Mechanical Sensitivity

Activity

The Science

This activity aims to provide you with the understanding of the relationship between brain and body muscles. Our brain is responsible for interpreting the signal transferred from our sensory organs such as eyes, ear, skin, tongue, and nose. As a result of this, we are able to understand the environment around us.

The smallest amount of touch necessary for someone to feel is called the “Tactile Detection Threshold”. It is the lowest level of a stimulus that an organism can detect. As we age, our skin becomes thinner and the absolute threshold for touch increase, meaning we become more sensitive to touch. In general, women have a lower absolute threshold and are more sensitive to touch than men. It also varies from person to person. Different parts of the body have different tactile thresholds, because the number of nerves in each part of the body varies. Nerves exchange electrical signals between your brain and your muscles, which in turn help you to feel sensations and move your muscles.

In this activity, you will measure the tactile threshold of your friend using a tool called 'von Frey hairs'. Von Frey hairs were first introduced by a physiologist Max von Frey and developed from human and animal hair for sensory and pain research. In today's society, von Frey hairs are used as clinical equipment in case studies for patients suffering from paralysis or undergoing a surgery. You will learn to create and use Von Frey hairs at home to measure tactile thresholds at different parts of your body.

Materials

- Strings of various thickness: nylon, dental floss, toothbrush bristle (soft, medium, hard), craft wire
- Popsicle sticks
- Glue/ tape
- Blindfold
- Ruler
- Scissors
- Paper
- Pencil
- Friend or family member to test on

Instructions

The activity consists of two parts. The first part is the process of creating von Frey hairs. The second part is to test it to measure tactile threshold on your subject.

Making the von Frey hairs

1. With the help of a ruler and scissors, cut a piece of string that measures of 2 inches.
2. Using tape or glue, attach the string to the end of a popsicle stick at a right angle (90 degrees) to the stick.
3. Repeat steps 1 and 2 for each of the different thickness strings you have.

Your von Frey hairs are ready to use! You can use the popsicle stick as a handle to hold it.

Test your subject's tactile threshold

1. Place the popsicle sticks on a surface (i.e. table) in the order of decreasing thickness of attached strings.
2. Sit next to a friend and blindfold them so that they cannot see anything.
3. Ask them to place their hand and arm on the surface.
4. Pick up the first of the von Frey hairs (the popsicle stick with the thickest string) and touch it very gently on the fingertip of their hand.
5. Ask them to tell you how strongly they felt the touch. Is it a strong, medium or a light touch? Or maybe they do not feel anything at all.
6. Record their response on your paper with a pencil.
7. Now touch it on their palm and record their response.
8. Now touch it on their arm and record their response.
9. Have them turn their hand over. Then touch the von Frey hairs on the back of their hand and record their response.
10. Repeat the steps 3 to 9 with the next von Frey hairs getting smaller in thickness each time.
11. Record the responses for all the von Freys hair: fingertip, palm, arm and back of the hand. What trend do you notice?

Further investigation

- Perform the activity on other friends or family members and compare their tactile thresholds.
- Compare thresholds for people with different genders and age groups. Are women and younger people more sensitive?
- Test different parts of the body. Is the detection threshold different for different parts? What is most and least sensitive part of your body?

Things to think about

- Why don’t we detect a touch when we are asleep?
- Why can we detect a painful touch even when we are asleep?
- Which parts of our body have the most and least number of nerves? Do we sense differently on these parts?
- Do our senses other than touch are also affected by age?