

## Letter to the Editor

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# The Necessity of Wearing Facemasks Correctly Especially for Students During the Epidemic

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Ever since the outbreak of coronavirus disease 2019 (COVID-19), the public started to know more about the features of this disease. It spreads fast and has a strong infection rate. Meanwhile, it also results in massive death rates on a global scale.<sup>1,2</sup> COVID-19 can have person-to-person transmission through sneezing or respiratory droplets caused by cough. Its major infection routes are mouth and nose.<sup>3</sup> Asymptomatic people may play a crucial part in disease spread.<sup>3</sup> To reduce the spread of COVID-19, wearing masks and keeping proper hand hygiene are of great importance. Figure 1 shows the situation of teachers and students wearing facemasks in class in a university in China.

## Do Facemasks Cause Carbon Dioxide (CO<sub>2</sub>) Accumulation?

Facemasks are a simple and powerful tool used to reduce the spread of COVID-19. One of the major concerns of the public is about the side effects. There are a variety of rumors about it, such as immune system weakness, hypercapnia, and hypoxia. People are concerned that inhaling high levels of carbon dioxide (CO<sub>2</sub>) in excess of human tolerance is life-threatening because of the likelihood of CO<sub>2</sub> accumulation from wearing masks. However, CO<sub>2</sub> accumulation caused by wearing a mask does not have any scientific base. Many studies have already debunked that myth. An observational study of 20 healthy volunteers revealed mild increases in physiological responses (respiratory rate, heart rate, oxygen saturation, and so on) from wearing a surgical mask for 1 h at moderate operating frequency. However, this does not have clinical significance.<sup>4</sup> Only minor effects were caused by wearing masks when people are doing aerobic exercise. Additionally, surgical masks only have a mild impact on end-tidal CO<sub>2</sub> and seem exclusively to be engaged in strenuous exercise. Therefore, it is safe for healthy individuals to wear a face mask.<sup>5</sup> A study exploring new N95 masks designed for children indicated that the physiological parameters, including the end-tidal CO<sub>2</sub>, fractional concentration of inspired CO<sub>2</sub>, oxygen saturation, and pulse rate, all fell within an acceptable range when children wear a mask. Most children did not experience breathing difficulties.<sup>6</sup> Therefore, masks with or without micro fans were comfortable and safe for children aged 7 to 14 y old when they imitated daily routine activities.<sup>6</sup> A recent study focusing on the influence of masks over the gas exchange in chronic obstructive pulmonary disease (COPD) patients and healthy people found that COPD patients did not show significant physiological changes in gas exchange after a 6-min walk test with a surgical mask, especially in terms of the CO<sub>2</sub> retention.<sup>7</sup> Altogether, it suggests from the current evidence that, although perceived force may be altered and breathing difficulties may increase during activity, there is only limited effect of wearing a mask on blood gas, respiration, and other physiological parameters. Such an effect is even undetectable during strenuous exercise. Moreover, most masks often do not fit the face perfectly, especially when speaking or exhaling. Compared with respiratory droplets, which carry the virus causing COVID-19, CO<sub>2</sub> molecules are so small that they can pass easily through cloth masks.<sup>8</sup> Therefore, the Centers for Disease Control and Prevention (CDC) clearly states that wearing a facemask does not raise the level of CO<sub>2</sub>.<sup>8</sup>

## Conclusions

More measures should be taken to prevent infection in the current outbreak. Wearing a facemask is considered as the first step of preventing and controlling the spread of the virus and pandemic. Health professionals should educate the public that masks are important for keeping the pandemic controlled. Students, as they have classes and are in a crowd, should be particularly careful.



**Figure 1** The situation of teacher and students wearing facemasks in class in a university in China.

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