Core knowledge content

Concussions

A concussion is a common form of head and brain injury, and can be caused by a direct or indirect hit to the head or body (for example, a car crash, and fall or sport injury). This causes a change in brain function, which can result in a variety of symptoms. With a concussion there is no visible injury to the structure of the brain, meaning that tests like MRI or CT scans usually appear normal.

When a person suffers a concussion, the brain suddenly shifts or shakes inside the skull and can knock against the skull's bony surface. A hard hit to the body can result in an acceleration-deceleration injury when the brain brushes against bony protuberances inside the skull. Such forces can also result in a rotational injury in which the brain twists, potentially causing shearing of the brain nerve fibres.

It is not yet known exactly what happens to brain cells in a concussion, but the mechanism appears to involve a change in chemical function. In the minutes to days following a concussion, brain cells remain in a vulnerable state. New research emphasizes that the problem may not be the structure of the brain tissue itself, but how the brain is working. The exact length of this change is unclear. During this time period, the brain does not function normally on a temporary basis, and is more vulnerable to a second head injury.

Most concussions occur as a result of a collision with another object while the object or person is moving at a high rate of speed. Forces such as these (and others) can result in deceleration and rotational concussive injuries.

It is important to seek medical advice immediately after a high impact hit to the head or body. Often, concussions can go untreated (and even unnoticed by others) because symptoms are often invisible to casual observers. Many times, the symptoms of a concussion may not be identified until the person recovers to the point where increased exertion causes symptoms to worsen.

Symptoms

Although symptoms may not be immediately apparent, it is important to be aware of possible physical, cognitive, and emotional changes. Symptoms may actually worsen throughout the day of the injury or even the next day. Without proper management, a concussion can result in permanent problems and seriously affect one's quality of life.

A concussion affects the function of the brain, and can result in symptoms such as memory loss or amnesia. It is important that others be aware of the signs and symptoms of concussions in order to help identify the injury in others. Individuals should be removed immediately from the current activity (including sports, work and school), should not drive and seek medical attention immediately.

Following a concussion, individuals may experience many different signs and symptoms. A symptom is something the person will feel, whereas a sign is something friends, family, or a teacher/coach may notice. It is important to remember that some symptoms may appear right away and some may appear later. No two concussions are the same. The signs and symptoms may be a little different for everyone. Some may be subtle and may go unnoticed by you as the injured person, co-workers, friends, and family. It is very important that the individual be honest about their symptoms to ensure they get proper medical attention.

The table below outlines some of the possible symptoms a person may experience and signs a person might exhibit as a result of a concussion.

	Symptoms reported	Signs observed
Physical	• headache • stomach ache • blurred vision • pressure in head	• loss of consciousness • nausea/vomiting • seizure/convulsion • poor coordination/balance • amnesia (loss of memory)
Cognitive	• feeling in a fog • difficulty concentrating • difficulty remembering	• difficulty concentrating • difficulty remembering • confusion • slowed reaction time
Behavioural	• irritability • sad/emotional • nervous/anxious • depressed	• inappropriate emotions • depression
Sleep related	• drowsiness • difficulty falling asleep	• drowsiness

Diagnosis and recovery

Mild concussions can resolve fully with proper rest and management in a week or two (usually seven to 10 days), but concussions which are not diagnosed can lead to long-term and more serious health implications. The first and most important step is to consult a doctor, preferably one familiar in concussion management.

It is very important for anyone with a concussion to heal completely before doing anything that could lead to another concussion. Hurrying back to sports and other physical activities increases the risk of second impact syndrome which can happen as a result of a second head injury. Although very rare, second impact syndrome can cause lasting brain damage and even death.

Return to School

A concussed person needs adequate rest before returning to learning activities. The person will return to learning by gradually through a series of stages, moving on to the next stage only when the person has been symptom-free for 24 hours. After a period of cognitive and physical rest, the concussed person can slowly begin to introduce short periods of light cognitive activity before returning to school part time at a reduced workload, and gradually increasing the time and workload until he or she is able to safely return to a full-time academic load. For a detailed outline of the Return to School protocol, see the infographic https://parachute.ca/wp-content/uploads/2019/06/Return-to-School-Strategy.pdf.

Return to Activity

A concussed person should be removed from activity immediately and assessed by a medical doctor. Given that symptoms may worsen after the event, individuals should not return to activity. When concussed, the ability to assess situations and events may be impaired. Post-concussive symptoms may intensify with an increase in activity, so it is important that return to activity is gradual and monitored/supervised by a medical professional.

Prevention

It is important to take a preventive approach when dealing with concussions. This is especially true after a recent concussion. Because concussions are an invisible injury, it is important to share concussion information with others, to inform them of the injury and provide information education on concussions.

Protective equipment can reduce the risk and severity of head injury. It is important to have a good quality, properly fitted helmet. Protective equipment should be certified and well maintained.

Road/off-road safety

The number one safety rule when you ride a bicycle or engage in an activity where a collision can occur is to wear a helmet every time. A helmet gives you a real chance of walking away from a fall or a collision. A helmet should be the correct size for the person and be properly adjusted and worn on its own (no hats underneath).

Helmets

Bicycle helmets should be replaced after five years or after a crash. After five years, the plastics of the helmet dry out and may become brittle with age. Also, older helmets may not meet current safety standards. A bicycle helmet should also be replaced when you outgrow it, or if it is visibly damaged.

All other helmets should be replaced after a crash or large impact, when it does not fit anymore, or if the helmet has cracks, dents, frayed/torn straps, or a missing liner.

Skateboarding has its own type of helmet that covers more of the back of the head. Because falls are common in skateboarding, these helmets are made of material that is specifically designed to withstand multiple impacts on the same spot. It is very important to wear the proper helmet for the proper sport.

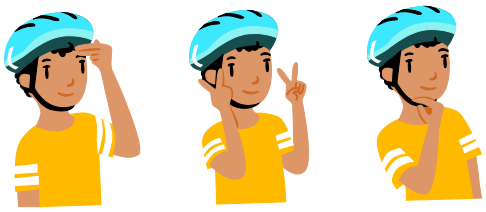
SINGLE USE helmets mean that the helmet is only certified for one activity. Baseball batting helmets are an example of a single use helmet. Multi-USE helmets are certified for more than one activity. The helmet certification sticker will tell you which activities your helmet is certified for. All helmets should meet safety standards.

SINGLE IMPACT means that the helmet is designed to protect you against a single crash, after which you must replace the helmet, e.g. bicycle and most ski/snowboard helmets.

MULTIPLE IMPACT means the helmet can withstand multiple hits before losing its protectiveness, e.g. hockey helmets

The **2V1** is an easy way to make sure a helmet fits right so it can protect the head.

- **2** - Two fingers above your eyebrows to the bottom of your helmet
- **V** - Four fingers to make a “V” shape around the bottom of your ears
- **1** - One finger under the strap beneath your chin



The helmet works by absorbing the force of the impact and spreading it out over the whole helmet. The impact on your head and brain are reduced. Your skull is hard but it is not very thick (about the thickness of three pennies stacked up). You can crack your skull just by hitting your head on the ground after falling off a bike.

The brain is floating in a sack of fluid inside the skull. When the head is hit, the brain moves around in the fluid against the sides of your skull. This can cause bruising, swelling, and potentially cause bleeding in the brain. Many brain injuries can be permanent.

Bicycle safety

Equipment required by law:

- Helmet: Cyclists under 18 must wear a helmet. Helmets are strongly recommended for cyclists over 18.
- Lights and reflectors: A white light mounted on front of your bike, a red reflector on the back at night
- Bell or horn
- Reflective tape: White reflective tape on the front forks, red reflective tape on the rearstays

Recommended equipment:

- Rack or basket
- Water bottle in holder
- Shoes that cover your toes
- Red light on the back of the bike for night riding
- Bright coloured clothing to be more visible

- Bike lock

Traffic signs are an important way to help us use the roads safely. Signs help us decide who gets to go first and who must wait their turn. Cyclists must obey traffic laws like drivers of other vehicles. Here are a few of the most important signs:

- **One way:** Ride in the same direction as the sign
- **Pedestrian crossover**: Stop to let pedestrians cross the street
- **Yield:** Let other traffic go first
- **No bicycles allowed**: Stay away from roads with these signs - they are not meant for cyclists
- **Stop sign**: Stop and look all ways for traffic. Go when it is your turn and it is safe to do so.
- **Railway crossing:** Obey railway signals. Cross at right angles. Stop and walk your bike over the tracks.

It is important for a cyclist to always get off their bike to cross at a crosswalk or busy street. Check all ways and cross when safe to do so. Shoulder checks should be done regularly and especially before making a turn. If riding in a group, it is important to ride single file.

If riding behind a vehicle that is making a right turn, stay behind the vehicle. Never try to pass. This is to prevent the person from being caught between the curb and the vehicle. Cyclists need to follow the rules of the road similar to vehicles. Going through a stop sign or a red light can be deadly.

Wearing headphones can be very dangerous when participating in road and off road activities. Headphones affect your ability to hear traffic, siren and other vehicles around you as well as others who may be trying to alert you to dangers.

Resources and references

Ontario Ministry of Health and Long-Term Care. (2011). *Concussion Tool for Coaches, Teachers, Parents, Students and Athletic Therapists*. Retrieved from: http://www.health.gov.on.ca/en/public/programs/concussions/docs/onf_concussion_tool_en.pdf

Ontario Ministry of Transportation. (2021). *Young Cyclist Guide*. Retrieved from: https://files.ontario.ca/mto-young-cyclist-guide-en-2021-09-16.pdf

Parachute Canada. (2019). *Parachute's Protocol for Return to Learn After a Concussion*. Retrieved from: https://parachute.ca/wp-content/uploads/2019/06/Return-to-School-Strategy.pdf