

Our Sensory Systems

The Auditory System:

Our auditory system or sense of hearing allows us to hear and interpret when someone talking, be aware of possible dangers, and to enjoy music. Sounds can alert or calm us depending on the intensity and frequency. We are born with the ability to hear, but as babies we startle when we hear loud or unexpected noise. Gradually, our brains develop the ability to modulate sensations and tell whether the sound is one we can enjoy and use or must avoid for self protection. These abilities to hear and modulate sensations of sound underlie our ability to really listen to sounds around us and understand their meaning. Discriminative functions help us to refine details about the 'what' and 'where' of sounds, and to be able to distinguish between foreground and background sounds in order to hear the main sound without being distracted.

The Visual System:

Vision enables us to identify sights. Vision should not be confused with eyesight. Eyesight is the basic ability to see. Vision is a skill we gradually develop as we integrate the senses and make sense of what we see. As we move we develop our eyes become better coordinated. Our visual system is the most important way we determine where we are in space as we combine visual information with vestibular (movement and balance), proprioceptive (body awareness) and tactile information. We combine touch and vision to make sense and understand qualities that we see and feel. As we develop we can anticipate what something feels like just by looking at it! As we hear a sound the visual system reinforces our ability to locate and identify it.

Visual discrimination helps us to refine details about what we see, where that object is in relation to other objects, and where we are in relation to it. Other discriminative skills include being aware of images in our peripheral vision, distinguishing objects in the foreground from the background (figure ground), visual attention and visual memory.

The Taste (gustatory) System:

Chemical receptors in the tongue, closely entwined with the olfactory (smell) provide us with information about different types of taste such as sweet, sour, bitter, salty and spicy.

The Olfactory (smell) System:

The olfactory (smell) and gustatory (taste) systems are closely linked. Unlike any of the other senses, the olfactory sense is processed first by areas of the brain that are strongly implicated in emotion and memory which is why odours, more than any other sense, can trigger strong memories and emotions. Smell is important for enjoying what we eat. Odours are used to detect danger (eg gone off food or something burning), for pleasure and to help us navigate our environment.

The Touch System:

Our sense of touch allows us to feel the world around us, plays a major part in developing bonds with those who love us and, together with the sense of proprioception, provides our sense of body awareness. Unlike other senses such as hearing or vision, the sense of touch exists all over the body including in our mouths giving our body boundaries. We are always actively touching or passively being touched by something- other people, clothes, furniture, cutlery. Even if we are stark naked, our feet still touch the floor and the air touches our skin! Touch receptors sense light touch, firm touch pressure, skin stretch, vibration, movement, temperature and pain. Our sense of touch allows us to be gentle when picking up an egg or firm when picking up a heavy book. Linked to our taste system, the tactile receptors in the mouth determine the temperature, texture and movement of food or other objects.

The tactile system is composed of **two systems**, the discriminative and the protective. The **discriminative system** allows us to determine where we are being touched and what is touching us. It gives us information about the consistency and texture of something (whether it is hard, soft, rough, sharp, hot, cold etc). The **protective system** alerts us to threats and makes respond quickly ('fight or flight' response) to any stimulus that is perceived as potentially harmful.

The Proprioceptive Sense:

The proprioceptive sense is our **positioning and body awareness sense**. It allows us to know where our body parts are without looking at them. This sense underlies a person's ability to place body parts in a position in space and to 'grade' movements (judge the timing, direction and pressure of a force). This happens at a subconscious level such as when holding our bodies upright in a chair, and a conscious level, for example when we uncross our legs and stand up. Our 'proprioceptor' receptors are located within our muscles, joints and ligaments, tendons and connective tissues. Every time that we contract, squeeze or stretch a muscle, or put weight on or stretch a joint, we stimulate the sensory receptors that tell us what our body is doing. We get the most proprioception when we do resistive work such as lifting a full bag of shopping. When we are moved passively, such as a shoe shop assistant putting our foot into a shoe, the proprioceptive system is activated but to a much lesser extent than when the movement is active. Because there are so many joints and muscles throughout the body, the proprioceptive system is very large.

We have all experienced the loss of proprioception, for example when our arm 'falls asleep' after we've slept on it. We may still be able to move the arm but not in a coordinated way. When this happens, we lose the sensory input from our muscles that tells us what we are doing. Without proprioception, drivers would be unable to keep their eyes on the road while driving, as they would need to pay attention to the position of their arms and legs while working the pedals and steering wheel. We would not be able to touch type or play an instrument without staring at our fingers.

How not to stick a fork up your nose! Learning to control a fork involves proprioception. Stab too hard and the carrot breaks up into pieces. Hold the fork at the wrong angle and the carrot becomes mush. With practise and repeated input to the brain, eventually the person learns to stab the carrot and fine tune the movements so that the carrot ends up in the mouth and not up the nose!

Another important function is to help modulate our arousal level. Proprioceptive experiences calm and organise us, bringing us back to a calm, alert state when we have been under or over stimulated.

The Vestibular System:

Our vestibular system is responsible for detecting movement (in what direction and how fast) and how our body reacts against gravity, orientating us within our environment, telling us about up and down and whether we are upright or not. It also provides us with our sense of balance. The receptors for our vestibular system are located within our inner ears. It registers every movement (even the most subtle) of our head in any direction, changes in gravity as we move which results in a perception of feeling heavier if we move rapidly upwards or lighter if we move rapidly downwards (think what it feels like when on a swing). It also gives us a physical reference that helps us make sense of visual information.

Movement can have both a stimulating and a calming effect on our body. It can be easily overloaded and we all experience differing levels of vestibular tolerance throughout our development. Many of us know what it feels like to stimulate our vestibular system by riding on a spinning fairground ride. Some of us will leave the ride feeling dizzy or sick, others will be wanting to re-join the queue again!

Muscle tone is influenced by the vestibular system. Muscle tone is necessary for smooth, efficient movement, good stability and balance. The vestibular system also supports the development of bilateral coordination, which is the ability to use both sides of our body.

The Interoception System:

Interoception provides sensations from our internal sensors near our organs, such as our stomach, intestines, and bladder. The system provides information about how our bodies feel inside. For example, interoceptors tell us when we are hungry or thirsty and what's going on inside our bladder and bowels. Interoception is key in learning to control your bladder and bowels.

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