

4. Sensation

Objectives

- Understand the different sensory systems involving vision, hearing, taste, smell, and touch
- Explain how the visual sensory system converts light into images
- Review the way in which the ear responds to sound waves
- Explore the pleasurable senses of taste and smell
- Understand the workings of the somatic sensory system involved in touch, pressure, temperature, and pain

Vocabulary

absolute thresholds	gate control theory	receptors	somatic receptors
auditory nerve	perception	retina	visual cortex
cochlea	pheromones	sensory adaptation	
endorphins	photoreceptors	sensory coding	

Background

Students constantly use their sensory systems—their sight, hearing, and senses of smell, taste, and touch—but seldom think about or appreciate them. However, these senses are of paramount importance, since they provide people with a way to experience and interact with their environment and to gain and process information from the world around them.

Through this chapter, students learn how sensory systems work and the specific processes involved in how human beings perceive. They start with a basic concept: each sensory system has receptors that are activated by stimuli they pick up and convey to the brain in the form of neural impulses, or sensations it can interpret. After students review this basic process, they learn more about the specific functions and issues involved in seeing, hearing, smelling, tasting, and feeling.

Students first discover the workings of the visual sensory system, the nature of light, and the different factors involved in seeing “color.” Next, students learn about hearing and sound, including a definition of

sound, its characteristics, how sound waves are converted in the ear, and what happens in deafness. They find out that perceiving is actually done in the brain—and not in the eye, ear, mouth, nose, or on the skin.

Students next learn how smell and taste occur and how somatic receptors of the skin feel sensations like touch, pressure, temperature, and pain. They find out how and why people feel pain. A variety of chapter features—diagrams of the eye and ear, explanatory tables, research notes on pheromones, a sidebar on managing pain, and a critical thinking feature on sensory deprivation—help students to appreciate their senses and ways in which they affect their lives.

Further Resources

Ackerman, Diane. *A Natural History of the Senses*. New York: Random House, 1990.

Schiffman, H. R. *Sensation and Perception*. New York: Wiley & Sons, 1982.

For Discussion

Review

1. What are the five sensory organs and to what kinds of stimuli do their receptors respond?
2. What is the difference between rods and cones?
3. What are three parts of the ear and the three characteristics of a sound?
4. What are the three types of deafness?

Critical Thinking

1. Which of your five senses—sight, sound, smell, taste, and touch—do you think is most important for your quality of life? least important? Why?
2. If your taste buds lost their sensitivity and you put a hot pepper in your mouth, what would it taste like? Why?
3. If you had a choice between feeling pain or not feeling pain for the rest of your life, which would you choose? Why?
4. Why do you think pheromones are more common with animals than humans?

Activities

1. Tracking the Five Senses

Divide students into groups of five with each member representing one of the five senses. Challenge members to come up with various activities (i.e., eating pizza, going to a movie) and take turns discussing how each sense is functioning during the specific activity.

2. What It's Like to Be Blind

Ask students to choose partners and have the partners take turns pretending to be blind. Each "blind" student should attempt to do something in class (i.e., sharpen a pencil) and note the issues, feelings, and altered sensations involved in the experience. Encourage a discussion of how the person's other senses functioned during the exercise.

3. Internet: Psychology Research on Sensory Systems

Direct the students to locate psychology research Web sites that discuss sensory systems. Ask them to print out site pages that are particularly interesting and to summarize what they find in short reports.

4. Special Sources: Sensory Deprivation

Using the library or Internet, have students research information, articles, or experiments on sensory deprivation that either support or refute the findings of John Lilly in this chapter. Analyze the similarities, differences, and issues involved, including the notion that humans create "alternative realities" to cope when their senses are deprived.

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As you read Chapter 4, write an answer to each question below.

1. How do people perceive?

2. Why is it a scientific fact that the world is NOT filled with color?

3. Why is a sound not a sound unless a person hears it?

4. What do the senses of smell and taste have in common?

5. How does the body alleviate pain?

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Find the best answer for each item. Then circle that answer.

1. What are receptors?
 - a. nerve cells that convert stimuli into neural impulses
 - b. nerve cells that block stimuli from reaching the brain
 - c. nerve cells that interpret and transform stimuli
 - d. none of the above
2. What are absolute thresholds?
 - a. maximum amounts of energy detected by sensory systems
 - b. average amounts of energy detected by sensory systems
 - c. minimum amounts of energy detected by sensory systems
 - d. minimum amounts of energy detected by endorphins
3. What is the process by which the brain organizes sensory information to make it meaningful?
 - a. resuscitation
 - b. stimulation
 - c. dilation
 - d. perception
4. What is the pattern of a neural message that a sensory organ sends to brain?
 - a. sensory coding
 - b. sensory adaptation
 - c. somatic reception
 - d. somatic coding
5. What term characterizes the reduction in sensory response to an unchanging form of stimulation?
 - a. sensory coding
 - b. sensory adaptation
 - c. somatic reception
 - d. somatic coding
6. What is the light-sensitive lining at the back of the eye that contains rods and cones?
 - a. pupil
 - b. retina
 - c. iris
 - d. cochlea
7. What is the visual cortex?
 - a. part of the brain where neural impulses are interpreted as visual images
 - b. part of the brain where neural impulses are interpreted as sound waves
 - c. part of the inner ear that contains receptors for sound waves
 - d. odor molecules given off by animals to communicate a sexual message
8. What is the auditory nerve?
 - a. bundle of nerves that carry odor stimuli to the brain
 - b. bundle of nerves that carry taste stimuli to the brain
 - c. bundle of nerves that carry sound to the brain
 - d. bundle of nerves that carry pain messages to the brain
9. What are somatic receptors?
 - a. nerves in the eye that transmit light stimuli
 - b. nerves in the nose that respond to odors
 - c. nerves in the ear that respond to sound waves
 - d. nerves in the skin that respond to touch, pressure, temperature, and pain
10. What are substances produced by the body that can eliminate pain?
 - a. photoreceptors
 - b. cochlea
 - c. cilia
 - d. endorphins

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Read each description, and write the letter of the correct term on the line.

- The process of tasting takes place _____.
 - in the mouth
 - on the tongue
 - in the spinal cord
 - in the brain
- The five senses use _____ to send messages to the brain so that we understand what we are experiencing.
 - sensory adaptation
 - sensory coding
 - absolute thresholds
 - gate control
- _____ are neurons in the retina that are light sensitive.
 - Corneas
 - Anvils
 - Irises
 - Photoreceptors
- _____ is considered the most important sense, giving the brain 70 percent of its sensory information.
 - Vision
 - Hearing
 - Smelling
 - Touching
- This process is NOT a function of the eye: _____.
 - light enters the eye through the cornea
 - photoreceptors respond to light sensitivity
 - blind spots interpret visual images
 - eyes catch light, converting it to neural impulses the brain can understand
- Each is a characteristic of color blindness, EXCEPT _____.
 - 8 percent of men and 1 percent of women are colorblind
 - most people are blue-red colorblind
 - it is usually inherited from one's maternal grandfather
 - fully colorblind people see things in shades of gray
- Sound waves are picked up by the _____ before being interpreted in the brain.

a. rods	c. auditory sensory system
b. cones	d. visual cortex
- Hearing aids have helped overcome _____.
 - conduction deafness
 - nerve deafness
 - stimulation deafness
 - auditory deafness
- _____ are odor molecules given off by animals that communicate a sexual message.

a. Taste receptors	c. Photoreceptors
b. Pheromones	d. Endorphins
- Scientists theorize that neural "messages" of pain to the brain are sometimes blocked in the spinal cord under the _____.
 - trichromatic theory
 - opponent-process theory
 - gate-control theory
 - gate-regulation theory

Essay Question

What benefits or applications are there for psychologists in knowing how the five senses function?