saskatchewan
preventioninstitute
our goal is **healthy** children

facts on

Protecting the Brain

The brain controls everything we do and how we experience the world around us, including how we move, breathe, speak, feel, see, hear, taste, smell, and remember. It is important to understand the function of the brain and the importance of protecting the brain from harm.

How is the brain organized?
The brain is divided into the **forebrain**, **midbrain**, and **hindbrain**, each with multiple parts and specific functions. The **forebrain** is the largest part and includes the cerebrum. The cerebrum is responsible for higher brain functions like thinking, planning, interpreting, and processing. It is divided into the left and right hemispheres. The left hemisphere controls language and logical processing. The right hemisphere controls spatial perception and creativity.

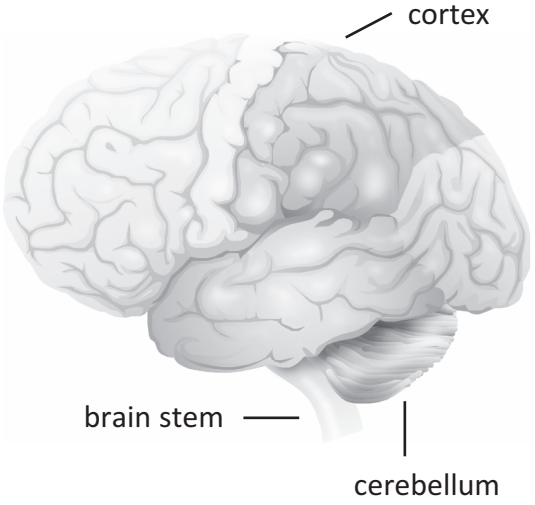
The cortex, which is the outer layer of the cerebrum, is divided into four lobes: frontal, parietal, occipital, and temporal. Each lobe has specific functions, including those listed below.

Frontal – organize, plan, problem-solve, and control behaviour and emotions

Parietal – muscle tone, strength, physical sensations, senses (vision, touch, body awareness), speech, reading, and writing

Occipital – visual processing and visual perception

Temporal – process sound, verbal memory, and controls the muscular components of speech



The **midbrain** is the smallest part and is located near the centre of the brain. Its primary role is to act as a relay station for sensory and motor information between the forebrain and hindbrain.

The **hindbrain** is located at the base of the brain and includes the cerebellum, pons, and most of the brainstem. The cerebellum regulates balance, posture, and coordination. The pons connects the brainstem to the cerebral cortex and coordinates signals between the brain hemispheres and the spinal cord. The brainstem relays stimuli from the body to the brain and responses from the brain to the body. It contains the centres that control breathing, heart rate, blood pressure, and involuntary reflexes like swallowing. The brainstem is also the nerve centre for sight and hearing, and it controls the muscles of the face, mouth, and neck.

The brain also contains the limbic system, which is involved in behavioural and emotional responses, especially those related to survival (e.g., eating; reproduction; and fight, flight, or freeze responses).

For More Information Contact:
1319 Colony Street
Saskatoon, SK S7N 2Z1
Bus. 306-651-4300
Fax. 306-651-4301
info@skprevention.ca
www.skprevention.ca

The Saskatchewan Prevention Institute is supported by:
Government of Saskatchewan
Kinsmen Telemiracle Foundation
SaskAbilities Council
University of Saskatchewan
Community-At-Large

The structures of the limbic system are located under the cerebral cortex and above the brainstem.

How is the brain naturally protected?
The brain has multiple layers of protection, including the rigid structure of the skull, the meninges, and the cerebrospinal fluid. The meninges consist of three membranes that cover and protect the brain. The brain floats in cerebrospinal fluid, which cushions and protects the tissue of the brain. The outer surface of the skull is smooth but the inner surface of the skull is rough with sharp edges. These sharp edges can damage the brain in injuries where the brain continues to move forward after the body and head have come to a sudden stop.

How can the brain be injured?
The brain can be injured before or after birth. Prenatal exposure to teratogens such as alcohol or drugs can cause lifelong harm to the brain. After birth, damage to the brain can happen when energy is transferred through motion and by illness. Examples include:

- a blow to the head (e.g., motor vehicle crash, assault, fall)
- penetration of the skull (stabbing, projectile)
- disease or infection
- lack of oxygen (e.g., drowning, choking)
- violent shaking (pediatric abusive head trauma, whiplash)

Brain injuries affect the way the brain normally works, and can result in physical, cognitive, emotional, and behavioural problems. Becoming aware of the ways that the brain can be injured is an important step in avoiding risks which may cause a brain injury.

How can we protect our brains and the brains of our children?
Naturally, we think of helmets as providing protection for the brain. Helmets do provide protection, and it is important to wear properly fitted helmets in a variety of sport and work-related activities (e.g., cycling, contact sports, construction sites).

It is also important to use other safety devices and take precautions that can help to reduce the risk of a head impact or whiplash injury. The following can help to protect children's brains from injury:

- Use appropriate child restraints and seat belts in all vehicles.
- Use safety equipment such as safety gates at the top and bottom of stairs, straps on high chairs, wall anchors for furniture, and handrails and guardrails on playground equipment.
- Effectively supervise young children while playing and teach children to use safe play habits.
- Use proper sporting equipment, including helmets.
- Follow concussion guidelines for return to sport and play, available at http://www.parachutecanada.org/downloads/resources/Concussion-Parents-Caregivers.pdf.
- Never shake, throw, or hit an infant or child; caregivers should be taught healthy ways to calm a crying baby and deal with their own frustration.

The brain of a developing fetus can be protected by providing the fetus with a healthy environment, free from alcohol, tobacco smoke, and other drugs. Support women who are pregnant or trying to get pregnant and have stopped or reduced their alcohol use.

We only have one chance with the brain that we have. Injuries to the brain can result in lifelong damage and impacts. In all situations, precautions must be taken to keep the brain as safe as possible.

Select References

National Academy of Sciences. (2014). *Linking helmet protection to brain injury*. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK224915/

Neurotrauma Law Nexus. (n.d.). *Child brain injury*. Retrieved from http://www.neurolaw.com/traumatic-brain-injury/

Neurotrauma Law Nexus. (n.d.). *Traumatic brain injury*. Retrieved from http://www.neurolaw.com/child-brain-injury/

Parachute. (n.d.). *About injuries*. Retrieved from http://www.parachutecanada.org/injury-topics

Queensland Brain Institute. (n.d.). *Brain anatomy*. Retrieved from https://qbi.uq.edu.au/brain/brain-anatomy

Saskatchewan Prevention Institute. (2019). *Abusive head trauma (shaken baby syndrome)*. Retrieved from https://skprevention.ca/resource-catalogue/child-development/abusive-head-trauma-shaken-baby-syndrome/

saskatchewan
preventioninstitute
our goal is **healthy** children

RESOURCE 4-005 Revised 2019