = Hong Kong dollars

TABLE 2. Construct validity and reliability of the measurement model

		Mean±SD	VIF	Loadings	AVE	CR	Cronbach's alpha
Attitude (ATT)					0.822	0.933	0.891
ATT <sub>1</sub>	Continuing to wear a mask after the pandemic will be beneficial to me.	3.42±1.198	3.507	0.927			
ATT <sub>2</sub>	Continuing to wear a mask after the pandemic will be reassuring to me.	3.47±1.192	3.472	0.925			
ATT <sub>3</sub>	Continuing to wear a mask after the pandemic will be necessary for me.	2.77±1.270	2.043	0.866			
Behavioural intention (BI)					0.791	0.919	0.867
BI <sub>1</sub>	I intend to continue wearing a mask in the future.	2.88±1.300	2.828	0.924			
BI <sub>2</sub>	I will recommend that my friends, relatives, and colleagues continue wearing masks.	2.71±1.168	2.271	0.881			
BI <sub>3</sub>	I will always wear a mask in public, even after the COVID-19 pandemic ends.	2.80±1.305	2.076	0.862			
Perceived behavioural control (PBC)					0.661	0.853	0.747
PBC <sub>1</sub>	I am financially capable of continuing to wear a mask.	3.92±1.044	1.350	0.701			
PBC <sub>2</sub>	I can overcome any difficulty associated with continuing to wear a mask.	3.81±1.072	1.681	0.876			
PBC <sub>3</sub>	I have sufficient self-confidence to decide to continue wearing a mask.	3.96±1.080	1.590	0.851			
Perceived response cost (PRC)					0.841	0.941	0.905
PRC <sub>1</sub>	Continuing to wear a mask after the announcement will be time-consuming.	2.65±1.182	2.185	0.862			
PRC <sub>2</sub>	Continuing to wear a mask after the announcement will make everyday life very difficult and unbearable.	2.51±1.241	4.164	0.939			
PRC <sub>3</sub>	Continuing to wear a mask after the announcement will be extremely onerous.	2.54±1.284	4.309	0.948			
Perceived response efficacy (PRE)					0.861	0.949	0.919
PRE <sub>1</sub>	After the announcement, I believe that continuing to wear a mask can protect against COVID-19.	3.74±1.149	3.364	0.928			
PRE <sub>2</sub>	After the announcement, I believe that continuing to wear a mask can reduce the impact of COVID-19.	3.60±1.184	3.638	0.938			
PRE <sub>3</sub>	After the announcement, I believe that continuing to wear a mask can ensure protection against COVID-19.	3.50±1.228	3.097	0.918			
Perceived reward of maladaptive behaviours (PRMB)					0.626	0.833	0.706
PRMB <sub>1</sub>	I perceive that breathing is easier without wearing a mask.	4.21±0.980	1.410	0.847			
PRMB <sub>2</sub>	I perceive that I look more attractive without a mask.	3.07±1.058	1.292	0.707			
PRMB <sub>3</sub>	I perceive that it is easier for others to see my face without a mask.	3.97±1.043	1.568	0.813			
Perceived self-efficacy (PSE)					0.883	0.958	0.934
PSE <sub>1</sub>	I feel confident that I can continue wearing a mask even if it is time-consuming.	3.32±1.310	4.072	0.944			
PSE <sub>2</sub>	I feel confident that I am able to continue wearing a mask without considerable effort.	3.46±1.326	3.797	0.936			
PSE <sub>3</sub>	I feel confident that I can continue wearing a mask even if I occasionally forget to do so.	3.21±1.383	3.972	0.940			
Perceived severity (PS)					0.779	0.876	0.716
PS <sub>1</sub>	If I contract COVID-19, it is likely to be a serious illness.	2.64±1.174	1.451	0.887			
PS <sub>2</sub>	I often suspect that people around me have contracted COVID-19.	2.72±1.206	1.451	0.877			

Abbreviations: AVE = average variance extracted; COVID-19 = coronavirus disease 2019; CR = composite reliability; SD = standard deviation; VIF = variance inflation factor



TABLE 2. (cont'd)

		Mean±SD	VIF	Loadings	AVE	CR	Cronbach's alpha
Perceived vulnerability (PV)					0.745	0.921	0.885
PV <sub>1</sub>	It is likely that I am at risk of contracting COVID-19 after the announcement.	3.53±1.151	2.743	0.868			
PV <sub>2</sub>	It is likely that COVID-19 can still affect my health after the announcement.	3.66±1.118	2.834	0.886			
PV <sub>3</sub>	It is likely that I will contract COVID-19 after the announcement.	3.42±1.164	3.172	0.891			
PV <sub>4</sub>	It is likely that further outbreaks will occur after the announcement.	3.16±1.166	1.665	0.803			
Subjective norms (SN)					0.802	0.942	0.917
SN <sub>1</sub>	My family and friends support me in continuing to wear a mask after the announcement.	3.47±1.138	3.280	0.900			
SN <sub>2</sub>	My family and friends believe I should continue wearing a mask after the announcement.	3.22±1.157	4.266	0.931			
SN <sub>3</sub>	My family and friends will continue wearing masks after the announcement.	3.41±1.162	3.446	0.910			
SN <sub>4</sub>	My family and friends continue to wear masks, and I should make the same choice after the announcement.	2.95±1.254	2.156	0.839			

TABLE 3. Values of construct correlations, square roots of average variance extracted (italic font), and heterotrait-monotrait ratio of correlations (grey shades)

	ATT	BI	PBC	PRC	PRE	PRMB	PSE	PS	PV	SN
<b>ATT</b>	0.907	0.788	0.512	-0.504	0.752	-0.241	0.795	0.591	0.614	0.748
<b>BI</b>	0.896	0.889	0.455	-0.519	0.640	-0.285	0.777	0.544	0.507	0.766
<b>PBC</b>	0.610	0.541	0.813	-0.326	0.515	0.004	0.529	0.273	0.407	0.500
<b>PRC</b>	0.556	0.580	0.372	0.917	-0.443	0.328	-0.615	-0.238	-0.322	-0.493
<b>PRE</b>	0.829	0.715	0.607	0.481	0.928	-0.115	0.709	0.545	0.641	0.656
<b>PRMB</b>	0.298	0.352	0.132	0.396	0.144	0.791	-0.228	-0.139	-0.082	-0.207
<b>PSE</b>	0.870	0.859	0.616	0.664	0.764	0.276	0.940	0.534	0.556	0.754
<b>PS</b>	0.740	0.689	0.364	0.293	0.670	0.196	0.652	0.882	0.658	0.528
<b>PV</b>	0.684	0.573	0.498	0.354	0.708	0.131	0.607	0.821	0.863	0.539
<b>SN</b>	0.827	0.857	0.577	0.534	0.713	0.255	0.814	0.652	0.593	0.896

Abbreviations: ATT = attitude; BI = continuous behavioural intention; PBC = perceived behavioural control; PRC = perceived response cost; PRE = perceived response efficacy; PRMB = perceived reward of maladaptive behaviours; PS = perceived severity; PSE = perceived self-efficacy; PV = perceived vulnerability; SN = subjective norms

one item related to perceived behavioural control; consequently, this item was removed. Internal consistency reliability was considered satisfactory because composite reliability and Cronbach's alpha exceeded the threshold value of 0.7. The average variance extracted for all constructs was >0.5, suggesting good convergent validity after the removal of five items: one item each from perceived severity, perceived response efficacy, perceived self-efficacy, attitude, and behavioural intention. The variance inflation factor for each item was <5, indicating no critical levels of collinearity. Table 3 depicts the results of the assessment of discriminant

validity. Given the adequacy of indicator reliability, internal consistency reliability, convergent validity, and discriminant validity, evaluation of the structural model could proceed.<sup>29</sup>

### Structural model

Table 4 displays the results of direct effects in the structural model. Of the 17 hypotheses, 10 were supported based on the results generated through a bootstrapping procedure with 5000 resamples. Four constructs—perceived severity, perceived self-efficacy, subjective norms, and attitude—had significant positive effects on the intention to

continue wearing a mask. In contrast, perceived reward of maladaptive behaviours had a significant negative effect on mask-wearing intention. Consequently, hypotheses H2, H3, H5, H7, and H8 were supported. However, perceived vulnerability, perceived response efficacy, perceived response cost, and perceived behavioural control were not significantly associated with the intention to continue wearing a mask. Thus, hypotheses H1, H4, H6, and H9 were not supported.

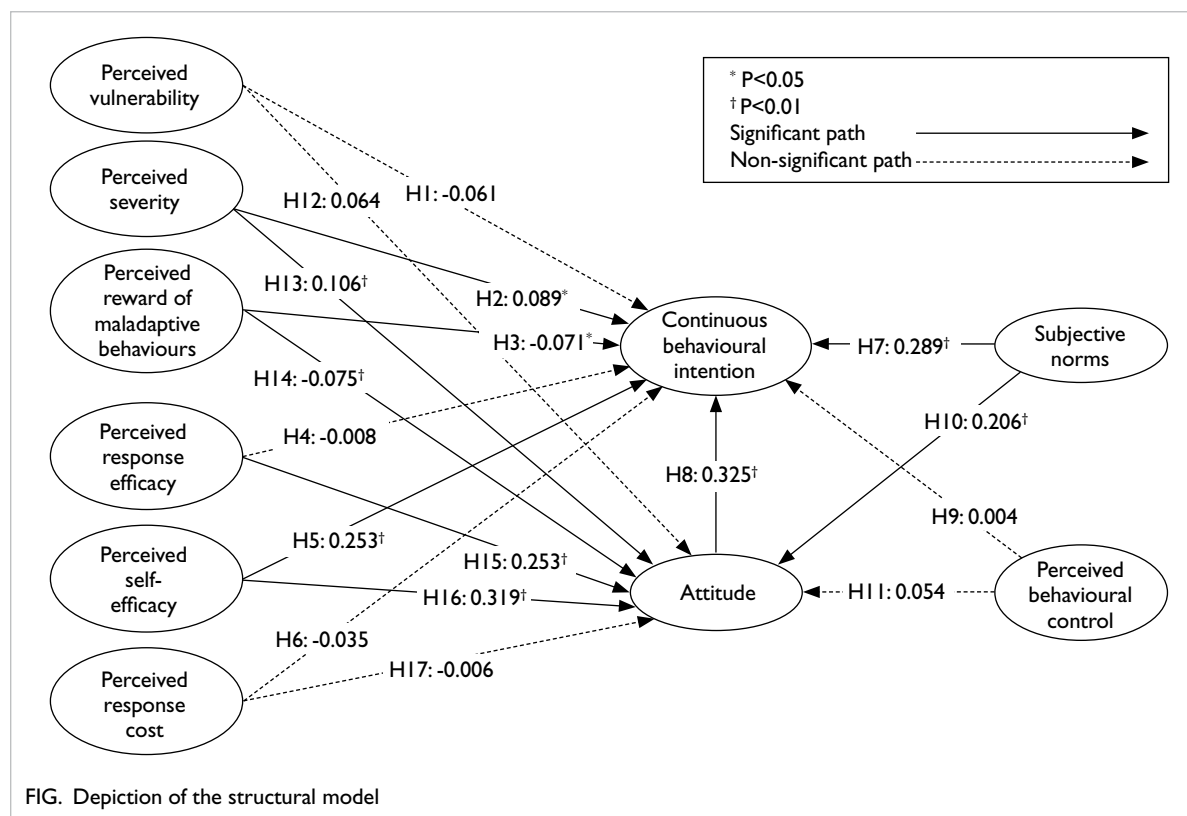
Furthermore, subjective norms, perceived severity, perceived response efficacy, and perceived self-efficacy had significant positive effects on attitude, whereas perceived reward of maladaptive behaviours had a significant negative effect on attitude. Therefore, hypotheses H10, H13, H14, H15, and H16 were supported. However, no significant relationships were observed between perceived behavioural control and attitude, perceived vulnerability and attitude, or perceived response cost and attitude. These findings did not support hypotheses H11, H12, and H17 (Table 4). The results of the structural model are depicted in the Figure.

Table 5 shows the results of the mediation model. Attitude had a partial mediating effect on the relationships of perceived self-efficacy, perceived reward of maladaptive behaviours, subjective norms, and perceived severity with the intention

TABLE 4. Direct effects of the structural model

Hypothesis	Path relations	Path coefficient	t value	P value	Decision
H1	PV → BI	-0.061	1.386	0.166	Not supported
H2	PS → BI	0.089	2.398	0.017	Supported
H3	PRMB → BI	-0.071	2.527	0.012	Supported
H4	PRE → BI	-0.008	0.202	0.840	Not supported
H5	PSE → BI	0.253	4.463	<0.001	Supported
H6	PRC → BI	-0.035	0.891	0.373	Not supported
H7	SN → BI	0.289	6.658	<0.001	Supported
H8	ATT → BI	0.325	5.572	<0.001	Supported
H9	PBC → BI	0.004	0.142	0.887	Not supported
H10	SN → ATT	0.206	4.263	<0.001	Supported
H11	PBC → ATT	0.054	1.531	0.126	Not supported
H12	PV → ATT	0.064	1.528	0.127	Not supported
H13	PS → ATT	0.106	2.889	0.004	Supported
H14	PRMB → ATT	-0.075	3.060	0.002	Supported
H15	PRE → ATT	0.253	5.982	<0.001	Supported
H16	PSE → ATT	0.319	6.467	<0.001	Supported
H17	PRC → ATT	-0.006	0.196	0.845	Not supported

Abbreviations: ATT = attitude; BI = continuous behavioural intention; PBC = perceived behavioural control; PRC = perceived response cost; PRE = perceived response efficacy; PRMB = perceived reward of maladaptive behaviours; PS = perceived severity; PSE = perceived self-efficacy; PV = perceived vulnerability; SN = subjective norms



to continue wearing a mask. These results partially supported hypotheses H19, H20, H21, and H22. Additionally, attitude had a full mediating effect on the relationship between perceived response efficacy and the intention to continue wearing a mask, supporting hypothesis H24. However, no mediating effect of attitude was observed in the relationships of perceived response cost, perceived vulnerability, and perceived behavioural control with continuous behavioural intention. These results did not support hypotheses H18, H23, and H25.

## Discussion

Most respondents continued wearing masks during the 3 weeks after the mandatory mask-wearing requirement had been lifted. Perceived severity, perceived self-efficacy, subjective norms, and attitude were positively associated with the intention to continue wearing a mask, whereas the perceived reward of maladaptive behaviours was negatively associated with this intention. Perceived severity suggests that individuals were concerned about the consequences of contracting COVID-19. Given that COVID-19 had influenced daily life and behaviour for 3 years, it is understandable that perceived severity remained a motivator for continued mask-wearing as a protective measure. Furthermore, some individuals may have experienced anxiety and sought to minimise the risk of infection. Thus, the pandemic itself may have outweighed their desire to return to pre-pandemic norms.<sup>30</sup> Additionally, perceived self-efficacy indicates that individuals with confidence in

their ability to wear a mask effectively were more likely to continue doing so. Personal protective measures can reduce the risk of infectious diseases<sup>31</sup>; mask-wearing is considered a feasible and acceptable method for preventing and reducing the spread of influenza-like illnesses.<sup>32</sup> During the COVID-19 pandemic, some studies showed that perceived severity and perceived self-efficacy were significantly associated with intentions to comply with COVID-19 preventive behaviours.<sup>17,33,34</sup> Individuals perceived that contracting COVID-19 posed a serious threat, whereas mask-wearing remained a feasible and effective strategy for preventing transmission, even after the mandatory mask-wearing requirement had been lifted.

Notably, the perceived reward of maladaptive behaviours had a significant negative effect on the intention to continue wearing a mask. This finding suggests that individuals who perceived benefits from not wearing a mask were less likely to express an intention to continue mask-wearing. The decision not to wear a mask may be attributed to various factors, including concerns about social judgement, the inconveniences associated with preventive measures, and daily hassles.<sup>35,36</sup> The prolonged COVID-19 pandemic led to pandemic fatigue, which may have contributed to a perception among some individuals that the pandemic had ended once the mandatory mask-wearing requirement was lifted, thereby reducing their motivation to continue wearing a mask.

Attitudes and subjective norms had significant positive effects on the intention to continue wearing a mask. This observation indicates that individuals who held a favourable attitude towards mask-wearing and perceived social pressure or influence from others to wear a mask were more likely to express an intention to continue this practice. Attitudes and subjective norms were previously identified as predictors of mask-wearing intention during the COVID-19 pandemic.<sup>3</sup> Before the pandemic, the local population in Hong Kong exhibited a positive attitude towards mask-wearing. For example, patients and caregivers in outpatient settings generally wore face masks; protecting others was a primary motivation for this approach.<sup>37</sup> Individuals with a positive attitude towards mask-wearing may have been influenced by government-led promotion of preventive behaviours since the severe acute respiratory syndrome epidemic in 2003, which caused mask-wearing to become a social norm within the community.<sup>38</sup> The present findings indicate that higher levels of perceived self-efficacy, perceived reward of maladaptive behaviours, subjective norms, and perceived severity not only directly increased the intention to wear a mask but also influenced individuals' attitudes, leading to an increased intention to continue mask-wearing.

TABLE 5. Mediating effects of the structural model

Hypothesis	Path relations	Indirect effect	t value	P value	Result
H18	PRC → ATT → BI	-0.001	0.193	0.847	No mediating effect
H19	PSE → ATT → BI	0.131	4.440	<0.001	Partial mediating effect
H20	PRMB → ATT → BI	-0.038	2.586	0.010	Partial mediating effect
H21	SN → ATT → BI	0.091	3.265	0.001	Partial mediating effect
H22	PS → ATT → BI	0.041	2.448	0.014	Partial mediating effect
H23	PV → ATT → BI	0.004	1.429	0.153	No mediating effect
H24	PRE → ATT → BI	0.081	4.363	<0.001	Full mediating effect
H25	PBC → ATT → BI	0.018	1.439	0.150	No mediating effect

Abbreviations: ATT = attitude; BI = continuous behavioural intention; PBC = perceived behavioural control; PRC = perceived response cost; PRE = perceived response efficacy; PRMB = perceived reward of maladaptive behaviours; PS = perceived severity; PSE = perceived self-efficacy; PV = perceived vulnerability; SN = subjective norms



These results provide empirical evidence supporting the role of attitude as a mediator in the intention to continue wearing a mask. Thus, the relationships among perceived self-efficacy, perceived reward of maladaptive behaviours, subjective norms, perceived severity, and the intention to continue mask-wearing can also be explained by individuals' attitudes.

In the present study, perceived vulnerability did not directly predict the intention to continue wearing a mask. A study also showed no significant association between perceived vulnerability and the adoption of preventive behaviours.<sup>39</sup> A possible explanation is that the prolonged COVID-19 pandemic led individuals to consider themselves less vulnerable compared with early stages of the pandemic. The removal of government restrictions may have further reinforced the perception of reduced vulnerability to COVID-19.<sup>40</sup> Additionally, the results of this study did not demonstrate a statistically significant direct effect between perceived response efficacy and the intention to continue wearing a mask. However, a mediating role for attitude was identified in this relationship, indicating that perceived response efficacy influenced attitude, which then determined the intention to wear a mask.

## Implications

This study highlights the importance of understanding the predictors of mask-wearing intention after the mandatory mask-wearing requirement was lifted. A high frequency of mask-wearing was observed after the removal of the requirement. This finding has implications for future research regarding the long-term effects of habitual mask use and its impact on public health. From a practical perspective, the findings indicate that attitude towards continued mask-wearing was the strongest predictor of mask-wearing intention, suggesting that citizens are prepared for future health crises. Policymakers can utilise these insights to develop guidelines encouraging mask use during influenza seasons.

## Limitations

This study had certain limitations. First, the sampling method relied on non-probability snowball sampling, which may affect the representativeness of the sample. Second, participation was limited to individuals with access to email and social media, leading to overrepresentation of younger and more educated individuals. Younger participants may consider themselves less likely to experience severe health consequences if they contract COVID-19. Consequently, the findings may not be generalisable to the entire population.

## Conclusion

To our knowledge, this is one of the first studies

to use an online questionnaire to identify the predictors of mask-wearing intention after the mandatory mask-wearing requirement in Hong Kong was lifted in March 2023. Attitude towards continued mask-wearing, subjective norms, and perceived self-efficacy exhibited strong positive effects on the intention to continue wearing a mask. Regarding research implications, this study provides new insights into the evaluation of Hong Kong citizens' transition to a post-pandemic era. The high frequency of mask-wearing observed may be attributed to concerns about COVID-19 and the establishment of mask-wearing as an accepted and habitual behaviour within the local population. Furthermore, the findings suggest that Hong Kong citizens are well prepared for future health crises, such as severe acute respiratory syndrome and additional COVID-19 outbreaks. The positive attitude towards mask-wearing reflects recognition of its feasibility and effectiveness as a durable non-pharmaceutical public health intervention to reduce airborne disease transmission.

## Author contributions

Concept or design: TKC Ng, BYF Fong.

Acquisition of data: All authors.

Analysis or interpretation of data: TKC Ng, BYF Fong.

Drafting of the manuscript: TKC Ng, BYF Fong.

Critical revision of the manuscript for important intellectual content: All authors.

All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

## Conflicts of interest

All authors have disclosed no conflicts of interest.

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## Ethics approval

This research was approved by the Research Committee of the College of Professional and Continuing Education of Hong Kong Polytechnic University, Hong Kong (Ref No.: RC/ETH/H/133). Informed consent was obtained from all participants prior to the study and for the publication of this research.

## Supplementary material

The supplementary material was provided by the authors and some information may not have been peer reviewed. Accepted supplementary material will be published as submitted by the authors, without any editing or formatting. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by the Hong Kong Academy of Medicine and the Hong Kong Medical Association. The Hong Kong Academy of Medicine and the Hong Kong Medical Association disclaim all liability and responsibility

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