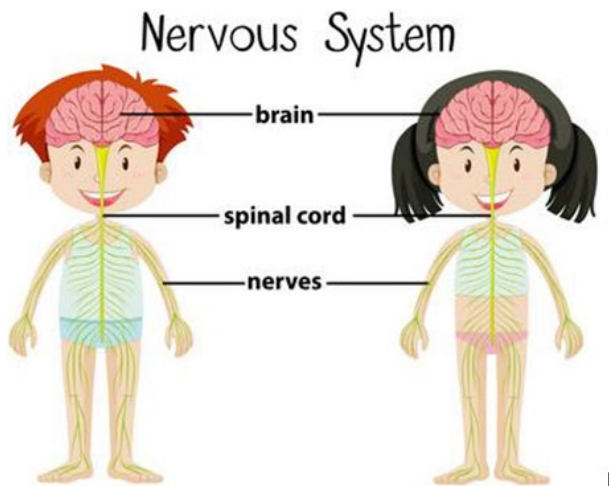
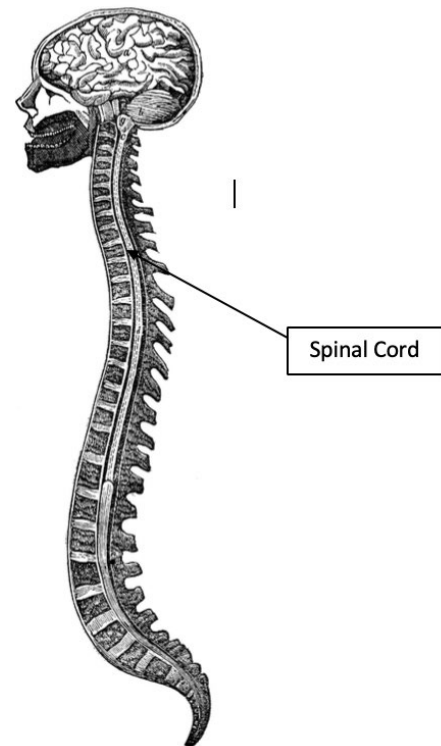


**The Nervous System – Part 2**

**The Spinal Cord**

The **spinal cord** is a bundle of nerves that go to and from the brain. It is enclosed in and protected by the spinal column, which is a series of bones joined together.

Your spinal cord is connected to your brain stem and is essential in **transporting messages** from your body to your brain. It is essentially the highway for communication between the body and the brain. When the spinal cord is injured, the exchange of information between the brain and other parts of the body is disrupted and this can cause major issues!



Check out this video to learn more about that spinal cord and how it transports messages to your brain: <https://youtu.be/L2fYuZW4tg4>

## Neurons

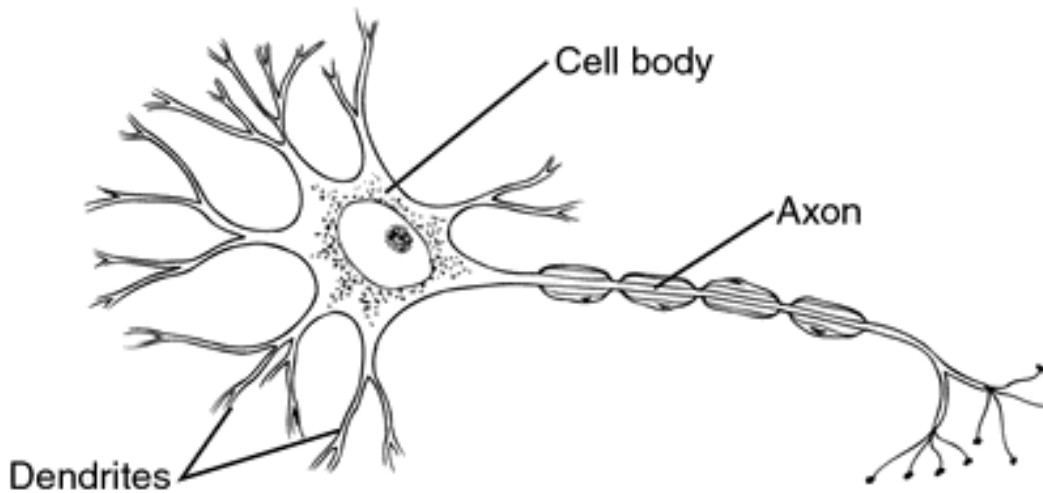
The human body is made up of trillions of cells. Cells of the nervous system called nerve cells or **neurons**, are specialized to carry "messages" through an **electrochemical** process. The human brain has approximately **86 billion neurons**. These neurons transmit information to other nerve cells, muscle, or gland cells. Most neurons have a cell body, an axon, and dendrites.

**Did you know:** Neurons are **the oldest** and **longest** cells in the body! You have many of the same neurons for your whole life. Although other cells die and are replaced, many neurons are **never replaced** when they die. In fact, you have fewer neurons when you are old compared to when you are young.



## Axons and Dendrites

Neurons have specialized cell parts called **dendrites** and **axons**. Dendrites bring electrical signals to the cell body and axons take information away from the cell body (cells have a body, just like humans do!).



Here are some of the differences between axons and dendrites:

#### **Axons**

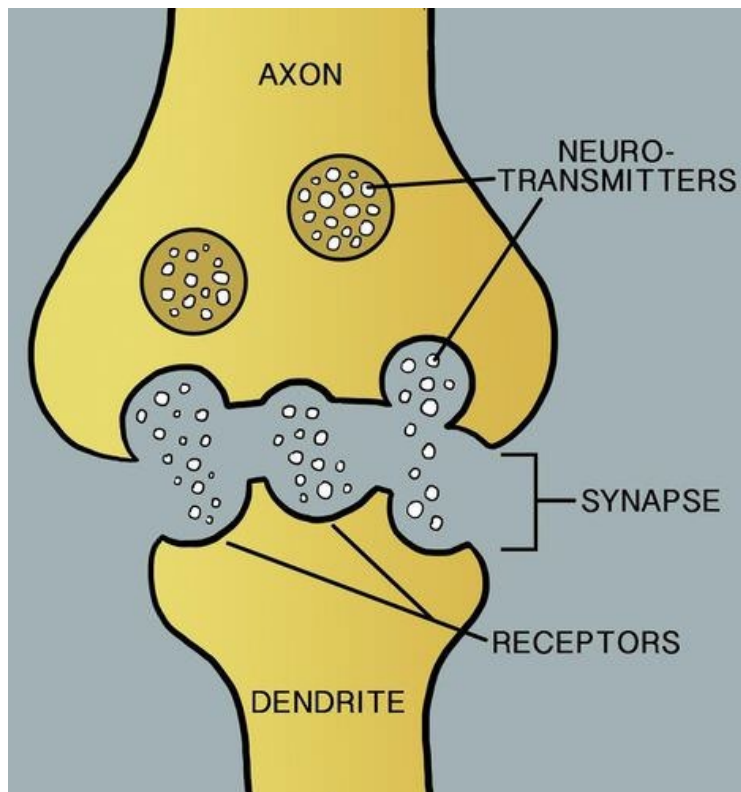
- Take information away from the cell body
- Smooth Surface
- Generally only 1 axon per cell
- Branch further from the cell body

#### **Dendrites**

- Bring information to the cell body
- Rough Surface (dendritic spines)
- Usually many dendrites per cell
- Branch near the cell body

## **Neurotransmitters**

**Neurotransmitters** are special chemicals that your neurons use to talk to each other. They are released from the axon of one neuron into a **synapse**, which is a gap between neurons. **Receptors** on the dendrite of a nearby neuron pick up the neurotransmitter and the message is sent. This is how neurons can communicate with each other without touching!



## Optical Illusions

The brain is sent messages and processes these messages in order to understand the world. But, like everything, your brain can make mistakes! For example, **optical illusions** occur because our brain is trying to interpret what we see and make sense of the world around us. These illusions simply trick our brains into seeing things which may or may not be real. It takes your brain a split second to make a judgment about what you are looking at. Take a look at the image below, what do you see?



The image above actually shows a young woman and an old woman. Can you see both? 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.



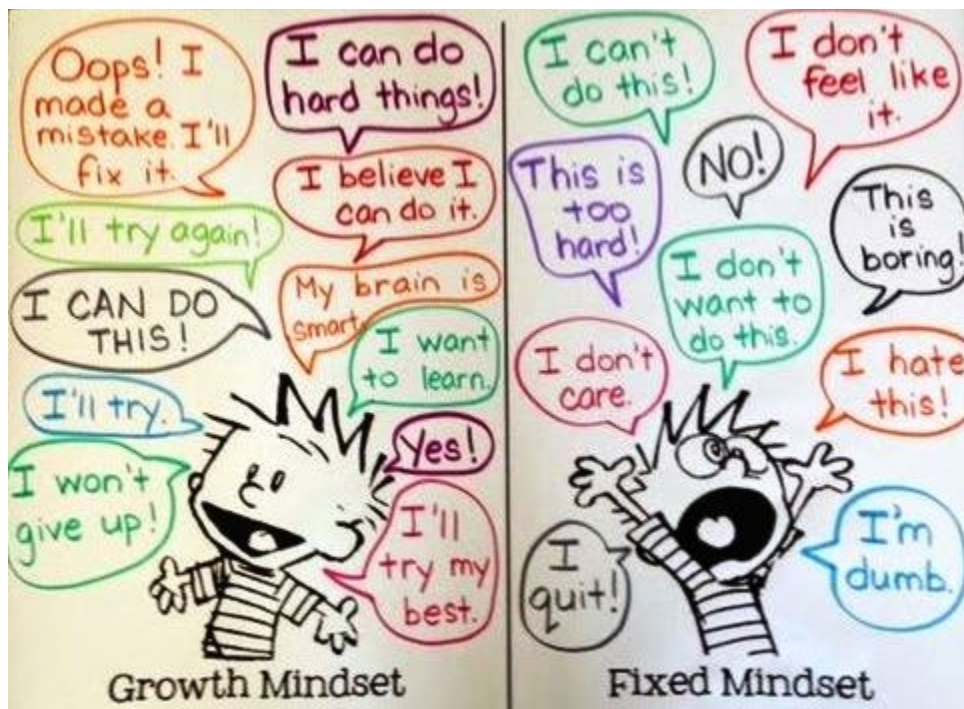
Check out this demonstration of illusions in National Geographic's show **Brain Games**:  
<https://youtu.be/w986vl6uZpU>

## Two Mindsets

Have you ever heard about the power of positivity? Did you know that your thoughts have the ability to control the outcome of things in your life? It's true, positive thinking, or in other words having a positive mindset, is able to influence your life.

The word '**mindset**' is a word that is used to describe your thoughts. The thoughts you have can either be positive, or they can be negative. People who think positively typically have what we call a **growth mindset**. Someone who has a growth mindset is better able to tackle challenges and succeed because they realize that their brain is able to grow, learn and improve at anything they want! Having a growth mindset means knowing that you can *learn* to be *good* at something. People who think mostly negative thoughts typically have a **fixed mindset**. Someone with a fixed mindset will quit things easier and shut down when they fail, instead of practicing to get better since they believe that they can't learn and improve beyond what they already know.

Check out the image below. Can you see the difference between the thoughts of someone with a growth mindset vs. a fixed mindset? Which mindset do you think you have?



So, if you have a fixed mindset, is it possible to adopt a growth mindset? Watch the video below to learn about Carson Byblow, a grade 5 boy and his journey towards having a growth mindset, or as he calls it "the mindset of a champion." Pay close attention to the challenges Carson faced and how he learned the power of the word 'yet'.



The Mindset of the Champion: <https://youtu.be/px9CzSZsa0Y>

Complete the following:

What protects the spinal cord? \_\_\_\_\_

*Video: Operation Ouch – The Spinal Cord*

Watch the video “Operation Ouch – The Spinal Cord” to answer the following questions:

1) What does the spinal cord do?

\_\_\_\_\_

2) In the domino demonstration, each links of dominoes represents:

\_\_\_\_\_

3) What does the myelin sheath do?

\_\_\_\_\_

What are the cells in the nervous system called? How many does a human brain have? \_\_\_\_\_

Compare axons and dendrites.

<b>Axons</b>	<b>Dendrites</b>

What are neurotransmitters?

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What is a synapse? \_\_\_\_\_

In the video *Brain Games - Optical illusions*, why does your brain get tricked in these optical illusions?

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**Video: *The Mindset of a Champion***

Watch the video "The Mindset of a Champion" to answer the following questions:

1) What did Carson struggle with from K-4th grade? \_\_\_\_\_

2) What was the "best advice" that Carson received?

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Sort the phrases provided and organize them into the correct column in the table on the next page.

Is inspired when others do well	Likes to try new things	Embraces a challenge	"This is too hard; I can't do this."
"She's just smarter than I am"	Believes effort helps you learn	"Tomorrow I will get a fresh look at this"	"I'm just not a 'science-y' person"
Can learn from their mistakes	"Mistakes help me improve"	"I can't do this yet, but I will get it eventually"	"I'll never get this"
Gets upset when there is not immediate success	"My effort and my attitude determine my abilities"	Tries multiple approaches	Believes in themselves.

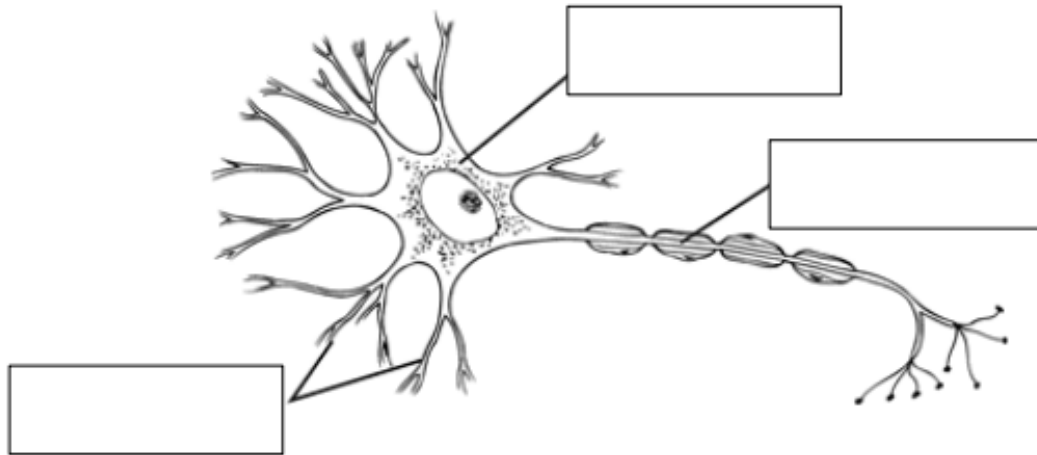
<b>Growth Mindset</b>	<b>Fixed Mindset</b>



Label the neuron:

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- Word Bank**
- Cell body
  - Axon
  - Dendrite



Label 3 main parts of the brain:

- Word Bank**
- Cerebellum
  - Cerebrum
  - Brain stem

