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| Frequently asked questions  |
| COVID-19 transmission from air-circulating, wind-moving devices and activities | IPCAR (updated 08/04/2021)November 2020 |

# Updates

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| Version/Date | Changes |
| Version 2 | * Advice provided on use of devices now aligned with the Victorian Health Service Guidance and Response (VHSGR) COVID-19 risk levels
* Additional devices included (e-cigarettes/vaping devices, gym equipment, ceiling fans)
* Advice on group singing updated
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# COVID-19 infection

COVID-19 is primarily spread through human-to-human transmission within close proximity via respiratory droplets (that is, droplet transmission) and contact transmission. COVID-19 can also be spread via virus-containing aerosols. Respiratory droplets are generated when an infected person coughs, sneezes or talks, and during aerosol-generating procedures (AGPs).

Transmission of respiratory viruses can occur when respiratory droplets carrying infectious pathogens are expelled from the respiratory tract of infectious individuals and either land on a susceptible person or another surface, or remain airborne and travel greater distances under certain conditions. Transmission of COVID-19 can occur when a person comes into close contact with a contaminated surface or item (referred to as fomites). The person may become infected if they touch their nose, eyes or mouth with a contaminated hand or object.

Poor ventilation and airflow in indoor environments have been implicated as increasing the risk of transmission of COVID-19(World Health Organization, 2020).

## Purpose

To provide guidance on the use of air-generating, air-moving and wind-blowing devices and activities, and the risk of transmission of COVID-19. This includes fans, air conditioning units, wind-blowing instruments and singing in groups (for example, choirs).

## Key points

* Ventilation is required to maintain air quality in an indoor environment with the removal of stale air and the introduction of fresh air.
* Modelling and studies of outbreaks have suggested that heating ventilation and air conditioning (HVAC) systems may increase the dispersal of infectious particles and lead to increased transmission of COVID-19; however, there is currently insufficient evidence to prove this (Borro et al., 2021; Chirico, Sacco, Bragazzi, & Magnavita, 2020).
* There is limited research into small air-circulating devices such as hand dryers and fans and the risk of spread of COVID-19. Previous studies into the risk of the spread of bacteria or viral particles from hand dryers have demonstrated increased contamination in the immediate environment (air and surfaces) (Huang, Ma, & Stack, 2012).
* A well-ventilated space can reduce the concentration of viral particles in the air, lowering the risk of aerosol transmission. To improve air circulation in an area, heating, ventilation and air conditioning (HVAC) systems or fans (with or without filters) may be used.
* The risk of transmission of COVID-19 through the use of air and wind-moving devices discussed in this document is low, especially in settings where there is no active disease or community transmission of COVID-19. Use of air and wind-moving devices should be aligned with the [Victorian Health Service Guidance and Response (VHSGR) to COVID-19 risk levels](https://www.dhhs.vic.gov.au/victorian-health-service-guidance-and-response-covid-19-risks), where COVID Active and COVID Peak represent active community transmission of COVID-19 <https://www.dhhs.vic.gov.au/victorian-health-service-guidance-and-response-covid-19-risks>.

# Frequently asked questions about air-circulating devices, wind-moving devices and activities

### What are air-circulating devices?

For the purposes of this document, air-circulating or wind-moving devices are devices which are capable of creating air currents or turbulence which may facilitate aerosol movement and displacement. Examples of devices include:

* small air-circulating devices such as:
	+ hand dryers
	+ hairdryers
	+ fans (for example, personal fans, handheld fans)
	+ e-cigarette or vaping devices
* larger air-circulating devices such as:
	+ variations of fans (for example, office fans, pedestal and ceiling fans industrial fans)
	+ heating, ventilation and air conditioning (HVAC) units.

## Hand dryers

### Is it safe to use hand dryers in bathrooms?

While there may be some evidence that hand dryers disperse water droplets from hands during the drying process, the most important factor in reducing the spread of germs during drying is to wash your hands thoroughly, especially rinsing the soap off (and hence germs), before you dry them. Drying hands with a hand dryer or paper towel are both considered safe practices.

## Hair dryers

### Do hair dryers spread COVID-19?

There is a theoretical risk that a hair dryer may spread contaminated air around a room, if there is an infected person in the room (Natale, 2020). The risk of spreading COVID-19 in this way is considered very unlikely unless respiratory droplets (from an infected person coughing) are directly in the path of the hair dryer when it is being used and another person is present. When there is active community transmission of COVID-19, it is recommended that a hairdryer is only used by someone alone in a room with the door closed. If there is no community transmission, hair dryers are not likely to pose a risk to others within the immediate vicinity.

## Fans

### Is it safe to use personal fans indoors?

If infectious aerosols and droplets are present, air currents generated from fans may move the droplets a greater distance. Therefore, as they can transfer air from one area to another more quickly, indoor personal fans should be avoided for heating or cooling purposes in shared indoor non-residential spaces when there is active community transmission of COVID-19. An alternative way to increase natural ventilation and general air circulation is to open windows and doors. When there is no active community transmission of COVID-19, fans are safe for use in all indoor settings.

If the ventilation rates for a space do not meet the minimum non-residential building requirements, the use of a fan placed close to an open window may increase air mixing within the room or space and improve ventilation (World Health Organization, 2021b). However, ventilation of spaces using HVAC systems is preferred to natural ventilation (that is, use of fans and windows).

### Are fans safe for use in open office spaces?

Fans are safe for use in single occupancy rooms; however, fans for air circulation in open office spaces where there are several people present should be avoided while there is active community transmission of COVID-19 (Global Heat Health Information Network, 2020).

### Can fans be used safely in indoor spaces at home?

Ceiling fans can improve circulation of air in an indoor space and avoid accumulated pockets of stagnant air. Fans can be used in the home setting among family members that are living together and not affected by COVID-19 (World Health Organization, 2020). Air blowing from an infected person directly towards another person in a closed space may increase the risk of transmission of the virus; therefore, use of fans should be avoided when a family member is unwell or has been diagnosed with COVID-19 and is not isolated away from other people in the household (World Health Organization, 2020).

Ventilation of rooms may also be improved by opening windows to increase circulation of fresh air, if appropriate (World Health Organization, 2020).

### Can fans be used in residential aged care?

In a single occupied room, fans may be used for resident comfort with the door closed, regardless of the infection status of the individual. However, staff entering a closed space may be at risk from air blowing from an infected person; therefore, fans should be turned off when another person enters the room of a confirmed or suspected COVID-19 patient.

### Can fans be used in gyms?

If there is active community transmission of COVID-19, the use of fans in gyms is not recommended. The rationale for this recommendation is that exercise leads to an increased production of aerosols (heavy breathing may stimulate coughing and expulsion of respiratory droplets). These respiratory droplets and aerosol particles may be moved from person to person by the use of fans.

Consider the following options to reduce the need for fans in gyms.

* Reduce the air conditioning temperature of the gym environment by 1–2 degrees Celsius.
* Open windows or adjust air conditioning to increase ventilation in common areas and avoid use of recirculated air via ventilation systems (Safe Work Australia, 2020)

It should be noted that it is not recommended for people to wear masks during strenuous exercise as masks may reduce the ability to breathe comfortably. Sweat can make the masks become wet or damp more quickly, which also makes it difficult to breathe and reduces the ability of the mask to protect the wearer. One of the most important preventative measures during exercise is to maintain physical distancing of at least 1.5 metres from other people (World Health Organization, 2020).

### Can ceiling fans be used in foyer areas?

The use of ceiling fans can improve circulation of outside air and avoid accumulating pockets of stagnant air in an occupied space. However, it is critical that good outdoor ventilation is maintained when using ceiling fans (for example, by opening outdoor-facing windows or when HVAC systems are used) (World Health Organization, 2021a). Ceiling fans should be adjusted to pull air upwards rather than downwards (for example, tilt blades upwards if possible) (Jayaweera, 2021). Any adjustments made to ceiling fans should only be done if it is deemed safe by specialists or professionals.

## Air conditioning and ventilation systems

### Can air conditioning be used?

Air conditioning and ventilation systems that are well maintained and operated should not increase the risk of virus transmission. Increasing the rate of air exchange, reducing (or eliminating where possible) recirculation of air and increasing the use of outdoor air in heating, ventilation and air conditioning (HVAC) systems can help to reduce the risk of transmission of COVID-19 (World Health Organization, 2021b). All air conditioning and ventilation systems should be inspected, maintained and cleaned regularly.

### Which air conditioner settings are to be used in buildings?

It is recommended that recirculation modes on centralised heating, ventilation and air conditioning (HVAC) systems should be switched off (Centers for Disease and Control and Prevention [CDC], 2021). Air-handling units with central recirculation should be configured to supply as much outdoor air as reasonably possible.

For systems that do not use outdoor air (for example, they run on recirculated air only), manufacturer’s device maintenance guidance should be checked to determine if there are alternative options to supplement ventilation and reduce COVID-19 spread. Examples of alternative options include opening of windows as much as possible, use of portable air-cleaning units or installation of standalone air-conditioner units (Blocken et al., 2021).

## Non-medical aerosol-generating devices and activities

Non-medical aerosol-generating devices and activities can include:

* equipment and devices used by police for breath testing
* medical equipment for spirometry
* musical instruments such as wind and brass instruments
* singing in a choir.

## Police devices

### Can personal breath testing equipment be used safely?

Personal breath testing equipment or ‘breathalysers’ are used regularly by police officers. The breathalyser devices can operate in two modes – active or passive. The passive mode is when the person is required to speak closely into the device but does not contact it directly. The active mode requires the person to blow directly into the device.

When used in active mode, a person is required to blow with one long continuous breath into a disposable mouthpiece attached to the device, (usually handheld). Where possible, this active test should be conducted outdoors, with maximum possible distance between the police officer and the person blowing into the device.

When conducting this procedure, the police officer must wear a mask. The mouthpiece can be disposed of in a normal rubbish bin and the police officer must perform hand hygiene after disposal of the mouthpiece (New South Wales Health, 2020). All reusable devices and equipment should be cleaned and disinfected according to manufacturer instructions between each use.

## Medical equipment

### Can spirometry equipment be used?

Spirometry is a routinely performed test to look at pulmonary or lung function. It measures the amount and speed of air going in and coming out of the lungs when breathing through a tube into a spirometry machine.

To ensure safe working practices when performing spirometry, develop a procedure that includes the following considerations:

* Undertake a clinical risk screen of all clients prior to them being tested that includes
	+ clinical screening for symptoms (fever, cough, shortness of breath, sore throat, loss of smell or taste)
	+ epidemiological screening to ask about contact with a confirmed or suspected case in the previous 14 days, possible high-risk occupation, and whether the patient resides in or has travelled through an area with elevated risk of community transmission
	+ a temperature check (temperature should be less than 37.5 degrees Celsius).
* Testing should not be undertaken on anyone who has either symptoms or other risk factors for COVID-19. If unwell, refer them to their GP or advise them to be tested for COVID-19.
* Ensure adherence to infection prevention and control precautions, such as appropriate use of PPE and hand hygiene.
* All assessments and procedures should be performed, wherever possible, adhering to1.5 metre physical distancing.

## Gym equipment

### Are rowing machines, exercise bikes or other wind-generating types of equipment safe to use?

In environments where people are exercising, there is evidence that exertion, deep exhalation and inhalation can generate more particles in the air. With little to no evidence currently available, the theoretical risk of droplet and aerosol generation by some gym equipment (such as exercise bikes and rowing machines) is unlikely.

However, mid-to-high-speed airflow currents created when these types of gym equipment are in use may facilitate aerosol and droplet movement within a space.

When there is no active community transmission of COVID-19, the risk of aerosol transmission is very low, and all equipment can be considered safe to use. When there is active community transmission of COVID, the risk of aerosol transmission is significantly higher - extra precautions may be needed and you may need to stop using wind-generating equipment.

Ventilation provided by facility HVAC systems or independent air conditioning units is an important factor in providing indoor exercise facilities with fresh air and minimising aerosol transmission. It is recommended that windows and doors are left open to introduce fresh air, wherever possible, and air conditioning systems or units are well maintained. Installation of air filters may be considered but these are not necessary if minimum HVAC requirements can be met.

## Musical instruments

### Can playing musical instruments pose a risk?

Aerosol generation during the use of certain musical instruments is influenced by factors like the changing of dynamic levels, articulation pattern and breathing technique (He, Gao, Trifonov, & Hong, 2021). The tube structure (for example, tube length, turnings and valves) and mouthpiece design (for example, air-jet, single reed or double reed) of the instrument may also influence the concentration and size of aerosol produced.

Some instruments pose a higher risk of aerosol generation than others. Based on aerosol generating capabilities compared to normal speaking and breathing, wind instruments can be categorised into low (for example, tuba), intermediate (for example, bassoon, piccolo, flute, bass clarinet, French horn and clarinet) and high-risk (for example, trumpet, bass, trombone and oboe).

Higher risk instruments generate more aerosols of a smaller aerosol size when played, in comparison to lower risk instruments and speaking. It is this generation of greater numbers of aerosol particles (which may contain infectious virus) that increases the risk of airborne disease transmission.

Other high-risk routes of transmission of COVID-19 when playing instruments include:

* breath condensation and saliva collection in some instruments after playing
* sharing and touching of reeds
* playing or using shared instruments (for example, piano and microphone) without proper hand hygiene prior to commencing.

Appropriate collection and disposal of condensation and saliva should always be practised. Hand hygiene should be performed before and after playing shared musical instruments, and surfaces should be cleaned and disinfected between each use.

### Can wind and brass instruments be used?

### When there is no active community transmission of COVID-19, the theoretical risk of disease transmission from playing wind and brass instruments is very low. When there is active community transmission of COVID-19, wind and brass musical instruments may still be used; however, additional measures are required to mitigate or reduce the risk of infection transmission. Examples of these include the following:

* Playing musical instruments outdoors will significantly reduce the risk of infection transmission.
* Reducing the number of people present in an indoor space. This might entail changed seating arrangements for different musical activities involving the use of wind and brass instruments, including orchestras, bands or music classes. The maximum number of individuals allowed in a given space should follow density limits set by the Department of Health.
* Incorporating additional physical distancing between the musicians. Musicians playing high-risk instruments should be at least two metres apart (to account for the length of the instrument) and distance between those playing wind instruments and other musicians should be maximised as much as possible.
* The audience should be distanced as far as practical from brass and wind musicians. With indoor performances, the audience may be required to wear a face mask if required by local restrictions.
* Room ventilation enhancement (for example, open windows) is important.
* Performers playing non-wind instruments (for example, percussion and string players) should wear face masks if performing in settings where face masks are required by local restrictions.
* Users of brass instruments should monitor and drain their breath condensate (‘spit valve’) regularly. Musicians must drain this fluid and dispose of it in a rubbish bin and then perform hand hygiene.
* Wind instruments are for individual use and should not be shared unless thoroughly cleaned and disinfected before reuse.
* The use of a barrier cap on the bell end of a brass instrument offers a significant reduction in release of respiratory aerosols into the immediate surroundings. This is a possible mitigation method for playing in groups, especially in hard to ventilate spaces.

## Singing in group settings such as choirs

### Are choirs safe?

During singing, droplets and aerosols are emitted and can follow ambient airflow patterns in a space (Bahl et al., 2020). If infectious individuals are present, group singing may transmit COVID-19 and the longer the singing, the greater the risk. Singing inside in a poorly ventilated area with infectious singers that are not physically distanced has been shown to be associated with the spread of COVID-19 amongst the group (Hamner et al., 2020).Humming and singing softly have been shown to be of lower risk for aerosol production.

When there is no active community transmission of COVID-19, the risk of droplet and aerosol transmission from choral singing is low, so normal practices may be permitted. When there is active community transmission of COVID-19, singing in group settings is less safe and additional precautions are needed to reduce or mitigate transmission of COVID-19.

It is important to assess the state of health of anyone attending group singing to ensure the safety of others. People at high-risk of severe illness (that is, any signs or symptoms of COVID-19) should not participate in group singing while there is active community transmission of COVID-19.

Examples of strategies that can be applied to reduce risk of infection transmission include:

* singing outside or in a well-ventilated room (with windows open)
* physical distancing of at least 1.5 metres while singing in groups
* shorter performances (of less than an hour)
* running singing lessons, classes or practices outdoors if practical
* use of glass-petitioned rooms
* running singing lessons, classes or practice sessions virtually.

### E-cigarettes/vaping devices

There is evidence showing that the infection risk of environmental aerosol transmission of COVID-19 from a person using an e-cigarette or vaping device is less than from that same person speaking or coughing (Sussman, Golberstein & Polosa, 2021).

Even though the risk is lower, it is recommended that people maintain a two-metre distance from the person who is vaping or smoking.

People using these devices should also be aware that frequent hand-to-mouth action and sharing of devices with others may increase the risk of infection. Hand hygiene should be performed before and after using the device.

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Authorised and published by the Victorian Government, 1 Treasury Place, Melbourne.

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