Station 1 Skull: Mr. Egghead

Purpose

Learn how your brain is protected inside your skull.

Performing the experiment

Use a recording sheet and follow the directions listed below:

1. The plastic containers represent your skull and the eggs represent your brain.

2. Observe Container A. Predict what will happen to the egg in Container A if you shake it.

3. Observe Container B. Predict what will happen to the egg in Container B if you shake it.

4. **Gently** shake Container A and record your observations. Was your prediction correct?

5. **Gently** shake Container B and record your observations. Was your prediction correct?

6. Were your results the same or different?

Station 1 Skull: Mr. Egghead

Question to think about

Why did the egg in Container A break but the egg in Container B did not?

Explanation

The difference between the results in the two containers is the water! The water in Container B was protecting the egg, acting like a cushion. In the brain there is a type of water called the Cerebrospinal Fluid that helps to protect the brain from sudden impacts. From this experiment we know that both the Cerebrospinal Fluid and the skull surround the brain and also protect it!



Observe: What do you see?

My observations of Container A:			
My observations of Container B:			
Predict: What will happen if I GENTLY shake each container?			
My prediction for Container A:			
My prediction for Container B:			
Perform: What were the results?			
My prediction for Container A was:			
correct	incorrect		
If you circled "incorrect" please explain what happened instead:			
My prediction for Container B was:			
correct	incorrect		
If you circled "incorrect" please explain what happened instead:			

Station 2 Frontal Lobe: Left Brain/Right Brain

Purpose

Discover whether you are more "Right-brained" or "Left Brained."

Performing the experiment

- 1. Take a recording sheet and put your partner's name on it.
- 2. Read off each "TASK" and have your partner complete each activity. Circle the result for each task in the "RIGHT or LEFT?" column.
- 3. Fill in the answer blanks with the total number of right or left answers. Tell your partner what their results are!
- 4. Now your partner can do the same for you!

Station 2 Frontal Lobe: Left Brain/Right Brain

Question to think about

If I do more things with my right hand, foot, eye or ear does that make me "Right-brained"?

Explanation

NO!! This is a trick question! When it comes to the brain, think: OPPOSITES. The right side of your body is controlled by the left side of the brain, and vice-versa. If you did more things with your right hand, foot, eye or ear you are "Left-brained"!!!!



Recording Sheet for:

<u>Directions</u>: Ask your partner to do the following things. Observe whether they use the right or left hand, leg, eye or ear to do each activity. Circle their response for each on the chart below.

Task	Right or Left?	
Write your name.	Right Hand Left Hand	
Kick an imaginary ball.	Right Leg Left Leg	
Look through a tube.	Right Eye Left Eye	
Listen through a wall.	Right Ear Left Ear	
Total	Right Side	
	Left Side	
Results:	I am more	
(You MUST read the "Explanation"	Right-brained!	
before circling your answer!)	Left-brained!	
	Both!	

Station

Frontal Lobe: "Hairs" to Your Sense of Smell

Purpose

Discover what is inside your nose that helps your brain recognize familiar smells.

Performing the experiment

1. Get a recording sheet and smell the contents of each container, one at a time. Write down what you smell on the numbered blanks on your sheet.

2. For each container you will also rate the smell by circling any of words that describe it.

3. Do you have a memory that you associate with any of these smells? Share memories with your partner.

4. Did you guess the smell correctly? Circle "correct" or "incorrect" for each.

Station 3

Temporal Lobe: "Hairs" to Your Sense of Smell

Questions to think about

- 1. Why do we have the ability to smell things? That's right to enjoy the good smell of things like flowers or cake!
- 2. Can you think of another reason why we would need smell in our lives?
- 3. How does our brain know what our nose is smelling?

Explanation

Smell can help us **survive** and this is why it is important. For example, if there is a fire in the house you will be able to smell the fire, which will then tell you that you have to get out of the house. Inside your nose are small hairs! Everyone has them – look into your friends nose and you will see some. Where these hairs meet the skin in your nose there is a cell which is like a little "button" that is pushed down when the hair is moved. When a smell gets into your nose it moves the hair, which then pushes the button and it then sends a message to your brain that there is a smell out there. Then your brain tells you what smell it is!

Frontal Lobe: "Hairs" to Your Sense of Smell

Recording Sheet

#1	#2	#3
Smell	Smell	Smell
good ok bad	good ok bad	good ok bad
correct incorrect	correct incorrect	correct incorrect
#4	#5	#6
Smell	Smell	Smell
good ok bad	good ok bad	good ok bad
correct incorrect	correct incorrect	correct incorrect
#7	#8	#9
Smell	Smell	Smell
good ok bad	good ok bad	good ok bad
correct incorrect	correct incorrect	correct incorrect

Frontal Lobe: "Hairs" to Your Sense of Smell

Answer Key

#1	#2	#3
vanilla	onion	orange peel
#4	#5	#6
garlic	cinnamon	banana
#7	#8	#9
lemon	vinegar	coffee



Purpose

Discover another role of the sense of smell.

Performing the experiment

1. Close your eyes and pinch your nose.

2. Hold out your other hand and when your partner gives you a sucker, put it in your mouth.

3. Once the sucker is in your mouth you may open your eyes, but you MUST KEEP PINCHING YOUR NOSE.

4. Try to guess the flavor of the sucker in your mouth. Was you guess right or wrong?

5. As you finish your sucker pinch your nose every once in a while. Do you taste less of the flavor when your nose is pinched?



Question to think about

Why was it difficult to guess the flavor of the sucker when you were pinching your nose?

Explanation

This activity demonstrates exactly what happens when you have a cold and you cannot smell very well! The molecules from the sucker that carry the smell cannot reach the olfactory receptors in your nose. Smell and taste are closely related and work together. Smelling something actually helps you taste it! This is why when you smell good food, it will surely taste good! But... if you smell something bad would you want to taste THAT?!



Purpose

To explore what we need in order to hear.

Performing the experiment

1. With your partner, take turns saying the word "banana" very close into each other's ears. Do you each hear the word banana? Yes!

2. Next, take turns saying "bliblabloblu" very close into each other's ears. Do you each hear something? Yes! Not a word, but a sound.

3. Now slowly blow some air into each other's ears. Do you each hear something? Yes! Weird, isn't it? You are not putting a word or a sound into your ears, but yet you each hear something!

4. Gently place your finger in your own ear (Ewww! NOT your partner's ear!) Now wiggle your finger around. What happens? Do you "hear" something? Funny sounds? Does your partner hear **your** finger wiggling in your ear? No! Stop moving your finger and keep it very still. What do you hear now? Not much, right?



Question to think about

Do you really need to have a **sound** around you in order to hear something?

Explanation

No. You can actually hear things that don't make a sound! Just like your nose, inside your ears are little hairs. If you don't believe me, just look into your partner's ears and you will see some hair! Just like the hairs in your nose, the hairs in your ears will move each time that a sound enters the ear. And when the hairs move, they press a "button" that sends a message to the brain saying, "I hear something!" Even though air blowing into your ear or your finger wiggling do not make sounds, the air and your finger trigger the hairs to send a message to the brain. Remember when you stopped wiggling your finger? The messages to the brain stopped, too!



Purpose

To explore how your ears are connected to your sense of balance.

Performing the experiment

1. Observe the container with water and plants in it. What happens to the plants when the container is moved from side to side? In a circle?

2. Now with the help of a partner turn youself around in place for 10 full circles and then abruptly stop.

3. Immediately try to walk 10 steps in a straight line toward the cone.

4. What happened to you?



Question to think about

Why were you unable to walk a straight line after spinning? (Believe it or not, the algae you observed holds the answer!)

Explanation

There are hairs all the way inside your ear – in the back where you can't see them. These little hairs are surrounded by water – just like the algae was. When the water in the container moved, so did the algae, didn't it? This is exactly what the hairs in the water of your ear will do when you move. When the hairs move a message is sent to your cerebellum that you have moved. When you turned around in 10 circles the hairs moved in unexpected ways and the messages they sent to the brain were confusing. When you stopped moving the hairs continued to move, which made walking in a straight line impossible!



Purpose

Explore how doing yoga poses can help you practice controlling the movement of the hairs in your inner ear and improve your balance. Try to move in and out of the poses slowly so the hairs in the water in your inner ear stay as calm as possible!

#1











arms.

Butterfly Pose (Baddha Konasana)





bring your feet inwards, with the soles of your feet touching together. Inhale deeply, pressing the thighs and knees down toward the floor. the wings of a butterfly. Start slow and gradually increase the speed.

Slowly straighten your legs out in front of you and relax.



Station 6

































Purpose

Test your short term memory.

Performing the experiment

- When your partner says go, view the color pictures on the page. There are 15 pictures and your partner should time you for only <u>25 seconds</u>.
- 2. In that 25 seconds try to remember as many objects as you can. You must turn the page over *immediately* once your 25 seconds is up!
- 3. Now take an answer sheet and put your name on it. Write down as many different objects as you can remember seeing on the page. They can be in any order.
- 4. Once you've tried your very best and written down as many as you can remember, you may once again look at the picture sheet to see how many you got right.
- 5. Compare your answers to an adult's answers. Who remembered more objects?



A real hippocampus (left) is shaped like a seahorse!



Questions to think about

#1: What did you have for breakfast this morning? This should be an easy question.

#2: What did you have for breakfast 4 days ago? Mmm...This should be a more difficult question to answer.

Explanation

There are two types of memory: one that is called the **short-term memory** that helps you remember what happened within the last day or so, and one called **long-term memory** that helps you remember things that happened a long time ago, such as your birthday party last year when you got a great gift. The hippocampus is the part of your brain that holds your memories!

For children, remembering things that happened in the long-term is more difficult. Remember when I asked you what you ate for breakfast 4 days ago? That was more difficult than remembering what you ate this morning.

For older people it's the exact opposite! For them it is easier to remember things that happened a long time ago. Their long-term memory is very good!



THE HIPPOCAMPUSE TREMEWBER.

Answer sheet:

- 1.
 9.

 2.
 10.

 3.
 11.

 4.
 12.

 5.
 13.

 6.
 14.

 7.
 15.

 8.
 -). .
 - 0.
 - 1.
 - 2.
 - 13.
 - 4.



THE HIPPOCAMPUS: IREVENBER,

Answer sheet:

- 1.
 9.

 2.
 10.

 3.
 11.

 4.
 12.

 5.
 13.

 6.
 14.

 7.
 15.
- 8.

- .
- .
- .
 - I I I



Purpose

To observe how different parts of the body perceive pressure points.

Performing the experiment

- 1.Get a friend and place a bandana over their eyes. (No peeking!)
- 2. Hold the modeling clay upside down and gently place the toothpicks on your friend's upper arm so the tips of the toothpick touch the skin at the **same time**.
- 3. Ask your friend if he or she felt one or two pressure points.
- 4. Now try it again, only this time place the tips of the toothpicks gently on their hand at the **same time**.
- 5. Ask your friend if he or she felt one or two pressure points.

Station 8 Neurons, Neurons, Everywhere!

Question to think about

Did your friend feel the same amount of pressure points on their upper arm as they did on their hand? Chances are they didn't!

Explanation

The reason behind this is that neurons in the skin act like a button, and when that button is pushed it sends a message to the brain that the skin has been touched. There are more of these "buttons" (neurons) in your hands than in your upper arm, so when something touches your hand it has more chance of pushing a button than if you touch your arm!



Purpose

To demonstrate that there are more neurons in certain areas of the body than in others.

Performing the experiment

1. Look at the bean bags in the first Hula Hoop. How many are there?

2. Now stand just outside the hoop and toss the Beanie Baby straight up in the air. You want it to land **inside** the hoop.

3. Did the Beanie Baby touch any of the bean bags when it landed?

4. Now move to the second hoop. How many bean bags can you count now?

5. Again, stand just outside the hoop and toss the Beanie Baby straight up in the air. Remember: You want it to land **inside** the hoop.

6. Did the Beanie Baby touch any of the bean bags when it landed? How many?



Questions to think about

Did I have different results for the two hoops? Why or why not?

Explanation

Hoop #2 had more bean bags inside it. Your chances of landing on or touching one of them with the Beanie Baby were better than your chances with Hoop #1.

This activity demonstrates how the touch "buttons" in your skin work. There are more neurons in certain parts of your body, and these parts are more sensitive to touch. This is the same reason why during the toothpick activity sometimes you felt one touch point and other times you felt two. It's all in the neurons!!



Purpose

To see if different parts of the tongue are more sensitive to different characteristics of food: i.e., salty, bitter, sour, sweet.

Performing the experiment

The taste buds on the tongue are, of course, important for the flavor of food. One at a time, try each of the taste items provided. Move each taste item around your tongue, sensing the taste in each of the areas labeled on the drawing of the tongue. Be sure to take a sip of water in between flavors. Also be careful in testing the back part of the tongue...some people may gag!

Test items:

- 1. Small piece of a lemon drop (sour)
- 2. Salt (salty)
- 3. Small piece of unsweetened chocolate (bitter)
- 4. Small piece of Lifesaver (sweet)

Are parts of the tongue more sensitive to specific flavors or are all parts of the tongue equally sensitive to the flavors? If so, indicate on a drawing of the tongue the areas that are most sensitive to the different tastes. Compare your tongue drawing results with those of your partner.

Station 9 PARETAL LOBE: TONGLE TWEETS!

Question to think about

Are parts of the tongue more sensitive to specific flavors or are all parts of the tongue equally sensitive to the flavors?

Explanation

There are four basic tastes: sweet, salty, sour and bitter. All other tastes come from a combination of these four basic tastes. **NEWS FLASH:** Different parts of the tongue can detect ALL types of tastes. Your parents and grandparents might not agree. For years people have looked to German scientist David P. Hänig's version of a "tongue map" as a guide to the areas of the tongue where certain foods are tasted. However, results from many later experiments indicate that ALL areas of the mouth containing taste buds – including several parts of the tongue, the soft palate (on the roof of your mouth) and the throat – are sensitive to ALL taste qualities!

The way in which taste information is carried from the tongue to the brain shows that individual taste qualities are NOT restricted to a single region of the tongue. There are two cranial nerves responsible for taste perception in different areas of the tongue: the **glossopharyngeal nerve** in the back and the **chorda tympani branch of the facial nerve** in the front.

Station 9

Tongue Drawing

- <u>Directions</u>: Put the numbers 1 4 on the map to indicate areas where each taste was the strongest.
 - 1. Sour lemon drop
 - 2. Salty salt crystals
 - 3. Bitter unsweetened chocolate
 - 4. Sweet Lifesaver



Station 9

Tongue Drawing

<u>Directions</u>: Put the numbers 1 – 4 on the map to indicate areas where each taste was the strongest.

- 1. Sour lemon drop
- 2. Salty salt crystals
- 3. Bitter unsweetened chocolate
- 4. Sweet Lifesaver



Station 10 Iccipital Lobe: Who's the Bossf

Purpose

Understanding depth perception: Which one of your eyes is "The Boss"?

Performing the experiment



 Cut out the small hole in the middle of the paper, being careful to cut right on the curved line. You will be looking at something across a room through the hole in the paper.

2. Choose something stationary (not moving) to look at across a room (at least twenty feet away) like a clock, or something on a shelf. Hold the paper with both hands, one hand on either side. Hold the paper straight in front of you at eye level with your arms fully extended.

3. Move the paper until you can see the object you picked through the hole. Once you can see the object through the hole, **hold your head and**

the paper VERY still. Without moving your head or the paper, slowly close your left eye (keeping your right eye open) and then switch and open your left eye and close your right. *Remember to not move your head or the* paper!

4. Most likely, when you close one of your eyes, you'll still be able to see the object through the hole, but when you close the other eye, you will no longer be able to see the object. The eye that can still see the object when the other is closed is your dominant eye (THE BOSS.)

Station 10 Occipital Lobe: Who's the Bossf

Questions to think about

How does this work? What makes one of your eyes "The Boss"?

Explanation

Your left and right eyes see things from slightly different angles, and usually your brain uses the slight differences to help you figure out how close or far away things are (optometrists call this depth perception, or stereo acuity.) When you look at something very close to you, the information from your two eyes is quite a bit different than when you look at something far away, and your brain has to decide which eye it should believe when it is trying to figure out exactly where something is.

You can try this, too. Hold your finger directly in front of your left eye, about three inches away from your face. Holding your head and finger still, first close your left eye, and then your right. Your two eyes are reporting different things to your brain, right? Your brain tends to pick one eye to be in charge of determining the exact spatial location of things when your eyes are telling it different things. This eye becomes your dominant eye, or "THE BOSS."

Station 11



Purpose

To discover ways that you can actually trick your brain!!!

Experiment

One at a time look at each picture provided. What do you see? Do the shapes seem to be moving on the page? Do you see one picture the first time you look and something different the next? Have fun making discoveries with your partner!



Questions to think about

What is happening when I look at these pictures? Why am I seeing different things at different times? Why do some pictures look like they're moving?

Explanation

Optical Illusions can use color, light and patterns to create images that can be deceptive or misleading to our brains. The information gathered by the eye is processed by the brain, creating a perception that in reality, does not match the true image. Perception refers to the interpretation of what we take in through our eyes. Optical illusions occur because our brain is trying to interpret what we see and make sense of the world around us. Optical illusions simply trick our brains into seeing things which may or may not be real.

Station 12 Occipital Lobe: The Stroop Effect!

Purpose

To see if you can trick your own brain using color words!

Performing the experiment: Test #1

- 1. Look at the list of words mounted on black paper.
- Read the <u>COLORS</u> of the words aloud quickly to your partner.
- 3. Next look at the list of words mounted on white paper
- Read the <u>COLORS</u> of the words aloud again, *quickly* to your partner.

Example: If the word is pink but its <u>color</u> is green you should say "green" or if the word is red but its <u>color</u> is yellow you would say "yellow."

5. Now ask your partner to read the words lists to you.
<u>Remember</u>: They must read the **COLORS** – NOT THE WORDS!!

Station 12 Occipital Lobe: The Stroop Effect!

Purpose

To see if you can trick your own brain using direction words!

Performing the experiment: Test #2

1. Look first at Direction Words List A. Each box on the page has a direction word that is in a certain **position**: Up, Down, Right, or Left.

2. When you read Lisa A you are to read the **POSITION** of the word. Read the words in the boxes to your partner now starting at the top and working across each row.

3. Flip the paper over so that you are looking at Direction Words List B. Again you are to read the **POSITION** of the word and **NOT the actual word**. <u>Example</u>: For the first box you would say "right" and for the second box you would say "up".

4. Now ask your partner to read the words lists to you. <u>Remember</u>: They must read the **POSITIONS** – NOT THE WORDS!!

Station 12 Occipital Lobe: The Stroop Effect!

Questions to think about

Boy, this stuff is difficult, isn't it?! Why??

Explanation

It is because you are a good reader! You are faster at reading the words than your brain is at A) identifying the color of the ink or B) identifying the positions that the words appear in. The second part of each test is hard because the words, colors and positions are **incongruent** (they do not agree). This creates a conflict that the brain has to resolve! The reason it takes longer is because the brain has to suppress the wrong answer that interferes with the right answer, before the right answer comes through!

Station 13 Say "Jell-O" to Your Brain!

Purpose

To see and feel what a real brain might be like. The consistency of the human brain has been compared to Jell-O, tofu, and even warm butter! It is surrounded by cerebrospinal fluid, which acts as a "shock absorber" inside the skull

Fun Facts about the Brain for Kids

- The neurons in your brain make enough electicity to generate a lowwatt light bulb.
- Your neurons are joined by tiny pathways or roads. When you do something a lot – like ride your bike – the pathways in your brain that send messages about bike riding are strengthened. This is sort of like a walking path that you walk on every day.
- If you don't do something very often, the pathways become weak. Imagine an old pathway filled with grass and weeds. Practice really does make perfect because it strengthens neural pathways. If you're not good at something, start practicing! Chances are, you'll get better!
- Your brain sends more messages everyday than all the phones in the world. Now that's a lot of texting!!
- Messages can fly from the nerves in your body to your brain at more than 150 mph. Whew!
- Exercising can make you smarter! When you exercise, blood flow to the brain is increased. Your brain also releases hormones that can help you learn. So, get moving to get smarter!!

Station 14 Do-it-Yourself Thinking Cap

Purpose

To create a hat "map" that shows the different parts and functions of your brain!

Performing the activity

You will need two pages: 1 right brain pattern and 1 left brain pattern.

- Cut out each hemisphere along the edges.
- Next find each white triangular section. You will need to cut **cut on the solid lines** for each of these sections.
- Apply glue to the white part of each triangular section and fold the patterned part over it to form a small curve. You must hold each of these sections firmly in place until the glue stiffens. This could take some time!
- After the gluing process is complete you are ready to tape the two brain hemispheres together. Begin by turning the hemispheres upside down. Important: Be sure that the temporal lobe sections are pointing up. (When finished with the hat the temporal lobe sections will sit right above your ears.)
- Without overlapping the paper begin taping the two hemispheres together, first applying tape in the center. Continue taping the edges together, on both sides.

Station 15 Safety Smarts

Source: Eric H. Chudler, Ph.D. University of Washington https://faculty.washington.edu/chudler/brainfit.html

Neuroscience for Kids



Brain Fitness - Your Guide to Good Brain Health

IMPORTANT: You are born with just about all the neurons (nerve cells) that your brain will ever have^{*}. Damaged brains are NOT easy to fix. Here are some suggestions for good brain health.

1. Wear your seat belt!

In a car, truck or airplane, your seat belt will help protect your head and brain from injury. Motor vehicle accidents are by far the greatest causes of brain injuries, accounting for 37-50% of all brain injuries.



(Statistic from Amer. J. of Diseases of Children, Vol. 144, pages 627-646, 1990 and <u>Brain Injury Association USA</u>)

2. Wear your helmet!



Whether you are <u>biking</u>, skating or skateboarding, your helmet will protect your head if you fall. Make sure that your helmet meets or exceeds the American National Standards Institute (ANSI) and Snell Memorial Foundation standards for safety.

Head injury is the most common cause of death in bicycle crashes accounting for 62% of all bicycle-related deaths. (*Statistic from Morbidity and Mortality Weekly Report, Vol. 44, No. RR-1, pages 1-17, 1995*)



3. Stay away from illegal drugs!

<u>Drugs alter brain function</u> - no question about that. Although damage done by some drugs can be reversed, some drugs may change brain function permanently. Why take the



4. Know the risks involved with sports!

This applies mainly to boxing, football and the martial arts. However, even <u>soccer</u>, climbing, horseback riding, diving and skiing have risks. Always wear your safety equipment properly and be in good physical condition for your sport.

In the United States in 1987 and 1988, 92,763 emergency room visits were made for injuries related to horseback riding. 18.9% of these visits were made due to injuries to the head and neck. (*Statistic from Morbidity and Mortality Weekly Report, Vol. 39, no. 20, pages 329-332, 1990*)

Did you know?



Each year there are about 300,000 brain concussions that occur during sports activities. This statistic from the Center for Disease Control.

5. Look before you leap!



I know it sounds impossible, but people DO dive into swimming pools without water. Dive only in the deep end of the pool and make sure that the water in the lake and at the beach is deep enough to dive in head first. Also, be aware of any objects, such as large rocks, that may be hidden under the water.

There are up to 1,000 spinal cord injuries each year in the United States when people dive into swimming pools or other bodies of water - (*Statistic from Morbidity and Mortality Weekly Report, Vol. 37, no. 30, pages 453-454, 1988*)



6. Look both ways before crossing the street!

I know that you have heard this one before, but accidents do happen and you can't be wearing your helmet all the time.

7. Stay away from guns!



I don't think I have to explain this one.

Firearms were the second leading cause of injury-related deaths in 2002. A total of 30,242 firearm-related deaths were reported in the United States in 2002. (*Statistic from <u>Centers for</u> <u>Disease Control and Prevention</u>)*

8. Make sure you have a "good" surface around your playground equipment!



Just in case you <u>fall off of a climber</u>, a soft impact-absorbing surface will cushion your drop.

In the United States from 1983-1987, 66.5% of the school playground-related injuries involved the head and neck. (*Statistic from Morbidity and Mortality Weekly Report, Vol. 37, no. 41, pages 629-632, 1988*)



9. Eat right!

Your brain needs energy to work its best.



10. Dispose of chemicals properly!

Many chemicals, such as pesticides and cleaners, contain neurotoxins that can kill nerve cells and damage nerves. These dangerous chemicals can be found in your home or at places of work. Dispose of these materials properly!