
MODULE 20

Other Senses

Module Preview

Besides vision and hearing, the senses of touch, body position and movement, taste, and smell are important to our ability to interact with the environment. The sense of touch is actually four senses—pressure, warmth, cold, and pain—that combine to produce other sensations such as “hot.” Our effective functioning also requires a kinesthetic sense and a vestibular sense, which together enable us to detect body position and movement.

Taste, a chemical sense, is a composite of sweet, sour, salty, bitter, and umami sensations and the aromas that interact with information from the taste buds. Smell, also a chemical sense, does not have basic sensations, as there are for touch and taste.

Module Guide

Touch

- ▶ Lectures: The Amazing Capabilities of Touch; The Remarkable Case of Ian Waterman
- ▶ Exercises: Two-Point Thresholds; Touch Localization; Nystagmus; Vision and Balance
- ▶ Exercise/Project: Warm Plus Cold Equals Hot
- ▶ Video: Module 11 of *The Brain* series, 2nd ed.: *Sensory–Motor Integration*
- ▶ Instructor Video Tool Kit: *Losing One’s Touch: Living Without Proprioception*

20-1. *Describe the senses of touch, and distinguish between kinesthesia and the vestibular sense.*

Our sense of touch is actually four senses—pressure, warmth, cold, and pain—that combine to produce other sensations, such as “hot.” There is no simple relationship between what we feel and the type of specialized nerve ending found there. Only pressure has identifiable receptors. The rubber-hand illusion illustrates how touch is not only a bottom-up property of our senses but also a top-down product of our brain and expectations.

Kinesthesia is the system for sensing the position and movement of individual body parts. Sensors in the tendons, joints, bones, and ears as well as skin sensors are continually providing our brain with information. A companion **vestibular sense** monitors the head’s (and thus the body’s) position and movement. The biological gyroscopes for this sense of equilibrium are in the *semicircular canals* and *vestibular sacs* in the inner ear.

Pain

- ▶ Lectures: Cultural Differences in Pain; Pain Control
- ▶ Exercise: The Revised Reducer–Augmenter Scale
- ▶ Videos: Modules 20 and 21 of *The Mind* series, 2nd ed.: *Phantom Limb Pain* and *Treating Chronic Pain*; Programs 4 and 9 of *Moving Images: Exploring Psychology Through Film: Brain Reorganization: Phantom Limb Sensations* and *Firewalking: Mind Over Matter?*
- ▶ Instructor Video Tool Kit: *Phantom Limb Sensations; Pickpockets, Placebos, and Pain: The Role of Expectations; Coping With Pain*

20-2. *State the purpose of pain, and describe the biopsychosocial approach to pain.*

Pain is an alarm system that draws our attention to some physical problem. Without the ability to experience pain, people may die before early adulthood. There is no one type of stimulus that triggers pain, and there are no special receptors for pain. Instead there are different *nociceptors*—sensory receptors that detect hurtful temperatures, pressure, or chemicals. The **gate-control theory** of pain is that small fibers in the spinal cord open a “gate” to permit pain signals to travel up to the brain, or large fibers close the “gate” to prevent their passage.

The biopsychosocial approach views pain not only as a product of biological influences, for example, of injured nerves sending impulses to the brain, but also as a result of psychological influences such as our expectations and social influences such as the presence of others. Pain is controlled through a combination of medical and psychological treatments.

Taste and Smell

- ▶ Lectures: Taste Preferences; Synesthesia
- ▶ Exercises: Taste: The Basic Taste Sensations; Genetic Effects in Taste
- ▶ Exercise/Project: Taste
- ▶ Projects: Mapping Your Tongue; Kinesthetic Capture
- ▶ Video: Segment 12 of the Scientific American *Frontiers* series, 2nd ed.: *Tasters and Supertasters*
- ▶ Instructor Video Tool Kit: “*Supertasters*”; *The “Red Hot” Chili-Eating Contest: Sensitivity to Taste; Synaesthesia: The Man Who Tastes Words*

20-3. *Describe the senses of taste and smell, and comment on the nature of sensory interaction.*

Taste, a chemical sense, is a composite of sweet, sour, salty, bitter, and umami sensations and of the aromas that interact with information from the taste buds. Taste buds on the top and sides of the tongue contain taste receptor cells, which send information to an area of the brain’s temporal lobe. Taste receptors reproduce themselves every week or two. As we grow older, the number of taste buds and taste sensitivity decrease.

Sensory interaction refers to the principle that one sense may influence another, as when the smell of food influences its taste. In a few individuals, the senses become joined in a phenomenon called *synaesthesia*, where one kind of sensation such as hearing sound produces another such as seeing color.

- ▶ Lectures: Anosmia; Gender-Related Odors; Pheromones; Fragrance Effects
- ▶ Exercise: Identifying Odors

Smell (*olfaction*) is also a chemical sense, but without any basic sensations. The 5 million or more olfactory receptor cells, with their approximately 350 different receptor proteins, recognize individual odor molecules, with some odors triggering a combination of receptors. The receptor cells send messages to the olfactory lobe, then to the temporal lobe and to parts of the limbic system. An odor’s ability to spontaneously evoke memories is due in part to the close connections between brain areas that process smell and those involved in memory storage.