

Original Research

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Factors Influencing Wearing Face Mask in Public During COVID-19 Outbreak: A Qualitative Study

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Abstract

Objective: Wearing face masks is believed to mitigate coronavirus disease 2019 (COVID-19) virus transmission by filtering respiratory droplets. This study was to explore the factors influencing wearing face masks in public in China during COVID-19 outbreak.

Methods: This study was a qualitative semi-structured interview research design and was guided by the Protection Motivation Theory. Participants from Jiangxi Province China were interviewed by means of WeChat video call. Thematic analysis was used to analyze the data.

Results: Recruitment efforts were suspended when 21 participants (aged 23 to 72 y) were successfully enrolled and the data reached thematic saturation. Four themes were identified when participants described factors influencing them to wear face masks: knowledge of disease (subthemes were severity of disease, and individual vulnerability to disease), environmental facilitators and constraints (subthemes were government recommendations, public opinion, and affordability and availability of face masks), understanding of protection effectiveness (subthemes were protection effectiveness of wearing face masks, and selection of protective measures), and past experiences.

Conclusions: Individuals' decision to wear face masks was influenced by the combination of factors identified. Identification of these factors provides guidance for explaining wearing face masks in public and helps policy-makers develop feasible recommendations for wearing face masks during COVID-19 outbreak.

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2,¹ was initially reported in China in December 2019² and spread rapidly around the globe over the next few months. COVID-19 has high virus transmission rate (by means of respiratory droplets and contact routes) and mortality rate.³ According to a recent World Health Organization COVID-19 epidemiological update,⁴ until October 17, 2021, over 240.2 million cases have been reported globally with over 4.8 million deaths. Due to the absence of specific and effective treatment for COVID-19, interrupting virus transmission is the primary strategy used to prevent infection and control outbreak.⁵

Wearing face masks mitigates COVID-19 virus transmission by filtering respiratory droplets⁶ and is increasingly being adopted by many people in public. There are 3 considerations when wearing face masks. First, different types of face masks have varying levels of protection against COVID-19 virus transmission. There are 3 main types: fabric face masks (eg, cloth covering and scarf); medical face masks (also referred to as surgical masks); and filtering face piece respirators (eg, N95, KN95, and FFP2).⁷ Fabric face masks provide very limited protection for the wearers against virus transmission and are not appropriate in health-care settings. However, they can be used in public because their physical barrier can reduce the risk of droplet transmission.⁷ Compared with fabric face masks, medical face masks are thought to have more effective filtering capabilities due to the strict requirements of production standards designed to provide protection against infection. However, there is limited evidence supporting the protection of medical face masks against COVID-19 virus transmission.³ Respirators can filter over 95% of droplets when inhaling and provide effective protection for the wearers against virus transmission.⁷ Second, face mask use alone is not sufficient to suppress COVID-19 virus transmission.³ Individuals should be aware of the false sense of security when wearing face masks. Whether face masks are worn or not, compliance with hand hygiene, physical distancing, and other infection prevention and control measures are critical to prevent COVID-19 virus transmission.³ Third, people who have received COVID-19 vaccines should not be exempt from wearing face masks because vaccines do not provide 100% protection.⁸ Although vaccines can prevent people from developing symptoms, it is still possible for vaccinated people to be infected by the virus without showing symptoms. If vaccinated people are infected and do not wear face masks, they can become silent spreaders of the virus and potentially put unvaccinated people at risk.

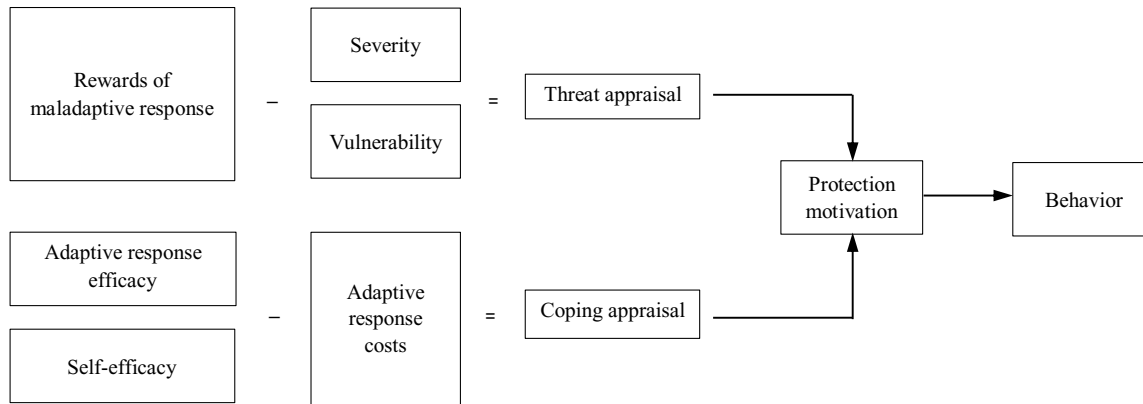


Figure 1. The Protection Motivation Theory.

Countries worldwide are experiencing different stages of COVID-19 trajectory and have issued different policies for wearing face masks. In China, wearing face masks is required in public places with high population density, where ventilation is insufficient, and where physical distancing (> 1.0 meter) is difficult to maintain.⁹ However, there are discrepancies between government recommendations and observed public behaviors, indicating that government recommendations might not be the only factor influencing wearing face masks in public.

Understanding the factors influencing wearing face masks in public is important for policy-makers to develop feasible guidelines and help educate people why, when, and how to properly wear face masks during COVID-19 outbreak. To the best of our knowledge, no previous study has explored factors influencing wearing face masks in public. This study aims to explore the influencing factors of wearing face masks in public during COVID-19 outbreak.

Theoretical Framework

The Protection Motivation Theory (PMT)¹⁰ was used as the theoretical framework for this study. The PMT was originally developed in 1975 to understand the impact of fear appeal on behaviors and then revised in 1983 to describe the cognitive processes of performing behaviors (Figure 1). In the PMT, behavioral performance (wearing face masks) is determined by protection motivation (intention to wear face masks) in response to a threat (COVID-19 outbreak). The development of protection motivation encompasses 2 appraisal processes: threat appraisal and coping appraisal. First, the threat appraisal process consists of appraising severity of the threat (harm from COVID-19), vulnerability to the threat (probability of being infected with COVID-19), and rewards of maladaptive responses (benefits of not wearing face masks). Threat severity and vulnerability can decrease the likelihood of maladaptive responses, while rewards of maladaptive responses can increase the likelihood of maladaptive responses. Second, the coping appraisal process consists of appraising adaptive response efficacy (efficacy of wearing face masks in preventing COVID-19), self-efficacy of performing adaptive responses (confidence in wearing face masks), and adaptive response costs (negative consequences of wearing face masks). Adaptive response efficacy and self-efficacy of performing adaptive responses can increase the likelihood of adaptive responses, while

adaptive response costs can decrease the likelihood of adaptive responses.¹¹ The PMT has been widely used to explain and predict health behaviors, such as exercise, dietary behavior, smoking, alcohol drinking, safe sex, and medical adherence.¹¹

There are 2 reasons for using the PMT in this study. First, the PMT encompasses the theoretical constructs (factors) that increase/decrease (influence) the likelihood of adaptive/maladaptive responses (wearing face masks or not) to a threat (COVID-19 outbreak). This aligns with the purpose of this study—to explore the factors that influence wearing face masks in response to COVID-19 outbreak. Second, the PMT outlines cognitive responses that result from fear appeal,¹¹ and fear is a likely psychological response to the high transmission and high mortality rates of COVID-19. In this study, the PMT was used to develop the interview questions and discuss the results. Conscious efforts were made not to use the PMT to identify a priori factors influencing wearing face masks in public.

Methods

Research Design

This study was a qualitative semi-structured interview research design.

Settings and Participants

Participants were recruited from Jiangxi Province, China, between March 31 and May 25, 2020. Jiangxi Province covers 170,000 km² and has a population of 46.5 million.¹² The number of accumulative confirmed COVID-19 cases was 935 at the beginning of data collection,¹³ and there was no new confirmed case during the period of data collection.¹⁴ Inclusion criteria for recruiting participants were ≥ 18 y of age and able to use WeChat video call. Exclusion criteria included suspected or confirmed COVID-19 cases and cognitive impairment.

Data Collection

This study used purposive sampling to recruit participants. Pedestrians were approached and invited as potential participants, provided an explanation about the study, and screened for eligibility. Eligible participants who agreed to participate in this study were asked to provide their WeChat IDs for the purpose of video interview. To avoid the risk of COVID-19 transmission, interviews were conducted by means of WeChat video call on the days appointed. Written informed consent was obtained from all participants before data collection.

Table 1. Interview questions

Interview questions	
1	Can you please tell me whether you wear a face mask in public during COVID-19 outbreak? If yes, • What type of face mask do you usually wear in public (medical face mask, respirator, fabric face mask, or others)? • How often do you wear a face mask in public (rarely, sometimes, often, or always)?
2	Can you please tell me what reasons/factors make you (not) wear a face mask in public during COVID-19 outbreak?
3	Can you please tell me what you know about COVID-19?
4	Can you please tell me the impact of wearing a face mask in public on you during COVID-19 outbreak?
5	Can you please tell me how you understand the role of wearing a face mask in protecting against COVID-19?

Semi-structured one-to-one interviews were conducted to collect data. Interview questions (Table 1) were first prepared after considering the PMT constructs, then tested, reviewed, and revised by means of 3 pilot interviews before they were used in the major interviews. The question “Can you please tell me what you know about COVID-19?” reflects participants’ understanding of the disease, including severity and vulnerability. The question “Can you please tell me the impact of wearing a face mask in public on you during COVID-19 outbreak?” reflects participants’ understanding of benefits and costs of wearing face masks in public (rewards of maladaptive response and adaptive response costs). The question “Can you please tell me how you understand the role of wearing a face mask in protecting against COVID-19?” reflects participants’ understanding of efficacy of wearing face masks in preventing COVID-19 (adaptive response efficacy). In the pilot interviews, the participants had difficulty in responding to the question reflecting confidence in wearing face masks (self-efficacy) – “Can you please tell me how your confidence in wearing face masks influences the usage of face masks?”. Therefore, this interview question was excluded from the major interviews. Participants’ demographic characteristics were also collected during the interviews.

Interviews were conducted by a female PhD nurse researcher (D.C.) with expertise in qualitative methods and health behaviors. Participants had no previous contact or relationship with the interviewer before being interviewed. Each interview took approximately 1–1.5 h and was audio recorded. The length of interviews varied according to participants’ wishes and topic requirements.¹⁵ Sampling was stopped when the data collected reached thematic saturation—the point when no new themes emerged from data analysis.¹⁶ To enable the detection of thematic saturation, data analysis was intertwined with data collection from the beginning.

Data Analysis

Interviews were transcribed verbatim and de-identified before data analysis. Thematic analysis was used to analyze the data and consists of 6 phases.¹⁷ The first phase is familiarizing with data, involving repeated reading of the data to become immersed and intimately familiar with the content. The second phase is generating codes, involving generating succinct labels (codes) that identify important features of influencing factors of wearing face masks in public. The third phase is generating candidate themes, involving examining the codes and collated data to identify significant broader patterns of meaning underpinned by a central concept or idea (themes). The fourth phase is reviewing themes, involving

checking candidate themes against the dataset to determine whether they tell a convincing story of the data and refining them if needed. The fifth phase is defining themes, involving working out the scope and focus of each theme and deciding on an informative name for each theme. The final sixth phase is producing the report, involving weaving the analytic narrative and data extracts and then contextualizing the analysis in relation to existing literature. Although thematic analysis is introduced here as a linear 6-phase method, it is an interactive and reflective process involving constant movement between phases. During the process of thematic analysis (W.H. and D.C.), analytical memos and notes containing ideas and thoughts about the data and reasons for coding and grouping the data were recorded.¹⁸

Lincoln and Guba¹⁹ developed 4 criteria (credibility, dependability, confirmability, and transferability) to judge the merits of qualitative research. The strategies to ensure trustworthiness of this study are summarized in Table 2.

Ethical Considerations

Written informed consent was obtained from all participants before data collection. Ethical approval was obtained from Jiujiang University Ethics Committee (2020-JS-031).

Results

Recruitment efforts were suspended when 21 participants were successfully recruited (2 declined and 1 could not be reached on the day appointed) as thematic saturation was reached after data analysis. The participants’ demographic characteristics and frequencies and types of face masks worn are summarized in Table 3. Four themes were identified from participants’ description about the factors influencing wearing face masks: knowledge of disease, environmental facilitators and constraints, understanding of protection effectiveness, and past experiences (Table 4).

Theme 1: Knowledge of Disease

Individuals’ knowledge of COVID-19 greatly influenced their decision to wear face masks, from 2 perspectives (subthemes): severity of disease and individual vulnerability to disease. These 2 subthemes reflect the 2 PMT constructs of “severity” and “vulnerability.” Participants described COVID-19 as an extremely contagious disease and that the consequences of being infected are very likely severe. Their understanding of COVID-19 severity led them to believe that it was important to wear face masks.

It was reported that many people died of COVID-19. It is very contagious. You know, human-to-human transmission. I have to be cautious and wear a face mask. (Participant 2)

Some participants thought that it was necessary to wear face masks due to their previous history of vulnerability to other respiratory infectious diseases. Other participants who believed they were strong and seldom sick still chose to wear face masks due to the high virus transmission and high mortality rates of COVID-19.

I am easily infected by the people with common cold. . . . I need to wear a face mask to protect myself. (Participant 7)

I think that my disease resistance is okay. But COVID-19 has a high virus transmission rate and high mortality rate. . . . It is not worth taking the risk of not wearing face mask. (Participant 15)

Table 2. Strategies to ensure trustworthiness

Criterion	Strategy	Activity
Credibility	Prolonged engagement	Each interview lasted 1-1.5 h. The sufficient interview time ensured engagement in the field with participants, and enabled participants to answer interviewer's questions and support their statements with examples.
	Persistent observation	During data analysis, the researchers constantly read and re-read data to become immersed and intimately familiar with the content, generated codes and themes, reviewed and revised themes, and produced the report.
	Investigator triangulation	Two researchers analyzed the data independently and compared their results. If results differed, they discussed the results until the most suitable results were found to represent the data. They held regular meetings during the process of data analysis.
Transferability	Member check	All participants were invited to review the interview transcripts and give further comments to make additional contributions or strengthen accuracy.
	Thick description	A thick description of the participants and the context was provided to enable the readers to evaluate the transferability of this study.
Dependability and confirmability	Audit trail	A 5-phase audit ²⁰ was conducted by an independent external auditor who was not directly involved in this study and 2 research team members. The independent auditor possesses knowledge and expertise in qualitative methods and health behaviors.

Table 3. Participants' demographic characteristics and wearing face masks

Characteristic	N or Min - Max
Age (y)	23-72
Gender	
Male	12
Female	9
Education	
Bachelor's degree or higher	5
Certificate or diploma	9
Middle school or lower	7
Frequency of wearing face masks in public	
Always	5
Often	13
Sometimes	3
Rarely	0
Never	0
Type of face masks worn in public	
Medical face masks only	16
Medical face masks and N95 respirators	3
Medical face masks and fabric face masks	2
Others	0

Theme 2: Environmental Facilitators and Constraints

Environmental factors, such as government recommendations, public opinion, and affordability and availability of face masks, either facilitated or constrained participants' wearing face masks. One participant described the impact of government recommendations on the decision to wear face masks.

The country is requiring and educating us to wear face masks. . . . I am not clear about the disease because I have not experienced it before. But I surely will follow government policy anyway. (Participant 5)

Public opinion refers to the prevalent views on wearing face masks in public. Participants perceived public opinion regarding the importance of wearing face masks, and subsequently adjusted their behavior to conform to the public opinion in the social groups to which they belong. The subtheme "public opinion" reflects the PMT construct of "rewards of maladaptive response." Participants would

receive "negative" rewards from public opinion if they conducted maladaptive response (not wearing face masks in public).

There are so many community workers and complex securities supervising your wearing face masks in public. If you do not wear a face mask, you will be seen differently. . . . You will not be allowed to enter complexes, food markets, and supermarkets without a face mask. (Participant 10)

Most participants chose to wear medical face masks because they are more affordable compared with the respirators. Availability of face masks in market also influenced participants' choice. The subtheme "affordability and availability of face masks" reflects the role of the PMT construct of "adaptive response costs" in wearing face masks.

N95 respirators are more expensive than medical face masks and not always available in shops. . . . I only used N95 respirators in shopping malls or supermarkets where the population density is high. (Participant 13)

Theme 3: Understanding of Protective Measures

Participants' decision to wear face masks was influenced by their understanding of protective measures against COVID-19. Some participants believed that medical face masks meet medical standards during production and, therefore, provide effective protection for the wearers against COVID-19. Others believed that only respirators could effectively protect them against COVID-19. The subtheme "protection effectiveness of wearing face masks" reflects the PMT construct of "adaptive response efficacy."

Medical face masks must meet the medical standard during production. . . . I feel safer with a medical face mask on. (Participant 7)

I normally wear N95 respirators in public, because only respirators provide effective protection against COVID-19. . . . Sometimes I have to wear medical face masks if N95 respirators are not available. (Participant 18)

Some participants thought that it was unnecessary to wear face masks in public when physical distancing could be achieved.

I do not see that the face mask adds any further protection of what we are already doing in terms of physical distancing. . . . I only wear face masks in places with high population density. (Participant 20)

Theme 4: Past Experiences

Another influence on participants' decision to wear face masks was the recollection of the severe acute respiratory syndrome (SARS)

Table 4. Themes and subthemes

Themes and subthemes		The Promotion Motivation Theory constructs reflected by subthemes
1	Knowledge of disease	
1.1	Severity of disease	Severity
1.2	Individual vulnerability to disease	Vulnerability
2	Environmental facilitators and barriers	
2.1	Government recommendations	–
2.2	Public opinion	Rewards of maladaptive response
2.3	Affordability and availability of face masks	Adaptive response costs
3	Understanding of protective measures	
3.1	Protection effectiveness of wearing face masks	Adaptive response efficacy
3.2	Selection of protective measures	–
4	Past experiences	

outbreak in 2003, when many people wore face masks as a protective measure against SARS virus. They similarly took a precaution by wearing face masks during COVID-19 outbreak. SARS was first reported in China and affected 26 countries with more than 8000 deaths in 2003.²¹ It resulted in substantial detrimental effects on the economy and daily life in China. Those participants who experienced SARS outbreak were inclined to wear face masks.

The spread of COVID-19 makes me recall the SARS outbreak in 2003. I was in Beijing at that time. . . . So many people wore face masks. We must learn a lesson from SARS and wear face masks to protect against the virus. (Participant 10)

SARS has caused such a huge damage to economy and daily life. I saw from the news that many people wore face masks. Now COVID-19 seems to be worse than SARS. Wearing face masks is so important and necessary now. (Participant 13)

Discussion

Wearing face masks is an effective, affordable, and easy-to-implement measure in the battle against COVID-19.²² This study deepens the understanding of wearing face masks in public during COVID-19 outbreak. Individuals' decision to wear face masks in public is influenced by a combination of 4 factors: knowledge of disease, environmental facilitators and constraints, understanding of protective measures, and past experiences.

Factors Influencing Wearing Face Masks in Public

Individuals' knowledge of attributes and consequences of a disease influences their intention to perform health behaviors to combat the disease.²³ In this study, participants' knowledge of COVID-19 was found to influence their decision to wear face masks through several routes. Continuous education about COVID-19 by the government provided knowledge regarding its high infectivity and severe consequences, which evoked fear and led people to take protective measures,¹¹ such as wearing face masks. Also, participants described concerns about their vulnerability to COVID-19 and the importance of wearing face masks regardless of individual levels of resistance to disease.

Environmental facilitators and constraints are important factors influencing the implementation of health behaviors.^{18,24} Government recommendations and public opinion about the importance of wearing face masks in China increased the usage of face masks in public. Chinese has been identified as the representation of collectivist culture.²⁵ Different from individualist

culture that primarily considers individual needs and attitudes, collectivist culture prioritizes public opinion when deciding individual behaviors.²⁵ When the government and public opinion encourage people to wear face masks, individuals who do not adopt this protective measure are more likely to adapt their opinions, revise their beliefs, and change their behaviors as a result of social interactions with other people.²⁶

Factors outside of individual control, such as supply shortage, can make wearing face masks difficult or impossible. During COVID-19 outbreak, initial shortages were observed for several reasons: (1) the demand of face masks was dramatically increased; (2) the beginning of COVID-19 outbreak coincided with the Chinese New Year holiday, which meant a reduced workforce and insufficient storage of raw materials in face mask factories; (3) city lockdowns and transport restrictions made it challenging for the face mask manufacturing workforce to return to work; and (4) panic buying worsened the shortage of face masks in the market.²⁷ Despite the boosted production capacity of face masks, there could potentially be another wave of shortages if COVID-19 outbreak is not controlled and more countries implement a universal face mask wearing policy, because respirators and medical face masks are designed for single use.

Individuals' understanding of protection effectiveness of wearing face masks influenced their usage of face masks. Most participants in this study believed that medical face masks meet medical standards during production and can, therefore, provide wearers effective protection against COVID-19 virus transmission. However, evidence on the effectiveness of wearing face masks is limited and inconsistent, and the World Health Organization (WHO) continues gathering scientific data to inform it.³ The result of this study indicates that some people might overestimate the effectiveness of wearing medical face masks in public, and that clearer education on where, when, how, and what type of mask should be worn are needed.

Past experiences were found to influence future behaviors because experiences shape individuals' beliefs about the behaviors, which in turn influence behavioral intention and subsequent behaviors.¹¹ In some East Asian regions, particularly after SARS in 2003, wearing a face mask in public during flu seasons or other disease outbreaks is considered a reasonable measure to constrain disease transmission in the community and has become a social norm for outbreak control.²⁸ In this study, some participants wore face masks because they understood the importance of wearing face masks against virus transmission after experiencing SARS outbreak.

Extension of the PMT

This study extended the PMT when explaining the influencing factors of wearing face masks in public. Although some themes identified in this study reflect the PMT constructs, participants also described some other influencing factors that do not reflect the PMT constructs, such as the subtheme “government recommendations,” the subtheme “selection of protective measures,” and the theme “past experiences.” Some studies stated that the PMT is not a sufficient model of health behavior and will benefit from the inclusion of additional constructs.¹¹ A Japanese research²⁹ investigated the factors influencing wearing face masks against COVID-19 and reported that only 34% variance of wearing face masks could be explained by severity of COVID-19, self-efficacy, response efficacy, rewards, norm, and impulse to take necessary actions.²⁹ Their result indicates that the remaining 66% variance may be explained by additional factors other than the 6 factors that they investigated. This current study provided evidence for additional factors that should be considered when explaining the factors influencing wearing face masks in public.

Considerations When Applying the Results to Other Ethnic Groups

The results of a study are normally interpreted with the study context and sample. This study recruited participants in China. As a result, there may be a misconception that the results are only applicable to a Chinese population. In reality, many people in countries other than China have also adopted wearing face masks as a protective response to COVID-19 outbreak. It is reasonable to assume that some factors influencing wearing face masks identified in this study would be shared by other ethnic groups.

However, several considerations should be taken into account when applying the results of this study to other ethnic groups. First, countries worldwide are experiencing different stages of COVID-19 trajectory. On October 24, 2021, the number of new confirmed COVID-19 cases was 56 in China, 2041 in Australia, and 78,075 in the United States.³⁰ People from areas with poor control of COVID-19 outbreak are more likely to take protective measures, such as wearing face masks. Second, there are discrepancies in the recommendations for wearing face masks among different countries.³¹ Although governments recommend people to wear face masks when physical distancing is difficult to maintain, the definitions of social distancing are not consistent: > 1.0 meter in China,⁹ > 1.5 meter in Australia,³² and > 6 feet or 1.8 meter in the United States.³³ The various government recommendations for social distancing might influence wearing face masks in public. Third, the difference in people’s reaction to their governments’ recommendations should be noted. The collectivist nature of Chinese culture may demonstrate a high degree of compliance with government recommendations and constraint on individual behaviors,^{34,35} whereas an ethnic group with individualist culture may demonstrate greater variance in compliance with government recommendations. Fourth, availability of face masks may differ among countries. The access to face masks in China is easier compared with other countries because China contains the largest amount of face mask manufacturers and the largest production capacity globally. Fifth, the theme “past experience” might not be referenced in other ethnic groups due to the absence of a comparable event to COVID-19. Other countries experienced much fewer cases of SARS, whereas in 2003, SARS primarily affected China (7748 cases in China out of global 8422).³⁶

Limitations

There are 3 limitations in this study. First, the strategy of recruiting participants might limit the generalization of the results. Future studies can use a stratified purposive sampling method to promote generalization.³⁷ Also, collecting data from areas with different COVID-19 infection rates should be considered. Second, the limitation of applying the results of this study to other ethnic groups cannot be excluded. Further studies are needed to confirm the influencing factors in other ethnic groups. Third, the disadvantages of video interviews cannot be ignored. For example, an interviewer might miss the opportunities to observe the participants’ physical space and respond to their body language and emotional cues.³⁸ Also, there is a potential risk of biased results to exclude those who were unable to use WeChat video call. Future studies could conduct face-to-face interviews when protection measures (eg, vaccination and social distancing) are secured.

Conclusions

This study identified 4 themes as factors influencing wearing face masks in public in China. These include knowledge of disease, environmental facilitators and constraints, understanding of protective measures, and past experiences. Identification of these factors provides guidance for explaining wearing face masks in public and helps policy-makers develop feasible recommendations for wearing face masks during COVID-19 outbreak.

Supplementary material. To view supplementary material for this article, please visit <https://doi.org/10.1017/dmp.2022.52>

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W.H. and D.C. contributed to the study conceptualization and design, data collection and analysis, and writing. G.G. contributed to the study design and writing. D.K. contributed to the data analysis and writing. All authors read and approved the final manuscript.

Conflict(s) of interest. The authors declare that there is no conflict of interest.

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