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What shapes people’s willingness to wear a face mask at the beginning of a public health disaster? A qualitative study based on COVID-19 in China

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A B S T R A C T

COVID-19 should not be the world’s last public health disaster, so there is an urgent need to learn from COVID-19 to prepare better for the next public health disaster. This study aims to understand the factors that make people wear a face mask at the beginning of an outbreak of public health disaster. Semi-structured interviews were conducted during April 2020 in China, one month after the COVID-19 was declared a pandemic. The respondents were members of the public living in China, covering two age groups: young adults and older adults. They were recruited using a convenient sample and snowball sampling strategy. The results were analysed using content analysis. Seventeen subjects were recruited, among which nine were young adults (average age = 26.4; SD = 10.5), and eight were older adults (average age = 60.4; SD = 12.1). This study found that environmental factors, personal factors, factors concerning wearing masks, specific circumstances, and development of the pandemic were the common factors considered by both young adults and older adults. This study should help the authority formulate prevention policies better to reduce the risk of an outbreak if there is a new virus outbreak in the future, unfortunately.

1. Introduction

COVID-19 is regarded as a global public health disaster. The number of cases, deaths, and affected population has gone far beyond any disaster since the Spanish flu in 1918 [1]. Concerning its severity, the World Health Organisation declared the COVID-19 crisis as a pandemic in March 2020. This declaration means that the COVID-19 disaster is much more impactful than other previous crises such as SARS, MERS and H1N1 [2]. The disaster has disturbed social activities and consumed over $82 trillion globally [3]. Although disasters are often regarded as sudden, unpredictable events, acts of nature, and fate, they are ongoing processes associated with misinformed development [3]. Asking the general public to follow health advice is one of them in the COVID-19 disaster. In detail, wearing face masks is regarded as one of the most effective ways to prevent COVID-19 transmission [4-8]. In particular, Wong, Teoh, Leung, Wu, Yip, Wong and Hui [9] highlighted that countries with early awareness on face mask use had lower numbers of daily COVID-19 cases. However, despite the effectiveness of wearing masks and the spread of this information in society, wearing masks was not generally accepted by the public at the beginning of the pandemic [10-12]. Therefore, it is essential to look into the factors influencing people’s willingness to wear masks at the beginning of this public health disaster. According to the Theory of Planned Behavior [13], people’s behavioral intention is the most prominent determinant of their actual behavior. Therefore, it is believed that if a person is willing to wear a face mask, he or she would wear the face mask in public space. The importance of this research is that COVID-19 should not be the world’s last public health disaster. Hence, there is an urgent need to learn from COVID-19 in order to understand how to motivate people to follow health advice, i.e., to wear masks, at the beginning of the next public health disaster.

Despite an increasing number of studies looking into the popularity of wearing masks in society ([e.g., 10-12]), little focus was put on the potential reasons for people to comply with the suggestions on wearing masks in public space that is generally open and accessible to everyone, such as parks, markets, and streets. Furthermore, the opinions among different age groups were overlooked. Therefore, the following two research questions remain unclear:

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What factors drive or hinder people’s willingness to wear a mask in public space at the beginning of an outbreak of public health affairs?

What are the differences in the above factors between young adults (age between 18 and 45) and older adults (age 45 or over)?

In light of the above, in-depth, semi-structured interviews with nine young adults and eight older adults were conducted to investigate the reasons for wearing masks in public space in April 2020, when residents were still advised to stay indoors and practise preventative measures despite the scheduled ease on travel curbs. Meeting and gathering were prohibited at that time. This paper distinguishes itself from previous literature in the following ways:

This study is one of the early investigations that looked into the factors influencing individuals’ willingness to wear masks in public space at the beginning of the COVID-19 pandemic. This contribution should help the authority formulate relevant pandemic prevention policies and control plans.

This study is one of the first studies investigating the different opinions and rationales that young adults and older adults hold regarding wearing masks in public space. This contribution should help the authority formulate relevant promotion strategies for young adults and older adults and increase the effectiveness of control plans.

However, it should be stressed that this study’s primary objective was not on what we should do now to stop the current COVID-19 pandemic, which had already broken out for a year. Instead, it aimed to tell what measures we should take to encourage people to collaborate to reduce the risk of an outbreak if there is a new virus outbreak in the future, unfortunately.

2. Literature review

A disaster means an unforeseeable and often unexpected event that results in significant damage, destruction, and human suffering. It frequently exceeds society’s capacity to deal with the issue based on society’s resources [14]. It causes threats to human life and dignity, impoverishment of vulnerable people, degradation of the environment, and an impediment to community development efforts [15]. To this end, disaster risk management refers to the society’s ability to avoid or reduce the many potential consequences of a disaster by changing existing environmental, socioeconomic, and administrative systems is referred to as disaster risk management or adaptation [16]. Its key components are preparedness and response measures, which focus on methodically creating and executing policies and procedures to prevent or mitigate the negative impacts of disasters by reducing vulnerability, safeguarding assets, and preserving the ecosystem [17].

A public health disaster refers to disasters linked to public health. It could be an infectious disease pandemic that has catastrophic or severe societal effects, a public health consequence of natural or artificial disasters, or a latent, “silent”, or low-prevalence public health problem that has the potential to develop pandemic capabilities quickly [18]. Large-scale outbreaks such as SARS, H1N1, Ebola, Zika, and, most recently, COVID-19 are typical examples of public health disasters. They demonstrated how public health disasters could cause high morbidity and mortality, have negative socioeconomic consequences, and overload health systems [19]. Because of the severity of public health disasters, scholars have long looked into how people and governments could do better when encountering public health disasters. They gathered information from previous public health disasters to prepare for future unknown ones. For example, AlQahtany and Abubakar [15] conducted a questionnaire study to investigate popular perceptions and attitudes around disaster risks in Saudi Arabia. They discovered a strong positive linkage between residential location and disaster risk perception, as well as a large positive relationship between residential location and disaster risk concern. As a result, they suggested governments increase public knowledge of disaster prevention and encourage active disaster preventive behaviours in disaster-prone locations. Alwidyam, Trainor and Bissell [20] also conducted face-to-face interviews with emergency medical service personnel in Delaware, United States, to learn about their perspectives on working during natural disasters and disease outbreaks, as well as whether they were willing to come to work in such circumstances. Their findings provide a foundation for emergency medical services, public health, and emergency management authorities to formulate actions based on emergency medical service professionals’ opinions on their work during disasters and public health emergencies. Frazier, Wood and Peterson [21] looked into residual risks in public health and disaster management. Using a case study, they established an objective, scientific, data-driven technique for presenting the state of risk assessment, as well as a novel way for identifying hazards that persist after mitigation measures had been applied. All these studies’ results could help peoples, governments, and organisations to improve their disaster prevention, mitigation and response.

Wearing a face mask seemed to be a useful measure for COVID-19 disaster risk reduction [9]. Hence, investigating people’s masks wearing behaviour during COVID-19 is an essential topic in public health disaster risk management or reduction. Multiple relevant studies have been conducted both quantitatively and qualitatively. For quantitative research, Rahimi, Shirali, Araban, Mohammadi and Cheraghali [22] statistically assessed the prevalence of face mask use and explore different types of face masks and their distribution among pedestrians in southwest Iran. They concluded that the usage of face masks was relatively uncommon in Ahvaz, particularly among men and younger individuals. Lao, Li, Zhao, Guo and Zhou [23] uncovered that predictors and mechanisms of facemask use and handwashing among Chinese in the early stages of the COVID-19 pandemic using the health action process approach and a longitudinal online survey. They found that increasing action self-efficacy could boost people’s willingness to wear masks, and increasing action control improves the translation of intention into behaviour. Li, Liu, Li, Qian and Dai [24] also established a mathematical model to assess the impact of using medical masks in public for preventing COVID-19. They showed that using a face mask in conjunction with social distance could successfully flatten the epidemic curve. Hence, they claimed that wearing a mask as a non-pharmaceutical intervention to fight COVID-19 appeared to be a reasonable solution. Simultaneously, some scholars looked into people’s mask-wearing behaviour from the perspective of the impact of wearing a mask on human bodies. As such, they could predict and explain the obstructing factors of wearing masks. For example, Shein, Whitticar, Mascho, Pace, Speicher and Deakins [25] investigated whether cloth masks or surgical masks would hamper oxygenation or ventilation at rest or during physical activities. They looked into the impact of face masks on various human indicators, such as heart rates, oxygen levels, and transcutaneous carbon dioxide tension. The study revealed that wearing cloth masks or surgical masks did not affect pathologic gas exchange. Rapisarda, Trimboli, Fortunato, De Martino, Marsico, Demonte, Augimeri, Labate and Gambardella [26] investigated how headache symptoms change as a result of wearing a face mask in a group of healthcare workers with a low-medium risk to COVID-19 using a specifically designed self-administered questionnaire. They revealed the emergence of de novo linked facemask headache in previously headache-free participants. They also found an aggravation of pre-existing primary headache disorders, most commonly reported by subjects with migraine disease.

For qualitative research, Omura, Stone, Petrini and Cao [27] conducted a qualitative descriptive study to find out how clinical and academic nurses in Japan, Australia, and China feel about wearing face masks to protect themselves and others and to see whether there are any variations in their attitudes toward wearing masks. They found that nurses from various work contexts, nations, and areas of practice hold a variety of personal and professional health attitudes concerning mask wear, and these attitudes vary depending on their personal circumstances. For example, some nurses believe that wearing masks is essential for patient care, while others believe that masks are unnecessary and can cause discomfort. The study also found that nurses’ attitudes toward mask wearing are influenced by factors such as their personal health status, their work environment, and the availability of appropriate personal protective equipment. Additionally, the study highlighted the need for further research to explore the complex interplay between these factors and nurses’ attitudes toward mask wearing.
use. Zhang, Wang, Shi, Sheng, Liu, Zhao, Huang, Xia, Liu, Dai, Bao, Wu, Xu and Luo [28] employed a qualitative research approach to document the practice of a citywide face-mask-wearing strategy of the Shanghai Municipal Government. They gathered data through work records and insider interviews, which provided insights on how the strategy worked and how it could be improved. Yoo, Dutra, Fanfan, Sniflen, Wang, Siddiqui, Song, Bang, Kim, Kim and Groer [29] conducted an exploratory qualitative study to explore the differences and similarities among government-provided community and healthcare system guidelines of the United States, China, South Korea, the United Kingdom, Brazil, and Haiti, as well as to investigate the relationship between guideline issue dates and the prevalence or incidence of COVID-19 cases. They found that the primary discrepancies in the evaluation and testing criteria in the guidelines across the six nations centred on the importance of COVID-19 testing in the general population, which was highly reliant on each country’s healthcare capability. In contrast, the most comparable guidelines, on the other hand, dealt with the clinical signs and symptoms of COVID-19, as well as prevention strategies.

In summary, although an increasing number of studies investigated peoples’ masks wearing behaviour during COVID-19, most of them were government or organisation related and at the middle stage of the pandemic. There is a significant lack of academic research addressing the facilitating and obstructing factors that shape people’s willingness to wear a face mask at the beginning of a public health disaster from the general public’s perspective. Besides, the opinions among different age groups were overlooked. AlQahtany and Abubakar [15] stated that disaster risk reduction and management activities that aim to reduce mortality and economic losses might benefit from public knowledge and attitudes. They also added that public perceptions and attitudes regarding catastrophe risks are significant drivers of preventive measures, making them a valuable source of information about and determinants of public behavioural outcomes. Hence, it is vital to understand what makes or hinders people follow the preventive measure – to wear a mask at the beginning of the COVID-19 so that the authorities could improve their strategies to reduce the risk of having the next severe public health disaster. With this goal, this study interviewed 17 people in two different age groups: young adults and older adults. It evaluated the content of the acquired information from the interview using a content analysis method. Based on the analysis results, the associated factors influencing individuals of different ages wearing masks were obtained.

3. Method

This study was a qualitative and semi-structured interview-based study. The purpose of this study was to explore and understand people’s views about wearing face masks in public space during the start of a public health disaster and the factors that influence their feelings and potential attitudes. The study in the present state is exploratory in nature. Hence, the adoption of a qualitative approach was appropriate for effectively capturing this type of information [20,30]. Semi-structured interviews were employed as the data collecting method in this study. This approach allowed researchers to obtain more information from the subjects by recording their words, ideas, and expressions. While semi-structured interviews use a set of pre-determined questions, they also allow researchers to go beyond the responses to learn more and deeper about specific topics [20,30].

3.1. Study procedures

This study complied with the American Psychological Association Code of Ethics and was approved by the Institutional Review Board at the authors’ institution. Informed consent was obtained from each participant. This study recruited members of the general public in China for 15–20 mins of in-depth, semi-structured interviews about why they wore face masks in public space at the beginning of the COVID-19 outbreak. The interviews were conducted during April 2020 and lasted for two weeks. The subjects were recruited using a convenient sample and snowball sampling approach by posting invitations in WeChat groups, inviting group members to join and spread the messages to other groups. This recruitment method is widely used in qualitative studies [31]. The subjects covered two age groups: young adults (age between 18 and 45) and older adults (age 45 or over). The range of ages was set based on the third level of detail (broader age group classification) for health services usage according to the “Provisional Guidelines on Standard International Age Classifications” generated by the United Nations [32]. Given the research objectives, to explore the differences between the young adults and older adults’ opinions about wearing masks in public, a relatively broader age group classification was adopted on purpose. As face-to-face meetings were prohibited during the pandemic, the interviews were held using video calls to reduce the infection risk while ensuring the data’s validity. Before the interview, the subjects needed to fill in an online informed consent form and a questionnaire about their background information. They were then required to answer a series of open-ended questions about their willingness to wear face masks in public space. The conversations of the interviews were audio-recorded to facilitate subsequent analysis.

The interview questions involved four major parts:

1. Habits of wearing face masks. This part accounted for the majority of the interview questions. It aimed at understanding people’s habits of using masks. For instance, “Would you wear masks whenever you go outside?” and “In what circumstances would you take off your mask?”.  
2. The attitude of wearing face masks. This part concentrated on respondents’ attitudes towards wearing masks. For example, “Do you think it is troublesome to wear masks?”;  
3. Source of knowledge. This part aimed to discover the channels where people gain information about the importance and the correct method of wearing masks. For instance, “What has strengthened your awareness of wearing a mask during the pandemic?”.  
4. Intention to wear face masks in the future. This part aimed at knowing whether wearing masks has a deep-going and profound impact on people’s awareness and intention towards protecting their health. For example, “Would you wear masks in the future, even after the pandemic?”.  

To assure the work’s credibility and validity, the researchers had invited qualitative research specialists and healthcare experts to comment on the study procedures and interview questions. Besides, similar to Ref. [20], the researcher performed one further interview for each group after the information collected from the interviews had achieved saturation, meaning that future interviews would contribute nothing new to the data and codes, which guarantees that no new themes emerged. This ended with a total of 17 interview results.

3.2. Data analysis

This study employed an inductive content analysis method to analyse the young adults and older adults’ perspectives regarding wearing face masks in public space, attempting to organise their views into themes and sub-themes. Content analysis is “a research method for the subject interpretation of the content of text data through the systematic classification process of coding and identifying themes and patterns” [33]. It is a systematic and rigorous method widely used in qualitative research to extract themes and subthemes (underlying factors) from interviews [e.g., 20, 27, 34, 35]. Hence, this study employed content analysis to analyse the results of the interviews.

Three researchers were responsible for this analysis. At the beginning of the investigation, researchers transcribed the audio recordings of the interviews into textual transcripts. After completing the transcription, they needed to read through the transcripts to verify their completeness.
and accuracy. Next, two researchers repeatedly read and got a complete picture of the conversations’ contents and contexts [36]. During the comprehension process, they understood the conversation’s meaning, identified critical statements, created labels (or coding criteria) for the comments, and produced themes and sub-themes by grouping similar ideas. In detail, the analysis began with open coding, which entails coding all potentially useful and relevant data for addressing the study questions [37]. Given that the majority of the interview questions were to understand the underlying factors that affect people’s mask-wearing willingness, versus coding was one of the most common coding strategies utilized [38]. To maintain track of the actual meaning of these codes, each code was tagged with a detailed description. After fully coding transcripts, the codes were adjusted to combine near or similar codes and begin the second coding cycle. In the second cycle of coding, a comprehensive evaluation of the quotes in each code was conducted. The codes were then categorized into subthemes, with each subtheme having applicable codes. The perspectives of participants within these subthemes, as well as the notes and memoranda, were used to construct themes [38]. The two researchers carried out the comprehension process separately to ensure the reliability of the analysis. After that, they held a meeting with the third researcher to make a consensus on the possible inconsistencies in the coding schemes and finalize the final themes and sub-themes. Finally, researchers counted the frequencies of the sub-themes to examine whether the sub-themes were common (“Yes” and “No” were used to code the presence or absence of each sub-theme) [35].

To ensure the results’ credibility and integrity, the researchers inquired the subjects about the themes and findings after completing the analysis. The subjects stated that these findings did not surprise them, implying that these themes are in line with the subjects’ beliefs [20].

4. Results

4.1. Demographic information

A total of 17 people enrolled in this study, among which 9 were young adults (average age = 26.4; SD = 10.5) and 8 were older adults (average age = 60.4; SD = 12.1). The subjects came from a vast diversity of occupations, including students, farmers, private enterprise employees, private company owners, freelancers, health care workers, civil servants, and retirees. Table 1 displays demographic information about these subjects.

4.2. Young adults

Five themes and 23 sub-themes emerged related to facilitators and barriers to young adults’ mask-wearing willingness at the beginning of the COVID-19 outbreak. They are displayed in Table 2 and Table 3, respectively. As shown in Table 4, 119 interview statements were derived, among which 72 (60.5%) were facilitators, and 47 (39.5%) were barriers.

4.3. Older adults

Five themes and 23 sub-themes were identified for the older adult group. They are exhibited in Table 5 and Table 6, respectively. As shown in Table 7, a total of 93 interview statements were derived, among which 68 (73.1%) were facilitators, and 24 (26.9%) were barriers.

5. Discussion

5.1. Similarity

Referring to Tables 4 and 7, environmental factors, personal factors, factors concerning wearing masks, specific circumstances, and development of the pandemic were the common factors considered by both young adults and older adults regarding wearing masks in public space. Under these factors, comfort level, safety protection, media publicity, impressive cases, and perceived risk were the most frequently mentioned sub-factors shared across the young adults and older adults. The explanation of these sub-factors is as follows:

5.1.1. Comfort level

Comfort level refers to people’s feelings of discomfort when they are wearing a mask. A high comfort level means the person is comfortable, and vice versa. Many interviewees expressed that wearing masks caused breathing difficulty. For example, a 19-year-old man also described: “It (wearing face masks) is a little stuffy. Breathing is not that smooth and not that comfortable.” A 67-year-old man also pointed out: “Sometimes, I feel stuffy (when I wear a mask for a long time).” Li, Tokura, Guo, Wong, Wong, Chung and Newton [39] pointed out that face masks with high breathing resistance would make it difficult for people to inhale enough oxygen and lead to hypoxia. Besides, interviewees also showed concern about not feeling comfortable on eyes, ears, and face when wearing a mask, especially when they had been wearing it for several hours. For example, an 18-year-old female subject mentioned: “It (wearing face masks) hurts my face. I feel painful.” Another 39-year-old male subject also claimed: “I can’t wear glasses if I wear a mask. Otherwise, I can’t see things clearly (as my glasses fog up).” When they felt uncomfortable, they would be more likely to take it off. Hence, the comfort level of face masks would affect people’s willingness to wear a mask.

5.1.2. Safety protection

Safety protection refers to the role of masks in protecting humans from COVID-19. Many studies showed that wearing masks could prevent the spread of COVID-19 and reduce the risk of infecting COVID-19 (e.g., 4,7), and such a message was promoted and spread through society. Hence, the subjects generally believe that wearing masks could keep them safe from COVID-19. For example, an 18-year-old female subject said: “It (the face mask) is beneficial to prevent others’ droplets from getting into my body through my nose and mouth. It can reduce the opportunity of getting infected.” A 68-year-old male subject expressed: “I believe medical

Table 1
Demographic information of the subjects (n = 17).

|                      | Frequency | Percentage |
|----------------------|-----------|------------|
| Gender               |           |            |
| Male                 | 8         | 47.1%      |
| Female               | 9         | 52.9%      |
| Education level      |           |            |
| Junior high school and below | 7 | 41.2%      |
| High school/vocational school/technical school/technical secondary school | 4 | 23.5%      |
| University and above | 6         | 35.3%      |
| Below 3000 RMB       | 10        | 58.8%      |
| Between 3000 and 6000 RMB | 7    | 41.2%      |
| Place of residence   |           |            |
| Countryside          | 3         | 17.6%      |
| Town                 | 6         | 35.3%      |
| City                 | 8         | 47.1%      |
| Frequency of going out during the pandemic |           |            |
| Once a week or less  | 10        | 58.9%      |
| Two to four times a week | 4 | 23.5%      |
| Five times a week or above | 3  | 17.6%      |
| Duration of going out (each time) during the pandemic |         |            |
| 30 mins or less      | 3         | 17.6%      |
| 30 mins to 1 hr      | 5         | 29.4%      |
| 1 to 2 hrs           | 6         | 35.4%      |
| Over 2 hrs           | 6         | 35.3%      |
| Number of masks per person in a family |       |            |
| 1–5                  | 6         | 35.3%      |
| 6–10                 | 5         | 29.4%      |
| 11–20                | 4         | 23.5%      |
| More than 20         | 2         | 11.8%      |
| Recent working environment |       |            |
| Working from home    | 13        | 76.5%      |
| Garment factory      | 1         | 5.9%       |
| Hospital             | 1         | 5.9%       |
| Community service office | 1 | 5.9%       |
| Construction site    | 1         | 5.9%       |
Factors that facilitate young adults’ mask-wearing willingness.

| Themes                  | Sub-themes                  | Sample quotes from the textual data                                                                 |
|-------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------|
| Development of the pandemic | Authority influence | “As soon as Prof. Nanshan Zhong (a well-known scholar) advised people to wear masks, we knew it’s time to wear masks.” |
| Environmental factors  | Community publicity | “There are promotion videos in schools, and teachers often remind us to take precautions when going out. Besides, the village committee also propagandises (the importance of wearing masks) in the community.” |
| Geographical factors   |                             | “In some areas, such as rural areas or villages, the importation (of people) is strictly controlled (whether or not to wear a mask is not that important).” |
| Government action      |                              | “You can hardly get out without a mask! The gatekeeper of the housing estate won’t let me go out without a mask. This is the rule.” |
| Impressive cases       |                              | “It’s the time around the Chinese New Year festival. After I heard that Wuhan was locked down, I began to think about buying masks.” |
| Influence of relatives and friends | Media publicity | “We (my families and friends) supervise each other (to wear masks).” |
| Social climate         | Factors concerning wearing masks | “I think when the whole society begins wearing masks together, it becomes a normal social phenomenon.” |
| Factors concerning wearing masks | Accessibility | “This kind of mask is easy and convenient to buy in the market.” |
|                          | Affordability       | “The surgical masks are inexpensive (so I need to wear a surgical mask when I go out).” |
|                          | Safety protection     | “It (the face mask) is beneficial to prevent others’ droplets from getting into my body through my nose and mouth. It can reduce the opportunity of getting infected.” |
|                          | Troublesome          | “It is effortless to put the mask on.” |
|                          | Health consciousness | “First of all, I don’t want others to infect me… I was one of the first batches of people to be aware of the COVID-19, so I took it seriously. I wear a mask every time I go out.” |
|                          | Knowledge of disease | “The virus is more infectious this time, so I am cautious.” |
|                          | Occupation/ personal requirement | “Because of my occupation (a renovator), it is common for me to wear masks, so I have been using N95 all the time.” |
|                          | Perceived risk       | “As you don’t know who is asymptomatic, you don’t know who is infected and who isn’t. If the person next to you is asymptomatic, and you don’t wear a mask, you may get infected.” |

Factors that impede young adults’ mask-wearing willingness.

| Themes                  | Sub-themes                  | Sample quotes from the textual data                                                                 |
|-------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------|
| Development of the pandemic | Environmental factors | “I think the pandemic has been controlled, so I don’t need to wear two masks at the same time.” |
|                          | Geographical factors | “In my opinion, a cotton mask is good enough to ensure travel safety if not in high-risk areas.” |
|                          | Social climate            | “The restrictions imposed have been lifted, so we think it’s unnecessary (to wear masks).” |
|                          | Influence on social activities | “The communication between people has a sense of distance.” |
|                          | Factors concerning wearing masks | “I can’t buy it (N95),” |
|                          | Accessibility       | “It’s hard to obtain because there are few channels of access.” |
|                          | Affordability       | “If it is at the present price, I can’t accept it because it is way too expensive.” |
|                          | Comfort level          | “It is a little stuffy. Breathing is not that smooth and not that comfortable.” |
|                          | Troublesome          | “I think wearing masks is very troublesome. I am a lazy person.” |
|                          | Personal factors | “Head-hung masks and head-tie masks are troublesome to wear.” |
|                          | Health consciousness | “Because some people don’t think there is a need to wear a mask.” |
|                          | Occupation/ personal requirement | “We, as ordinary citizens, don’t need masks like N95 when going out. Only medical professionals need to use it.” |
|                          | Personal habits | “I always remind myself to wear a mask when I need to go out, but I don’t go out often, so I sometimes still find myself without a mask on the street. Maybe I still have not got used to wearing it.” |
|                          | Specific circumstances Specific occasion | “If I am inside my housing estate, I don’t wear masks (although it is a public space).” |

“As a result, they would be more likely to wear masks in public space.

5.1.3. Media publicity

Media publicity suggests the role of the media in disseminating
sequences of infecting the disease [43]. This information was also spread to everyone to wear a mask every day. Media publicity allows pandemic-related information to be quickly and efficiently shared [40]. For example, a 68-year-old male subject recalled: “I saw it on TV, the severity of COVID-19. So, you must wear masks. We are wearing masks. People around me are usually wearing masks. I think it is comfortable to wear a mask.”

Table 4: The frequency of the factors mentioned by young adults in the interviews.

| Themes/Sub-themes | Facilitators | Barriers | Total | Percentage of total |
|-------------------|--------------|----------|-------|--------------------|
| Environmental factors | 29 | 6 | 35 | 29.4% |
| Media publicity | 6 | 0 | 6 | 5.0% |
| Impressive cases | 6 | 0 | 6 | 5.0% |
| Geographical factors | 1 | 4 | 5 | 4.2% |
| Influence of relatives and friends | 4 | 0 | 4 | 3.4% |
| Community outreach | 4 | 0 | 4 | 3.4% |
| Government action | 3 | 0 | 3 | 2.5% |
| Authority influence | 3 | 0 | 3 | 2.5% |
| Social climate | 1 | 1 | 2 | 1.7% |
| Influence on social activities | 0 | 1 | 1 | 0.8% |
| Personal factors | 25 | 8 | 33 | 27.7% |
| Health consciousness | 5 | 1 | 6 | 5.0% |
| Psychological security | 6 | 0 | 6 | 5.0% |
| Perceived risk | 5 | 0 | 5 | 4.2% |
| Personal habits | 2 | 3 | 5 | 4.2% |
| Responsibility | 5 | 0 | 5 | 4.2% |
| Occupation/personal requirement | 1 | 4 | 5 | 4.2% |
| Knowledge of disease | 1 | 0 | 1 | 0.8% |
| Factors concerning wearing masks | 12 | 21 | 33 | 27.7% |
| Safety protection | 8 | 0 | 8 | 6.7% |
| Affordability | 1 | 6 | 7 | 5.9% |
| Comfort level | 2 | 5 | 7 | 5.9% |
| Troublesome | 0 | 7 | 7 | 5.9% |
| Specific circumstances | 3 | 9 | 12 | 10.1% |
| Specific activity | 0 | 7 | 7 | 5.9% |
| Specific occasion | 3 | 2 | 5 | 4.2% |
| Development of the pandemic | 3 | 3 | 6 | 5.0% |

Table 5: Factors that facilitate older adults’ mask-wearing willingness.

| Themes | Sub-themes | Facilitators | Barriers | Total | Percentage of total |
|--------|------------|--------------|----------|-------|--------------------|
| Development of the pandemic | “I’m afraid of the second wave (of outbreaks, so I keep wearing masks).” |
| Environmental factors | Authority influence | “Prof. Nanshan Zhong and Prof. Lanjuan Li (all encourage people to wear masks).” |
| | Community publicity | “The village campaign publicises from door to door the knowledge relevant to the protection and the importance of wearing masks every day.” |
| | Government action | “Our country has imposed a strict ban (on not wearing masks in public space).” |
| Impressive cases | “I saw a doctor plugging a big tube into a patient body to rescue the patient. The patient should be suffering. (Since then, I wore masks to prevent suffering.)” |
| Influence of relatives and friends | “I must wear a mask, or my granddaughter wouldn’t allow me to go out.” |
| Influence on social activities | “People around me are usually acquainted. We can still recognise each other even though we are wearing masks.” |
| Media publicity | “I saw it on TV, the severity of COVID-19.” |
| | “It’s (the news about COVID-19) on TV and the media every day.” |
| Place of residence | “We are so close to Beijing, and many people are coming back from abroad, so we must wear a mask, and we can’t treat it lightly.” |
| Social Climate | “It’s (wearing masks) is very common nationwide. You wear it, I wear it, and everybody has to wear it. People have got used to it (wearing a mask).” |
| Factors concerning wearing masks | Comfort level | “I think it is comfortable to wear a mask.” |
| | Safety Protection | “I believe medical masks are relatively safe.” |
| | Troublesome | “It is effortless (to take this preventive measure).” |
| | Personal factors | Health consciousness | “I don’t want to be infected with pestilence. So I pay special attention to it.” |
| | Knowledge of disease | “This is a dreadful disease. (Therefore, precautions like wearing masks are needed.)” |
| | Occupation/ Personnel requirement | “Because I am a medical worker, I must pay great attention to it (wearing a mask).” |
| | Perceived risk | “You don’t know who the carrier (of the COVID-19) is. So, you must wear a mask when you contact strangers.” |
| | Personal Habits | “I don’t smoke (so I don’t need to take it off once I wear it).” |
| | Psychological security | “I was accustomed to it (wearing masks). I will wear a mask spontaneously when I go out.” |
| | Responsibility | “Wearing a mask is a psychological comfort. I’ll feel better than not wearing one.” |
| | During the pandemic, I rarely go out … I don’t want to cause trouble for the country.” |
| Specific circumstances | Specific activity | “I wore two masks every time I need to contact people from the infected areas.” |
| | Specific occasion | “If I go out to buy groceries (in markets, crowded places), I will wear an N95 mask. However, if I… (continued on next page)"
Table 6
Factors that impede older adults’ mask-wearing willingness.

| Themes                              | Sub-themes | Sample quotes from the textual data |
|-------------------------------------|------------|-------------------------------------|
| Development of the pandemic         | "If the pandemic is over, there is no need (to wear masks)." |
| Environmental factors               | Geographical factors | "I think there is no need to wear an N95. It (the pandemic) is not very serious in our town." |
|                                    | Influence on social activities | "It’s inconvenient to communicate with others." |
| Factors concerning wearing masks    | Accessibility | "I’ll use it if I have it (an N90 mask), but I can’t get any." |
|                                    | Affordability  | "The cost of N95 masks is relatively high." |
|                                    | Comfort level  | "Sometimes, I feel stuffy (when I wear a mask for a long time)." |
|                                    |               | "I can’t wear glasses if I wear a mask. Otherwise, I can’t see things clearly (as my glasses fog up)." |
| Specific circumstances              | Specific activity | "I have to take it (the mask) off to eat, smoke, and drink." |
|                                    | Specific occasion | "I don’t go too far away from my home, so one mask is enough." |

5.2. Differences

Referring to Tables 4 and 7, this study found that environmental factors seemed to have a greater impact on older adults’ willingness to wear masks in public space than young adults. In contrast, factors concerning wearing masks, specific circumstances, and the development of the pandemic seemed to affect young adults’ willingness than older adults substantially. Regarding the sub-factors, the following differences were found between the young adults and older adults:

First, young adults seemed to pay closer attention to the cost and difficulty of buying masks than older adults. For example, a 20-year-old male subject complained: "If it is at the present price, I can’t accept it because it is way too expensive." Another 18-year-old female straightforwardly complained, "I can’t buy it (N95)." A 20-year-old subject explained: "It’s hard to obtain because there are few channels of access." This phenomenon may be because older adults usually did not need to buy masks themselves. In contrast, young adults normally had to buy face masks on their own for themselves and their families. Hence, these two groups would be more sensitive to the cost and the level of difficulty of obtaining face masks.

Second, young adults appeared to be more concerned with the influence of relatives and friends than older adults. The influence of relatives and friends means the extent to which friends and relatives influence the decision-making process beyond the role of other sources of information. The social circle of young adults is generally larger than older adults because they need to go out for work and study [45,46]. Hence, young adults may have more opportunities to contact others and be influenced by their friends and relatives than older persons who often remain in their community. For example, a 19-year-old male subject strictly stated: "We (my families and friends) supervise each other (to wear masks)." In contrast, older adults usually pointed out they were requested by their sons or daughters to wear face masks. For example, a 68-year-old male subject expressed: "I must wear a mask, or my granddaughter wouldn’t allow me to go out."
Therefore, in the early stage of COVID-19, the production capacity of such protective resources was insufficient to cope with the surging demand.

To address the problem mentioned above, it is suggested that the government should increase the transparency of the information. Multi-channel publicity can be used to promptly keep the public informed of the latest developments of the pandemic and reduce panic buying caused by a lack of relevant information. In terms of market supply, the purchase rules of relevant medical protection products should be refined. The supply of masks should be optimized through purchase restrictions and the establishment of official channels. For example, the government may consider setting up a temporary centralised mask-selling platform through the internet during a public health disaster. Such that young adults could access all the supply sources through a single platform. The government can also ration the supplies and demands through this platform, such as imposing purchase limits and flipping bans on the platform. Furthermore, the government can specify official selling points in the villages and towns so that older adults could obtain face masks from these selling points with their social security cards. In addition, measures from the government side such as policy preference, personnel training, and tax incentives are suggested to support enterprises in obtaining relevant production qualifications and increasing the production capacity of the medical protective resources.

6.2. Organisations

6.2.1. Mask manufacturers

This study discovered that both young adults and older adults were concerned with the comfort level of the face masks. Interviewees of the study reported that ear pain and breathing difficulties were caused by long time mask-wearing. Especially for those who wear glasses, water vapour on the lenses may be generated while wearing face masks, which affects the experience of use. Therefore, for mask manufacturers, additional consideration should be given to the comfort level of wearing masks on top of meeting the basic qualification requirements. It has been demonstrated that ease of use of a product profoundly affects users’ attitude, use intention, and actual usage of the product [47,48]. Hence, it is recommended that the mask manufacturers should follow human factors engineering design principles further to make the face masks user-friendly [49]. For example, the facial characteristics and dimensions (e.g., the width of the face and the height of the bridge of the nose) should be considered while designing the face masks to make the sizes more suitable for the target ethnic populations. In addition, mask manufacturers should consider reducing the price of the face masks, especially at the early stage of the public health disaster, as it is one of the public’s major considerations. For example, they should find ways to optimise their supply chain to enhance production efficiency and capacity [50].

6.2.2. Media companies

This study showed that media propaganda is one of the major reasons that intensifies people’s mask-wearing willingness. Media is the main channel for people to access information about COVID-19 [51,52]. Hence, media companies should take the initiative to promote prevention strategies on top of reporting the updated information about the disease. For example, the media should endeavour to convey the importance and the proper way of wearing masks. The study’s findings show that the young adults and older adults had different preferences on the channels for receiving COVID-19 information. For young adults, they were more affected by social media such as Weibo and WeChat. In contrast, for older adults, they were mostly affected by traditional media such as TV, radio, and newspapers. Therefore, all media have the responsibility to promote public health information to enable people of different ages to receive timely and accurate information about the pandemic to the fullest extent. It is also worth noting that our study revealed that extraordinary and profound events (such as the lockdown of Wuhan city and a surge in the number of people infected with COVID-19) could raise people’s mask-wearing willingness at the beginning of the pandemic. Therefore, the publicity of impressive cases about the disease is suggested when coping with public health disasters in the early stages.

6.3. Individuals

This research found that individuals’ health consciousness and knowledge of disease are essential factors that encourage them to wear masks in public space. Hence, individuals should be aware of their responsibility in society. Everyone needs to understand that COVID-19 is highly contagious [42] and can lead to severe consequences [43]. An infected person can also spread the disease even they are asymptomatic [53]. Therefore, it is advocated that individuals should keep track of the latest news about the pandemic and be self-disciplined. They should wear masks in public space at all times, reduce the frequency of going out, avoid staying in crowded areas, maintaining personal hygiene and practising social distancing to prevent the spread of the virus. In particular, considering the differences between the two age groups in the findings, it is suggested that young adults should take more responsibility in helping older adults in obtaining information about the pandemic, acquiring knowledge of the disease, and developing skills on self-protection.

7. Limitations and future works

This study involves several limitations. First, as this study aimed to catch the initial feelings of members of the general public about the idea of wearing masks in public space at the beginning of the COVID-19 outbreak, this study needed to be performed at the time when residents were still advised to stay indoors and practise preventative measures. Hence, this study encountered severe difficulty finding subjects due to the city lockdown and travel restriction policy. Although this study has already aimed to achieve acceptable coverage by including people from young to elderly, the conclusions drawn in this study may not apply to other societies and nations due to the limited number of participants and potential geographical bias. Therefore, an investigation with a large sample size covering different communities should be performed in the future. Second, stuck to the research questions and objectives, the current study only explored the different opinions and rationales that young adults and older adults hold regarding wearing masks in public space. Other factors such as education level and type of sector engaged that might influence the behaviour of the respondents were not considered in the present study. However, these factors are worth to be investigated to make the picture clearer. For example, it is worth knowing whether people with higher income would have less concern about the affordability of using face masks. Hence, further research using quantitative methods such as regression analysis and structural equation modelling is needed to see how different subjects’ demographics would affect people’s willingness to wear masks in public space. Third, although Theory of Planned Behavior and other relevant research [e.g., 23] works have confirmed the significant relationship between behavioural intention and actual behaviour, there might be a discrepancy between the perceived willingness to use face masks and the actual act of using face masks. Hence, a future case-control study (e.g., face mask users versus non-face mask users in the same community) should be conducted to validate this speculation. Lastly, although this study discovered many factors that influence people’s mask-wearing willingness in public space, the casual relationship among these factors is still unclear. Hence, further research should be carried out to investigate how each factor interacts with another.

8. Conclusions

COVID-19 should not be the world’s last public health disaster.
Moreover, everyone should learn from the lesson and prepare better for the next public health disaster. This study was conducted in the context of the COVID-19 public health disaster in 2020 and focused on factors that influence people’s willingness to wear face masks in public space at the beginning of an outbreak of public health affairs. The research interviewed 17 members of the general public, among which nine were young adults and eight were older adults. The interview conversations were analysed using the content analysis method. This study’s findings should help the authority formulate relevant pandemic prevention policies and control plans better if there is a new virus outbreak in the future, unfortunately.

Declaration of competing interest

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

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