# *HUMAN BODY: PUSHING THE LIMITS*
## *Sensation*
## Teacher's Guide

**Grade Level:** 6–12 **Curriculum Focus:** Science **Running Time:** 43 minutes

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## Program Description

One million sensors, forty-five miles of nerve fibers—humans possess sensors that warn of danger and perform extraordinary feats when they work collaboratively with the brain. These sensors keep humans alive, and alert them of hot, cold, and pain. Along with the brain, they even assist the body in making instant decisions—both consciously and unconsciously. Find out how these sensors, working with the brain, use delayed and chronic pain to help humans survive.

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## Learning Objectives

After viewing the program and participating in discussion, students will be able to:

- Understand some of the scientific concepts regarding the brain and its functions;
- Develop an appreciation of "how we know" what we know about the brain;
- Understand an organism and its environments;
- Understand the interdependence of organisms.

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## Classroom Connections

Have you ever had any pain? Can you describe several types of pain you have experienced—from severe to what is identified as "subtle pain systems" in the program? Remember when you experienced this subtle pain and describe what you thought your body was trying to communicate to you.

Imagine this scene: you are attending a family gathering and someone dressed in an outfit you completely dislike walks up to you and says, "You look wonderful. I love what you are wearing." What happens to your body when you become embarrassed? What happens to your body when you are less than truthful? Do the sensors and your brain direct your body to reveal far more about how you really feel and what you really think than you would prefer? Is your body a "lie detector via the body responses"? Think of an example and share.

## Classroom Activities

How important are both ears? Make an X or visible mark on the floor with tape, chalk, or erasable marker. Measure distances in straight-line increments of five feet from the X and label each of these points with the distance it is from the X (five feet, ten feet, fifteen feet, etc.) Place a subject on the X and blindfold him/her. Stand on one of the points away from the X. Say the subject's name with your normal speaking voice. The subject must now tell you on which line you are standing. Try it when the subject uses one, then, both ears. Make it harder with shorter distances from the X. Are both ears better than one in judging distance?

How sensitive is your touch? Get ten different grades of sandpaper from a hardware store (the grades are on the back of the paper). Cut each grade into sections for different groups to use. On each section, write the grade on the back for future reference. Have students arrange the sandpaper in order from smoothest to roughest. Students will be able to look at the grade on the back to see if the sandpaper is arranged correctly. Next, try this exercise with a blindfold so students will only rely on touch when putting the sand paper in order.

- Were you able to arrange the sandpaper in order?
- Was it more difficult when you had a blindfold on?

Think about how much you use all of your senses each day. Imagine you woke up one day and one of them was gone. If you had to choose to lose one sense, which one would it be? Why would you choose this sense?

## Target Vocabulary*

**diabetes mellitus -** variable disorder of carbohydrate metabolism caused by a combination of hereditary and environmental factors and usually characterized by inadequate secretion or utilization of insulin, by excessive urine production, by excessive amounts of sugar in the blood and urine, and by thirst, hunger, and loss of weight

**endorphin -** any of a group of endogenous peptides (as enkephalin) found especially in the brain that bind chiefly to opiate receptors and produce some of the same pharmacological effects (as pain relief) as those of opiates

**nerve -** any of the filamentous bands of nervous tissue that connect parts of the nervous system with the other organs, conduct nervous impulses, and are made up of axons and dendrites together with protective and supportive structures

**sweat -** the fluid excreted from the sweat glands of the skin

**white blood cell** - any of the blood cells that are colorless, lack hemoglobin, contain a nucleus, and include the lymphocytes, monocytes, neutrophils, eosinophils, and basophils—called also *leukocyte*

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## Academic Standards

National Academy of Sciences
The National Academy of Sciences provides guidelines for teaching science in grades K–12 to promote scientific literacy. To view the standards, visit this Web site:
http://books.nap.edu/html/nses/html/overview.html#content.

This guide addresses the following standards:

- Life science
- Science as inquiry