



MOTION AND CYBER SICKNESS

This handout is intended as a general introduction to the topic. As each person is affected differently, speak with your health care professional for individual advice.



Key points

- Motion sickness is caused by being in a moving vehicle.
- Cyber sickness is triggered by viewing moving content on digital devices.
- Both bring on nausea or discomfort.
- Symptoms usually go away within hours after the motion or digital session stops.
- May be caused by a sensory mismatch or conflict between the signals the balance system sends to the brain.
- Many strategies can reduce symptoms if situations likely to bring on nausea or discomfort are unavoidable.
- Vestibular rehabilitation (an exercise-based therapy) can help the brain get used to signals that trigger these conditions.
- Some medications can help prevent or treat motion sickness. They work best if taken beforehand.

What is motion sickness?

Motion sickness is nausea or discomfort that happens when you are exposed to certain types of motion, such as riding in a boat, car, or airplane. Motion sickness is also very common during space travel. The nausea and discomfort may last for several hours after the motion stops.

Some people have only mild symptoms, but other people have severe symptoms that can severely interfere with their lives. Rarely, motion sickness can cause so much vomiting that it causes dehydration.

Not everyone gets motion sickness, although nearly anyone can get it if the motion is severe enough. But some people are more likely to get motion-sick, including women and children under 12. There is some evidence that motion sickness is more common in the middle of the menstrual cycle. People with other conditions that cause nausea, including early pregnancy, migraine, and vestibular disorders, are likely to get motion sickness as well.

Motion sickness is less common in children younger than 2 and people older than 50. People who do not have a functioning vestibular system do not get motion sickness.

Some people have symptoms of rocking or swaying for a month or more after being exposed to motion. They have a rare condition called mal de débarquement syndrome (MdDS). Its key feature is the opposite of motion sickness: the symptoms often get better while the person is experiencing passive motion, for instance being in a moving car or boat.

What is cyber sickness?

Cyber sickness is the umbrella term for nausea or discomfort triggered by viewing moving digital

content on devices such as smartphones, tablets, desktop computers and eXtended reality (XR). It is similar to motion sickness, except that the “motion” that causes it is virtual, not real. When scrolling quickly on a smartphone, for example, you see movement that you do not feel. As with motion sickness, the symptoms of cyber sickness can last for several hours after the digital session ends. Cyber sickness is a subset of visually induced dizziness. It is also called digital motion sickness.

People who are more sensitive to visual motion signals are more likely to get cyber sickness. If someone tends to get motion sickness, they are also likely to get cyber sickness. Cyber sickness is more common in people with a history of concussion, a vestibular disorder, migraine and fainting (syncope).

A recent study suggests that changes in the visual and vestibular cortical (outer layer of the uppermost part of the brain) network of some people make them more likely to get cyber sickness.

As many as 40% to 70% of people experience some cyber sickness when using XR, and the number is even higher for some programs.

Cyber sickness affects people of all ages. It remains unclear whether gender plays a role. Researchers are divided on whether or not there are gender differences in susceptibility to cyber sickness.

Anecdotally, some researchers and health professionals suggest people with anxiety or personality traits such as perfectionism and ambition are more vulnerable to cyber sickness. So far this has not been backed up by robust scientific evidence.

What are the causes of motion and cyber sickness?

The brain's balance system combines information from many sources, including:

- the **vestibular system** (the semicircular canals and otoliths in the inner ear), which senses when your head tilts, turns or changes speed

- the **visual system**, which lets you see
- the **proprioceptive system**, which sends signals about position, pressure, movement and vibration from the legs and feet and the rest of the body

The most popular theory is that motion and cyber sickness are both caused by a sensory mismatch or conflict between the signals the balance system is sending to the brain. These signals may also clash with the brain's expectations (known as your internal model of motion). For example, when you are riding in a car:

- your vestibular system says that you are moving
- your proprioceptive system says that you are sitting still
- your visual system may be getting different signals depending on what you are looking at; for example, if you are trying to read or look at your phone, your visual system will say you are not moving
- unless you are the driver, you do not know exactly when you are going to slow down, speed up or turn; motion sickness may become even more of a problem in self-driving cars

Similarly, if you are watching movement on an XR headset, your visual system detects movement, but your vestibular and proprioceptive systems do not. This can create a mismatch or conflict between the different parts of the brain's balance system, similar to visually induced dizziness. It is caused by a mismatch or conflict between the different parts of the brain's balance system, similar to motion sickness.

Some XR simulations are more likely to cause cyber sickness than others because the amount of simulated movement is more extreme.

What are the symptoms of motion and cyber sickness?

The main symptom of motion and cyber sickness is nausea. Before nausea appears, though, many people feel other symptoms, including:

- a feeling of stomach fullness or awareness
- heartburn
- headache
- salivation (watery mouth)
- needing to urinate (pee) more often
- malaise (generally feeling unwell)
- sleepiness or fatigue (tiredness)
- irritability or restlessness
- belching
- yawning
- cold sweat
- turning pale
- flushing
- feeling warm
- light-headedness
- dizziness without spinning
- feeling wobbly, imbalanced, or unstable

In the most severe cases, people with motion and cyber sickness vomit. Some people can be completely unable to function, although this is rare.

How motion and cyber sickness is diagnosed

Usually, the symptoms of motion and cyber sickness go away within hours after the motion or use of an electronic device stops. If the symptoms continue for days or are really severe, visit a primary care physician to rule out other conditions. People with chronic or severe symptoms may be referred to a specialist such as a neuro-ophthalmologist.

How is motion sickness prevented and treated?

It is better and easier to prevent motion sickness than to treat it after it has started. For this reason, it is important to learn what situations are likely to give you motion sickness and avoid them if possible. If you cannot avoid them, there are other things you can do that may help to prevent or reduce the symptoms.

Many things can make motion sickness worse, including:

- more severe and unpredictable motion: riding in a car on a bumpy, twisty road is usually worse than riding on a train, and being on a boat is worse in rough weather
- reading, looking at your phone, and other tasks that involve focusing your gaze on something close to you
- not being able to see the horizon, for example if there is fog or if you are not near a window
- an empty stomach
- unpleasant smells

Reduce the motion as much as possible

Avoid unpleasant types of motion as much as you can. For example:

- Do not fly if storms or turbulence are likely
- Try not to take routes with many turns and ups and downs
- Do not travel on water during storms or if there are large waves

Sit where the movement is smallest

Try to sit in the place that has the least vertical (up-and-down) and rotational (twisting or swaying) motion:

- In a car, drive or sit in the front passenger seat; if you need to be in the back seat, lie down
- In an airplane, sit over the wing

- In a boat, sit near the surface of the water and face toward the waves; do not sit at the front (bow) of the boat, which is often the bumpiest part
- In a bus, sit near the front, facing forward, on the lowest level
- In a train, sit facing forward, on the lowest level

Get used to the motion gradually

If you are going on a long trip, it may help to take shorter trips with breaks to help you get adjusted. For example, you could spend a few hours on board a boat and see how you feel before you set off on a cruise.

Move in sync with the motion

Moving your body actively can help with motion sickness. If possible, try the following:

- Tilt your head into turns
- Drive or imitate the driver's actions
- Stand with your legs bent and move with the action of the vehicle or boat; do not try to stand too stiffly
- If possible, walk around

If it is not possible to move around, brace your body and head to avoid extra movement. If you can, lie as flat as possible.

Make sure you have a view

Watching the horizon can help with motion sickness:

- Avoid spaces without windows or where you cannot see the horizon
- Do not read, look at your phone or do anything else that keeps your eyes focused close to you
- Look forward, towards the direction you are travelling
- Focus on a distant point on the horizon and keep a wide view

If you cannot see the horizon, close your eyes or wear sunglasses.

Make yourself as comfortable as possible

Physical, mental and emotional discomfort can make motion sickness worse. Do everything you can to get as comfortable as possible and have a positive attitude:

- Do not drink alcohol
- Drink enough water to stay hydrated
- Eat frequent light, bland meals and snacks that are low in fat and acid, such as bananas, crackers, applesauce or toast
- If you have gastritis or stomach problems, get treatment for them if you can
- Try to be well rested before you start your trip
- Try to sleep
- Stay dry
- Make sure the space you are in is well ventilated and does not smell bad
- Try not to think or talk about motion sickness
- Distract yourself with music, breathing exercises or other relaxation techniques
- Cognitive behavioural therapy can also be helpful

Vestibular rehabilitation

Vestibular rehabilitation is a type of exercise-based therapy. It can be helpful for people with vestibular disorders who have motion sickness. Its goal is to help your brain get used to signals that trigger motion sickness. This is done through repeated, controlled exercises to reduce visual dependency for balance (sensory reweighting). A vestibular therapist can help you set treatment goals and design an appropriate program.

Vestibular rehabilitation for motion sickness may include:

- Habituation training
- Optokinetic exercises

Medication and other treatments

Some medications can help prevent or treat motion sickness. They work best if you take them before you start to have symptoms. The most common medications for motion sickness are:

- Transdermal scopolamine patches (Transderm-V®): Apply the patch behind one ear at least 4 hours before you are going to travel. Each patch lasts for 72 hours (3 days). This medication is available from pharmacists in Canada. It can cause drowsiness in some people.
- Over-the-counter anti-nausea medications such as dimenhydrinate (Gravol®): These are available in various forms, including capsules, chewable tablets and suppositories. Check the dosage instructions for the product you are taking. These medications can cause drowsiness, so you should not drive or operate heavy machinery if you take them.

If these products do not help your symptoms, talk to your doctor. Certain prescription medications may help with severe motion sickness.

Check with your pharmacist if you are taking any other medications or if you have any health conditions, especially glaucoma. If you have not used a motion sickness medication before, it is a good idea to try taking it at home so that you can see how it affects you before you need to travel.

If you smoke, temporarily stopping may reduce motion sickness.

Some people find that alternative therapies such as acupressure wristbands are helpful, although the evidence is limited. SEETROËN® and other brands of anti-motion sickness glasses may be helpful, but more research is needed to test their effectiveness.

Prevention and treatment of cyber sickness

Less is known about how to prevent cyber sickness, but this is an area of active research. At present, the best way to treat cyber sickness is to stop using the computer or XR system if you start to feel symptoms.

If you use a computer at work or school, some of these coping strategies may help minimize your symptoms:

- Adjust your head position and viewing angle.
- Increase the distance between your eyes and the screen.
- Reduce eyestrain by using modern flicker-free monitors. These use direct current modulation rather than pulse width modulation (PWM) to control brightness.
- Experiment with lower light settings on the screen. This may not help if you are using an older monitor.
- Reduce screen contrast.
- Increase font size.
- * Use arrow keys instead of a mouse to cut down on how much you scroll. This slows down the rate at which your eyes are exposed to motion on the screen.
- Reduce the scroll speed of your mouse.
- Use accessibility settings that reduce motion.
- Turn off screen notifications and pop-ups to lessen distraction.
- Follow your fingers as you swipe on touch screens.
- Take short breaks to close your eyes or look away from the screen at a fixed point in the distance or a plain background.
- Switch back and forth between screen-based and non-digital tasks throughout the day.

- Print documents and use hard copies of books, when possible.
- Take part in audio meetings instead of virtual ones, when possible.
- Remember to take deep, controlled breaths. This simple step increases your oxygen intake and can help reduce light-headedness.

Work with your employer or school to develop and carry out an accommodation plan if you have chronic (long-term) cyber sickness.

Some studies have found that cyber sickness may be worse if the XR headset does not fit well, such that the distance between the lenses is too wide for the person's eyes. This is more often a problem for women, who tend to be smaller than men. Making sure that the lenses are properly adjusted may help to reduce cyber sickness.

Rehabilitation therapy for cyber sickness

Rehabilitation therapy may help people who suffer from chronic cyber sickness. The therapy uses repeated, controlled exposure to images that trigger symptoms, such as scrolling black-and-white stripes and eye movements that mimic screen-based work. These are called optokinetic exercises. Doing them over and over helps your brain learn to process these digital visual signals properly. Your brain eventually gets comfortable with the idea that there is no threat when your eyes are moving, even though your body is not.

What to expect in the future

Motion sickness and especially cyber sickness are active areas of research. Software developers are continuing work on ways to eliminate or reduce the effects of cyber sickness. For example, researchers are working on systems to build artificial movement effects into self-driving cars. Scientists are looking into what causes motion and cyber sickness and how to predict who will be affected, as well as whether better treatments are possible.

Visit our website

View this and other articles about vestibular disorders – www.balance&dizziness.org.

In addition, find information about how the balance system works, the journey from diagnosis to treatment, building a wellness toolkit, and more.

Handout updated September 2021

If you find the information in this handout helpful, we ask for your help in return. The cause of supporting those affected by balance and dizziness disorders with ad-free, up-to-date, evidence-based information written for Canadians needs you. Please become its champion – [donate to Balance & Dizziness Canada](https://www.balanceanddizziness.org).

Copyright © Canadian Balance and Dizziness Disorders Society. Individuals may print a copy for their own use. Professional members of the Society may distribute and co-brand copies for their personal clients. Written permission is required from the Society for all other uses.

www.balanceanddizziness.org