Section 11.5: The Senses
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A. Answers may vary. Sample answer: Three specific examples of sensory processing disorders are: (1) Sensory over-responsivity, in which a person responds much more intensely to stimuli. For example, the person might become very agitated when touched by someone in a line-up or they may find that wearing clothing is unbearable; (2) Sensory under-responsivity, in which a person shows a very slow response to sensory input. For example, these people often have a very high threshold for pain and temperature; and (3) Dyspraxia, in which a person has difficulty processing sensory input, resulting in difficulty planning and co-ordinating physical movements. For example, a person with dyspraxia would have difficulties riding a bike.

B. SPD is often misdiagnosed because health care workers are not trained to recognize sensory issues. Often SPD is misdiagnosed as attention deficit disorder (ADD) or obsessive-compulsive disorder (OCD). These other disorders often have similar symptoms including short attention spans, anxiety, and being bothered by bright lights, loud noises, and certain textures.

C. Researchers are most puzzled by what actually causes SPD. Currently, the precise causes of this disorder are largely unknown; however, certain risk factors predispose an individual to SPD. These include certain genetic factors, not receiving enough stimulation during critical periods of neurological development as a child, fetal alcohol syndrome, exposure to environmental toxins, and other neurological disorders (for example, autism and Asperger’s syndrome).

D. Answers may vary. Reports should include the following information:

• SPD is a condition that exists when sensory information received through our senses does not get properly organized into appropriate responses by the body. SPD may affect as many as 1 in 20 people, although misdiagnosis as another condition is common.

• SPD is usually diagnosed by screening the individual for certain telltale signs that suggest abnormal development. If there are enough abnormalities, a more thorough assessment is performed, which can include standardized testing, detailed clinical observations, and parent-report measures.

• Symptoms of SPD include coordination problems, sensitivity to light and sound, reduced awareness of pain or temperature, hyperactivity or hypoactivity, extreme sensitivity to touch, and short attention span or distractibility.

• People with SPD often have problems with motor skills and other abilities needed to integrate successfully into social situations. They may also have trouble completing certain tasks. As a result, they often have low self-esteem and can become socially isolated and develop other emotional issues. This puts people with SPD at a much higher risk to develop anxiety-based disorders, depression, aggression issues, or other problematic behaviours.

• Treatment of SPD, once properly diagnosed, will depend specifically on the type of SPD the person has. Most treatments for SPD require occupational therapy with a sensory integration approach.

• Some examples of ongoing research in the field of SPD include treatment effectiveness studies for the remediation of SPD, developing reliable and valid scales that can be used to diagnose each of the subtypes of SPD, and investigation of the neurophysiological and behavioral causes of SPD.
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1. Sensory systems are important because sensory systems are the “gatekeepers” of an organism, ensuring that the organism receives and interprets external and internal stimuli in order to respond appropriately and maintain homeostasis.

2. Five sensory receptors and the type of stimulus each detects are as follows: 1) mechanoreceptors, which detect pressure, body position, and acceleration; 2) photoreceptors, which detect vision (shapes and light); 3) chemoreceptors, which detect taste and smell, as well as chemical conditions such as acidity; 4) thermoreceptors, which detect heat; and 5) nociceptors, which detect tissue damage and transmit pain signals.

3. Answers may vary. Sample answer: It is important for survival that we continue to be able to respond to changes in environmental stimuli, so adaptation to a constant stimulus allows our body to be prepared to sense changes.

4. Pain signals are to tell the body to reverse the cause of the pain to avoid tissue damage. Sensory adaptation in this case would be maladaptive because it would prolong the damaging conditions.

5. Both thermoreceptors and nociceptors are found in skin. (Note: students may indicate other similarities from prior knowledge, but this is the only similarity described in the text.)

6. The three thermoreceptors that are found in humans are: 1) Free nerve endings—the simplest type of thermoreceptors. The branched endings of sensory neurons are either unmyelinated or only thinly myelinated and adapt slowly to stimulation by heat; 2) Ruffini endings located deep within the skin, which are another type of slow-adapting receptor. They respond to temperatures above 45 ºC and also respond to touch and pressure; and 3) the bulb of Krause, which is located closer to the surface of the skin than other types of thermoreceptors. These are activated at 20 ºC or lower. When they sense temperature below 10 ºC these sensors alert the body to cold via painful freezing sensations.

7. Answers may vary. Presentations may include the following information: The body is tricked into perceiving the capsaicin as extreme heat and the spiciness is experienced as a burning sensation. The pain response produced when spicy foods are ingested elicits the release of pain-killing endorphins. The resulting production of endorphins can cause spicy food lovers to crave them repeatedly, although terming this an “addiction” in the typical sense of chemical dependency is questionable.

8. At higher elevations, the atmospheric pressure is lower than at sea level. This would cause an imbalance with the air pressure in the ear. Opening the Eustachian tube in the mouth by yawning, swallowing, or dropping the lower jaw allows the air pressure to equalize. When diving, the external pressure on the outer ear increases with depth. Increasing the air pressure in the middle ear can be achieved by swallowing or lowering the jaw to open the Eustachian tube, thereby raising the pressure on the inside of the eardrum to equal the pressure on the outside. The increased pressure can also be equalized by pinching the nose and blowing gently through the nose. A cold or infection can cause swelling of the Eustachian tube preventing air from entering. When this happens we experience “stopped-up” ears because we sense a pressure difference between the outer and middle ear caused by the eardrum bulging inward or outward. This interferes with the transmission of sounds and we may experience some degree of hearing loss.