

Facemasks and the COVID-19 pandemic: The harm caused by improper use of facemasks is a matter of concern

Yuan Zhou¹, Qi Wang², and Kai Zhang³

¹Tianjin Conservatory of Music

²Affiliation not available

³Tianjin Gong An Hospital

March 30, 2022

Abstract

Abstract: The use of facemasks has played an important role in the prevention of COVID-19. However, inappropriate use of facemasks also brings people certain problems. Therefore, the reasonable use of facemasks is a necessary measure to protect oneself and others in the current epidemic prevention and control.

Facemasks and the COVID-19 pandemic: The harm caused by improper use of facemasks is a matter of concern

Yuan Zhou^{a,+}, Qi Wang^{b,c,*,+}, Kai Zhang^{d,*,+}

1. College of Continuing Education, Tianjin Conservatory of Music, Tianjin, 300171, China.
2. Department of Acupuncture and Moxibustion, First Teaching Hospital of Tianjin University of Traditional Chinese Medicine, Tianjin, 300193, China.
3. National Clinical Research Center for Chinese Medicine Acupuncture and Moxibustion, Tianjin, 300381, China.
4. Department of Acupuncture and Moxibustion, Tianjin Gong An Hospital, Tianjin, 300042, China.

+Equally contributed.

*Correspondence to: Kai Zhang, MD

*Correspondence author at: Department of Acupuncture and Moxibustion, Tianjin Gong An Hospital, Tianjin, China.

No. 78 Nanjing Road, Heping District, Tianjin, 300042, China. Tel: 008613043295598.

E-mail address: coolzhangkai@163.com.

Kai Zhang ORCID 0000-0002-7248-1451

*Correspondence to: Qi Wang, MD

*Correspondence author at: Department of Acupuncture and Moxibustion, First Teaching Hospital of Tianjin University of Traditional Chinese Medicine, Tianjin, 300193, China.

No. 88, Chang Ling Road, Xi Qing District, Tianjin, 300381, China.

E-mail address: 1539221488@qq.com.

<https://orcid.org/0000-0002-6780-6338>

Yuan Zhou, MD

College of Continuing Education, Tianjin Conservatory of Music, Tianjin, China.

No.57 Shiyijing Road, Hedong District, Tianjin, 300171, China.

E-mail address: lark.zhou@126.com.

Number of words: 927.

The number of Figure:2.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

Conflict of interest statement

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Abstract: The use of facemasks has played an important role in the prevention of COVID-19. However, inappropriate use of facemasks also brings people certain problems. Therefore, the reasonable use of facemasks is a necessary measure to protect oneself and others in the current epidemic prevention and control.

Keywords: Facemasks; COVID-19; advantage; disadvantage.

Coronavirus disease 2019 (COVID-19), also known as 2019 novel coronavirus, occurred in Wuhan, China and caused global concern one year ago.¹ COVID-19 has rapidly spread to most countries in the world, and has provoked huge numbers of infections and deaths on a global scale.¹⁻⁴ COVID-19 can have person-to-person transmission through sneezing or cough-caused respiratory droplets from the mouth or nose of the infected.¹ Most countries adopt the strategies which were responded to the outbreak in terms of public health before, including community control, social distancing, quarantine and isolation. If isolation is performed correctly, transmission can be reduced. China has taken the strict quarantine measures to prevent the virus from spreading.⁵ Different countries have adopted different levels of epidemic prevention strategies. Some guidelines are included in the strategies, such as proper hand hygiene, the wearing of facemasks in public spaces and appropriate use of personal equipment for protection. There is evidence that transmission of asymptomatic infected people may play a crucial part in the spread of the disease.⁶ In order to reduce the effect of asymptomatic patients infected with COVID-19, universal use of facemasks with proper hand hygiene seems extremely useful. The facemask designed to filter efficiently enough can function as a passive barrier, which can prevent an infected person from spreading pathogens through aerosols or droplets from sneezing, coughing or talking.⁷ Facemasks have virtuous filtering effect to virus and bacteria. So, the preventive effect of facemasks is clear. Fig.1 shows the situation of students wearing facemasks during exams in a university in China.

Do facemasks have side effects?

Facemasks are a simple and powerful weapon against the spread of COVID-19, so the question is, do they have side effects? Inhaling high levels of CO₂ in excess of the human tolerable intake of CO₂ can be life-threatening as CO₂ is likely to accumulate with wearing facemasks. When CO₂ levels are higher than 5%, hypercapnia due to respiratory acidosis occurs. As a result, inability to concentrate and headaches can be caused by CO₂ toxicity.⁸ The available O₂ may be reduced while exercising with facemasks. In this case, air retention is greatly increased and most CO₂ exchange is prevented. Hypercapnia hypoxia can potentially aggravate the underlying pathology of an established chronic disease by potentially increasing the acidic environment, anaerobic metabolism, cardiac overload, and renal overload.⁹ In the past year, three Chinese middle school students died during physical education. All three students wore facemasks, including one who wore an N95 mask.¹⁰ While, whether wearing a facemask during strenuous exercise affects performance is controversial.

In response to this problem, Chinese experts point out that schools that have just resumed classes should not hold intense competitive sports competitions for the time being, and should gradually resume children's physical exercises.¹⁰ Do not wear facemasks during intense sports, especially N95 masks. Even medical staff should strictly abide by the requirement of the working time limit of 4 hours, and children should not wear it for a long time. In addition, facemasks may cause some skin problems. A randomized crossover designed study showed that due to the wearing of facemasks and respirators, the biophysical characters of skin can change. Compared with medical masks, N95 masks can cause more skin reactions.¹¹

Inappropriate use of facemasks

Wearing a facemask correctly is essential. If people don't have a tight fit, facemasks will not work. Taking off the facemask also requires correct operation. People should not touch the outside of the facemask. If there is no problem with the supply of facemasks, surgical masks should only be used once. Moreover, facemasks should be disposed of carefully in plastic bags when they become soiled. After handling facemasks, it is also necessary for users to wash their hands. If people do not change facemasks frequently or clean the masks made of cloth properly, pathogens will accumulate in facemasks. And, in a humid environment provided by the facemask, severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) can be kept active depending on water vapor provided by continuous breathing and can be limited by the mask fabric, then the increase in viral load is identified in the facemask. Therefore, facemasks may cause innate immunity failures and increased infections.¹² Fig.2 is the picture of our participation in the work of detection of SARS-Cov-2 nucleic acid in community. At that time, the outdoor temperature was around 0 degrees, and it was snowing slightly. We were working in the temporary tent set up outside, while our facemasks often became wet, and water mist appeared on the face shields. So, at that time we had to change our facemasks frequently and wipe face shields with clean rubber gloves.

Conclusion

It is necessary to take measures to prevent infection in the current outbreak. Wearing a facemask is considered as the first step in preventing and controlling the spread of pandemic. However, for people who are not suitable for wearing facemasks for extended periods of time, wearing facemasks for short periods of time in high-risk situations or other protective measures such as maintaining social distance should be considered, and care should be taken to wear facemasks in the correct way. Health professionals should give correct advice about the wearing of facemasks for the general public, especially students.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Ethical statement

In this study, we used two photographs and we have received authorization of agreement from people in the photograph. No ethical approval was required for this manuscript as this study did not involve human subjects or laboratory animals.

Reference

1. Wilder-Smith A, Freedman DO. Isolation, quarantine, social distancing and community containment: pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak. *J Travel Med.* 2020;27(2):taaa020. <https://doi.org/10.1093/jtm/taaa020>.
2. Zhang K. Is traditional Chinese medicine useful in the treatment of COVID-19? *Am J Emerg Med.* 2020;38(10):2238. <https://doi.org/10.1016/j.ajem.2020.03.046>.
3. Li Y, Zhang K. Using social media for telemedicine during the COVID-19 epidemic. *Am J Emerg Med.* 2020. <https://doi.org/10.1016/j.ajem.2020.08.007>. [Epub ahead of print].
4. Tang Q, Zhang K, Li Y. The Important Role of Social Media During the COVID-19 Epidemic. *Disaster Med Public Health Prep.* 2020. <https://doi.org/10.1017/dmp.2020.330>. [Epub ahead of print].

5. Tian H, Liu Y, Li Y, Wu CH, Chen B, Kraemer MUG, et al. An investigation of transmission control measures during the first 50 days of the COVID-19 epidemic in China. *Science* 2020;368(6491):638-42. <https://doi.org/10.1126/science.abb6105>.
6. Chan JF, Yuan S, Kok KH, To KK, Chu H, Yang J, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *Lancet*. 2020;395(10223):514-23. [https://doi.org/10.1016/S0140-6736\(20\)30154-9](https://doi.org/10.1016/S0140-6736(20)30154-9).
7. Jefferson T, Del Mar C, Dooley L, Ferroni E, Al-Ansary LA, Bawazeer GA, et al. Physical interventions to interrupt or reduce the spread of respiratory viruses: systematic review. *BMJ*. 2009;339:b3675. <https://doi.org/10.1136/bmj.b3675>.
8. Ikeda N, Takahashi H, Umetsu K, Suzuki T. The course of respiration and circulation in death by carbon dioxide poisoning. *Forensic Sci Int*. 1989;41(1-2):93-9. [https://doi.org/10.1016/0379-0738\(89\)90240-5](https://doi.org/10.1016/0379-0738(89)90240-5).
9. Chandrasekaran B, Fernandes S. "Exercise with facemask; Are we handling a devil's sword?" - A physiological hypothesis. *Med Hypotheses*. 2020;144:110002. <https://doi.org/10.1016/j.mehy.2020.110002>.
10. The student died while running with a mask during gym class. May 8, 2020. <https://baijiahao.baidu.com/s?id=1666115114325242085&wfr=spider&for=pc>. [accessed January 13, 2021].
11. Hua W, Zuo Y, Wan R, Xiong L, Tang J, Zou L, et al. Short-term skin reactions following use of N95 respirators and medical masks. *Contact Dermatitis*. 2020;83(2):115-21. <https://doi.org/10.1111/cod.13601>.
12. Lazzarino AI, Steptoe A, Hamer M, Michie S. Covid-19: Important potential side effects of wearing face masks that we should bear in mind. *BMJ*. 2020;369:m2003. <https://doi.org/10.1136/bmj.m2003>.

Fig.1 The situation of students wearing facemasks during exams in a university in China.

Fig.2 Photo of the author participating in the work of detection of SARS-Cov-2 nucleic acid in community.



