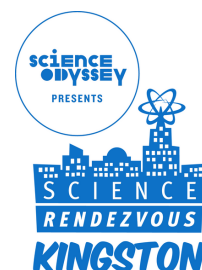


# SCIENCE RENDEZVOUS 2021



**CHILD and  
ADOLESCENT  
DEVELOPMENT**  
Queen's University



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# WANT TO PARTICIPATE IN STUDIES?



**WHO** can participate?

Infants  
Children  
Adolescents  
Families

**WHAT** types of activities?

Games  
Videos  
Surveys  
Conversations

**WHERE** do you participate?

Online via video chat or  
secure websites  
In-person at Queen's  
University

**HOW** can you participate?

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OR visit:  
<https://www.queensu.ca/psychology/devstudies>

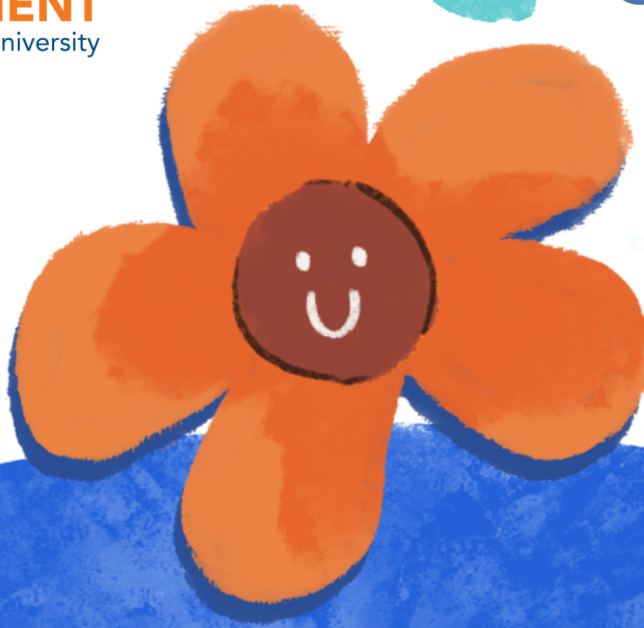


**CHILD and  
ADOLESCENT  
DEVELOPMENT**  
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Games

Stories

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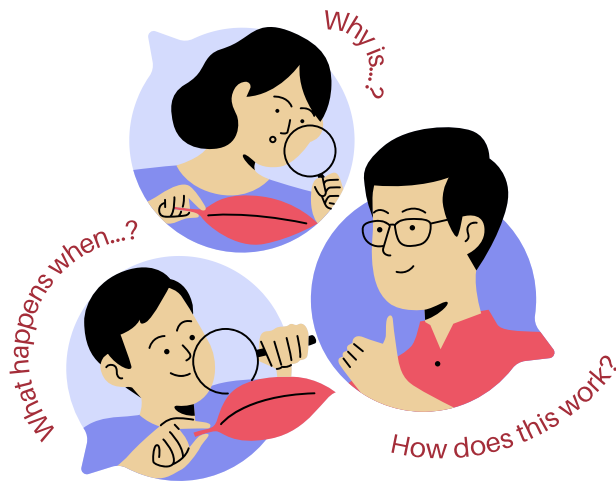


# PSYCHOLOGISTS ARE SCIENTISTS



# THINK LIKE A SCIENTIST!

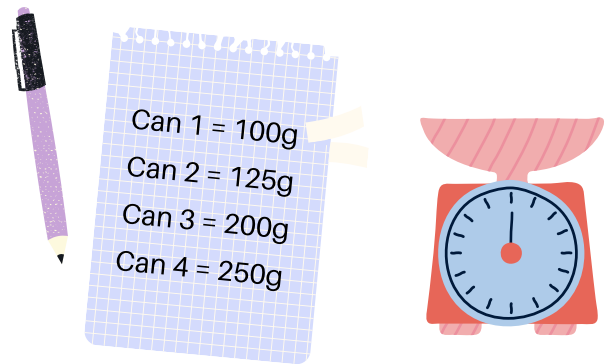
Scientists ask questions



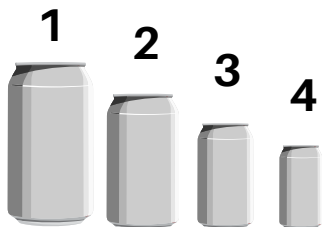
Scientists test  
**predictions** by  
doing **experiments**  
and making  
**observations**

Let's think like a scientist!

Question, predict, experiment, and observe!



Which can is the  
heaviest?



I predict that the  
largest can (#1) is  
the heaviest!



Looks like my  
predictions were  
wrong... the smallest can  
(#4) is the heaviest!



What do you think? Why might the  
small can be heavier than the large can?

# PSYCHOLOGISTS ARE SCIENTISTS

Psychologists ask **questions** like...

*How does the brain work?*

*How do we learn math, language, physics, art...?*

*How does our past affect our future?*

*What makes humans special?*

*How do we promote healthy development?*

Psychologists test **predictions** by doing **experiments** and making **observations**.



The activities in this book help you  
to think like a psychologist.

# MISSING METHODS

Here are just three of the *many* methods that psychologists use in their research - but, oh no! Each word is missing important letters! We've gathered all the missing letters here - can you figure out where each one goes?

[A C O R S T W]



I N ○ E R V I E ○

This machine is an MRI. That stands for: *Magnetic Resonance Imaging*

B ○ A I N  
S ○ A N



O B ○ E R V ○ T I ○ N

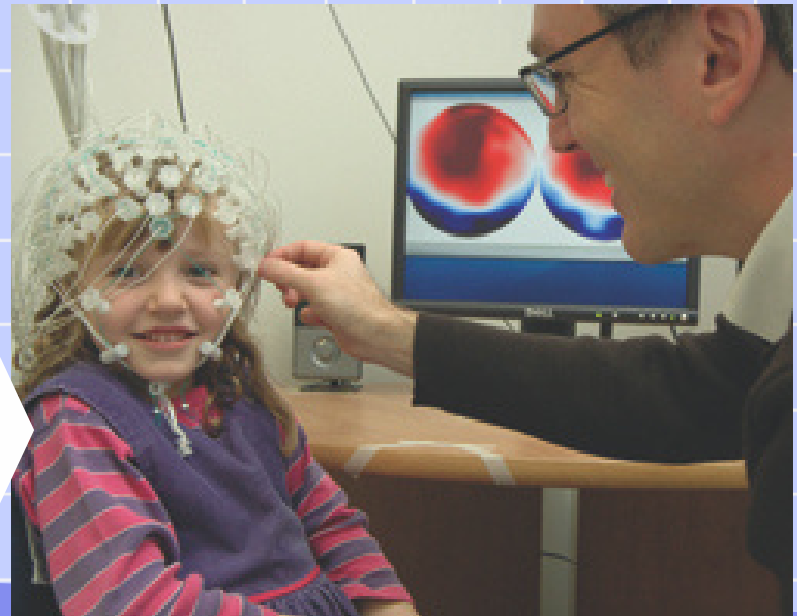
- 1) Interview
- 2) Brain Scan
- 3) Observation



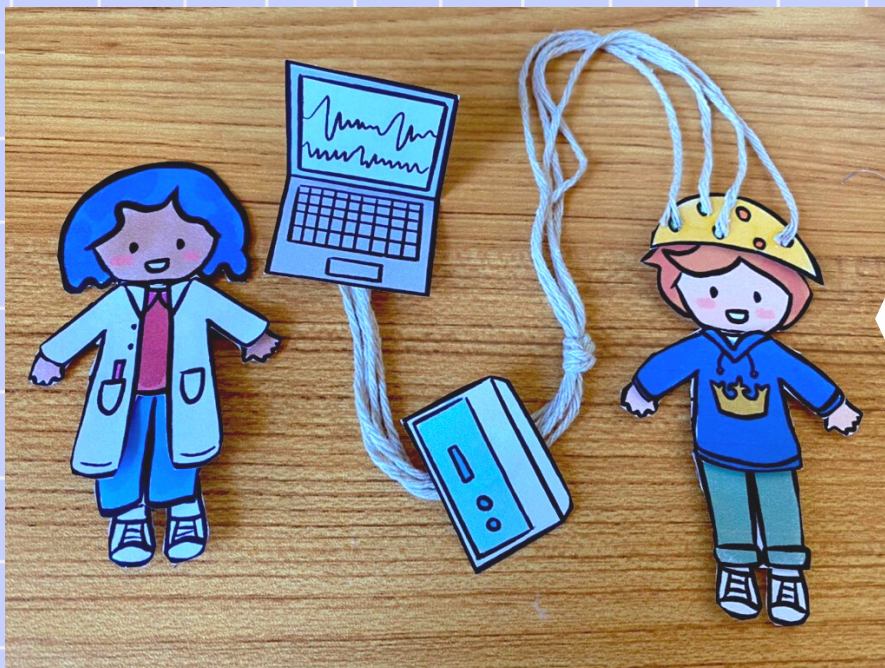
# Build your paper scientist

## THE EEG

Another method that psychologists can use in their experiments is **electroencephalography** (or **EEG**). In this method, scientists use a cap with little electrodes to measure brain activity.



With EEG, psychologists can observe how brain activity changes - while you are sleeping, learning, talking, etc.



In the next activity, you are going to build your own EEG lab to play!

# Build your paper scientist

1

Print the next page making sure to extend it to the whole paper sheet.



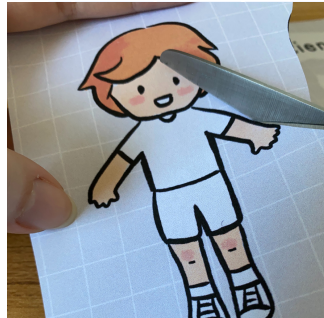
2

Use your favourite colouring materials and your creativity to give the clothes and gadgets your own style!



3

Cut out the drawings around the outer black lines - don't forget the flaps - they will hold clothes on the characters!



4

Decide which character will be the scientist and which will be the participant. Fold the clothing flaps behind them.



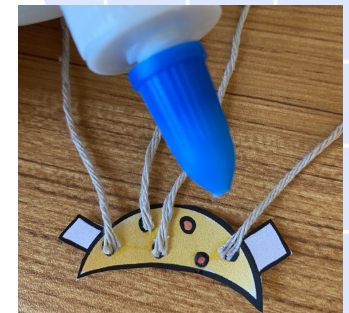
5

Fold the computer in the middle, so it looks like a tiny laptop!



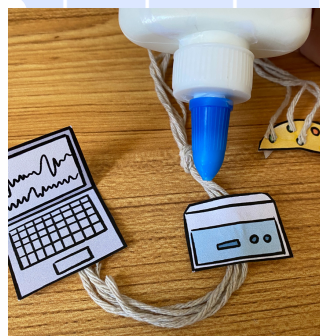
6

Glue some pieces of string to the EEG cap - they will look like wires!



7

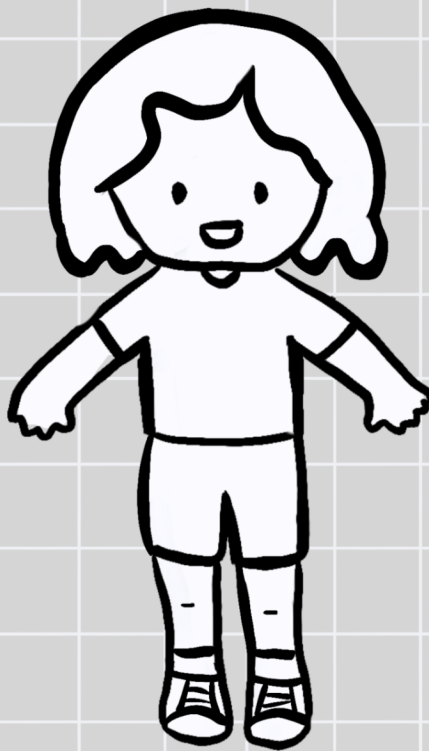
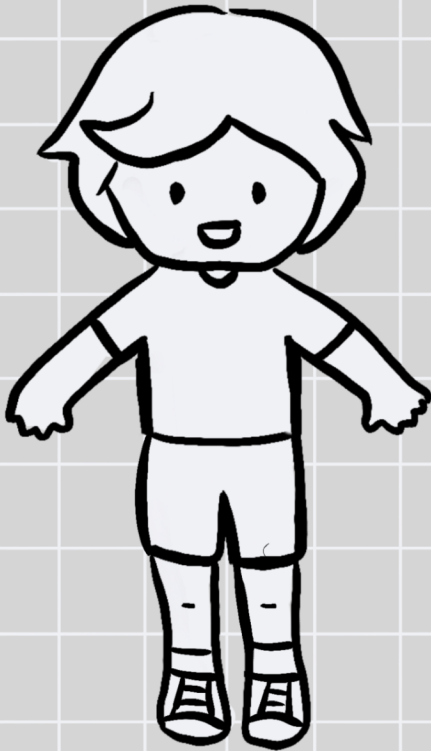
Glue the strings to the back of the laptop and gadget to complete the scientist's EEG equipment. Put the cap on the participant.



You're ready to play!

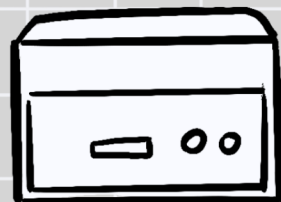
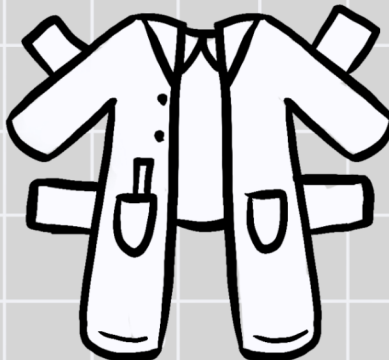
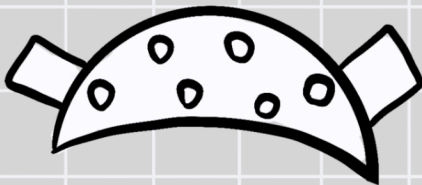


# Build your paper scientist



You will need:

- Scissors
- Coloured pencils, markers or crayons
- Pieces of string
- Glue





# Psychologists study **THE BRAIN**

This wrinkly organ inside our head is so amazing and powerful! The brain controls all the functions in our body, and with such great responsibility comes a lot of complexity. We need scientists to better understand how the brain works and what makes it special.



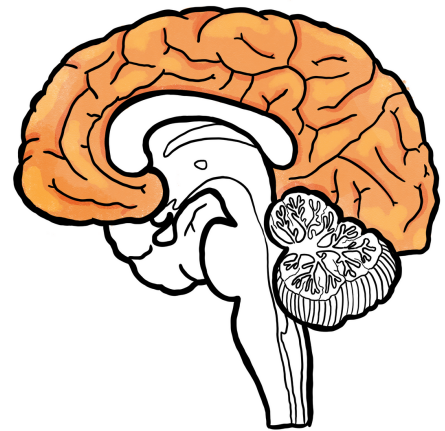
# Psychologists study **THE BRAIN**

## Parts of the Brain

### **1. CEREBRUM**

(say: suh-REE-brum)

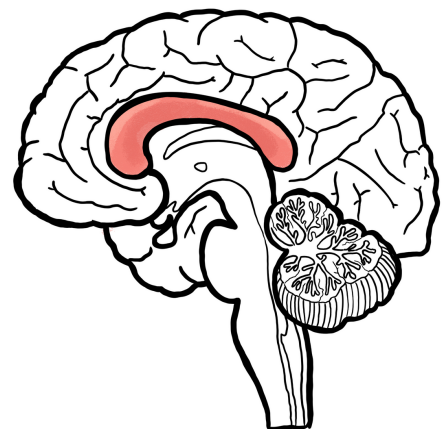
The Cerebrum is the largest part of the brain. It is the thinking part of the brain. It stores your memories and lets you learn and feel emotions. The Cerebrum also controls your voluntary muscle movements – like the movements that let you dance or speak! The cerebrum has two halves that we call ‘hemispheres’: the right hemisphere and the left hemisphere.



### **2. CORPUS CALLOSUM**

(say: KOR-pus ka-LOW-sum)

The Corpus Callosum is a thick band of nerve fibers that connects the two halves of the brain. It's a bridge for information to travel from one hemisphere to the other.



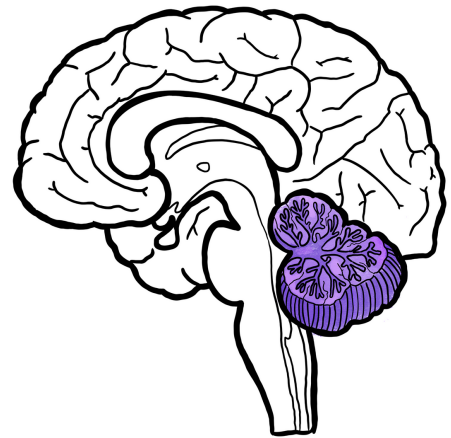
# Psychologists study **THE BRAIN**

## Parts of the Brain

### **3. CEREBELLUM**

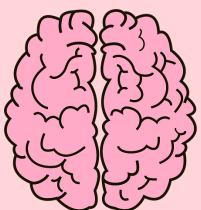
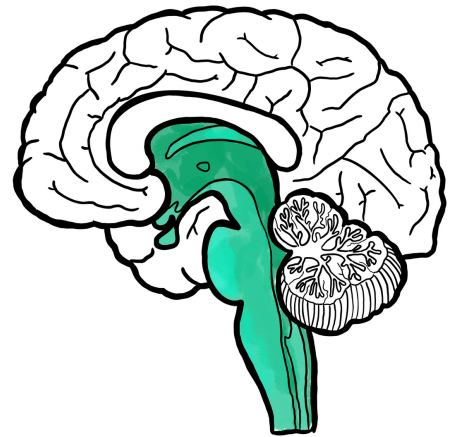
(say: sair-uh-BELL-um)

The Cerebellum is at the back of the brain and controls your balance, movement, and coordination. It lets you ride a bike or skate!



### **4. BRAIN STEM**

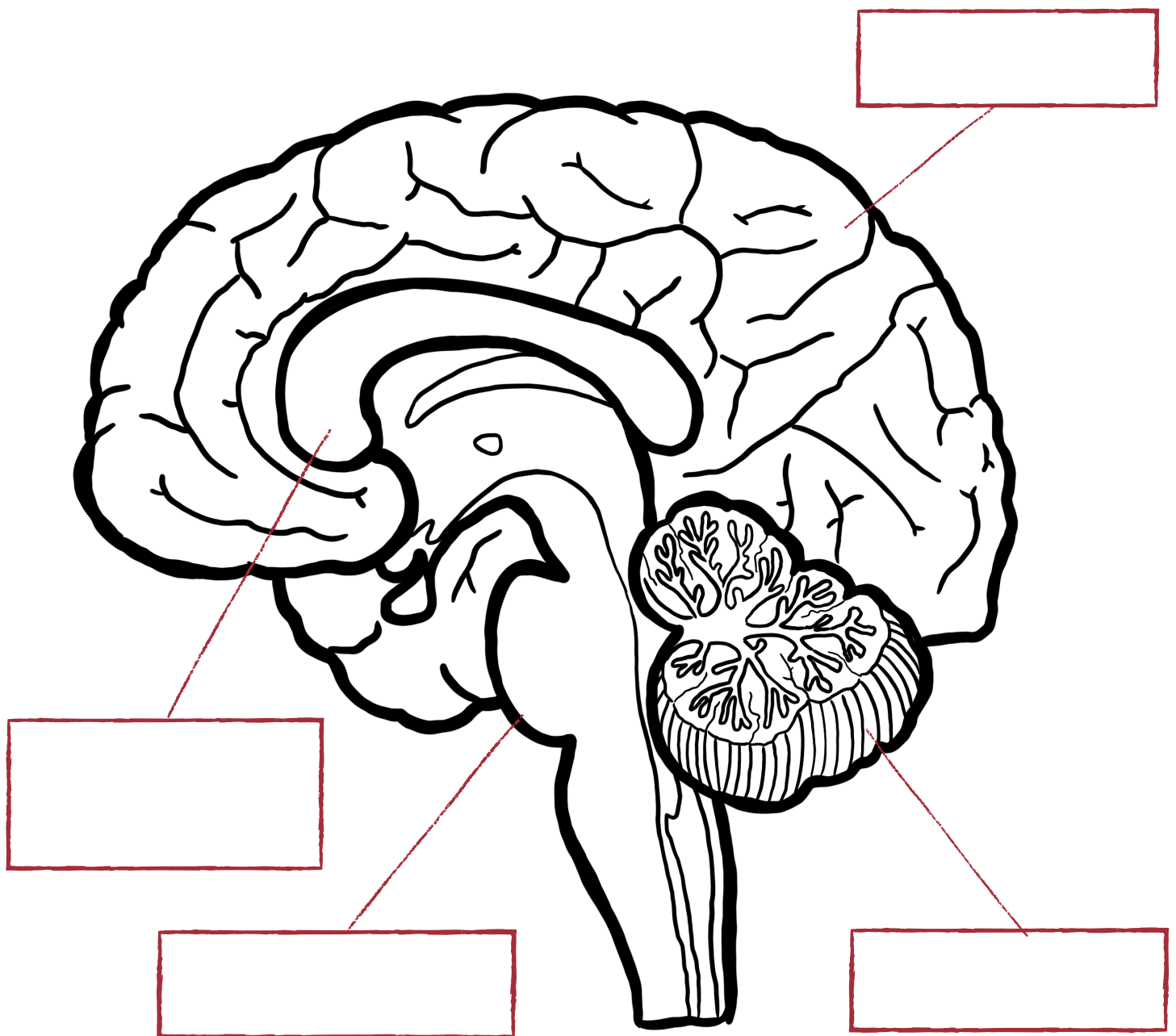
The Brain Stem connects the brain to the spinal cord. (The spinal cord is a bundle of nerves that is protected by your spine and is the main pathway for information to travel from the brain to the rest of the body). The Brain Stem is important for many of your basic body functions, like breathing and swallowing.



Note: In the pictures above, we 'sliced' the brain to take a look at the inside. The complete brain is formed by two halves - the hemispheres -- like this picture on the left.

# Psychologists study **THE BRAIN**

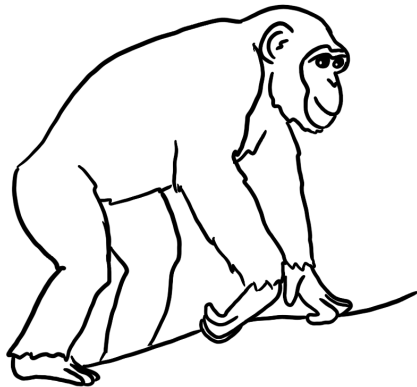
Now it's your turn!  
Colour and name the parts of the brain



# Psychologists study THE BRAINS OF OTHER ANIMALS

Psychologists also study the brains of other animals, to compare them to the human brain. Here are some of the animals that psychologists study. Can you guess which brain belongs to each animal?

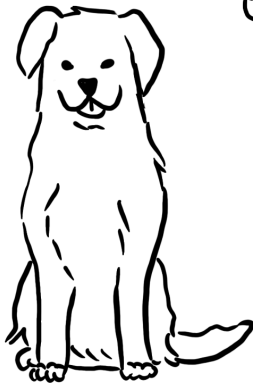
**Chimpanzee**



**Mouse**



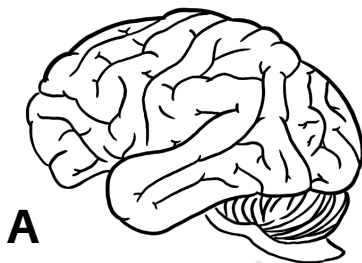
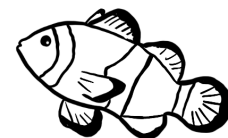
**Dog**



**Songbird**



**Fish**



**B**

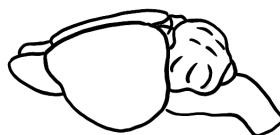


**D**

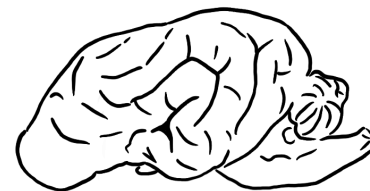


**A**

**C**



**E**



Answers: Chimpanzee (A), Mouse (C), Dog (E), Songbird (D), Fish (B)



# WHAT DO YOU KNOW ABOUT THE BRAIN?

Try out these 6 trivia questions and see how well you know the brain. When you are all done, make sure to check your answers on the next page.

(But, no peeking!)

1

True or False: The brain is the control centre of the nervous system.

2

The \_\_\_\_\_ is the biggest brain structure.  
(Hint: Look back at the brain colouring page!)

3

How much does an average adult brain weight?  
a. 7 lb/3.2 kg   b. 5 lb/2.3 kg   c. 3 lb/1.4 kg   d. 1 lb/0.5 kg

4

True or False: The brain has a million nerve cells called *neurons*.

5

How many hemispheres does the brain have?  
a. 1   b. 2   c. 3   d. 4

6

What are two examples of things we can do to take care of our brains?  
(Hint: There are lots of right answers!)



# WHAT DO YOU KNOW ABOUT THE BRAIN?

## ANSWERS

1

**True:** The brain helps you do lots of things like eat, talk, move, and learn!

2

The **cerebrum** is the biggest brain structure. It makes up about 85% of the brain.

3

**C:** The average adult brain weighs **3 lb/1.4 kg**

4

**False:** The brain actually has *billions* of neurons!

5

**B:** The brain has **2** hemispheres: the right hemisphere and the left hemisphere

6

**Possible answers:** Get enough sleep, eat balanced meals, exercise and play, wear a helmet when biking and skating, spend time with friends and family, do creative activities, learn new ideas, and many more!





Psychologists study

# **HOW WE SEE THE WORLD**

We experience the world through five main senses – we see with our eyes, hear with our ears, smell with our noses, taste with our tongues, and feel with our fingers. But our senses can sometimes fool us! What we see, hear, smell, taste, and feel may be different from what it's like in the real world...

# Psychologists study **THE FIVE SENSES**

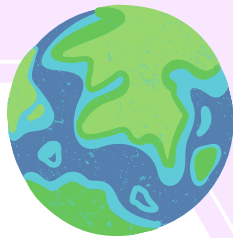
## Word Search

Can you spot the five senses?

E	R	Y	O	L	T	A	H	T	W
T	K	R	T	M	S	I	G	H	T
S	M	Z	R	N	L	Q	Y	B	S
A	P	N	E	L	W	Z	T	Q	E
T	X	D	E	T	H	S	O	W	C
F	O	M	S	R	D	N	U	O	S
P	S	D	Q	P	B	E	C	D	E
W	C	A	T	E	M	T	H	L	S

The five senses are: sight, sound, smell, taste, touch

**Test your senses at  
these links:**



[https://www.youtube.com/watch?v=\\_SHFwmPQ\\_rQ](https://www.youtube.com/watch?v=_SHFwmPQ_rQ) [Hearing]

<https://www.xrite.com/hue-test?PageID=77&Lang=en> [Vision]

## Guess That Flavour!

Here's a fun experiment you can do with a partner. You just need different flavours of jelly beans!

- Step 1: When your partner isn't looking, pick out five or more jelly beans.
- Step 2: Tell your partner to close their eyes and pinch the nostrils of their nose (so they can't see or smell anything!)
- Step 3: Give your partner one jelly bean at a time and ask them to guess the flavours, just by tasting them.

With their eyes closed and nose blocked, your partner is probably going to get a lot of the flavours wrong! Why? Because our sense of taste is helped a lot by our sense of smell.

What do you think - do your other senses work together too?

# How Fast Can You Go?

Here, we have two versions of the "Stroop Task" from Psychology research.

The first version is below - it uses words, so it will likely be most fun for school-aged children and adults.

The second version is on the next page - it uses pictures of objects, so it can be played by preschool children and early readers.

We explain the science behind this game on the next page!

## Word Stroop Task

Your job is to name the *colour* of each word, from left to right, as fast as you can. Use a timer to see how long each box takes you.

**YELLOW**   **RED**   **GREEN**   **BLUE**   **GREEN**  
**PURPLE**   **ORANGE**   **BLUE**   **YELLOW**   **RED**

Time:

**GREEN**   **ORANGE**   **YELLOW**   **RED**   **BLUE**  
**PURPLE**   **RED**   **BLUE**   **YELLOW**   **GREEN**

Time:

**BOOK**   **SQUARE**   **CHAIR**   **THREE**   **ONE**  
**CIRCLE**   **FLOWER**   **PAPER**   **TWO**   **OVAL**

Time:

What was your fastest time? Which box was the hardest?

Why do you think that is?



# Picture Stroop Task

Your job is to name the *colour* of each picture in a line, from left to right, as fast as you can. Use a timer to see how long each line takes you.



Time:



Time:



Time:

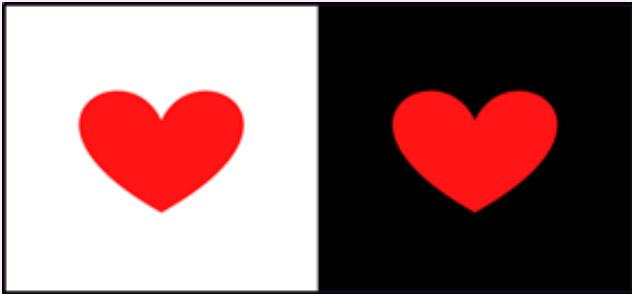
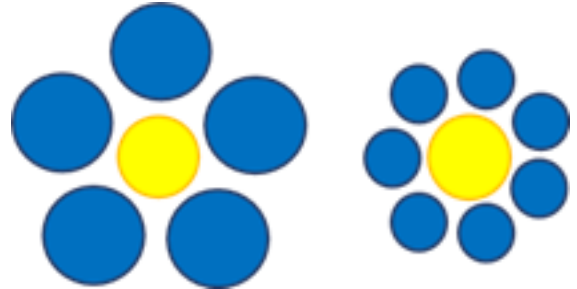
## The Stroop Effect

For many people, the top line of the Stroop task is much easier than the middle line – their first time is the fastest and their second is the slowest. You'll notice in the top line that all of the colours match with the pictures/words. It's easier for you to come up with those colour names because your brain already has them in mind (it thinks: 'apples are red'; 'those letters spell out orange'). In the middle line, the colours *don't* match. That means your brain has to fight with what it sees – it wants to say the colour the pictures should be (apples aren't purple!) or read what the letters spell out.

Can you guess what your brain is doing in the bottom line? Well, shapes don't usually have colours linked with them – a square or circle can be any colour. So, your brain does not get confused like it does when you see a blue banana. The Stroop task shows how our senses – and what we've learned in the past – can change how we think!

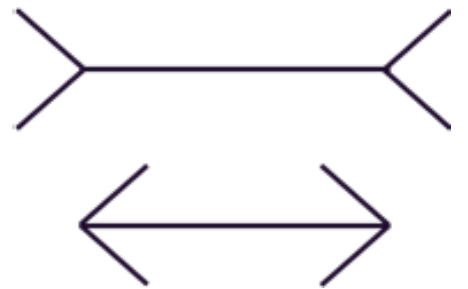
# Psychologists study **ILLUSIONS**

Which flower has the biggest yellow circle at its centre:  
the one on the left or the one  
on the right?



Which heart is a lighter/  
less vibrant shade of red:  
the one on the left or the  
one on the right?

Which line is longer:  
the one on the top or  
the one on the  
bottom?



## ANSWERS:

The correct answer to all three of these questions is: *neither*. Both circles, hearts, and lines are exactly the same! Don't believe us? Print this page and cut them out to check!

When you look at it again, even knowing that they're the same, they still look different, don't they? That's because your brain compares them to their surroundings. The small circles make the centre one on the right look bigger, arrows pointing out make the line on top look longer, and a dark background makes the heart on the right look lighter/less vibrant! Context can change what we see!



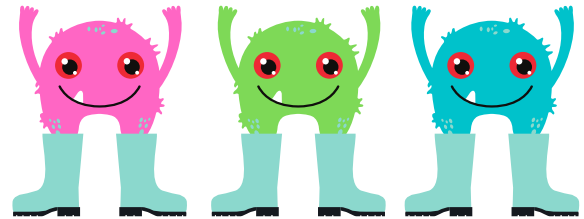
# Psychologists study **HOW WE THINK AND LEARN**

Psychologists explore the mind. They study how it works, like how we remember information, learn, and solve problems. They study how parents and teachers influence our learning. They also study the minds of other animals in order to better understand our own. This section will provide you with activities, reflection questions, and comics to help start your journey to becoming a mind-explorer!

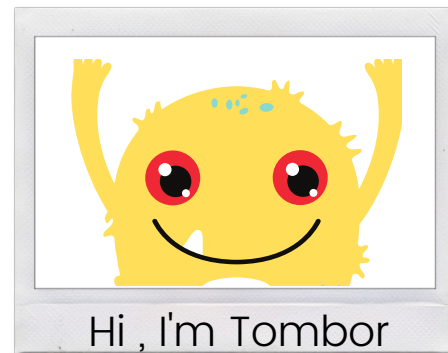
# Psychologists study **PROBLEM-SOLVING**

For this activity, read the story, circle "yes" or "no" to answer the question, and explain your answer in the lines provided.

All poggops wear blue boots.



Tombor is a poggop.



Does Tombor wear blue boots?

**YES**      **NO**

Explain your answer

---

---

---



To solve this problem, we need to use *deductive reasoning*. We use information from the story to answer the question. As long as the information is true, we can answer the question logically, in a way that makes sense.

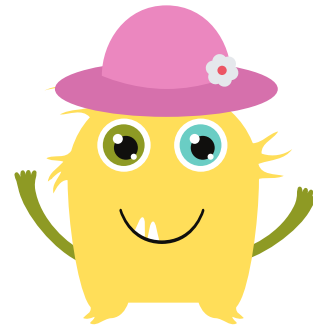
# Psychologists study **PROBLEM-SOLVING**

For this activity, read the story, circle "yes", "no", or "maybe" to answer the question, and explain your answer in the lines provided.

Danu is a regli



Danu wears a pink hat



Do all reglis wear pink hats?

**YES NO MAYBE**

Explain your answer

---

---

---



To solve this problem, we need to use *inductive reasoning*. We cannot simply use information from the story. Instead, we have to think beyond the information we were given to come up with an answer. And, our answer may not feel certain to us.

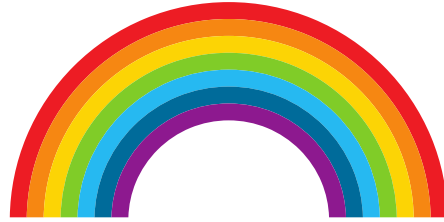


# Psychologists study **MEMORY**

Remembering the colours of the rainbow in order can be quite hard:

**RED, ORANGE, YELLOW, GREEN, BLUE, INDIGO, VIOLET**

Instead of memorizing all those words, remembering this name might help with your memory:



**ROY G BIV**



- This is called an *acronym*. To make an acronym, you take the first letter of each word and combine them to make a new word that is easier to remember.
- You can even turn it into an *acrostic* by turning the first letter of each word into new words that combine into a memorable phrase:

**RICHARD OF YORK GAVE BATTLE IN VAIN**

Can you make acronyms or acrostics to remember the words in these lists?

- The 8 planets in our solar system
- The 5 great lakes
- The 10 Canadian provinces

# Psychologists study **WHO HELPS YOU LEARN?**

For this activity, we are reflecting on who helps us learn:

- 1) In the "ME" circle, write or draw all the things you love to learn about: art, sports, science...
- 2) In the "HOME" circle, write or draw everyone at home who helps you learn those things.
- 3) In the "SCHOOL" circle, write or draw the teachers and friends who help you learn.
- 4) In the "COMMUNITY" circle, write or draw *anyone* or *anything* in your community that helps you learn: community programs, news, social media...

**COMMUNITY**

**SCHOOL**

**HOME**

**ME**



Psychologists are interested in how we learn from the people around us. Our world contains people who are directly related to us or that we see every day and have the greatest impact (family, friends, teachers). There are also many people we don't talk to as often (other people in our neighbourhood, city, or country).

# Psychologists study

## HOW THE ENVIRONMENT INFLUENCES LEARNING



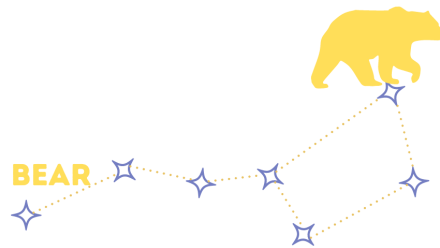
What we learn is influenced by what is around us. This fact is true even for how we learn new words. As you read through this comic, ask yourself: How do you learn words?

### LEARNING WORDS FOR THE OBJECTS AROUND YOU

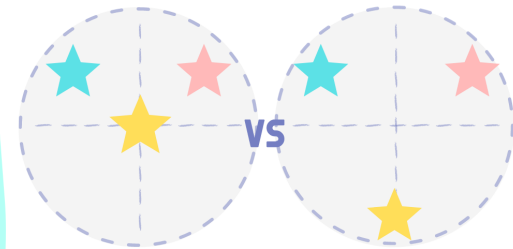
[@earlyexperiencelab](#)



Learning new words often means that you have connected a new name to an object.



When you were a toddler, you learned words for objects better when the objects were placed right in front of your eyes, rather than off to the side.



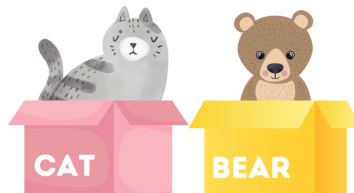
When an object was right in the center of your sight, you paid more attention to it – and you learned more.

When you were a toddler, you learned the name of soft or goopy things better (like oatmeal or pudding) when you were sitting in a highchair.

Why? Because you encountered that type of object more when you were eating.



When you were little – and probably even now – you learn new words better when the object is in the same place the first few times it is labelled.



Once you know it well, the object can be anywhere, and you'll still know its name.

### TAKE-AWAYS



- The world is full of objects.
- We learn the names of these objects pretty quickly.
- How fast we learn them often depends on where they are in our environment.

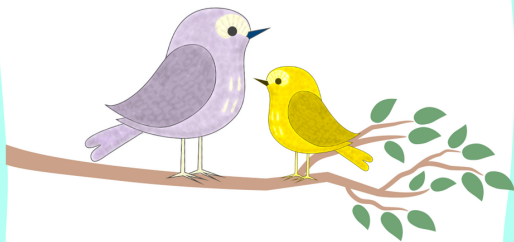
# Psychologists study **ANIMAL LEARNING**



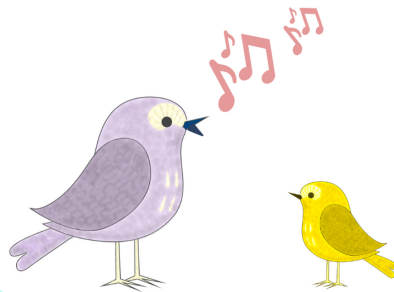
In order to better understand human learning, psychologists can also look at how animals learn. For this section, we present two comic strips. As you read through them, ask yourself: How does animal behaviour compare to human behaviour? What are the differences and similarities between humans and animals?

## HOW DO SONGBIRDS LEARN THEIR SONGS?

[@earlyexperience](#)



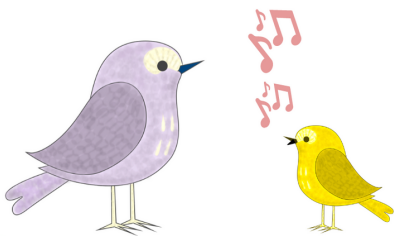
Young birds learn songs by listening to the songs of older birds.



The songs of young birds are not very good though. Young birds first make a "subsong" that is similar to when a baby starts to babble.



With some practice, though, birds start to perform songs that sound a lot like the songs of the adults around them.

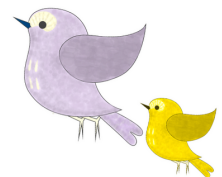


Male songbirds use these songs to defend their territory and attract mates.



## TAKE-AWAYS:

- Birds are not born knowing songs – just like humans are not born knowing words. Birds have to learn songs from others, and it takes practice!



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## How do Police Dogs learn to do their job?

[@socialcognitionlab](https://socialcognitionlab.com)



For thousands of years, dogs have helped humans with tasks like:



Guarding sheep and crops

Assisting people with day to day tasks



Locating objects and missing people.

Dogs are able to work alongside of us because they are great learners...



...and have an amazing sense of smell!

One way that dogs can learn is when we reward them for behaviours, like sitting when we say "Sit".

Sit!



Good dog!

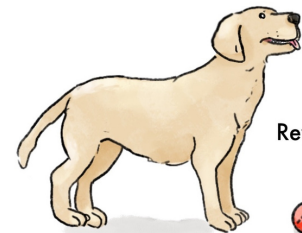


This is called positive reinforcement.

Here are 4 basic steps we can use to train dogs to help us, by using their nose to find objects or people.

1. Associating a marker (a word or sound) with a reward. We present the reward and the marker together over and over again.

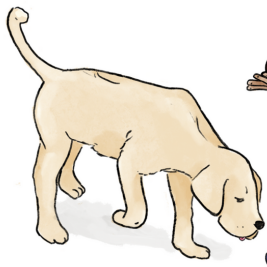
Ok!



Reward

2. Learning to sniff for the important odor. We use the marker and give the reward when the dog sniffs the odor (positive reinforcement).

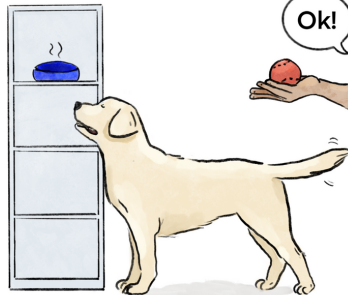
Ok!



New Odour

3. Learning to find the odor. The odor is moved to many different locations.

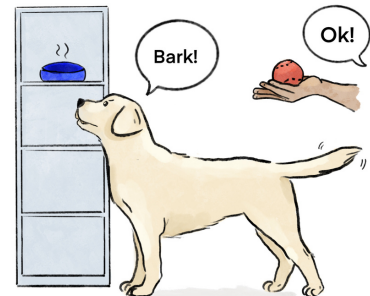
Ok!



4. Learning to communicate their find with their human partner. The marker and reward are only given after the dog does a behaviour like sitting or barking.

Bark!

Ok!



Once the dog learns how to communicate with their human partner, they are ready to apply these skills to real life situations!

Want more information? Check out this paper in Frontiers for Young Minds:

<https://kids.frontiersin.org/article/10.3389/frym.2020.00109>

# Certificate of Achievement

This is certify that

.....

has completed the activity book



Date: .....

Signature: .....