Mask use during the COVID-19 pandemic: A descriptive survey in South Korea

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Abstract
Extensive research on the coronavirus disease 2019 (COVID-19) is underway. However, there are not many studies on the use of masks, which are essential for infection prevention. This descriptive study aimed to understand the factors influencing the use of masks by Korean adults during COVID-19. We conducted an online survey with 280 adults in South Korea between August and September 2020, analyzing the data using SPSS version 24.0. Multiple regression analyses were performed to understand the factors that influence individuals' use of masks. The participants' perceived susceptibility, perceived barriers, other people's dignity, compliance with public order, reasonable decision making, and subjective norms explained 21.6% of mask use. Mask use is expected to increase further if people perceive a personal need to wear masks, if their peers perceive the importance of mask use, and if they possess civic consciousness that considers society as a whole. This paper makes a significant contribution to the field of public health, with evidence-based recommendations for increasing mask use, going beyond simply attributing mask use to individual preferences.

KEYWORDS
- civic consciousness
- COVID-19
- health belief
- pandemic
- personal protective equipment
- subjective norms
- use of masks

Key points
- The number of times that the participants wore masks differed significantly according to gender and occupation.
- The participants' perceived susceptibility, perceived barriers, other people's dignity, compliance with public order, reasonable decision making, and subjective norms explained 21.6% of mask use.
- Personal beliefs, influence from peers, and civic consciousness all influenced mask use.

1 INTRODUCTION

1.1 Study rationale
The coronavirus disease 2019 (COVID-19) has changed the daily lives of people around the globe. The World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020, with the US and many European countries enforcing strong stay-at-home orders. In South Korea, strict social distancing measures are still in place. According to a WHO report, as of April 29, 2021, there have been 148,999,876 confirmed COVID-19 cases reported worldwide, with 3,140,115 deaths (WHO, n.d.). The pandemic has made the use of face masks a part of daily life. Although the US and European countries initially recommended against the use of masks in the earlier phases of the pandemic, they eventually mandated their use. Currently, the US Center for Disease Control and Prevention (CDC)
recommends the use of masks in public spaces, at events and meetings, and at every gathering (CDC, n.d.). Similarly, the UK and France have made it mandatory to wear masks in all closed public spaces and stores (O’Grady, 2020).

Since COVID-19 is a respiratory illness that spreads through droplets, the use of masks can decrease its transmission (Korea Centers for Disease Control and Prevention, 2020) by reducing the spread of infected droplets, and thus can lead to significant reductions in deaths and economic costs (Howard et al., 2020). Moreover, since asymptomatic cases have also been reported, using masks is necessary to reduce transmission during encounters among the general public. Although vaccines have been developed and are being administered, more time is needed to achieve herd immunity so that people may engage in daily activities without wearing masks. Of course, masks may become necessary again if other viruses spread. Thus, the use of masks is an ongoing, important health behavior issue.

Compared to other countries, Koreans are more accustomed to using masks to protect their own health and that of others, partly due to previous epidemic events such as Middle East respiratory syndrome (MERS) and weather phenomena such as “yellow dust,” and there is no negative stigma around wearing masks (Ha, 2021). Through a comparative study on mask use in China and Poland (Wang et al., 2020), cultural differences in the wearing of masks between the East and the West were investigated. According to the study’s results, the mask-wearing rate was much higher in China than in Poland. China is known to feature stronger social conformity than Poland; in addition, in Poland, mask-wearing is perceived as being justified by one’s own disease or vulnerability, making it difficult to accept their broader usage. Similarly, during the current COVID-19 pandemic, Asian populations have tended to wear masks more voluntarily than those in the US or European countries. However, some people are still not completely compliant with the correct use of masks, or do not wear them at all, acting as major sources of infection in the spread of the virus. In a pandemic related to respiratory illness, the use of masks influences individual health as well as a country’s public health conditions. While wearing a mask is a personal health behavior, it can also be considered a health behavior to benefit others in the context of a pandemic. Moreover, this behavior may be influenced by other people and society in general. Thus, the factors that influence the use of masks should be investigated from multiple perspectives, including personal beliefs, influence from peers, and community spirit, to consider the greater impact on society.

First, the use of masks during the COVID-19 pandemic can be regarded as a preventative behavior to protect one’s own health, influenced by personal beliefs about the use of masks. Various theories have been suggested to predict human behavior, including the health belief model. This theory was developed to explain why people did not participate in X-ray screening for eradication of tuberculosis in the US in the 1950s (Hochbaum, 1956). The theory can be used to understand and predict people’s health-related behavior (Rosenstock, 1974b) and is widely used to explain preventative health behaviors. Here, health belief refers to an individual’s subjective belief about certain diseases or preventative behavior, and consists of perceived seriousness, perceived susceptibility, perceived benefits, and perceived barriers (Becker, 1974). Thus far, the health belief model has been used to explain many health behaviors, including smoking cessation, influenza vaccination, and self-examination for breast cancer (Hong et al., 2004; Y. H. Kim et al., 2017; M. K. Kim & Kim, 1990).

The use of masks differs from independent, personal disease prevention behaviors, such as health examinations. Therefore, it is difficult to explain behavior only through the personal health belief. Prevention of the spread of COVID-19 through the use of masks is not effective when only a few people wear masks, requiring instead the participation of a majority of the population. In other words, people should perceive that they are wearing masks not only for their personal health, but also to prevent the spread of a disease in society. In this context, civic consciousness should also be considered. Civic consciousness refers to each individual’s internal norms, leading to an attitude of voluntarily contributing to the growth of society as a member (Kwon, 2016). This concept emphasizes the community over individuals, and those with civic consciousness voluntarily engage in various activities based on these internal norms (Kwon, 2016). Moreover, civic consciousness can influence when individuals choose one value out of many, determining individual behavior (Mo et al., 2010). Multiple studies have suggested the following common characteristics of civic consciousness: participation, tolerance, political efficacy, law-abidance, and voluntarism (Mo et al., 2010). Civic consciousness should thus help explain the voluntary use of masks for the greater good of society and public health during the national crisis caused by COVID-19.

Individual behavior is influenced not only by personal beliefs, but also by their peers. The theory of planned behavior explains subjective norms as a social factor that determines behavior. Subjective norms refer to the attitudes of a group of people deemed to be important toward a certain behavior; they are related to whether other individuals support the particular behavior (Ajzen, 1991). Although the use of masks is a behavior to maintain one’s own health, it is also a social issue that prevents the spread of infectious diseases. Therefore, pressure from peers and the social context influence an individual’s use of masks. In this study, we aimed to explain the use of masks by South Korean adults using the health belief model, civic consciousness, and subjective norms.

In the recent past, there have been outbreaks of respiratory illnesses that can be prevented with masks, such as COVID-19 and MERS. However, research on the factors that influence the use of masks is lacking. Moreover, only a few studies have investigated human behavior to prevent infectious diseases. Although the use of masks has become mandatory during the COVID-19 pandemic, some people do not wear them correctly, which can lead to crises in personal health and national public health, such as the occurrence of second or third waves of respiratory illnesses. Thus, this study aimed to investigate the factors that influence the use of masks in South Korean adults, with the aim of providing basic information to increase the wearing of masks.
1.2 | Objectives

This study sought to investigate the factors that influence the use of masks in South Korean adults during the COVID-19 pandemic. The specific objectives were as follows. First, we investigated general characteristics of the participants of an online survey in South Korea. Second, we studied the differences in the use of masks according to the participants’ general characteristics. Third, we analyzed the correlation between the participants’ health belief, civic consciousness, subjective norms, and use of masks. Fourth, we investigated the factors influencing the use of masks by the participants.

2 | METHODS

2.1 | Design

This study was a descriptive survey to investigate the factors that influence the use of masks in South Korean adults during the COVID-19 pandemic.

2.2 | Participants

Koreans over the age of 19 participated in this study. They received an explanation of the study objectives and methods, and agreed to participate. The study data were collected online from 280 participants. Data collection occurred between August and September 2020, and the participants were recruited through an online survey using Google Forms. The first page of the survey provided details of the study and explained that the participants’ personal information would be protected. It also explained that the answers would be used solely for research purposes, stored on encrypted personal computers, and destroyed after the end of the study. Only those who provided consent participated in the study.

2.3 | Study tools

2.3.1 | General characteristics

The participants’ general characteristics were investigated in terms of gender, age, income, educational background, underlying diseases, past medical history, type of residence, area of residence, occupation, and marital status.

2.3.2 | Health belief

Health belief was measured using a modified version of a health belief tool for the use of masks, originally developed by Nah (2018). The tool consists of 14 items rated on a 5-point Likert scale in the following domains: perceived susceptibility, perceived seriousness, perceived benefit, and perceived barriers. Higher scores indicate higher levels of health belief. Cronbach’s α values in our study were as follows: .733 for perceived susceptibility, .739 for perceived seriousness, .797 for perceived benefits, and .794 for perceived barriers.

2.3.3 | Subjective norms

To measure subjective norms regarding the use of masks, Ajzen’s (2006) survey used for the theory of planned behavior was modified to fit the context of mask use during COVID-19. The scores for each item range from 1 (= not at all) to 7 (= very much), and higher scores indicate that the respondent receives higher levels of social pressure to wear masks from people whom they consider important. In this study, Cronbach’s α was .918.

2.3.4 | Civic consciousness

Civic consciousness was measured using the tool developed by Lee (2009), based on the civic consciousness questionnaire developed by the Korean Educational Development Institute (1994). The tool consists of four subdomains: other people’s dignity, compliance with public order, democratic procedures, and reasonable decision making. A total of 23 items were rated on a 5-point Likert scale ranging from 1 (= strongly disagree) to 5 (= strongly agree). Higher scores for each item indicate higher levels of civic consciousness. In this study, Cronbach’s α was .797 for other people’s dignity, .839 for compliance with public order, .705 for democratic procedures, and .767 for reasonable decision making.

2.3.5 | Use of masks

The use of masks was measured in terms of the number of times per 10 outings in which the participant wore a mask during the COVID-19 pandemic.

2.4 | Data analysis

The collected data were analyzed with SPSS 24.0. The following steps were followed:

1. The participants’ general characteristics were analyzed in terms of frequency and percentage.
2. Mann–Whitney and Kruskal–Wallis tests, which are nonparametric statistical methods, were used to measure the use of masks according to the participants’ general characteristics.
3. Pearson’s correlation was used to measure the correlation between the participants’ health belief, subjective norms, civic consciousness, and use of masks.
4. Factors that influence the participants’ use of masks were analyzed through multiple regression.
3 | RESULTS

3.1 | Participants' general characteristics

In all, 75.4% of this study's participants had graduated from university, and 68.2% had a middle income level. The ratio of residents in the metropolitan area and those in the provinces was similar. Among the study participants, 8.2% had an underlying disease and 7.1% had a past medical history (Table 1).

3.2 | Differences in mask use according to general characteristics

The number of times that the participants wore masks differed significantly only according to gender ($z = 2.88, p = 0.004$) and occupation ($\chi^2 = 17.44, p = 0.002$). Otherwise, mask use did not differ significantly depending on age, educational background, income, area of residence, type of residence, underlying diseases, past medical history, or marital status (Table 2).

3.3 | Correlation between health belief, civic consciousness, subjective norms, and mask use

The participants' mask use had a significant positive correlation with the perceived susceptibility ($r = 0.313, p < 0.001$), perceived seriousness ($r = 0.258, p < 0.001$), and perceived benefit ($r = 0.276, p < 0.001$) components of health belief. It also had a significant positive correlation with the subdomains of other people's dignity ($r = 0.255, p < 0.001$) and reasonable decision making ($r = 0.249, p < 0.001$) of civic consciousness, as well as with subjective norms ($r = 0.265, p < 0.001$) (Table 3).

3.4 | Factors influencing mask use

In the multiple regression analysis, participants' perceived susceptibility, perceived barriers, other people's dignity, compliance with public order, reasonable decision making, and subjective norms explained 21.6% of mask use (Table 4). The participants wore masks more often when they had higher perceived susceptibility ($\beta = 0.22, p = 0.005$), lower perceived barriers ($\beta = -0.13, p = 0.023$), higher score for other people's dignity ($\beta = 0.23, p = 0.030$), lower compliance with public order ($\beta = -0.55, p < 0.001$), higher reasonable decision making ($\beta = 0.24, p = 0.017$), and higher subjective norms ($\beta = 0.18, p = 0.030$). In the regression analysis, the Durbin–Watson score was 1.49, which is close to 2, indicating no autocorrelation of error. Moreover, the variance inflation factor was below 10, indicating no multicollinearity issues.

4 | DISCUSSION

This study investigated factors that influence the use of masks by South Korean adults with the aim of providing basic information to develop interventions for increasing the use of masks. The results indicated that South Korean adults wore masks on 9.71 out of 10 occasions, which is a very high usage rate. This suggests that the participants have cooperated well with mask use throughout the COVID-19 pandemic. This finding was similar to the result of a study of two countries with different viewpoints and practices on mask use, showing a higher rate of mask wearing in Asian countries (Wang et al., 2020); this high mask-wearing rate also reduced the rate of infection with respiratory viruses such as flu (Park et al., 2021). Our study also found that personal beliefs, influence from peers, and civic consciousness all influenced mask use. Therefore, to increase mask use, all three of these aspects should be considered.
In terms of mask use according to general characteristics, this study found that the use of masks differed according to gender and occupation. Female participants used masks more often than male participants. This finding is in line with that of a previous study, which assessed adult participants’ compliance with preventative behavior for COVID-19 and reported higher compliance in women than in men (A. R. Jung & Hong, 2020). In terms of occupation, office workers wore masks most often.

The following factors were found to influence mask use: perceived susceptibility to and perceived barriers from health belief, other people’s dignity, compliance with public order, reasonable decision making from civic consciousness, and subjective norms. In particular, participants wore masks more often when their perceived susceptibility based on health belief was higher and when perceived barriers were lower. In terms of civic consciousness, the participants wore masks more often when the score for other people’s dignity was higher, the score for compliance with public order was lower, and the score for reasonable decision making was higher. Moreover, they wore masks more often when the score for subjective norms was higher.

The study found that people wore masks when they thought they could be exposed to or infected with COVID-19 and when they had low levels of inconvenience or cost from mask use. According to many studies assessing the correlation between health belief and health behavior, the former influences the latter (Becker, 1974). In one study that assessed the influence of health belief on one’s intention to prevent COVID-19 according to the health belief model, perceived susceptibility had a significant effect on this intention (S. Y. Kim et al., 2020). Similarly, according to M. K. Jung et al. (2020), perceived susceptibility had a significant effect on mask use, in line with the findings of this study. Perceived susceptibility refers to an individual’s level of awareness of own risk for contracting a disease (Rosenstock, 1974a). In the present study, perceived susceptibility, rather than perceived seriousness, would have influenced mask use as COVID-19 spreads easily through the respiratory system. Compared to serious diseases with lower chances of occurrence, such as cancer,

### TABLE 2 Differences in the number of times the participants wore a mask according to general characteristics

| Variable                  | Categories                          | M ± SD     | Z or χ² (p) |
|---------------------------|-------------------------------------|------------|------------|
| Gender                    | Male                                | 9.53 ± 1.28| −2.88 (0.004) |
|                           | Female                              | 9.78 ± 0.75|            |
| Age                       | 20s                                 | 9.63 ± 0.92| 2.46 (0.652) |
|                           | 30s                                 | 9.76 ± 0.71|            |
|                           | 40s                                 | 9.64 ± 1.32|            |
|                           | 50s                                 | 9.89 ± 0.32|            |
|                           | 60s or older                        | 10.00 ± 0.00|            |
| Educational background    | High school degree or lower         | 9.64 ± 0.78| 2.66 (0.103) |
|                           | College degree                      | 9.77 ± 0.73|            |
|                           | Graduate degree or above            | 9.21 ± 2.32|            |
| Income                    | High                                | 9.37 ± 1.01| 6.01 (0.050) |
|                           | Middle                              | 9.80 ± 0.65|            |
|                           | Low                                 | 9.56 ± 1.43|            |
| Area of residence         | Seoul and Gyeonggi province         | 9.72 ± 1.07| −0.60 (0.547) |
|                           | Other                               | 9.70 ± 0.79|            |
| Type of residence         | Living with parents or children     | 9.69 ± 1.05| −0.39 (0.602) |
|                           | Others                              | 9.74 ± 0.66|            |
| Underlying diseases       | Yes                                 | 9.39 ± 2.15| −0.162 (0.871) |
|                           | No                                  | 9.74 ± 0.74|            |
| Past medical history      | Yes                                 | 9.25 ± 2.31| −0.196 (0.844) |
|                           | No                                  | 9.74 ± 0.73|            |
| Marital status            | Single                              | 9.66 ± 0.90| 1.25 (0.536) |
|                           | Married                             | 9.75 ± 0.97|            |
|                           | Other                               | 9.60 ± 0.89|            |
| Occupation                | Office worker                       | 9.88 ± 0.47| 17.44 (0.002) |
|                           | Healthcare                          | 9.36 ± 1.50|            |
|                           | Business owner                      | 9.63 ± 0.62|            |
|                           | Retail/service industry             | 9.45 ± 0.94|            |
|                           | Other                               | 9.63 ± 1.33|            |
| Variable                        | Perceived susceptibility | Perceived seriousness | Perceived benefits | Perceived barriers | Other people's dignity | Compliance with public order | Democratic procedures | Reasonable decision making | Subjective norms | Number of times the participant wore masks |
|--------------------------------|--------------------------|----------------------|--------------------|-------------------|------------------------|-----------------------------|------------------------|--------------------------|------------------|-----------------------------------|
| Perceived susceptibility       | 1                        |                      |                    |                    |                        |                             |                        |                          |                   | 0.313 (<0.001)                       |
| Perceived seriousness          | 0.657 (<0.001)           | 1                    | 0.688 (<0.001)     | 0.101 (0.090)      | 0.704 (<0.001)         | 0.718 (<0.001)              | 0.567 (<0.001)         | 0.668 (<0.001)         | 0.641 (<0.001) | 0.258 (<0.001)                       |
| Perceived benefits             | 0.627 (<0.001)           | 0.688 (<0.001)       | 1                  | 0.017 (0.780)      | 0.727 (<0.001)         | 0.738 (<0.001)              | 0.568 (<0.001)         | 0.711 (<0.001)         | 0.674 (<0.001) | 0.276 (<0.001)                       |
| Perceived barriers             | 0.084 (0.162)            | 0.101 (0.090)        | 0.017 (0.780)      | 1                 | 0.164 (0.006)          | 0.059 (0.324)               | 0.127 (0.034)          | 0.099 (0.098)          | 0.004 (0.952) | -0.084 (0.160)                       |
| Other people's dignity         | 0.588 (<0.001)           | 0.704 (<0.001)       | 0.727 (<0.001)     | 0.164 (0.006)      | 1                      | 0.790 (<0.001)              | 0.676 (<0.001)         | 0.777 (<0.001)         | 0.633 (<0.001) | 0.255 (<0.001)                       |
| Compliance with public order   | 0.597 (<0.001)           | 0.718 (<0.001)       | 0.738 (<0.001)     | 0.059 (0.324)      | 0.790 (<0.001)         | 1                           | 0.707 (<0.001)         | 0.782 (<0.001)         | 0.697 (<0.001) | 0.117 (0.050)                       |
| Democratic procedures          | 0.488 (<0.001)           | 0.567 (<0.001)       | 0.568 (<0.001)     | 0.127 (0.034)      | 0.676 (<0.001)         | 0.707 (<0.001)              | 1                      | 0.685 (<0.001)         | 0.550 (<0.001) | 0.111 (0.065)                       |
| Reasonable decision making     | 0.557 (<0.001)           | 0.668 (<0.001)       | 0.711 (<0.001)     | 0.099 (0.098)      | 0.777 (<0.001)         | 0.782 (<0.001)              | 0.685 (<0.001)         | 1                        | 0.586 (<0.001) | 0.249 (<0.001)                       |
| Subjective norms               | 0.580 (<0.001)           | 0.641 (<0.001)       | 0.674 (<0.001)     | 0.004 (0.952)      | 0.633 (<0.001)         | 0.697 (<0.001)              | 0.550 (<0.001)         | 0.586 (<0.001)         | 1                | 0.265 (<0.001)                       |
| Number of times the participant wore masks | 0.313 (<0.001) | 0.258 (<0.001)       | 0.276 (<0.001)     | -0.084 (0.360)     | 0.255 (<0.001)         | 0.117 (0.050)               | 0.111 (0.065)          | 0.249 (<0.001)         | 0.265 (<0.001) | 1                                  |
COVID-19 initially may have low perceived seriousness, owing to its flu-like symptoms. However, given its high rate of transmission, participants would have perceived a high level of susceptibility to COVID-19. Therefore, to improve mask use, the government and media should actively share all available information on COVID-19 with the public, so that people can recognize that everyone is susceptible to COVID-19.

Perceived barriers have been shown to directly affect the intention to engage in preventative behaviors against infectious diseases from abroad (Jang et al., 2020). Moreover, previous studies have found that people were more likely to practice social distancing when there were fewer perceived barriers (I. A. Kim, 2020), which is in line with our study. Our findings indicate that removing barriers can help promote behaviors to prevent infectious diseases, such as COVID-19. Therefore, masks should be readily available at affordable prices.

In this study, perceived seriousness and perceived benefits from health belief were found to have no significant influence on mask use. In the case of particulate matter, perceived seriousness and perceived benefits have been found to influence one's intention to wear masks (Chung, 2019), which differs from our findings. This may be because of the long duration of the COVID-19 pandemic. As the pandemic has been ongoing for a long time, people have become fatigued and less concerned about the potential serious outcomes of COVID-19. Moreover, mask fatigue has set in after a long period of use. Thus, continued public campaigns are needed to discourage the public from overlooking the seriousness of the COVID-19 pandemic and to prevent mask fatigue from setting in.

In terms of civic consciousness, other people's dignity, compliance with public order, and reasonable decision making, but not democratic procedures, influenced mask use. Mask use requires voluntary participation by the public, as mandatory mask use conflicts with personal freedom. Although very few studies have investigated the effects of civic consciousness on mask use, other studies on civic consciousness have found that it had a large impact on eco-friendly behavior (Kwon, 2016) and that scores for civic consciousness were higher when the respondent was interested in social problems (Yoon, 2007). Since mask use may also influence other people, it is different from personal health behavior, such as cancer screening or vaccination. We found that health belief, which is a personal belief, as well as civic consciousness, which emphasizes the sense of community (Kwon, 2016), influenced mask use. In South Korea, most people agree that the active understanding and participation of all people are crucial for the survival of society as a whole during national crises (Koo, 2002). Moreover, since the COVID-19 pandemic, the need for solidarity has been emphasized around the globe, and such solidarity tends to promote public cooperation (Kang, 2020). In South Korea, quick and widespread diagnostic tests, quick mass production of masks, and voluntary mask use by the public contributed to the response to COVID-19. For voluntary mask use, individuals should be aware that civic consciousness, which emphasizes shared public benefit rather than individual benefit, is necessary. They should strive to cultivate a mature sense of civic consciousness despite the difficult situation for everyone. However, this study found a negative correlation between compliance with public order and mask use, which should be investigated further in future studies.

Last, subjective norms were found to have a significant impact on mask use. In other words, mask use was higher when people whom the participants considered important thought that mask use was necessary. This finding is in line with M. K. Jung's study (2020), which found that subjective norms had a high explanatory power for mask use during the COVID-19 pandemic, and with I. A. Kim's study (2020), in which individuals with high levels of subjective norms were more likely to adopt preventative behavior during COVID-19. A study in the US and Italy found that while providing information on mask efficacy was ineffective in either country, the widespread use of masks in the periphery increased the intention to wear a mask in both countries (Bokemper et al., 2021). It can thus be confirmed that the influence of surrounding people is an important factor in wearing a mask. In other words, the behavior of others is likely to influence an individual's decision to wear a mask. Subjective norms are a social factor that determine behavior (Ajzen, 1991). Since mask use is influenced by personal beliefs as well as peer pressure, social pressure for mask use can be heightened to promote mask use for the prevention of COVID-19.

Mask use during the COVID-19 pandemic is a personal health behavior as well as one for society as a whole. Therefore, factors influencing mask use should be investigated from multiple perspectives.
This study has identified various factors that influenced mask use by participants. Based on the results, mask use will increase further if people perceive a personal need to wear masks, if their peers perceive the importance of mask use, and if they possess civic consciousness that considers society as a whole. The present study makes a significant contribution to existing literature by determining the various factors of mask use rather than interpreting it as a personal behavior.

Finally, we would like to mention the limitations of this study. This study followed the respondent sampling method, which limited the representativeness of our sample. Therefore, the sampling method in this study is not representative of the entire Korean population. Moreover, the situation related to COVID-19 has been changing day by day. Factors that may affect mask wearing, such as the emergence of mutated viruses and the administering of vaccines, were not addressed in this study.

**AUTHOR CONTRIBUTIONS**

Study design: Hyo Jung Kim
Data collection: Hyo Jung Kim and Song Yi Han
Data analysis: Hyo Jung Kim and Song Yi Han
Manuscript writing: Hyo Jung Kim

**CONFLICT OF INTEREST**

None declared.

**DATA AVAILABILITY STATEMENT**

The data that support the findings of this study are openly available in Wiley Online Library at [https://onlinelibrary.wiley.com/journal/14422018](https://onlinelibrary.wiley.com/journal/14422018).

**ETHICS STATEMENT**

This study was approved by the Institutional Review Board of Sunmoon University, and the approval number is SM-202005-038-2.

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