



ACTIVITY BOOKLET

**Think
about all
that goes into
a helmet.**



Name: _____

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Our Vision for Brain Waves

To inspire our youth to learn more about the vital role of the brain and spinal cord in our daily activities and to protect them by understanding the importance of brain and spinal cord injury prevention.

Objective

- To engage students by providing hands-on science lessons that allow the students to see the connection between the brain and our senses.
- To demonstrate the fragility of the brain and its vital role in every aspect of life.
- To support understanding of the signs and symptoms of a concussion.
- To empower students to use their brains to protect their bodies through an interactive injury prevention component.
- To instill the brain and spinal cord injury prevention message for a lifetime!

Who are we?

Parachute is a national, charitable organization. Our aim is an injury-free Canada. Parachute wants to bring attention to the issue of preventable injury and to help Canadians reduce their risks of injury and enjoy long lives lived to the fullest.

For more information
Please visit: parachute.ca



The Neuron

The human brain is made up of billions of cells called Neurons! Many neurons produce signals (packets of information) and pass them on to other neurons. This neuronal activity is how we think, move and feel. Neurons are different from other cells in our body because they have specialized branches. The branches that receive signals from other neurons are called the Dendrites.

The branches that pass signals to other neurons are called the Axons. NO other cells in the body have these specialized branches!

Let's talk neurons!

Neurons are one of the most specialized cells in the human body. The fastest neurons can send signals up to 120 metres per second!

Neurons that signal things like sharp pain send the message quickly. Other neurons, like those sending temperature signals, send signals up to two meters per second.

Let's Investigate

A. Does the number of "neurons" in a chain affect the signal speed?

YES

NO

B. What else do you think can affect the signaling speed?



Our skin cells and hair cells always grow back. A broken arm or bruise can recover, but damaged neurons cannot. The best cure for brain damage is prevention.

Anatomy

THE BRAIN IS VERY IMPORTANT FOR EVERYTHING THAT WE DO!

When we move, touch, see, think and feel emotions, we are using our brain! Different areas of the brain that serve different functions are called lobes. We have four very specialized lobes:

- The **Frontal lobe** is at the front of the brain and is your decision making centre. It allows you to solve problems and make plans.
- The **Parietal lobe** is at the top of the brain. It processes sensory or touch information coming from your entire body. It also allows you to make movements in response to anything in your environment.
- The **Temporal lobe** is at the side of the brain. It processes your memory, hearing, emotion and language.
- The **Occipital lobe** is at the back of the brain. It takes care of your vision.
- The **Cerebellum** is Latin for “little brain.” It is under the Occipital lobe and is responsible for coordinating your body movements.

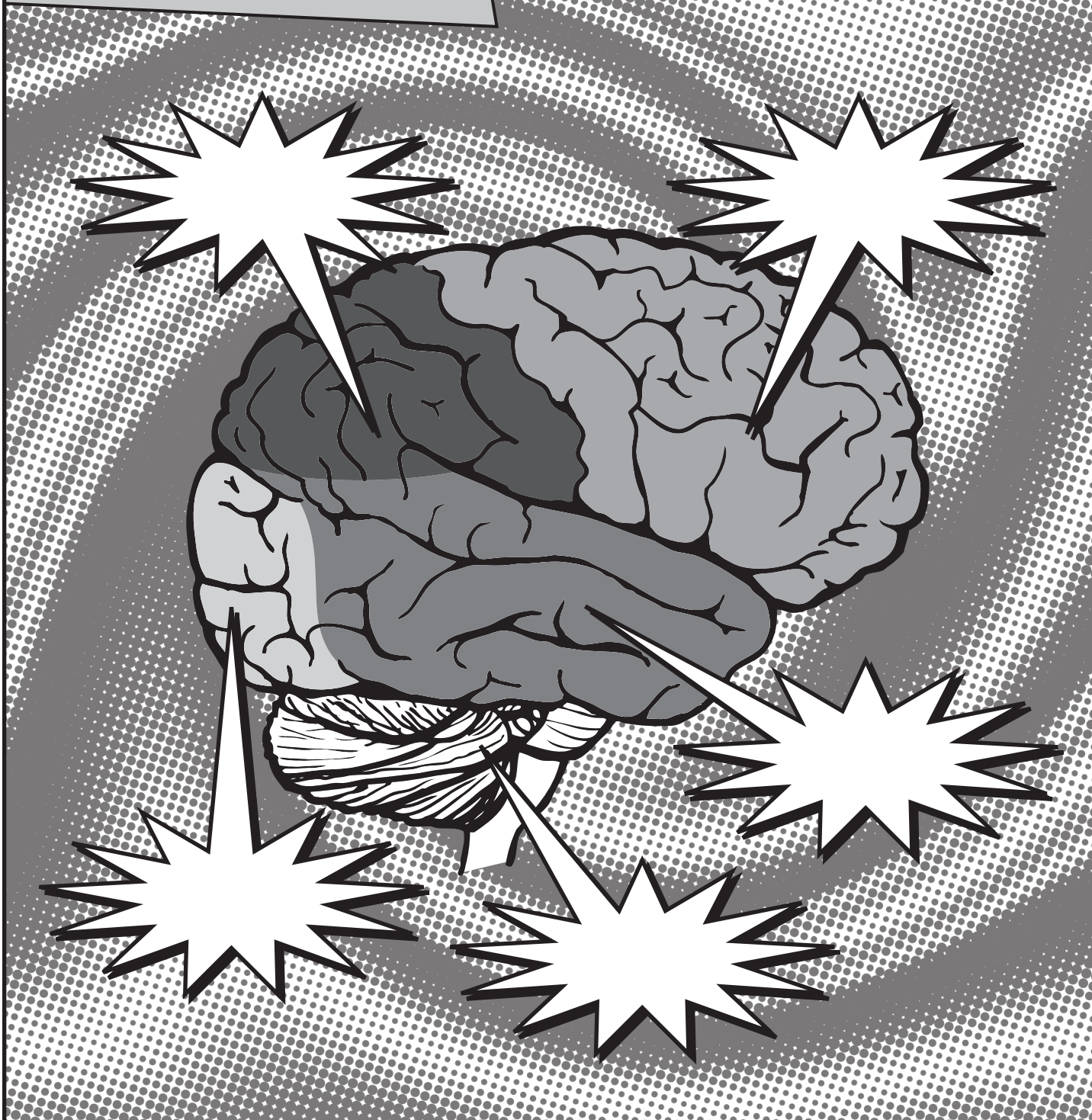
Can we live without our lobes?

We may be able to live without ice cream, but without a lobe, life just would not be the same!

For example, if your occipital lobe is damaged, you could be blind even though your eyes are in perfect condition!

THE BRAIN IS WHERE OUR PERCEPTION OF THE WORLD AROUND US COMES TOGETHER!

Label the lobes!



With an injury to the brain or spinal cord we would not be able to do the many things we do everyday. So, it is important that we always wear our helmets when we're active, think first, and play safely!

Smell

The sense of smell allows us to detect chemicals in the air. Another name for the sense of smell is olfaction.

Chemicals are breathed in through our nose and bind to special receptors. These receptors are found high up inside the nose in an area called the olfactory (smell) area. Information about which receptors have been activated is then sent to the olfactory bulb and then up higher into the brain. We can then become aware of what it is we smell in the world around us.

Steps To The Brain

A. What do you call the substances you can smell?

B. Where are the molecules received?

C. Where in the brain are they perceived?

Let's Investigate

Do the way things smell change over time?

Let's find out!

Smell some of the objects that have been brought in. Are they good smells?

Rate how strong the smell is on a scale from 1 to 10. 1 is a very weak smell and 10 is a very strong smell. We will check back later to see if this has changed.

HOW WOULD YOU RATE IT?

1 2 3 4 5 6 7 8 9 10

HOW WOULD YOU RATE IT NOW?

1 2 3 4 5 6 7 8 9 10

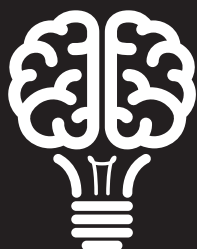
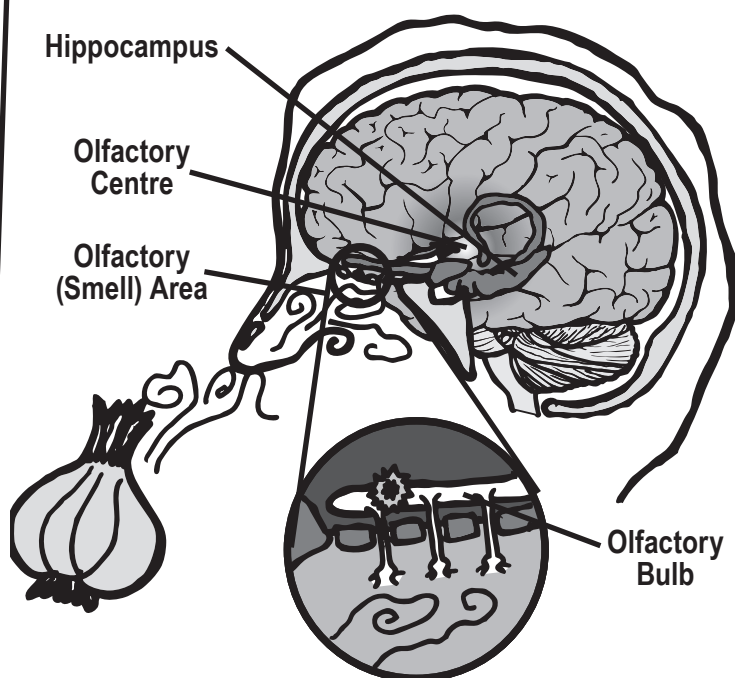
Can a smell change?

You may have noticed that the strength of the object's smell decreased with time.

This is known as adaptation.

In other words, our receptors in our nose become "used to" the smell, and the same smell does not activate as many "smell receptors" in our nose.

This might be a way to help you smell new things that are coming into your environment.



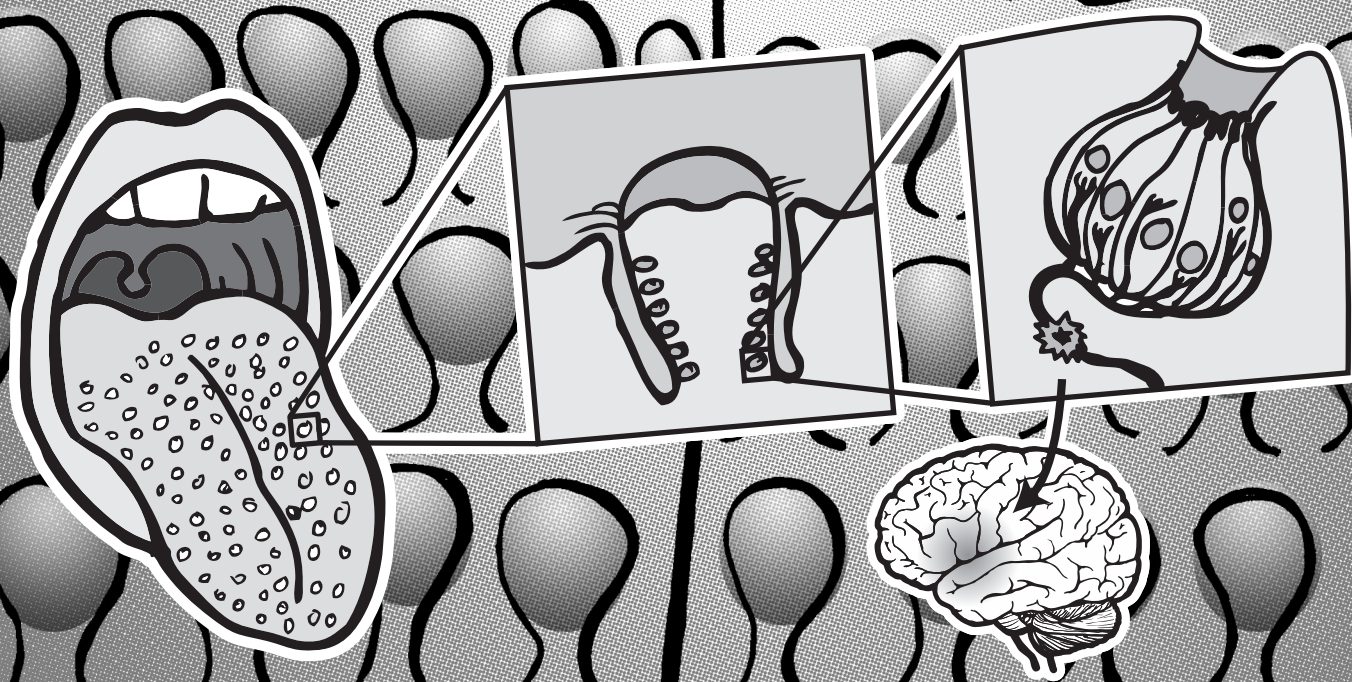
Some people in the world have no sense of smell. This is called anosmia. A serious head injury may cause anosmia. What kinds of good smells would you miss smelling if you had anosmia? Could anosmia be dangerous in any situations?

Taste

Smell and taste work together!

When you have a cold your food just doesn't taste as good. Why is that?

Smell and taste work together to bring out the real "flavour" of our favourite foods! Both smell and taste are our chemical senses.

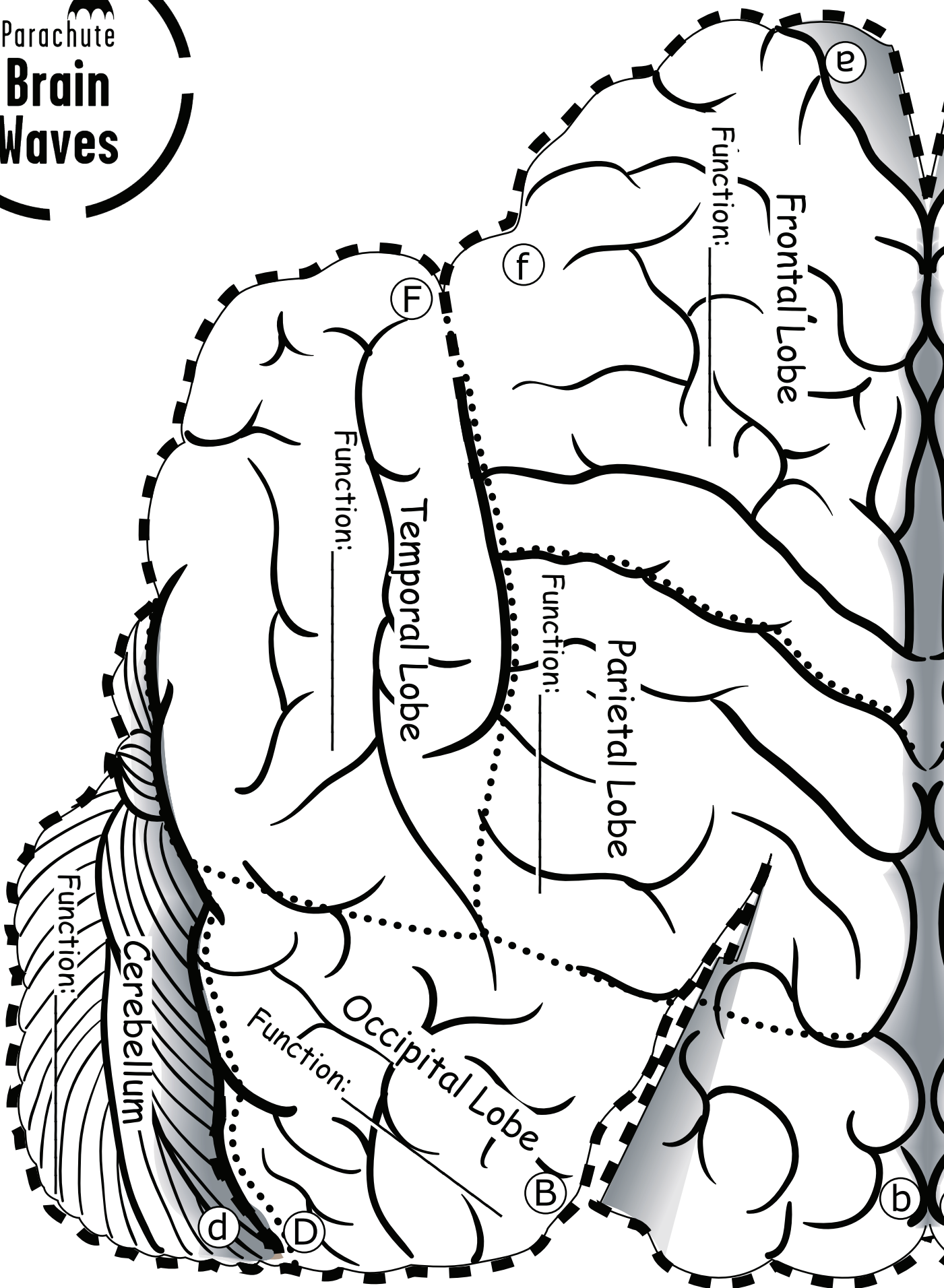
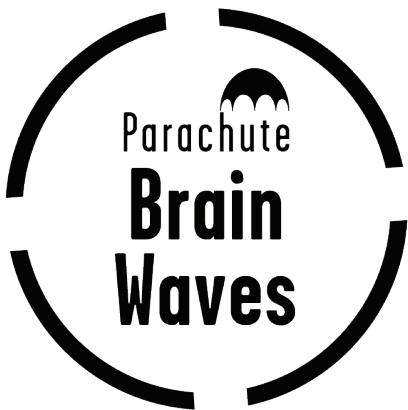


Thinking First CAP

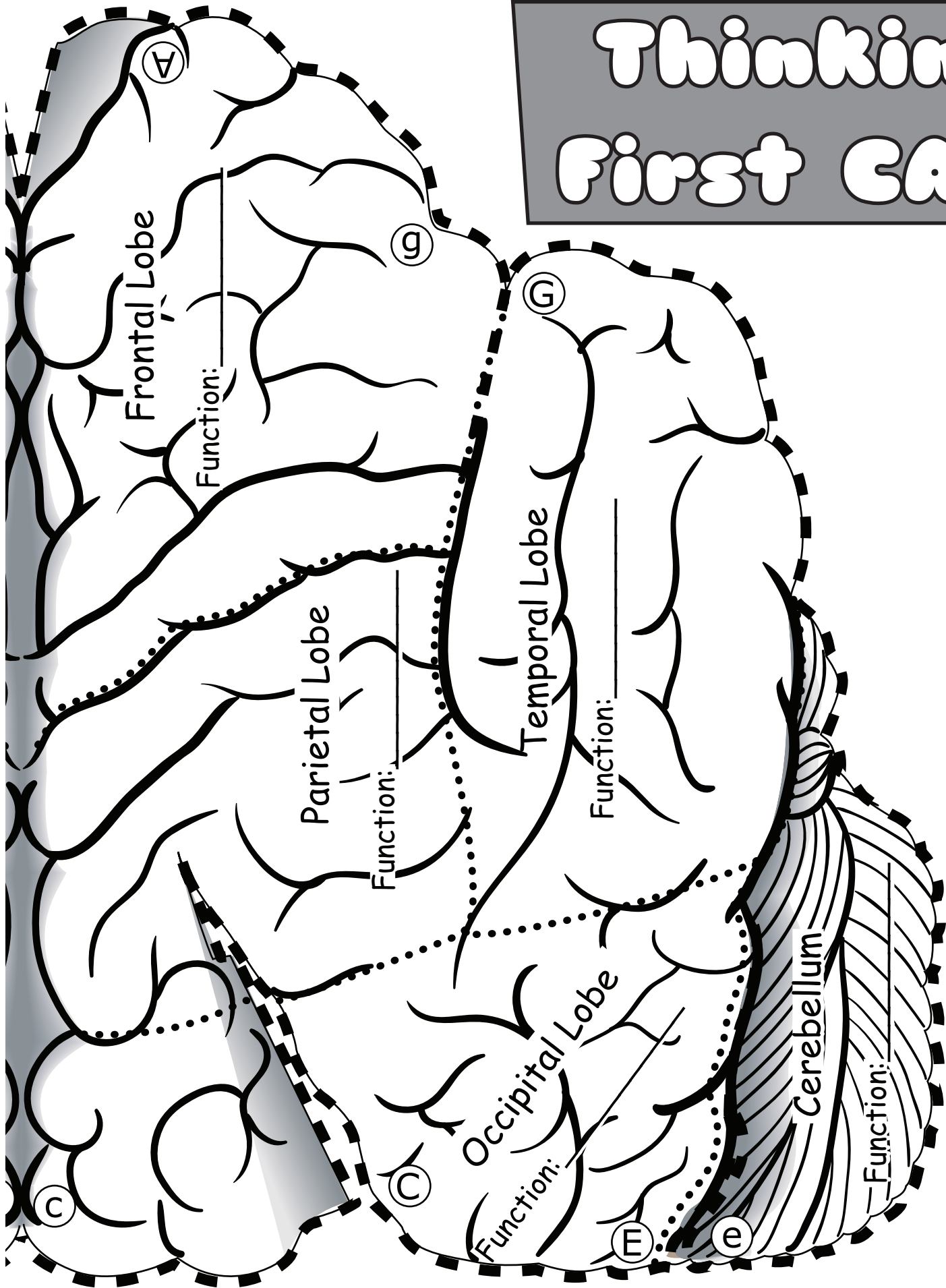
Directions

1. Fill in the blanks on the brain pattern on the next two pages. Colour the different lobes.
2. Remove this centre sheet in one piece from the booklet.
3. Cut along the heavy dashed line around the brain to cut out the pattern in one piece.
4. Fold or curl the paper so that “A” is on top of “a”. Tape in place. Tape “B” on top of “b”, “C” on top of “c”, and so on, to create your Thinking First Cap.

CAREFULLY REMOVE
THIS PAGE FROM
THE BOOKLET!



Thinking First CAP

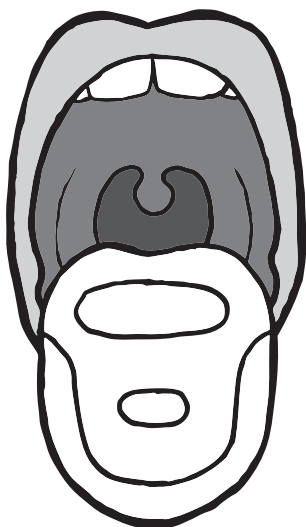


Let's Investigate

Taste cell receptors for sweet, salty, sour and bitter live in TASTE BUDS. Taste explorers have found that there are more taste buds on some parts of the tongue than on others. You can explore this as well!

Take a tasting stick and dip it into the salty solution. Probe the tip, sides and the very back of the tongue. Take a few good swallows, or rinse out your mouth between probes for the best results. You can use the other side of the tasting stick if you want to use more solution, but never re-dip the used side of the stick into the solution!

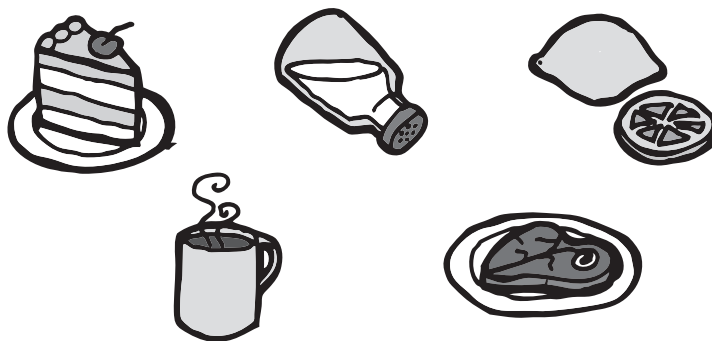
USE THE TONGUE MAP TO RECORD WHERE YOU HAD THE "TASTIEST" SENSATIONS!



Steps To The Brain

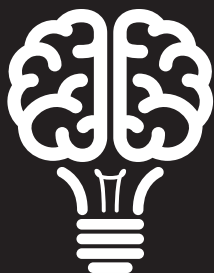


A. What do you call the substances that you taste?



B. Where are the molecules received?

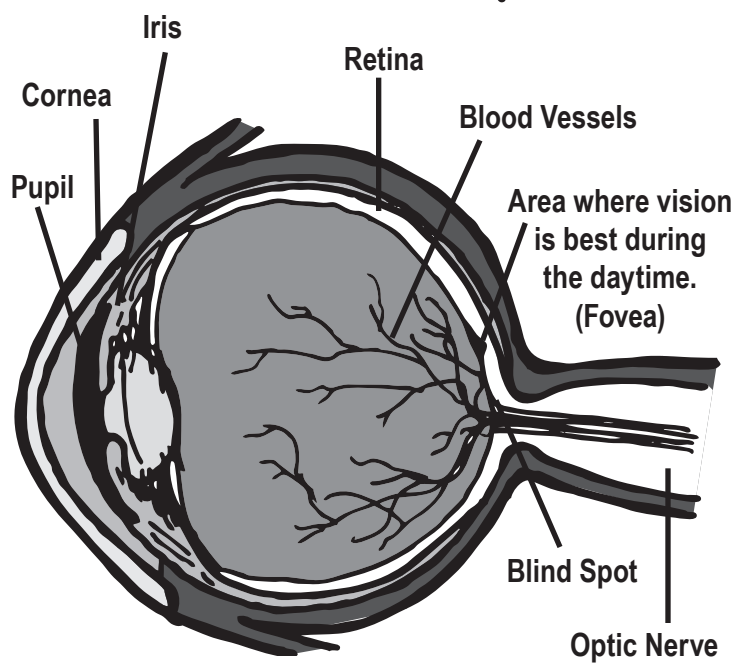
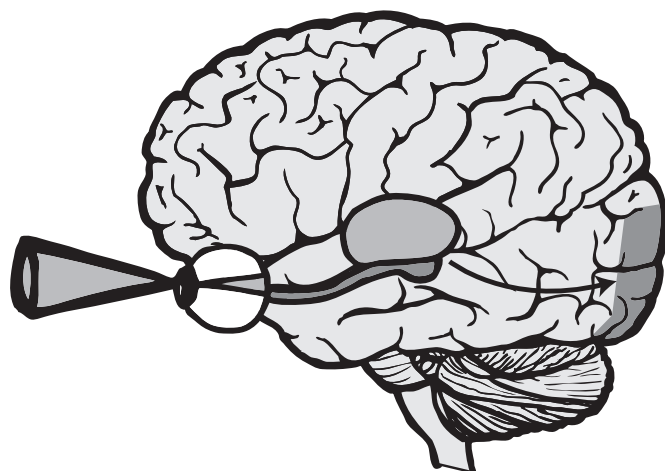
C. Where in the brain are they perceived?



Taste cell receptors (and smell receptors!) are replaced over and over again. So if you burn your tongue, there is no permanent damage to your sense of taste.

Why is it a good thing that we can grow new taste receptor cells?
What things would you miss tasting if you lost your sense of taste?

VISION



Seeing Colours!

*Have you ever seen a reddish-green?
How about a yellowish-blue?*

It is impossible to imagine these colours because red/green and yellow/blue are opponent hues and are perceived by different types of cones.

Looking at a single colour for a while makes the cones that see that colour tired, and they stop working.

For example, looking at a red stimulus tires red cones, therefore, you see its opposite colour, green!

COLOUR THIS RED!

COLOUR IN
THE IMAGES
AS DIRECTED.

STARE AT THE
IMAGE FOR A
WHILE, THEN
LOOK AT A
BLANK PIECE
OF PAPER.

WHAT DO
YOU SEE?



COLOUR THIS BLUE!

Steps To The Brain



A. We see:

L _ _ _ _ _ .

B. Where the light rays are received:

R _ _ _ _ _ .

On the retina, there are 2 types of cells (photoreceptors).

i. R _ _ _ _ _
are for dark vision and detection of movement.

ii. C _ _ _ _ _
are for colour vision and detection of fine detail.

Information from our retina exits the eye at the

B _ _ _ _ _ S _ _ _ _ _ .

C. Where in the brain it is perceived:

O _ _ _ _ _ L _ _ _ _ _ .



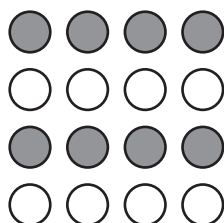
Some people can only see the world in shades of black and white. This is known as achromatopsia. Damage to cones in the retina or in specific areas of the occipital lobe may result in achromatopsia.

Let's Investigate

Your eyes like to...

- Group together similar objects near each other,
- Fill in gaps, Look at continuous lines.

A. Do you see the circles in rows or in columns?

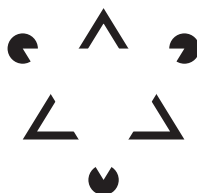


ROWS

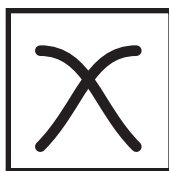
COLUMNS

BOTH

B. How many triangles do you see?



C. What are two ways to re-draw this pic?



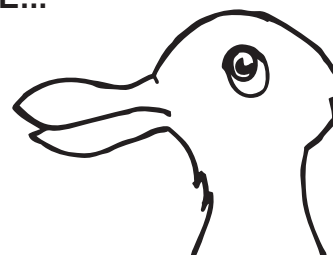
Practice Makes Perfect!

Your brain "sees" by learning certain things are more likely to be a certain way. Once it has learned this, the next time you see an object, your brain is faster at identifying it!

Practice helps build these pathways in the brain. That's why reading gets easier the more you practice.

**STUDY THE BELOW IMAGES.
DO YOU SEE...**

**RABBIT
-OR-
DUCK?**



**YOUNG GIRL
-OR-
OLD WOMAN?**



Remember to...

- Walk, don't run with sharp things in your hands, like scissors or pencils.
- Use good lighting when reading, writing or using the computer.
- Do not look directly at the sun.
- Wear proper eye protection during sports.
- Get your eyes regularly examined!

Your eyes are windows to your brain. Protect them!

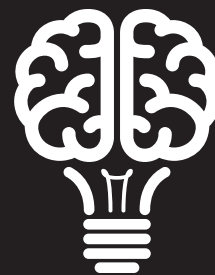
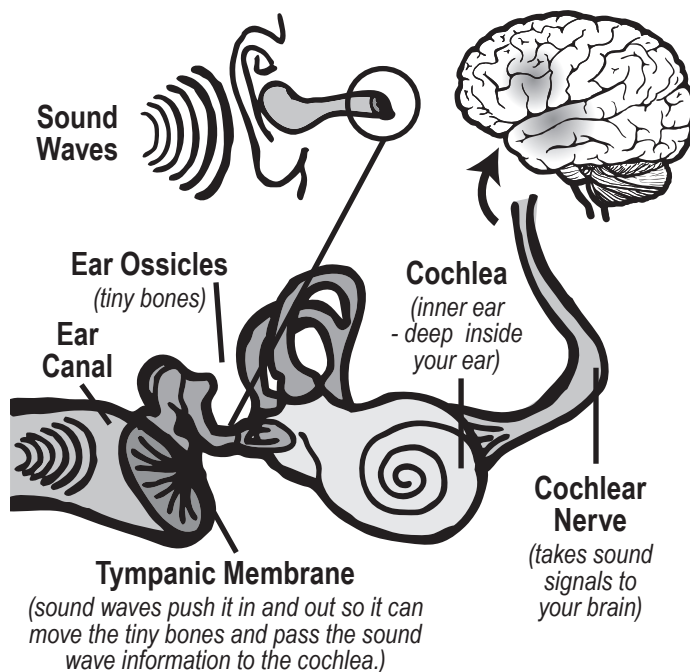


Hearing

Do Animals Hear Sound?

The ability to hear is only found in vertebrates and insects. Within these groups, mammals and birds have the most developed sense of hearing. Different animals hear soundwaves in different ranges of frequencies.

Humans:	20 - 20,000 Hz
Whales:	20 - 100,000 Hz
Bats:	1,500 - 100,000 Hz
Fish:	20 - 3,000 Hz
Crickets:	500 - 5,000 Hz



People can lose some or all of their hearing because of loud noises and head injuries.

- Hearing loss is most common amongst older people.
- Go to a doctor when you have an ear infection, pain in the ear, bleeding, constant dizziness and ringing or discharge.

Steps To The Brain

A. We hear:

S _____ W _____ .

B. Where the sound energy is received:

C _____ .

Hair cells are like little antennae in your cochlea. They pick up sounds and transmit auditory information to the brain where you actually hear it.

C. Where in the brain it is perceived:

T _____

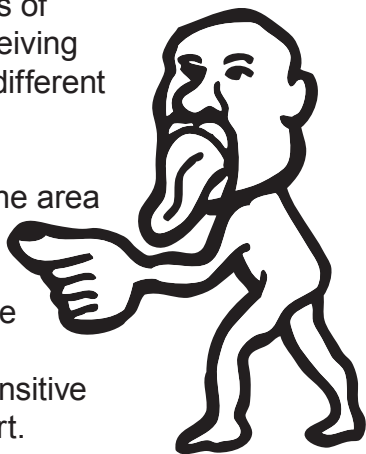
L _____ .

Touch

The Homunculus

The unusual body proportions of the homunculus (little man) reflect the relative sizes of sensory receiving areas from different body parts.

The larger the area in the brain used to represent the body part, the more sensitive the body part.



Steps To The Brain



A. Where are your touch receptors?

S _____

B. Where in the brain is the signal perceived:

P _____

L _____

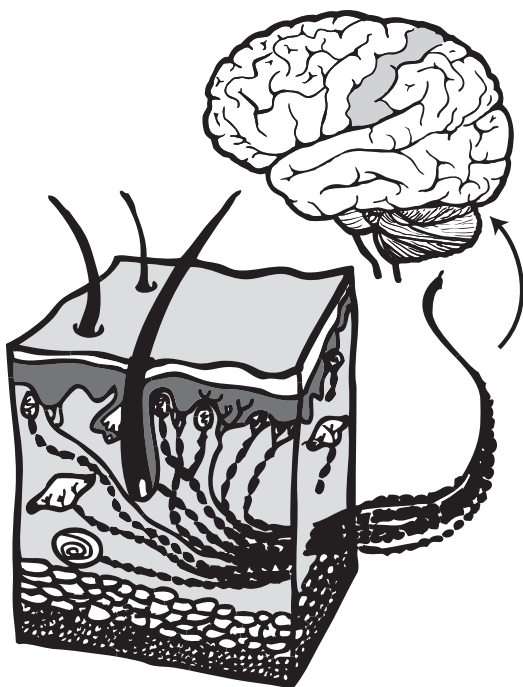
C. These receptors allow us to feel:

1. P _____

2. P _____ S ____ U R ____

3. V _____ T I O N

4. T _____ P _____



OUCH! You may not like feeling pain, but pain is actually useful for you. Pain is a warning sign that tells you to stop doing what you are doing to protect yourself. Some people are born with no sense of pain. You may think that this is good, but it is NOT!

CONCUSSIONS !

A **concussion** is a type of brain injury
Any blow to the face, neck, or body, causing a sudden jarring of the brain inside the skull can cause a concussion.

Anyone can get a
concussion!

Concussions, the Invisible Brain Injury

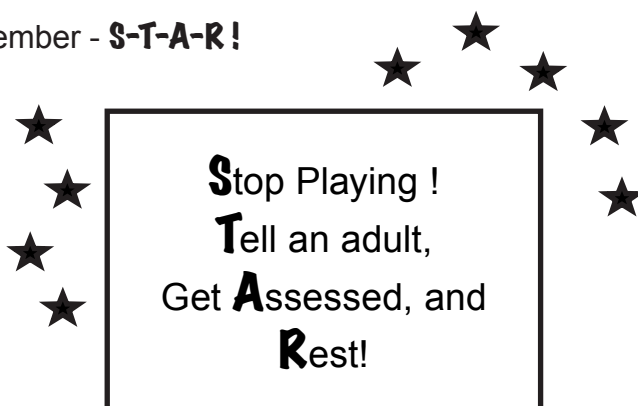
- A concussion cannot be detected directly from medical imaging tests.

Recognize Concussion Symptoms

PHYSICAL	COGNITIVE (THINKING)	EMOTIONAL	SLEEP DISTURBANCE
Loss of consciousness	General confusion	"I don't feel like myself"	Sleeping more than usual
Headache			
Nausea or vomiting	Difficulty remembering	Sadness	
"Pressure in the head"			Sleeping less than usual
Dizziness	Difficulty concentrating	Moody, grumpy (irritable)	
Tiredness			
Sensitivity to light or noise	Feeling like "in a fog"	Nervous or anxious	Trouble falling asleep

How to get better?? **REST !**

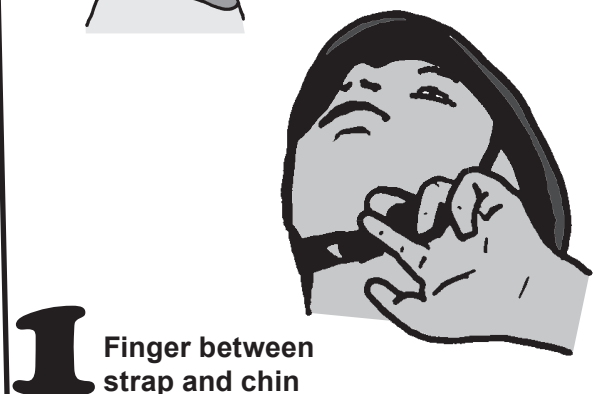
Remember - **S-T-A-R!**



Follow the

2VI
Rule

to make sure
your helmet
fits *right!*



Parachute wants to make a Brainiac out of all kids!

Parachute is a national charity dedicated to preventing injuries, including brain and spinal cord traumas among children and youth.

Donations to Parachute will increase our reach of this program even further. To do so, visit parachute.ca/donate

For more information on Parachute, visit us at parachute.ca, follow us on Twitter (@parachutecanada), or join us on Facebook (parachutecanada).



With an injury to the brain or spinal cord we would not be able to do the many things we do everyday. So it is important that we always wear our helmets when we are active, think first, and play safely!



Parachute

PREVENTING INJURIES. SAVING LIVES.

parachute.ca

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