

# Assessing the knowledge, attitudes and practice of mask wearing while exercising in fitness facilities in British Columbia (BC), Canada during the second year of the COVID-19 pandemic

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## **Abstract**

### **Background**

As the COVID-19 pandemic continues into its second year, public health measures remain in place in order to prevent the spread of the virus. One of these measures is the requirement for face masks to be worn at all times in public places. One of these places, fitness facilities, has slightly different requirements. Masks are not required to be worn while actually exercising in gyms and fitness facilities. This study assessed the knowledge, attitudes and practice of mask wearing while exercising in fitness facilities in BC, Canada during the second year of the pandemic. The goal of this study was to assess gym users' familiarity with the mask guidelines, and if the government needs to do anything different to make the guidelines clearer and more accessible.

### **Methods**

This study used a survey designed through SurveyMonkey and was distributed as an online self-administered survey through Reddit and Facebook. The survey consisted of 14 questions which pertained to demographic information, as well as participants' knowledge, attitudes and practice of mask wearing while exercising in fitness facilities in BC. Chi-squared tests were used to analyze the data.

### **Results**

Of the 276 participants in this study, 60% (N=165) of respondents identified as male, 37% (N=102) identified as female, 1.0% (N=3) identified as other while 2.0% (N=6) chose prefer not to answer. For the age of the participants, 2% (N=4) were 18 years old or younger, 37% (N=101) were 19-29, 44% (N=122) were 30-39, 16% (N=43) were 40 and older and 1.0% (N=2) chose prefer not to answer. This study found that in general, females tend to wear masks more often than males ( $p=0.0197$ ), there is no statistically significant association between age and mask wearing frequency ( $p=0.3575$ ), those who knew the mask rules well wore masks when required and those who thought masks were required at all times wore masks more frequently ( $p=0.0000$ ), and those who were in favour of mandatory mask wearing in gyms wore masks more frequently than those who were not in favour ( $p=0.0000$ ).

### **Conclusion**

This study identified a need for greater clarity in the way the government has disseminated the mask guidelines to the public. A significant number of participants believed masks were required at all times while exercising indoors. This may lead to other consequences such as

decreased time spent exercising. This information can be used to persuade the government to increase the clarity and ease in which mask guidelines are accessed by the public.

**Keywords:** gym, fitness, exercise, mask, mask mandate, mask wearing

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## **Introduction**

On March 11<sup>th</sup>, 2020 the World Health Organization officially declared that COVID-19 would be characterized as a pandemic (World Health Organization, 2020b). As the disease spread throughout the world, increasingly strict infection controls measures were put in place in order to inhibit the increasing rate of disease. Over the coming months, controls such as mandated mask wearing were put into effect in BC. As case numbers rose and fell, the mask mandate was lifted, but on August 25<sup>th</sup>, 2021 a province wide mask mandate was put in place when entering any public setting (Government of British Columbia, 2021). Among those settings were sport or fitness centres; however, masks were only required to be worn when not exercising. This led to a mix of people wearing masks all of the time, some of the time, and none of the time while exercising. The reasoning behind this is not well studied, but the goal of this research

project is to uncover some of those reasons.

## **Literature Review**

### **Transmission of SARS-CoV-2 in a fitness setting:**

The novel SARS-CoV-2 virus that created the pandemic starting in 2020 has been thoroughly studied over the past two years. Among the research is the consensus that the disease is most likely spread when the virus is expelled from the respiratory tract of an infected individual in droplets, and then absorbed via the eyes, mouth or nose of a susceptible host nearby (Hui et al., 2020). The BC Centre for Disease Control has suggested that to help prevent the virus from reaching a non-infected individual, we should remain two meters away from one another (BCCDC, 2020). In terms of exercising, droplet spread distance has been estimated to increase to greater than two meters, with studies showing droplets may travel anywhere from six to seven

meters, all the way up to potentially 20 meters with the correct conditions (Cordova & Latasa, 2020; Thoelen, 2021). This means that in a gym or fitness centre, unless very stringent guidelines are in place, people will be exercising close enough together that droplet spread infections may be an issue. This is significant because it was found that while performing hard exercise, droplets were detected at ranges of at least 1.8 meters away from the test subject, even when wearing a surgical mask (Helgeson et al., 2021). The CDC has recently published two reports of COVID-19 spread within fitness facilities. The first showed that of a total of 81 attendees of an in-person fitness class, 55 became infected with the virus; an attack rate of 68% (Centers for Disease Control and Prevention, 2021b). The second documented how a single fitness instructor was linked to spreading the disease to 21 other people across three facilities (CDC, 2021a). One common theme between the two reports is the lack of mask wearing in the facilities. The first report documents that 76% of attendees wore masks infrequently, while the second stated that masks were not required to be worn in the facilities. These reports verify that fitness

centres may be areas where the spread of COVID-19 can be rapid and difficult to contain, and only with the proper safety measures put in place can the public exercise with reduced risk of disease transmission.

The secondary mode of transmission that may take place in a gym or fitness setting is the spread of COVID-19 through indirect methods such as fomites. Equipment that is being used by many people may pose a risk to spreading the disease, especially if proper sanitation procedures are not being followed between uses. Fortunately, the role of fomites in spreading COVID-19 seems to be minimal. It has been documented that while there is definitely potential for spread through common contact surfaces, this method is not the principal area of concern (Rocha et al., 2021; WHO, 2020a). In a fitness setting however, people may be touching shared surfaces seconds after someone else. The COVID-19 virus does show the ability to survive on surfaces in viable numbers for several hours (Van Doremalen et al., 2020). This further highlights the importance of not only mask wearing, but the use of

surface sanitizers before and after using exercise equipment.

### **Effectiveness of masks:**

Mask wearing is thought to be an important part of preventing the spread of respiratory illness, and research has shown that not only do masks prevent droplet spread, but their use is also linked to decreased spread of several diseases such as COVID-19, influenza and rhinovirus (Leung et al., 2020; Milton et al., 2013; Cheng et al., 2020). These days there are typically two types of face coverings that are widely used by members of the public: cloth masks and surgical masks. While the most effective mask may be that of an N95 respirator, these are seldom seen in fitness settings. Typically research over the past few years has indicated that even though both cloth and surgical masks may block some respiratory particulates, surgical masks tend to be more effective. Macintyre et al. (2015) determined that penetration of cloth masks by respiratory aerosols was nearly 97%, compared to the 44% allowed by surgical masks. This also led to an increased rate of influenza spread among places where cloth masks were used instead

of surgical. It seems like the consensus is that if the option is available, surgical masks should be the priority choice when the only other option is a cloth mask, however as a last resort a cloth mask is better than nothing (Sharma et al., 2020; Davies et al., 2013; Kahler & Hain, 2020).

### **Physiology and mask wearing while exercising:**

While mask wearing has been shown to be at least somewhat effective in preventing the spread of several respiratory illnesses, there is still a downside to having to wear one while exercising. Perhaps the most common topic surrounding mask usage while exercising is the decrease in oxygen intake, and the increase of carbon dioxide build up in the body inhibiting physical performance. The most common measure of cardiopulmonary fitness is a  $VO_2$  Max test, which essentially measures how well one's body is using oxygen (Jewell, 2020). It was found that while wearing a cloth mask, there was an average of a 29% decrease in  $VO_2$  max, as well as a 14% reduction of exercise time (Driver et al., 2021). The study also found qualitatively that participants felt more shortness of breath, claustrophobia and discomfort

while wearing a mask during intense exercise than those that did not wear a mask. Building upon these themes further, it was also found that during rigorous exercise the feeling of being short of breath was increased, with cloth masks being worse for increasing these feelings than that of surgical masks (Fukushi et al., 2021). The study also found that cloth masks tend to increase heart rate during vigorous exercise whereas surgical masks do not at any exercise intensity. Luckily it was also shown that arterial oxygen saturation remained unaffected at any exercise intensity while using a mask (Fukushi et al., 2021). Such claims about blood oxygen levels remaining unchanged with mask usage while exercising may not be set in stone, however. There may be instances where oxygen saturation of the blood as well as pulmonary capabilities are lower while wearing a mask during exercise compared to exercising without a mask (Tornero-Aguilera et al., 2021; Fikenzer et al., 2020). While the results of these studies may contradict others, they also help confirm other negatives to mask wearing while exercising including an increase in subjective stress perception and an increase

in face and temple temperature. In general, there is a wide spread of results across a very small number of studies on exercise physiology and mask wearing. More quantitative data does not seem to reach a consensus, as such things as blood oxygen and blood pressure do not have a clear pattern between studies. Even something as easily measured as heart rate has been shown to both increase and remain the same during exercise with a mask (Fukushi et al., 2021; Tornero-Aguilera et al., 2021; Egger et al., 2021; Fikenzer et al., 2020; Epstein et al., 2021). Overall, there is insufficient evidence that wearing a mask while exercising should warrant panic surrounding the idea (Epstein et al., 2021).

### **Mask perception and compliance:**

While masks became mandatory for people to wear in public settings most recently as of August 25<sup>th</sup>, 2021, gyms remain exempt from the mandate during the period that someone is actually exercising (Government of British Columbia, 2021). Out in the general public, mandates certainly have a positive effect on mask usage. Research suggests that making masks mandatory may increase self-

reported mask usage by as much as 27% and may even reduce the total number of new COVID-19 cases in a community by 22% each week (Karaivanov et al., 2021). In theory a mandate stating one must wear a mask in public should result in 100% of the population wearing a mask all the time; however, this is not the reality in practice. Datta et al. (2021) found that in a healthcare setting where masks were mandatory, mask compliance was observed only 92.6% of the time among the healthcare workers. What are some of the reasons behind those who do not adhere to the ruling? There are many reasons that people give, but in general the more common themes tend to be around the belief that masks are unnecessary or ineffective, distrust in the government or even a social perception on how they might look to those around them (Wang et al., 2021; Craig et al., 2021; Georgieva et al., 2021). Gender may also play a role in how often masks are used. Recent studies have found that females typically wear masks more often than males (Capraro & Barcelo, 2020; Looi et al., 2021).

## **Purpose of the study**

The purpose of the study was to investigate the attitudes towards mask wearing in a fitness setting during a period in the COVID-19 pandemic when mask wearing was mandatory in gyms, when not exercising to find out the frequency in which masks are used, and the reasoning behind someone's choice to wear a mask or not. There exists a dichotomy between wearing a mask or not while exercising. This study attempted to identify the reasons for this, and perhaps help with the implementation of clearer guidelines on what exactly acceptable mask usage is in a fitness setting.

## **Methods and Materials**

### **Materials**

The materials for this study included a computer for performing the statistical analyses, SurveyMonkey software for designing and distributing the survey, Microsoft Excel for recording data, NCSS 2022 software for analyzing the statistical data, Research Ethics Board (REB) of BCIT approval, and a \$100 Visa gift card that was used in a prize draw for completing the survey.

### **Methods**

The standard method used in this study was a self-administered online survey designed through SurveyMonkey; a survey design platform that can house all survey information in Canadian servers to keep participant information confidential (SurveyMonkey Canada, 2021). A link to the survey was posted onto the online forum website Reddit as well as fitness groups on Facebook, where anyone who fits the survey eligibility could fill it out. The survey was open from January 30<sup>th</sup> until February 21<sup>st</sup>, 2022. The survey asked questions about general demographic information, frequency of mask usage while exercising in gyms, attitudes towards mandated mask wearing, reasoning behind wearing or not wearing a mask, as well as what knowledge the participants have surrounding the current mask guidelines in gyms. The majority of the questions were multiple choice and included a “prefer not to answer” option should they ever have felt uncomfortable answering the question. There was one open ended question where participants were allowed to discuss any further reasoning behind their decision to wear a mask or not. Those who chose to enter the draw were allowed to leave their

e-mail address at the end of the survey to be eligible for the \$100 Visa gift card prize draw.

### **Inclusion**

Participants of the study had to be current residents of British Columbia and attend a gym or recreation facility at least two times a week. The survey was open to all ages.

This study was approved by the Research Ethics Board of BCIT before being distributed to the public. A cover letter and consent form were included with the survey for all participants to read before completing the survey.

### **Results**

#### **Description of Data:**

The data that was collected from the survey was non-numerical data. Questions regarding participant demographic was both dichotomous data, as well as multichotomous nominal and ordinal data. Information gathered in the mask usage in gyms section was mainly multichotomous nominal data.

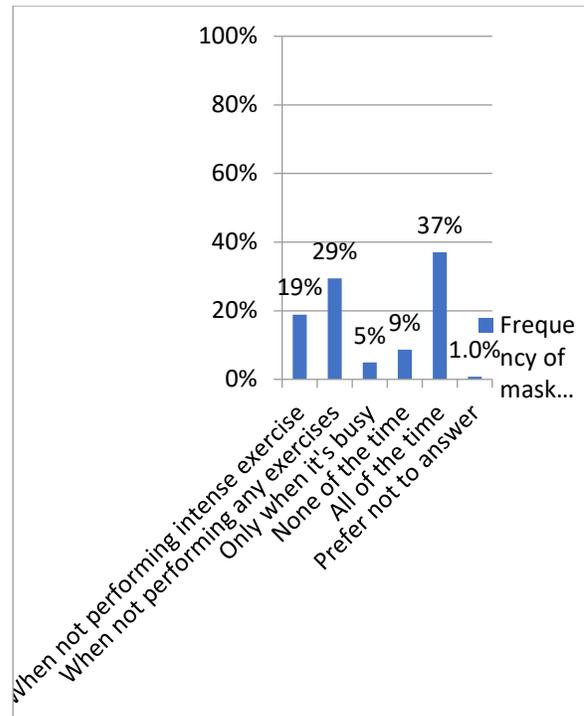
#### **Descriptive Statistics:**

The demographic data was presented in a bar graph using the percentages of the information gathered. In total there were 276 participants in the study.

In terms of gender, 60% (N=165) of respondents identified as male, 37% (N=102) identified as female, 1.0% (N=3) identified as other while 2.0% (N=6) chose prefer not to answer.

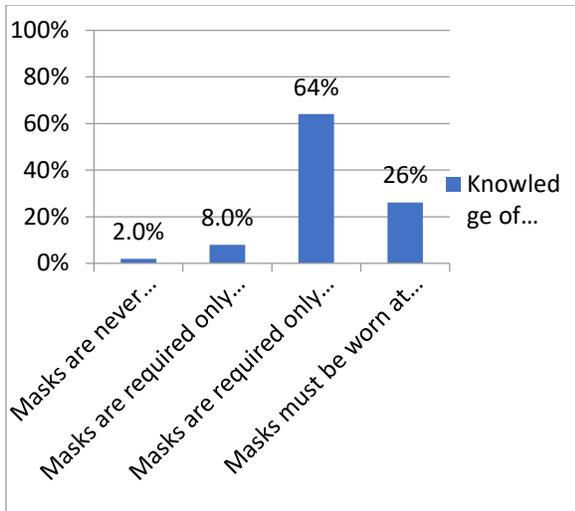
Looking at the ages of the participants, 2% (N=4) were 18 years old or younger, 37% (N=101) were 19-29, 44% (N=122) were 30-39, 16% (N=43) were 40 and older and 1.0% (N=2) chose prefer not to answer.

Next in terms of frequency of mask wearing while exercising in a fitness facility, 37% (N=98) of participants said they wear a mask all of the time, 19% (N= 50) said they wear one only when not performing intense exercise, 5% (N=14) said they wore one only when it's busy, 29% (N=78)said they only wear a mask when not performing any exercises, 9% (N=23) said they never wear mask while exercising in a fitness facility, while 1.0% (N=2) preferred not to answer (Figure 1).



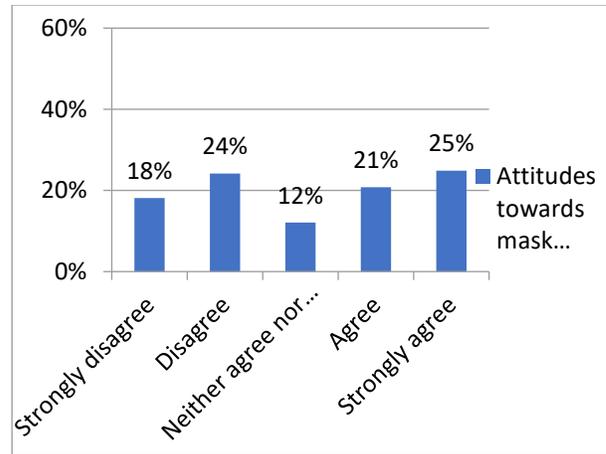
**Figure 1. Behaviour of mask wearing while exercising in a fitness facility of the participants**

Next the knowledge of the current BC gym guidelines was accessed. 2.0% (N=5) of respondents believed masks are never required to be worn in the gym, 8.0% (N=21) thought masks are only required when actually performing exercises, 64% (N=169) said masks are required only between equipment and when not exercising, while 26% (N= 69) said masks must be worn at all times while exercising in fitness facilities in BC (Figure 2).



**Figure 2. Knowledge of the BC mask guidelines for fitness facilities**

Finally the attitudes towards mask wearing while exercising in fitness facilities in BC were assessed. Respondents were able to choose whether they strongly disagree, disagree, neither agree nor disagree, agree or strongly agree on if masks should be mandatory at all times while exercising. The results showed that 18% (N=48) strongly disagree, 24% (N=64) disagree, 12% (N=32) neither agree nor disagree, 21% (N=55) agree, while 25% (N=66) strongly agree that masks should be mandatory at all times while exercising in fitness facilities in BC (Figure 3).



**Figure 3. Attitudes towards mandatory mask wearing while exercising in fitness facilities in BC.**

### Inferential Statistics

NCSS 2022 statistical software was used to analyze the data gathered. Chi-squared tests were used to look for associations in the data and answer the proposed hypotheses found in Table 1.

**Table 1. Hypotheses, tests used, results and conclusions.**

H <sub>0</sub> and H <sub>A</sub>	Test used	Result	Conclusions
<p>H<sub>0</sub>: There is no association between gender and frequency of mask wearing while exercising in fitness facilities in BC.</p> <p>H<sub>a</sub>: There is an association between gender and frequency of mask wearing while exercising in fitness facilities in BC.</p>	Chi-square test	p=0.0197	The null hypothesis can be rejected and it can be concluded that there is a statistically significant association between gender and how often one decides to wear a mask while exercising in gyms in BC. Males chose the “never wear a mask” more than females, however both groups had equal proportions of wearing masks all the time when in the gym. There is a potential Alpha error at p=0.0197.
<p>H<sub>0</sub>: There is no association between age and frequency of mask wearing while exercising in fitness facilities in BC.</p> <p>H<sub>a</sub>: There is an association between age and frequency of mask wearing while exercising in fitness facilities in BC.</p>	Chi-square test	p=0.3575	The null hypothesis is not rejected and it can be concluded that there is no statistically significant association between one’s age and the frequency in which they wear a mask at the gym.
<p>H<sub>0</sub>: There is no association between knowledge of the current BC mask guidelines for gyms and frequency of mask wearing while exercising in fitness facilities in BC.</p> <p>H<sub>a</sub>: There is an association between knowledge of the</p>	Chi-square test	p=0.0000	The null hypothesis can be rejected and in can be concluded that there is a statistically significant association between knowledge of the current BC guidelines and the frequency of which one wears a mask while exercising

<p>current BC mask guidelines for gyms and frequency of mask wearing while exercising in fitness facilities in BC.</p>			<p>in a gym. Those who believe the guidelines say masks must be worn at all times do just that, whereas people who are more familiar with the rules wear them more infrequently, and will take them off when actually exercising.</p>
<p>H<sub>o</sub>: There is no association between the attitudes towards mandatory mask wearing in gyms and frequency of mask wearing while exercising in fitness facilities in BC.</p> <p>H<sub>a</sub>: There is an association between the attitudes towards mandatory mask wearing in gyms and frequency of mask wearing while exercising in fitness facilities in BC.</p>	<p>Chi-square test</p>	<p>p=0.0000</p>	<p>The null hypothesis can be rejected and it can be concluded that there is a statistically significant association between the attitudes towards mandatory mask wearing in gyms and frequency of mask wearing while exercising in fitness facilities in BC. Those who agree and strongly agree with mandatory masks in gyms tend to wear masks more frequently while exercising, while those who disagree or strongly disagree wear masks more infrequently while exercising in fitness facilities in BC.</p>

## **Discussion**

This study aimed to explore the knowledge and practices of mask wearing in fitness facilities in BC by those who attend such facilities, and what their attitudes are towards mask wearing being mandated. With masks being only a recommendation while exercising in gyms, the goal of this

study was to see what groups of people actually follow the guidelines and if the guidelines are clear enough for gym users to find and interpret. The first area that this study looked into was gender vs. the frequency in which someone wears a mask. Recent studies have shown that in general females tend to wear face masks in public,

and intend to wear face masks more so than males (Capraro & Barcelo, 2020; Looi et al., 2021). This study follows this research as a greater proportion of females wear a mask all of the time while exercising, while more males never wear masks while exercising in fitness facilities. The association between gender and mask wearing frequency was strong, with a p value of 0.0197, meaning that this is most likely the truth. This is important to note, because it may be necessary to target males more when disseminating the mask guidelines to the public.

Next age was assessed as a factor in mask compliance in fitness facilities. The results did not show a statistically significant association, but this is most likely due to the fact that not enough participants of the survey were a part of the two oldest age ranges.

Thirdly was the association between mask wearing in fitness facilities in BC and attendees' knowledge of the current BC mask guidelines. This study found that there was a statistically significant association between how often one wears a mask while exercising in fitness facilities in BC, and their

knowledge of the guidelines. The majority of participants (N=169) in this study did know that masks are only required when actively exercising. The second highest choice was that of "masks must be worn at all times" (N=69). This means that nearly 30% of all participants believed that they must wear a mask at all times while exercising. Since more people are wearing masks than not, they are erring on the side of caution and preventing the spread of COVID-19 or any other respiratory diseases. This may have other detrimental effects however, as people who believe that masks must be worn at all times may be more likely to stay home and exercise less, which itself can have negative impacts on one's health.

Lastly the attitudes of mandated masks were explored, and how they were associated with how often one actually wears their mask while exercising. The results showed a strong, statistically significant association between the attitudes towards mandatory mask wearing in gyms and frequency of mask wearing while exercising in fitness facilities in BC with a p-value of 0.0000. With no alpha or beta error, the results confidently show that

those who have a greater acceptance of mandatory mask wearing are more likely to actually wear a mask while exercising, even if it is not required by law.

## **Knowledge Translation and Recommendations**

The results of this study may help influence how mask guideline information is disseminated to the public in the future. As it stands, the majority of people did understand the correct guidelines, but there was still a significant population that did not know what the guidelines truly stated. One suggestion would be that the government requires gyms to actually post the mask guidelines, as not every gym does that on their own. This would remove the need for someone to access the information only by internet, and everyone who walks into a gym, no matter their age, gender or personal characteristics will have access to the information.

## **Limitations**

The largest limitation that this study faced involved the closure of gyms in BC and the changing of the mask guidelines for gyms. Fitness facilities in BC were closed

from December 21<sup>st</sup>, 2021, until January 18<sup>th</sup>, 2022, a date which cut off a large portion of the time allotted for the study. With this decrease in time, and the increase in the Omicron COVID variant, one of the methods of collecting survey responses had to be skipped. The original study would have handed out posters with links to the survey in fitness facilities and community centres around Vancouver, but since this could not happen, only online methods were used. This greatly decreased the external validity of the study. In the future being able to post the survey in gyms and places more accessible to older adults and women will increase the validity of the study.

Also, since this survey was limited to being posted online only, responses may not have been entirely accurate, as people may have just skipped right to the end to input their e-mail for the prize draw. This also meant that there were several responses that were clearly not valid, as they would use vulgar e-mails and write anti-government messages in the open-ended section. These results were thrown out as they lowered the validity of the study. Future studies that are able to

distribute the surveys to gyms should get more honest, true responses as the respondents will be more invested as they themselves are definite gym attendees.

## **Future Research**

Future research projects that may be done surrounding this topic of study include:

- Analysing how mask wearing has impacted the amount people exercise. Have the mask mandates decreased the number of hours that people exercise for during the week?
- How have gym closures affected exercise and mental health?
- How well do masks prevent droplet spread while performing intense exercise?
- Analyzing mask wearing frequencies by using real life observations in fitness facilities

## **Conclusion**

This study found three statistically significant associations within the data. The first was that there was an association between one's gender and how frequently they wear a mask while exercising in fitness facilities in BC. In general females tend to

wear their masks more often than males.

The second association found was between knowledge of the current guidelines for mask wearing in fitness facilities in BC and how frequently the mask are actually worn in gyms. Those who knew the current guidelines would wear their masks in line with what the guidelines said, while those who believed masks were required all of the time did in fact wear mask more frequently. Finally an association was found between the attitudes towards mandatory mask wearing and the frequency of mask wearing while exercising in fitness facilities in BC. Those who were in favour of mandatory mask wearing wore masks more frequently while exercising than those who were not. This study will hopefully be used to alter the way in which governments disseminate mask guideline information to the public. Increased clarity and ease of access are two of the most important things that could be changed about how the information is currently given to the public. Better access to information will encourage people to continue to exercise and keep fit, while continuing to stay safe and healthy during any current or future pandemics.

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### **Competing Interest**

The authors declare that they have no competing interests while conducting this study.

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