Parachute Brain Waves

Instructor Guide

About this Guide

Thank you for helping bring important injury prevention messages to students in your community! You are essential to the success of Parachute Brain Waves. To help you deliver an action-packed day of fun, this guide has important information for you to review before you enter the classroom.

Section 1 – Instructor To-Do List

Section 2 – Materials Checklist

Section 3 – Presentation

Appendix

You do not have to memorize this entire manual. Please do not read to the students directly from this manual. Students prefer interaction! So:

- Keep your sentences and choice of words simple.
- Focus on presenting the key points through activities.

See the Appendix of this guide if you are looking for more information on a certain module. Additional resources, such as answers to frequently asked questions, are available through Parachute Brain Waves: Train for the Brain Online.

Contact info

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Section 1 - Instructor To-Do List

A minimum of one week before the presentation:

- Attend a training session
- Watch the Parachute Brain Waves: Train for the Brain Online training videos (eight in total)
- Review the Parachute Brain Waves Instructor Guide
- Review the Student Activity Booklet
- Identify any materials you may need to purchase or prepare (tip: use the Brain Waves Materials Checklist)
- Co-ordinate the presentation with your partner (if applicable)
- Communicate with the school contact to:
    - Confirm the date and time of the presentation
    - Confirm the location of the school and any visitor check-in requirements
    - Find out about any classroom needs or considerations. For example:
        - Are there any food allergies? This could impact the Taste Bud Mapping and Olfactory Adaptation Activities.
        - Is the classroom a scent-free space? This could impact the Olfactory Adaptation Activity.
        - Is there a latex allergy or policy against latex? This could impact using a balloon to map the brain lobes.
    - Remind the teacher to have students bring bicycle helmets on the day of the presentation

The day before the presentation:

- Confirm attendance/time of arrival with your partner (if applicable)
- Prepare activity materials
    - Jello brain (Find the recipe on parachute.ca/brainwaves)
    - Other materials as necessary (tip: use the Brain Waves Materials Checklist to make sure you have everything you need.)

The day of the presentation:

- Arrive 30 minutes before presentation start time
- Bring all materials (Remember to take the jello brain out of the fridge!)
- Ensure the teacher or other supervisor is present at all times to manage the class
- Thank the teacher and remind them to complete the online feedback survey
- Bring back the Jello brain mold (make sure to wash it) along with any unused activity booklets

Section 2 - Materials Checklist

Please ensure you have these materials for your Brain Waves presentation. Materials may vary depending on what activities you include in the presentation.

Materials provided by Parachute:

Received	Item	Quantity
	Student Activity Booklets (one per student)	
	Parachute Brain Waves Instructor Guide(s)	
	Powerpoint presentation slides	
	Jello brain mold	
	Concussion handouts	
	Online link to teacher, Site Coordinator and volunteer surveys	

Materials to purchase and prepare:

Received	Item	Quantity
	Ingredients for jello brain (see recipe for ingredients list)	
	Tray for the jello brain	
	Plastic wrap to cover the jello brain	
	Pieces of paper and a pen or marker (Passing the Note, Blind Spot, Scrambled Brains Activities)	
	Balloon for Naming the Lobes (Balloon Head) Activity	
	Scented product for Olfactory Adaptation Activity	
	Flavours for Taste Bud Mapping Activity (e.g., sugar, salt, lemon, coffee)	
	Cotton swabs for taste and touch activities	
	Blindfold for Sound Localization Activity	
	Helmet(s) for Helmet Fitting Activity	

Section 3 - Presentation

Note: Duration times are approximate.
Ensure the teacher or other supervisor is present at all times to manage the class.

Introduction

Slides 1-3

Welcome to Parachute Brain Waves!

- Introduce yourself to the participants.
- Introduce the agenda for the day and lay "ground rules" in the classroom (e.g., raise your hand if you have a question).

Any questions before we start?

Ask: What is the most important part of your body? - YOUR BRAIN

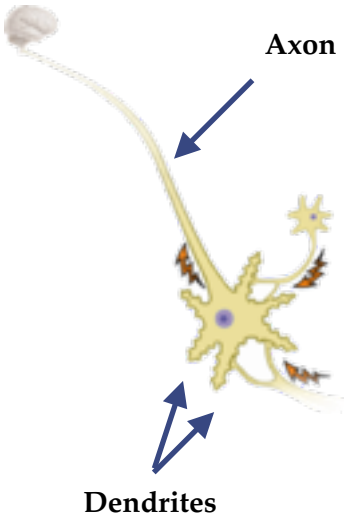
What is Parachute Brain Waves? Today we are going to learn about the brain, do some fun activities that will show you how important it is, and learn how to protect ourselves from injuries.

Neurons

Slides 4-8, Activity Booklet 2

1. The Neuron

Duration: 8 minutes



Cells are the building blocks of our bodies.
Brains are made of 100 billion cells called neurons.

Neurons are different from other cells in our body because they have special branches that come out from the centre of the neuron (the cell body or soma). Each neuron passes signals from one neuron to the next. No other cell in the body has specialized signaling like neurons. Messages can be sent from the body to the brain, and from the brain to the body.

Use the Neuron slides (6-7) to explain axons and dendrites:

- The axon comes out of the soma to pass signals to other neurons.
- The branches that receive information from other neurons are called the dendrites.

Neurons line up like a chain. The brain sends a message to the first neuron, and that message passed on from one neuron to the next down the chain until it reaches its destination.

2. Neuron Messaging

Duration: 10 minutes

Passing the Note Activity

This activity demonstrates how neurons are like messengers between our brain and our body:

1. Write a joke or word on two pieces of paper.
2. Divide the class into two uneven rows. The class is now two separate chains. Each person is a neuron, sending signals from the Brain (first person) to the Leg (last person).
3. Pass the note from the Brain to the Leg. Ensure the neurons don't look at the note! The Leg reads the note out loud when they receive it.

Activity Variations: Instead of using a note, you can try hand squeezing. You can also try using different "chain" lengths and/or longer and shorter messages.

Ask:
Q: Does the number of neurons in a chain affect the speed a message can be sent?
A: Yes. Signaling speed is affected by the number of neurons in the chain. It will take longer for a signal to reach its final destination if there are more neurons.

Q: What else might affect the speed of a message?
A: The type of message can also affect signal speed. If the message is simple, like a reflex from touching a hot stove, it will be fast. If the message is more complicated, like recognizing a face, it will take longer to process because it requires memories of that person and focusing on their physical features.

3. Let's Talk Neurons!

Duration: 3 minutes

The fastest neurons send signals up to 120 metres per second! Neurons that send temperature signals can move up to two metres per second.

Reflexes are sent by the shortest chains in our body. They are usually one or two neurons, or monosynaptic or disynaptic pathways.

Our skin cells and hair cells grow back. A broken arm or bruise can heal. Damaged neurons cannot repair themselves.

Ask:
Q: What things do you do to protect your neurons?
A: Wear a helmet, wear a seatbelt, look both ways before crossing the street, etc.

Ask:
Q: Now that we know that the brain is made of billions of neurons, what does it do?
A: It controls our ability to think, move, see, hear, taste, and smell**.** This is why the brain is so important!

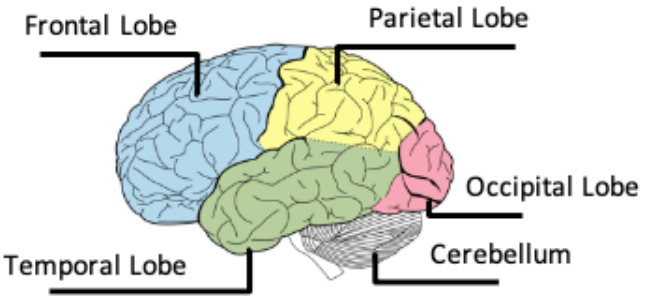
1. The Lobes of the Brain
Duration: 10 minutes

Naming the Lobes Activity

1. Name and describe the lobes of the brain using the "Lobes" slide (Slide 12).
2. Ask a student to help identify lobes on a balloon head.
3. Ensure students label the lobes in their Activity Booklets if supplied.

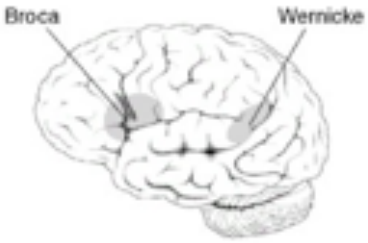
The brain has many different parts. Each part of the brain plays an important role in our life.

FRONTAL lobe - at the front of the brain. It is the decision-making centre responsible for problem solving, making plans, and speaking. Damage to Broca's area of the frontal lobe will affect someone's ability to speak.



PARIETAL lobe - at the top of the brain. It receives touch information from the entire body, allowing the body to move and understand where it is in space.

TEMPORAL lobe - at the side of the brain. It deals with memory, hearing, emotion, and language. Damage to the Wernicke's area of the temporal lobe will affect how someone understands language.



OCCIPITAL lobe - at the back of the brain. It takes care of vision. Damage to the occipital lobe can cause blindness, even if there is no damage to the eyes.

The **CEREBELLUM** is Latin for "little brain". This area is under the occipital lobe. It is responsible for coordinating body movements. (Note: the cerebellum is not a lobe)

2. Can we live without our lobes?

Duration: 5 minutes

Ask:
Q: Think about the lobes' functions. What would happen if your lobes were damaged?
A: Life with a damaged lobe would not be the same! Use example scenarios to help participants apply their knowledge. Samples are provided below, but feel free to think of your own!

Sample Ask:
Q: How would a person with an injury to their cerebellum act when they are trying to swing a baseball bat?
A: A person with damage to their cerebellum would not be able to coordinate their movements normally (they will miss the ball, not be able to swing the bat, etc.).

Sample Ask (see Slide 15):
Q: Robert wasn't wearing his helmet when he fell off his bike. After coming home from the hospital his friends noticed that he didn't like playing video games or soccer anymore, and he would laugh at different jokes. What lobe did he damage?
A: Frontal lobe (this lobe is responsible for functions like personality).

Sample Ask (see Slide 16):
Q: Brittany fell while snowboarding and she wasn't wearing her helmet. Later that night when she was watching TV, she noticed that all the kids on *The Family Network* were really blurry!! What lobe did she damage?
A: Occipital lobe (this lobe is responsible for vision).

Sample Ask:
Q: Jane was skateboarding with some friends when she fell. After the incident she only ate food from one side of the plate and walked around with one arm in her jacket. What lobe did she damage?
A: Parietal lobe (it receives information about touch/feeling and allows you to move your body in space).

The Senses

Slides 17

Introduction to the Five Senses

Ask:
Q: Can someone tell me 2 of the 5 senses?
A: Vision, touch, smell, taste, hearing

You need your brain for our senses to work. If you damage your brain, it can affect your senses. We are going to start with smell and taste. Smell and taste are grouped together as the chemical senses. Information from these senses can remind us of events we associate with certain tastes and smells.

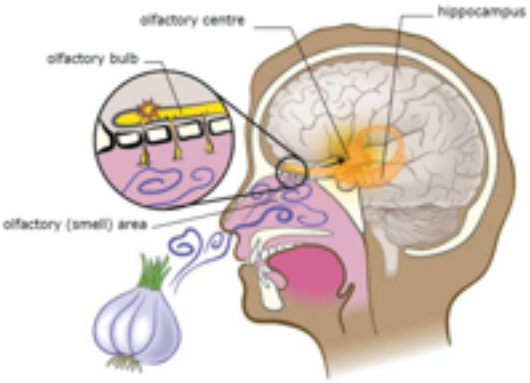
Smell

Slides 18-25, Activity Booklet 5-6

Smell is important. Smell can help us know when there is danger (e.g., smelling a gas leak or when food has gone bad). We can also enjoy good smells, like cookies baking in the oven!

1. How does the nose work?

Duration: 8 minutes



Chemicals enter our nose and bind to special receptors. The receptors are high inside the nose in an area called the olfactory epithelium. Information about the receptors that have been activated is sent to the olfactory bulb and the brain, allowing us to identify what we are smelling. Sense of smell is also known as "olfaction".

Ask:
Q: What are olfactory receptors?
A: They are the receptors that send signals to your brain, so you can recognize what you're smelling.

Q: Think back to the lobes of the brain. What lobe controls smell?
A: Temporal lobe

Ensure students have a chance to complete the Smell section of their Activity Booklet if supplied.

Activity Booklet "Steps to the Brain" Answer Key:

A. Odorants
B. Olfactory epithelium (mucous membrane)
C. Temporal lobe (also the olfactory bulb)

2. Can a smell change?

Duration: 12 minutes

Olfactory Adaptation Activity Part I (5 minutes)

1. Spread the scent around the classroom.
2. What do you think of the smell? Rate the strength of the smell on a scale of 1 to 10.
3. Does the smell remind you of anything? Olfactory bulbs communicate with the parts of the brain that are responsible for our emotions and memory.
4. Can a smell change?

What if we couldn't smell? (5 minutes)

Define **anosmia**. Anosmia is the inability to smell. It can be caused by head injuries and some diseases like Parkinson's disease. People with anosmia can experience depression and loss of

appetite. Not having a sense of smell can be dangerous if we need to smell fire (smelling smoke) or tell if food we are eating has gone bad.

Ask:
Q: Why is anosmia dangerous? What would it be like to have it? Have you ever lost your sense of smell?
A: Danger in a fire or gas leak, eating rotten food. You have probably experienced losing your sense of smell when you have been sick with a cold or flu.

Q: How can we avoid losing our sense of smell?
A: By protecting our brain! E.g., Wear a helmet, wear a seatbelt, look both ways before crossing the street, etc.

Olfactory Adaptation Activity Part II (2 minutes)

1. Ask participants to rate the strength of the smell from Part I again. If it hasn't changed, check back after the Taste lesson.
2. Have you ever adapted to a smell? E.g., Cooking at home
3. Why is adaptation important and useful? If we smelled everything all the time, we would be overloaded with stimulants.

Adaptation is experienced when a stimulus is present for a long time. After being in a freshly painted room for a while, the smell may not be as strong. However, someone entering the room for the first time will find the smell very strong because they are not adapted.

Taste

Slides 26-35, Activity Booklet 7, 12

1. Introduction and Taste Pathways

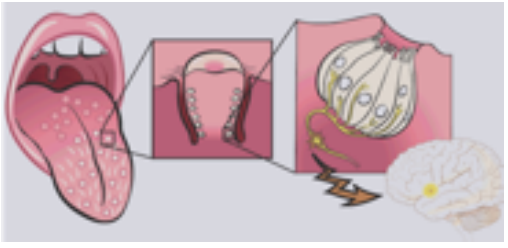
Duration: 8 minutes

Ask:
Q: What happens to the taste of your food when you are sick?
A: Your food doesn't taste as good! This is because smell and taste work together to bring out flavour in foods. Smell and taste are the chemical senses.

Taste Buds

A taste bud is a group of taste cells. Taste receptors are clustered into taste buds on our tongue, all over our mouth, on the roof of our mouth, epiglottis and upper esophagus.

Ask:
Q: Look at your neighbour's tongue. What do you see?
A: Taste buds are on each of the little white bumps (papillae).



Food that we eat is broken up into tiny pieces or molecules called **tastants**. These can only be seen with a microscope. Signals from taste receptors are sent to the brain to be

interpreted. Each taste bud has an opening called a taste pore and tiny hairs (called microvilli) on it. These tiny hairs can only be seen with a microscope. These tiny hairs send messages to the brain and tell us what type of food we are eating.

Taste and smell receptors can be replaced throughout our lives, something that cells in our brains generally cannot do. Since these receptors are found in areas that come in contact with the outside, fingers, hot liquids, and assorted foods, it is important that damaged cells can be replaced.

Ask:
Q: Think back to the lobes of the brain. What lobe controls taste?
A: Parietal lobe

Ensure students have a chance to complete the Taste section of their Activity Booklet if supplied.
Activity Booklet "Steps to the Brain" Answer Key:

A. Tastants (or molecules)
B. Taste buds (papillae)
C. Parietal Lobe

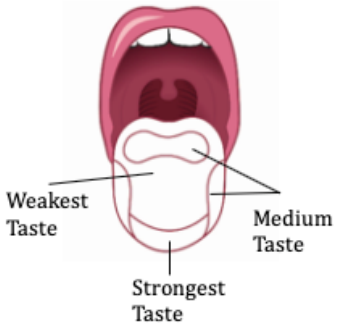
2. Types of taste

Ask:
Q: What are the four types of taste? (Take one answer per student)
A: There are four basic tastes: sweet, salty, sour, and bitter. There is even support for a fifth basic taste: umami (e.g., mushrooms). Can you give me an example of each taste?

Taste Bud Mapping Activity (12 minutes)

1. Use one or many flavours (salt water, sugar water, juice, vinegar, tonic water, and/or decaffeinated coffee). Distribute cotton swabs and taste cups.
2. Direct students to dip the cotton swab in the taste cup(s), then rub the swab on different areas of their tongue - the tip, the sides and the back. Remind students to take a new stick each time they dip!
3. Have students label the tongue map in their booklets to determine the areas of the tongue that can "taste" the best.
4. Use the tongue map slide to label the regions with more and fewer taste receptors.

Ask:
Q: Why can you taste more on certain parts of your tongue?
A: Tastes are more intense where there are more taste receptors.



Q: Where can you "taste" the most?
A: The tip of the tongue has more receptors than the middle of the tongue. The sides and the back have more receptors than the middle, but fewer than the tip. Therefore, the tip should be the "tastiest" region, followed by the sides, back and finally, the middle of the tongue.
Q: Have you ever burnt your tongue, or had a sore tongue after eating too much sour candy?

A: The pain comes from damaged taste buds. Injuries like these are not permanent because new taste cell receptors are produced all the time. How is this different from other types of nerve cells we've talked about?

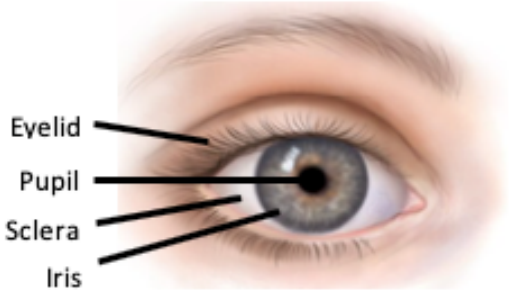
Ask:
Q: How can we protect our taste?
A: By protecting our brain! E.g., Wear a helmet, wear a seatbelt, look both ways before crossing the street, etc.

Vision

Slides 36-53, Activity Booklet 13-15

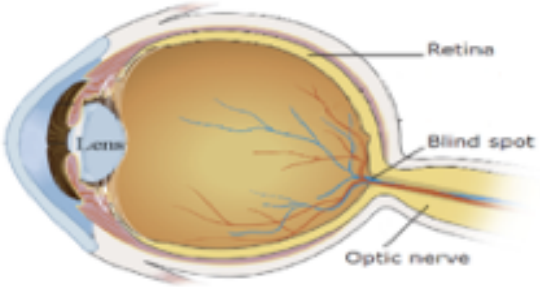
1. Anatomy of the eye

Duration: 8 minutes



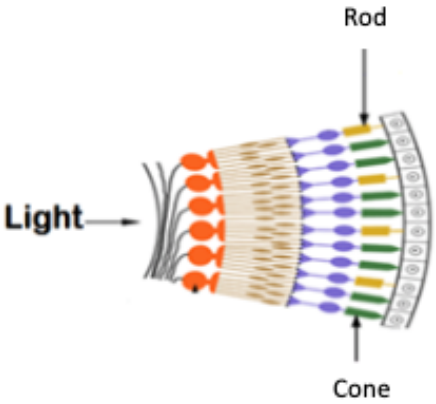
The human eye is ~2.5 cm in length and weighs about 7g (less than two nickels!). Muscles control the movement of the eye. The eyelid protects the surface of the eye. Tears clean the eye's surface. The surface of the eye, the cornea, acts like a filter. The iris and pupil adjust to the amount of light going into the eye. The lens focuses the image you are looking at.

The Visual Pathway
1. Lens
2. Retina
3. Optic nerve (blind spot)
4. Optic chiasm
5. Occipital lobe (visual cortex)



When light enters the eye through the lens, it is captured on the retina at the back of the eye. The retina has cells - **rods and cones** – that sense light. Rods are for night vision and seeing movement. Cones detect colour and detail.

This information goes through the optic nerve and travels to the brain. The optic nerve exits the eye at the blind spot. The blind spot has no rods or cones and cannot see light. The optic nerves from each eye cross the midline of the brain, reaching the occipital lobe on the opposite side of the brain.



Ask:
Q: Think back to the lobes of the brain. What lobe controls vision?
A: Occipital lobe
Ensure students have a chance to complete the Vision section of their Activity Booklet if supplied.

Activity Booklet "Steps to the Brain" Answer Key:

A. Light
B. Retina
   Rods
   Cones
   Blind Spot
C. Occipital Lobe

Blind Spot Activity (5 minutes)

1. Draw an X at one end of a strip of paper and an O at the other end.
2. Hold the strip of paper with your left hand at arm's length, with the letters facing you. The X should be on the right and the O should be on the left.
3. Cover your right eye with your right hand and focus your left eye on the X.
4. While focusing on the X, move the strip toward you until the O disappears.
5. When the O disappears, you have found your blind spot.

Colour Afterimage Activity (5 minutes)

1. Look at the image for 1 minute.
2. When the image is removed, what do you see?

This demonstrates the **Opponent Processing Theory of Colour Vision**. Every colour has an opposite colour. Afterimages are seen because neurons become adapted to the colour you are staring at. If you look at the image too long, the neuron gets tired and removes the block on the opposite colour when the image is removed.

Ask:
Q: Do you know what achromatopsia is?
A: It is colour blindness. Some people are not able to see colour because they are missing a cone type, have an abnormality in the cone, or have some abnormality in the colour perception area of the occipital lobe. There are tests to check for colour blindness.

Reversible Figure Illusions Activity (5 minutes)

1. Show each image one at a time and ask participants what they see.
2. Point out both figures in each image so participants can see.

Ask:
Q: How do we protect our vision?
A: By protecting our brain! (e.g., Wear a helmet, wear a seatbelt, look both ways before crossing the street, etc.) It's also very important to protect our eyes. Don't run with sharp things in your hands (like scissors), wear proper eye protection during sports and science experiments, get your eyes regularly examined, etc.

Hearing

Slides 36-53, Activity Booklet 13-15

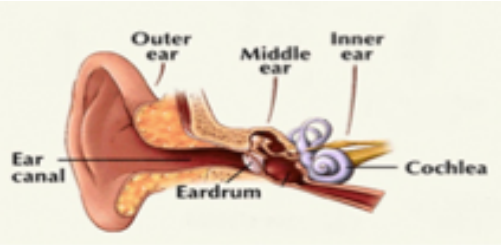
Ask:
Q: Why do you need your hearing?
A: Hearing allows you to communicate, listen for danger (e.g., fire alarm), and be aware of your surroundings. Hearing also allows you to enjoy sounds, such as music and nature.

1. The Parts of the Ear

Duration: 7 minutes

3 parts of the ear:
1. Outer Ear – Collects sound waves and sends them to the eardrum.
2. Middle Ear – Air-filled space containing ossicles, the 3 smallest bones in the human body. Ossicles amplify and transmit sound vibrations to the inner ear.
3. Inner Ear – Consists of the cochlea (a snail shaped structure). The cochlea has hair cells that receive the vibrations and send signals to the auditory nerve, and then onto the temporal lobe where the brain interprets the signal.

The Auditory Pathway
1. Outer ear (Pinna)
2. Outer ear (Eardrum)
3. Middle ear (Name the three Ossicles: malleus, incus, stapes)
4. Inner ear (Cochlea)
5. Inner ear (Hair Cells)
6. Auditory nerve
7. Temporal lobe



An object produces sound when it vibrates in matter. Matter is a solid, such as dirt; a liquid, such as water; or a gas, such as air. Most of the time we hear sounds traveling through the air.

The ear is divided into three parts: outer ear, middle ear, and inner ear. The outer ear (pinna) collects sound waves and sends them through the ear canal to the eardrum (tympanic membrane). The middle ear is an air-filled space containing ossicles, the three smallest bones in the human body (malleus, incus, stapes). These bones amplify and transmit sound vibrations across a tiny membrane into the inner ear, a snail-shaped, fluid-filled structure called the cochlea. Thousands of hair cells can be found deep within the cochlea on the organ of Corti. When the hair cells are excited by vibration, electrical impulses are made in the auditory nerve and sent to the brain to be interpreted as sound.

Ask:
Q: Think back to the lobes of the brain. What lobe controls your hearing?
A: Temporal lobe

Ensure students have a chance to complete the Hearing section of their Activity Booklet if supplied.

Activity Booklet "Steps to the Brain" Answer Key:
A. Sound Waves
B. Cochlea
C. Temporal Lobe

Ask:
Q: Why is it important to protect your hearing?
A: Loud noises can cause hearing loss by destroying the hair cells in the inner ear.

Q: How can you protect your hearing?
A: Avoid loud noises or use ear plugs. Tumors, objects in the ear, or infections that damage the eardrum can cause hearing loss. You can also protect your hearing by protecting your brain! E.g., Wear a helmet, wear a seatbelt, look both ways before crossing the street, etc.

Sound Localization Activity (8 minutes)

1. Blindfold one volunteer. Have them sit in the middle of the room and cover one ear.
2. Have other volunteers stand in different areas in the room and clap when you signal to them.
3. Ask the seated volunteer to point in the direction they hear a clap.
4. Repeat with no ears covered.

Ask:
Q: When was the seated volunteer better at locating the sound? Why?
A: The seated volunteer should be more accurate when they can use both ears. Our brains use the volume and time it takes for sounds to reach each ear to determine sound locations.

Touch

Slides 62-69, Activity Booklet 17

Ask:
Q: Why is your sense of touch important?
A: Touch is important because it allows you to feel comfort (e.g., a soft blanket), it can help you sense if something is dangerous (such as a hot doorknob), and lets you communicate with others (e.g., give someone a hug).

1. The Touch Pathway
Duration: 5 minutes

The types of touch:

- Pain - tissue damage, physiological, inflammation, neuropathic
- Temperature - heat (30°C to 45+°C) and cold (10°C to -38°C)
- Pressure
- Vibration
- Proprioception - Position in space (This concept might be too complex for the grade level)

The Touch Pathway:

1. Five touch receptors (see list above)
2. Spinal Cord
3. Somatosensory Cortex (Parietal Lobe)

Touch is categorized by the sensory receptors that detect the types of stimuli (pain, temperature, pressure, vibration). Receptors and neurons allow us to interpret sensation. Chemical, thermal or mechanical stimuli are changed to electrical signals that the brain can understand. The signals travel to the brain through the spinal cord.

Ask:
Q: Think back to the lobes of the brain. What lobe controls touch?
A: Parietal lobe

Ensure students have a chance to complete the Touch section of their Activity Booklet if supplied.

Activity Booklet "Steps to the Brain" Answer Key:
A. Skin
B. Parietal Lobe
C. Pain
Pressure
Vibration
Temperature

Pain "Pinching" Activity (5 minutes)

1. Have students pair up. Distribute one clothespin to each pair of students.
2. Have one student c lip the pinky finger of another student with a clothespin.
3. Take the clothespin off the pinky, and clip it onto the elbow.
4. Ask the students to repeat the above steps with their partners.
5. Ask the students to vote on whether they found the clothespin more painful on the finger or the elbow.

The distribution of pain receptors is different for different parts of the body, making some body parts more or less sensitive to pain. The clothespin should sting more when it is on the pinky finger than the elbow. The elbow has almost no pain receptors.

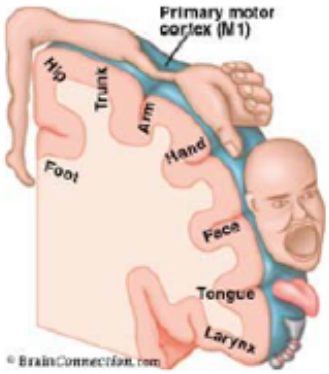
Two Point Discrimination Demonstration (5 minutes)

1. Have a volunteer close their eyes and hold out their hand.
2. Gently touch their finger using two cottons. Remember how far apart the cotton swabs are.
3. Ask: How many cotton swabs am I using to touch you? (They should say two)
4. Gently touch their arm using the two cotton swabs. Make sure the swabs are the same distance apart as before.
5. Ask: How many swabs did I use to touch you this time? (They should say one)

Result: It will be easier for the student to distinguish the swabs at the fingertips than their arm (more receptors in fingers).

There are more touch receptors at the fingertips than the arms. This is called **receptor distribution**.

Homunculus
The size of sensory receiving areas, relative to different body parts, is shown by the unusual proportions of the homunculus. A larger area in the brain means a greater sensitivity of that body part, relative to other body parts. Very sensitive areas of the skin, like fingers, have very high densities of receptors and closely packed neurons.



Looking at the homunculus, notice that the hands and fingertips are larger than the knees and forearm. The amount of brain devoted to each body part is important to determine how sensitive that body part is to touch. The more brain devoted to the function of a body part, the more sensitive it is. Use the homunculus slide to show that the fingers, mouth, tongue have a greater representation in the homunculus.

Concussions

Slides 71-74, Activity Booklet 18

A concussion is a brain injury that any person may experience at some point in their life. Any blow to the head, face, neck or body, which causes the brain to move around inside the skull, may cause a concussion. This section will touch upon what a concussion is, how it is caused, what the symptoms are, and why rest is an important first step for a healthy recovery.

1. Let's have a concussion discussion!

Duration: 2 minutes

Ask:
Q: What is a concussion? Have you heard of this word? What do you think it means? What is the difference between a concussion and a brain injury? Ask those in class who have ever had a concussion to raise their hand. Ask those who have had a brain injury to do the same.
A: A concussion is a **type of brain injury**, but most people do not realize this. The number of students raising their hands for concussion may be different from those doing so for brain injury. Emphasize that a concussion is a type of brain injury.

2. Video: "Concussions 101 – Dr. Mike Evans"

Duration: 8 minutes

If possible, show the video clip (~ 6 minutes). This video clip encompasses all of the aspects about concussions we wish to teach the students. We will use the points in the video and highlight them in subsequent activities.

Reinforce and explain that a hit/blow to the head or body can cause the brain to jostle back and forth within the skull. An impact to your head or body can injure your brain!

Why do doctors say a concussion is an invisible type of brain injury?
You can't see a concussion on medical imaging, such as X-rays and CT scans.

In summary:

- A concussion is a brain injury.
- A concussion affects the way a person may think, feel, and act.
- Any blow to the head, face or neck, or a blow to the body, which causes a sudden jarring of the head, may cause a concussion (e.g., a ball to the head in soccer, being checked into the boards in hockey, or falling down at recess).
- These injuries cannot be seen on medical imaging/tests, such as X-rays, Computed Tomography (CT) scans, or Magnetic Resonance Imaging (MRI).

3. Concussion Symptoms

Duration: 5 minutes

How does a concussion affect your mind, body, and feelings?
A concussion affects the way the brain functions. Because the brain does so many different things, a concussion may affect a person in lots of different ways.

Concussions cause various **signs and symptoms.** A person with a concussion might experience one or more of the following:

Physical	Cognitive (Thinking)	Emotional	Sleep-Related
• Headache • Loss of consciousness (blanking out for a moment) • Nausea or vomiting (Throwing up or feeling like throwing up) • Sensitivity to light or noise (Lights or noise bother me) • Dizziness • Low energy (Tired) • "Pressure in the head"	• Feeling like "in a fog" • General confusion (Being confused) • Difficulty remembering (Can't remember as well as before) • Difficulty concentrating (Find it hard to focus/ concentrate)	• "I don't feel like myself" • Irritable (Moody, grumpy) • Sadness • Nervous or anxious	• Sleeping less than usual • Sleeping more than usual • Trouble falling asleep

Scrambled Brains Activity

1. Cut strips of paper and on each one, write one of the symptoms from the "Concussion Signs and Symptoms Summary Table". On about 5 strips write out some symptoms that are not related to concussion. E.g., Broken leg, fever, cut on hand, scraped knee, sprained ankle.
2. Put all strips of paper in a bag.
3. Select a student from the class to pick a strip of paper from the bag. Ask them to read out the symptom on the paper they picked.
4. Vote as a class (by raising hands for True/False) on whether it is a symptom of concussion.
5. You can write these symptoms on the board as they are selected.
6. Repeat until all strips of paper are picked and you have all symptoms from the summary table on the board.

Ask:
Q: What do you think you should do if you think you have a concussion?
A: S-T-A-R: Stop Playing, Tell an Adult, Get Assessed, and Rest!

S-T-A-R:	**S**TOP Playing!	(Need to stop playing immediately)
	TELL an adult,	(Tell a coach, teacher, parent, or caregiver right away)
Get	**A**SSESSED, and	(Get checked by a doctor)
	REST!	(If you have a concussion, rest is the first step for getting better)

Emphasize that REST means you need to get proper sleep and might have to stop (or limit) doing things for a bit if they make your symptoms worse, such as playing video games. You might need to stay home from school.

More tips about concussion recovery:

- Get plenty of sleep at night and rest during the day. Resting the day or two after your injury is important.
- In the beginning, avoid activities that are physically or mentally demanding - they can make your symptoms worse!
- Avoid contact sports/activities and until your doctor says it is OK. Avoid rollercoasters, too!
- Depending on how you feel, you will probably need to avoid playing video games or using the computer for prolonged periods of time, especially early on in the recovery process.
- Gradually return to your normal activities, beginning with simple activities at home.
- Return to school and sports GRADUALLY with the advice of your doctor and teachers. Remember, returning to school comes FIRST!

Encourage them to discuss concussions with their friends and family. Encourage them to tell an adult if they think a friend or classmate might be hurt.

Ask:
Q: What do you think you can do to help your friend or classmate if they have a concussion?
A: Encourage them to tell an adult if they think they have a concussion; Share the concussion information you have learned with them; Reassure and support them while they are recovering and returning to school – let them know they are not alone!

How can we prevent concussions? Here are some examples:

- Follow the rules of the sport or activity you are playing. This includes listening to your teacher or coach when they give you instructions.
- Help prevent falls – pick up toys, games and books off the floor so people don't trip on them. Wear proper shoes in Phys Ed class.
- Respect others and never hit someone on the head.

Protect Your Head

Slides 75-78, Activity Booklet 18

Reiterate the importance of the brain and what it would be like to lose any of the senses.

All our senses are interrelated, our brain is like a computer it helps us find the meaning of all our senses.

Ask:
Is there a sound, smell or taste that you really like? How does it make you feel?

Protecting Your Brain
Emphasize that the best way to protect the brain is through injury prevention (e.g., wearing a helmet while cycling or skateboarding, wearing your seatbelt, etc.).

Helmet Fitting Activity

Do a helmet-fitting demonstration using the 2V1 rule. Have students follow along in their Activity Booklet if supplied.

A properly fitted helmet touches the front, back, top, and all sides of your head. The goal is to achieve a fit that is snug, level, and stable to resist violent shakes and hard hits. Incorrect helmet fitting reduces the helmet's ability to protect the head in a crash.

Follow the "2V1" approach:

"2" Adjust the fitting band or foam pads. Some helmets come with a fitting ring or band. Set the band to its largest setting while you adjust the straps and buckles. Only after the straps have been adjusted and secured should the band be tightened. If tightening the band causes extreme discomfort, and loosening it produces an incorrect fit, you may need to choose another helmet style.

If the helmet does not have a ring or band, it will come with foam pads. Foam pads can be added or removed on all sides of the helmet. Make sure the pads touch your head evenly, without being too tight. If the helmet does not come with a fitting ring or foam pads, contact the manufacturer and get another helmet.

Once the helmet is snug, ensure the front visor sits about two finger widths above the eyebrows, or just above the frame of your glasses. If you walk into a wall, the helmet should hit before your nose does.

"V" Adjust the side straps. Fasten the chin buckle and look at the side straps. Adjust the side straps so they form a "V" underneath the earlobes and sit behind the jaw line.

"1" Adjust the chin buckle. The buckle should be tight enough that only one finger fits between the strap and the underside of the chin. Opening your mouth wide should cause your jaw to pull on the chinstrap. Tighten the fitting band (from Step 1).

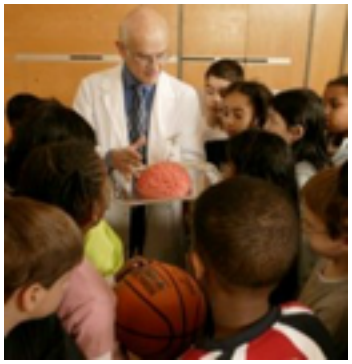
Wrap Up

Slides 79

Thank the students for their attention and participation.

Thank the teacher or supervisor and remind them about the online survey.

Bring out the jello brain!



Appendix

This Appendix contains additional information you may choose to include in your presentation or use to answer questions from participants.

Neurons

The first cellular part of the nervous system is neurons. Neurons process information and signal elements. They send messages to each other through electrical and chemical messengers. Electrical signals send messages from one part of the neuron to the other.

Chemical messengers carry information between neurons. Most neurons have branches called dendrites. Dendrites receive information from other neurons. One long cylinder-shaped part of the neuron, called the axon, becomes a series of smaller branches that form connections (or synapses) with other neurons. This allows messages to be sent from axon to dendrites.

There are different types of neurons:

- Sensory neurons (neurons that are sensitive to certain senses, i.e., touch or temperature);
- Motor neurons (neurons that affect muscles); and
- Interneurons (neurons that connect other neurons in the brain).

Anatomy

The nervous system is divided into two parts: the peripheral nervous system (PNS) and the central nervous system (CNS). The CNS is our brain and spinal cord, while the PNS is the spinal and cranial nerves that branch to extend to all parts of our body. These nerves send messages from the CNS.

The brain has many subdivisions:

- Cerebrum (the two massive hemispheres on the top of the brain)
- Cerebellum
- Brainstem (part of the CNS that lies between the cerebrum and the spinal cord).
- The lobes/divisions of the cerebrum are discussed in the neuron section.

Ask: Why we are capable of language, planning, fine motor movements, humour, etc., but other mammals are not? What distinguishes humans from other animals is our large cerebrum. Our cerebrum, or neocortex, is the most advanced cortex amongst mammals.

Smell

Smell (olfaction) receptors are high inside our nasal cavities in an area called the olfactory epithelium. Molecules dissolve in the nasal mucus and stimulate receptors. The activated receptors send signals to the olfactory bulbs. The bulbs are paired structures in the brain, just above the nasal cavities. To get to the brain, the receptors must send the signal through a special area of the skull called the cribriform plate, which has many tiny holes for cell extensions (axons) to pass through.

Olfactory areas of the brain work closely with structures involved in producing emotions. The limbic system is an example of a related area. There are also links to areas responsible for memory, which is why smells can produce detailed personal memories.

Humans can distinguish about 10,000 different smells. Our olfaction cells each have one type of receptor. When we smell something, the scent molecules will only activate these specific receptors. This allows us to identify the smell. Males and females smell differently, and there seems to be a decline in ability to smell with age. Animals have a very strong sense of smell and use their nose for many more things than humans do. They use smell to find food, mates, and avoid enemies and predators.

What animals have a good sense of smell? Dogs are an example of an animal with many more olfactory receptors than humans. Insects also have a very good sense of smell. Most birds have a poorly developed sense of smell.

Taste

Although you can taste each of the four tastes on all parts of your tongue, some places have more receptors for each type of taste. Sweet is best sensed at the tip of the tongue.

Much of the information about what we eat comes from our sense of smell. The taste of food is actually flavour. Flavour is a combination of: 1) input we receive from our taste buds; 2) olfactory information from food molecules that make their way up into the nasal cavity; and 3) sensory information, like texture and temperature, that tells us what food feels like in our mouth. Some nerves can be stimulated by pungent (strong smelling) or spicy foods.

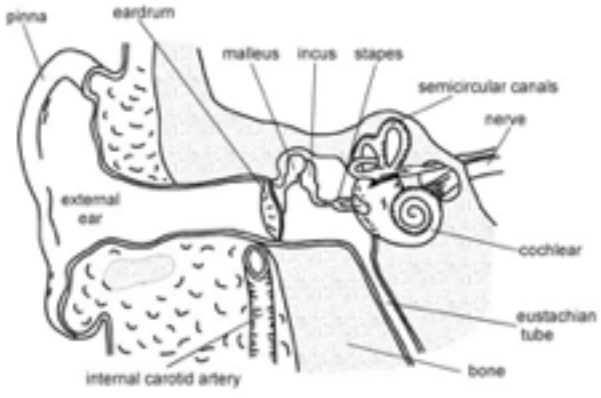
Vision

Vision (sight) is one of the most important senses humans use to understand the world. What we "see" is light. Light includes electromagnetic radiation with wavelengths between 380 to 760 nanometres. These are the only visible portion of the electromagnetic spectrum.

Colour Afterimage Activity: Red is opposite of green, blue is the opposite of yellow, and white is the opposite of black. Imagine there are three tubes, each have two sets of paint. When using a tube, you can only use ONE of the two colours inside (not both at the same time). Since these colours cannot be found together, they are opposite colours. A colour wheel is useful for explaining this concept.

Hearing

When something vibrates in the atmosphere, it moves the air particles around it. In turn, other air particles carry the vibration through the air. Vibrations send waves of pressure changes through the atmosphere. We hear different sounds from different vibrating objects because of differences in the sound wave frequency. A higher frequency means that the air pressure fluctuates back and forth more quickly. We hear



CROSS SECTION OF THE EAR

this as a high pitch. When there are fewer fluctuations, the pitch is lower. The level of air pressure in each fluctuation, the amplitude, determines how loud the sound is.

Sound waves cause the eardrum to vibrate. Humans can hear sound waves with frequencies between 20 and 20,000 Hz. The outer two-thirds of the pinna is lined with cartilage and contains sebaceous and wax glands. The wax prevents objects from going down the canal.

When sound waves reach the inner ear, they enter the cochlea. The cochlea is a snail-shaped, fluid-filled structure in the inner ear. Inside the cochlea is the organ of Corti. 25,000 tiny nerve endings, also known as hair cells, are located on the basilar membrane of the organ of Corti. The cilia (hair) of the hair cells make contact with another membrane called the tectorial membrane.

Touch

The somatosensory system is a part of the nervous system that processes information related to the sense of touch. The part of the brain that receives information about touch is called the somatosensory cortex on the post-central gyrus. Characteristics of the somatosensory cortex, somatotopic organization, can be demonstrated by the homunculus.

Two-point threshold is the minimal distance two stimuli must be separated to be recognized as separate stimuli by the brain. This distance is smallest in areas where there are a lot of touch receptors (e.g. the fingers).

A reflex is a reaction by the body that cannot be consciously controlled. An outside stimulus is detected by the sensory neurons. An electrical impulse is sent to the motor neurons, which send this information to the muscles to cause a contraction.

Helmet Fitting

Additional resources on helmets available at parachute.ca:

- Which Helmet for Which Activity
- 2V1 Helmet Fitting Bookmark

Note: Physical bookmarks can be purchased online at parachute.ca/shop.