1 INTERACTION

Our senses allow us to appreciate and interact with our environment. We could not survive without them! Our nervous system enables us to interpret the information from the senses and react.

Look and discuss ...

Which senses are being used? How?

1

2

We use our ... to ...

... is being used to ...

3

4

1 taste; 2 sight; 3 smell; 4 sight and hearing;
5 sight and touch; 6 hearing

Song 04
See, hear, touch, smell, taste

DOCUMENTARY
Sensing our world

Investigate

In this unit, you will invent a superhero and make a comic book about the nervous system. To do this, you will:

- learn how our bodies detect and respond to stimuli.
- understand the pathways of the nervous system.
- imagine life without one of your senses and develop empathy and respect for others.
- create a visual and written comic book relating to a sense and a reaction.

HOW DOES A COLD AFFECT YOUR SENSE OF TASTE?

05

By the end of this lesson, you will be able to identify and locate the receptors and organs related to the senses.

Interaction begins with our **sense organs**. These contain **receptors**, which are specialized cells that collect information, known as **stimuli**, from all around us. This information is then passed on to the **nervous system**.

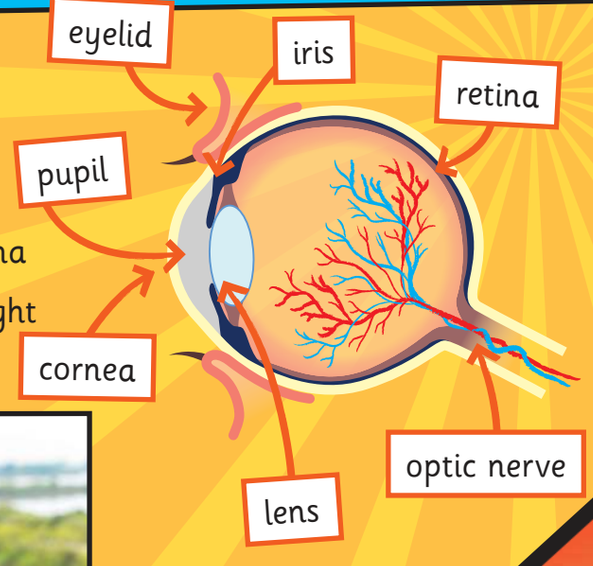
SIGHT

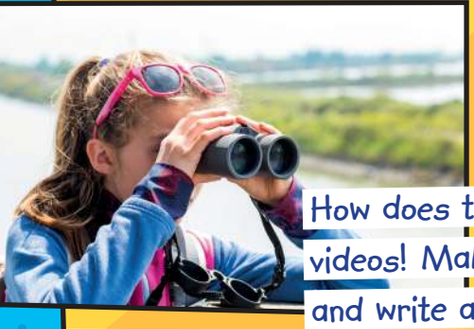
Organ: eye

Receptors: in the retina

Stimulus: reflected light

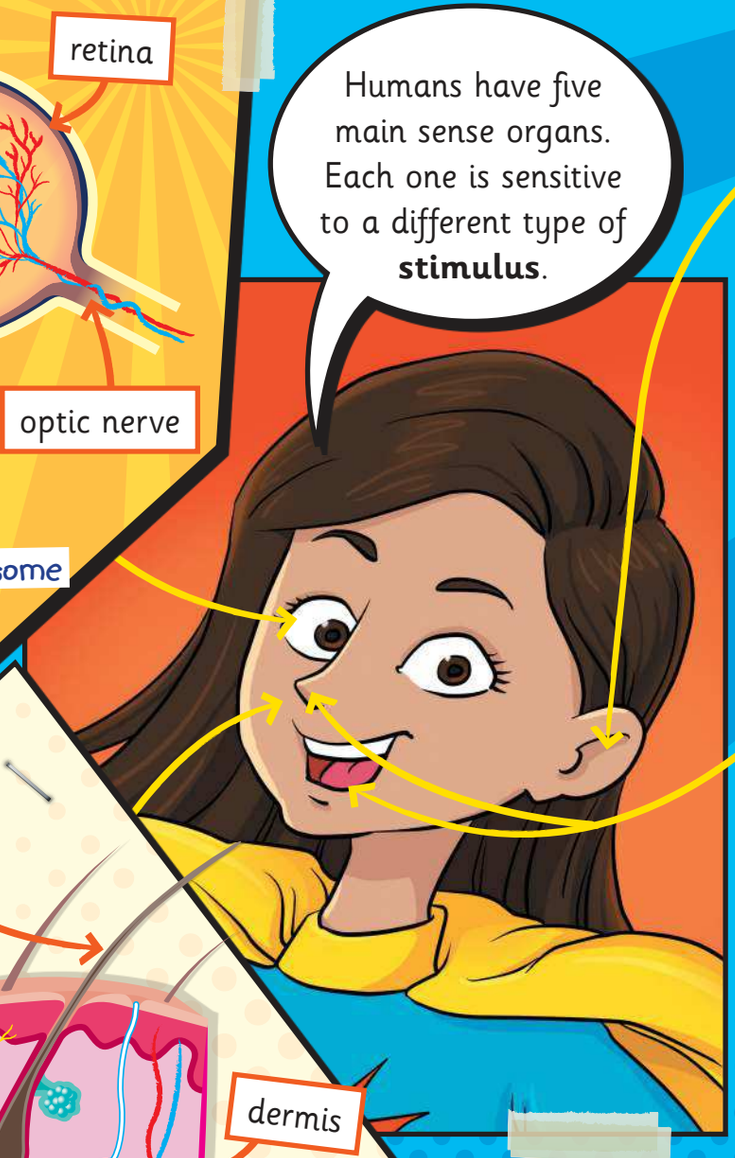
Nerve: optic





How does the eye work? Find some videos! Make a labeled model and write a description.

Humans have five main sense organs. Each one is sensitive to a different type of **stimulus**.



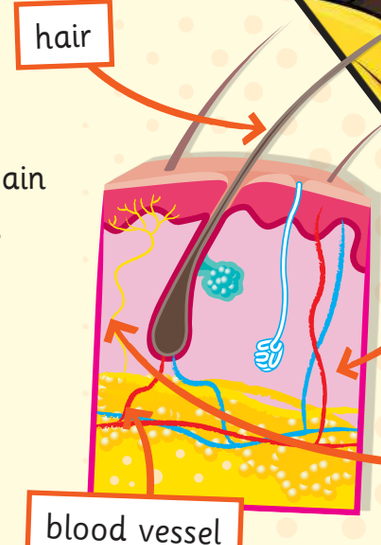
TOUCH

Organ: skin

Receptors: in the dermis

Stimulus: pressure, texture, heat, pain

Nerve: many sensory nerves in the peripheral nervous system



HEARING

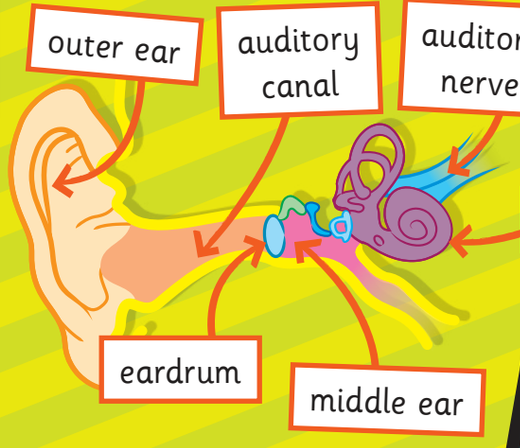
Organ: ear

Receptors: in the cochlea

Stimulus: sound waves

Nerve: auditory

Investigate how sound waves reach the nervous system through the ear.



SMELL

Organ: nose

Receptors: cells inside nostrils

Stimulus: chemicals in the air

Nerve: olfactory

Can you name the different types of taste?

TASTE

Organ: tongue

Receptors: cells in taste buds

Stimulus: chemicals in food

Nerve: gustatory

A lot of what we taste comes from smelling our food. When our nose is blocked, the chemicals cannot reach the receptor cells in our nostrils, which affects our sense of taste as well.

Design and do an experiment to test this!

Investigate STAGE 1

- **Choose a stimulus for your superhero. For example, they see something dangerous or hear someone shouting from far away. This will be their *super sense*.**
- **Find out how humans detect this stimulus. What receptors and organs are used?**
- **Create the first scene for your comic book. Draw and write about the sense, receptors, and organs involved.**

DO PARTS OF OUR BRAIN CONTROL DIFFERENT THINGS?

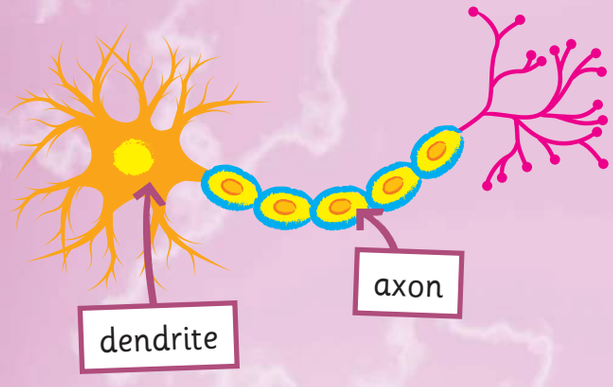
06

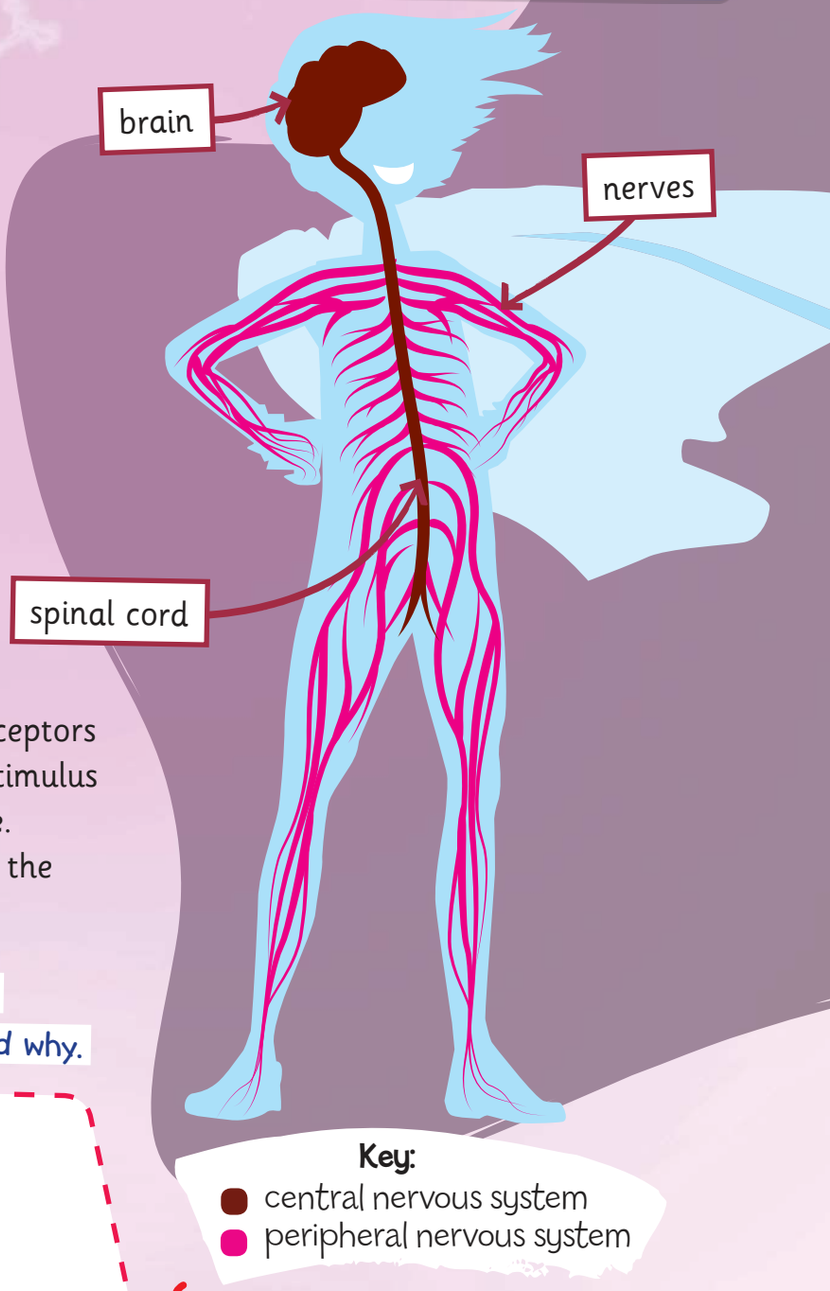
Discover ...

how the nervous system works.

Our nervous system is our body's control center. It interprets all the information we receive and tells our body what to do.

Like other systems, the nervous system is made up of cells, tissues, and organs. The smallest part is a nerve cell, or **neuron**.

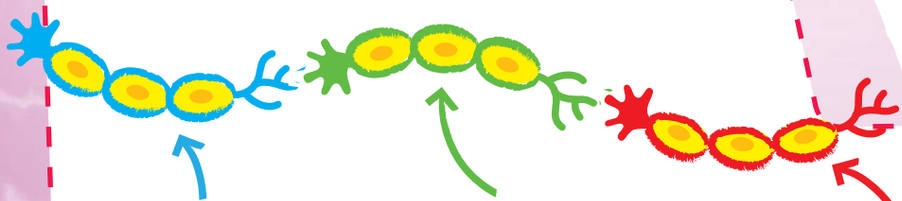




The **dendrites** in neurons are often the receptors from our sense organs. They transform a stimulus into an electrical signal, called an **impulse**. Once an impulse is started, it is sent along the **axons** of the neurons, through the body.

Nerve impulses can travel at speeds of 70 meters per second! Find out how and why.

There are three main types of neuron within the nervous system:



sensory neurons: carry signals from receptors to the spinal cord and brain.

interneurons: carry signals between the different parts of the central nervous system.

motor neurons: carry signals from the central nervous system to effectors.

Where in the body can you find each type of neuron?

By the end of this lesson, you will know the organs and processes involved in the nervous system.

The nervous system is divided into two parts: the **central nervous system** and the **peripheral nervous system**.

Look at the illustration. What does each part include?

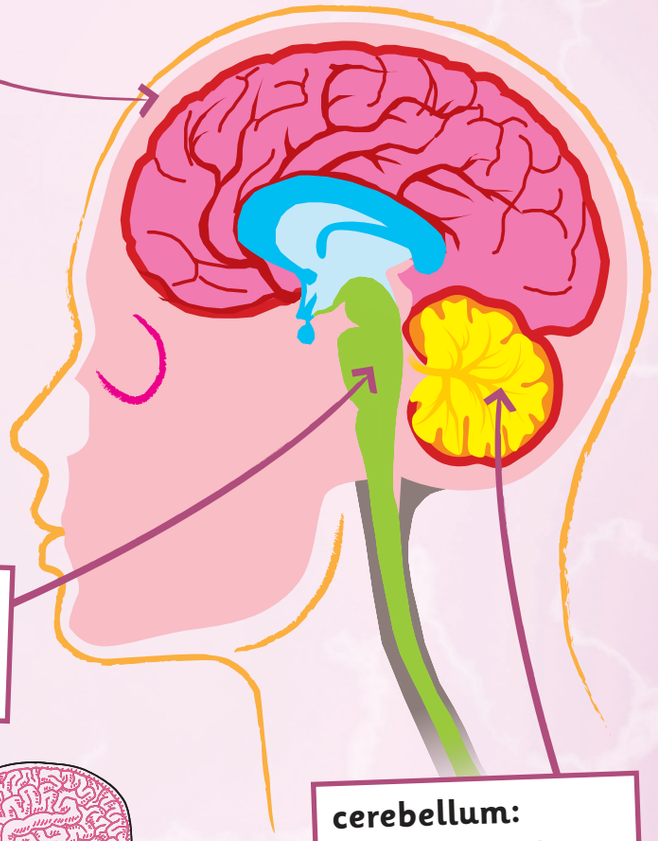
The **spinal cord** is nerve tissue that runs down our spine. It connects the nerves to our brain. It also controls reflexes.

The **brain** decodes the information from nerve impulses and decides if a response is needed. It coordinates a **response** with motor neurons.

Find out more about what the brain controls and draw a brain map.

Each part of the brain controls different processes.

cerebrum: thoughts, memory, feelings, decision-making, interpreting stimuli



brain stem: involuntary actions, sleeping

cerebellum: movement, balance, coordination

Investigate STAGE 2

- Think about your superhero's super sense. How does it reach the central nervous system?
- Create the next scenes for your comic book and include written descriptions. Remember to use connectors.
- Show the stimulus traveling along neurons and reaching the central nervous system.

Find another brain hidden in the unit.

Then, …

Next, …

Finally, …

Afterwards, …

HOW DO GYMNASTS BEND BACKWARDS?

07

Discover ...

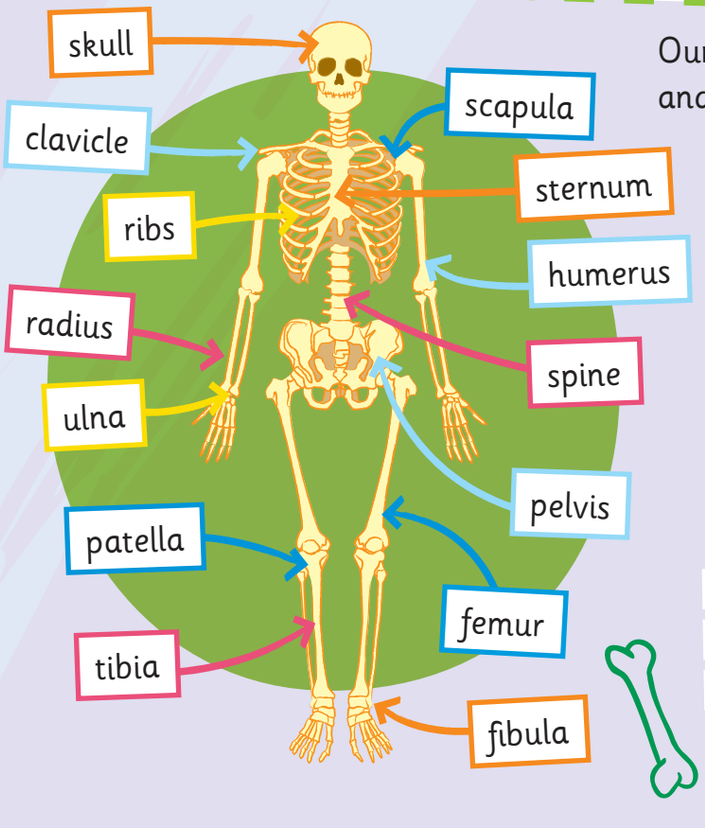
the parts of the musculoskeletal system.

When our central nervous system receives a stimulus, it tells our body how to **respond** by sending a message to a specific part.

The central nervous system sends out an impulse along the axons of motor neurons.

Motor neurons pass the impulse along until it reaches the **effectors**.

Effectors include the parts of our **musculoskeletal system**. This is made up of our **skeleton** and **muscles**, which work together to allow us to move.



Our skeleton supports our body and protects our inner organs.

What are bones made of?
Do they have another function?

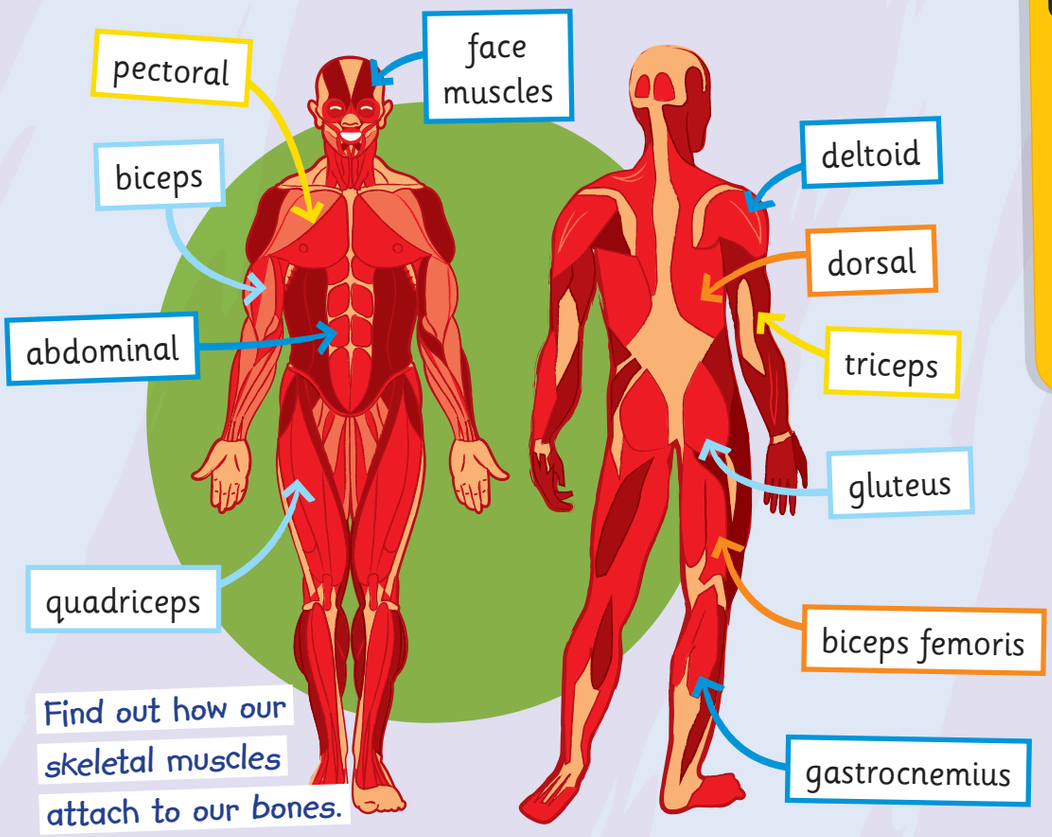
A **joint** is where two bones are connected. There are three types:

Fixed, like the parts of the skull.

Semi-flexible, like in the spine.

Flexible, like in the knee.

Which joints allow a gymnast to do this?



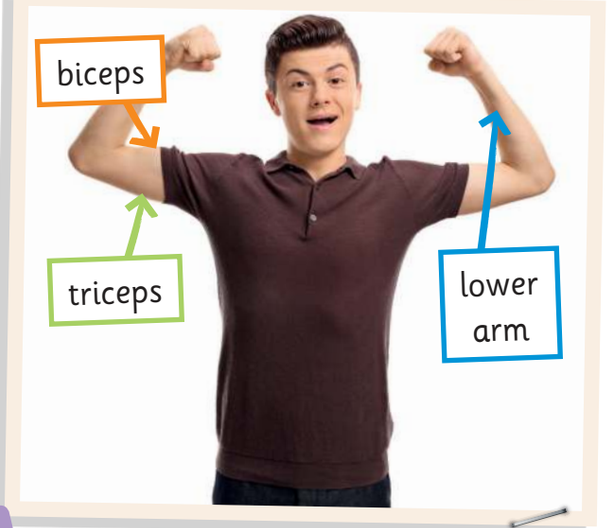
Find out how our skeletal muscles attach to our bones.

By the end of this lesson, you will know the muscles and bones involved in the musculoskeletal system.

Many of the muscles in our body work together in groups to move our bones. When a muscle receives a stimulus, it either **contracts** (gets shorter) or **relaxes** (gets longer). There are three types of muscle: **skeletal**, **smooth**, and **cardiac**.

Some muscles work in pairs, like the biceps and triceps muscles. When one muscle contracts, the opposite muscle relaxes.

Try it yourself! Describe the changes happening.



What is the fastest muscle in your body? If you blink, you might miss it.

Investigate STAGE 3

- **Find out which muscles and bones are involved in the response related to your superhero's initial stimulus.**
- **Discuss with a partner and compare the pathways of your super senses!**
- **Create some scenes to show the pathway and the response. Include pictures and written descriptions.**

My pathway includes the …

It travels along the motor neurons in the … to the …

WHAT HAPPENS WHEN YOU TOUCH SOMETHING HOT?

08

Discover ...

how reflexes work and keep us safe.

Most of the actions involving our **skeletal muscles** are **voluntary**.

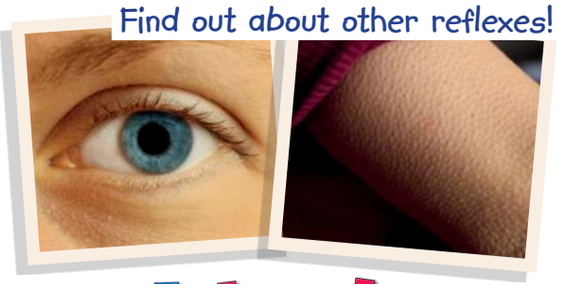
Our nervous system controls necessary functions that keep us alive, like breathing and heart rate, without us thinking. These are **involuntary** actions carried out by **smooth** and **cardiac muscles**.

Sometimes a very quick response to a stimulus is needed. This is called a **reflex** and it happens without us having to think.

Why are reflexes important?

In reflexes, a **sensory neuron** carries a message from a receptor to the **spinal cord**. A **motor neuron** carries the response message back to an effector. The brain is not involved. This is called a **reflex arc**.

Find out about other reflexes!



Investigate STAGE 4

- Imagine you no longer have one of your senses. What would your life be like?
- Find out about people who live without your superhero's sense. Discuss with a partner.
- To add drama to your comic, your superhero could lose their super sense. What happens? Include scenes to show this and add a paragraph to explain.

Look back

Is it quicker for an impulse to reach the brain or the spinal cord? Why is this important for reflexes?

People who cannot ... are ...

They manage without ... by ...

WHY DOES A TENNIS PLAYER MOVE WHILE WAITING FOR A SERVE?

By the end of this lesson, you will know how the musculoskeletal and nervous systems are connected and how reflexes work.

Hands On!

Background
When the knee is tapped, the patellar reflex makes the lower leg move. But sometimes the brain can get in the way of a reflex, changing the reaction.

Hypothesis
When your brain is activated, will your response to the stimulus be more, less, or the same?

Materials
table or desk, your hand

Method
1 Ask your partner to sit so their legs hang freely. Find the soft indent below the patella on one of your partner's knees. With your palm facing up, gently tap them in this spot with the side of your hand.

2 In the same position, have your partner lock their fingers together and ask them to try to pull their hands apart. Gently tap their knee again.

Conclusions
How can you explain the difference in the response?

Reflect 1
What is the response? Which muscles are responsible? Draw a picture.

Reflect 2
What is the response now? How does it compare to the response in Step 1?

When our brain is activated, our reflexes are …

Athletes should … to react … to a stimulus.

How could this knowledge be useful to athletes?