The Sense of Touch and How It Affects Development

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Touch is by far the most interesting and necessary of the “five senses”. Any movement requires an acute awareness of one’s own body which is gained through proprioception, an internal form of tactile sense. The sense of touch develops before all other senses in embryos, and is the main way in which infants learn about their environment and bond with other people. This sense never turns off or takes a break, and it continues to work long after the other senses fail in old age. Throughout life people use their sense of touch to learn, protect themselves from harm, relate to others, and experience pleasure. Interestingly, positive touch from others is necessary for an individual’s healthy development. Despite the presence of all other life requirements, without this positive touch infants will fail to thrive. Compared to the other senses, touch is very hard to isolate because tactile sensory information enters the nervous system from every single part of the body. As a result, very little research has been done on touch. However, recent studies have attempted to map how the sense of touch works and how a simple stroke of the skin can alter an individual’s health and behavior.

In the context of neurobiology touch is defined as “the special sense by which contact with the body of an organism is perceived in the conscious mind” (Gardner). One’s sense of touch allows an individual to determine an object’s size, shape, weight, texture, and temperature, and whether the object causes pain or pleasure. In this way, touch allows an individual to learn about the environment and change one’s behavior accordingly. In addition to determining information about objects outside of the body, touch receptors deep inside the body allow one to know the positions and shapes of one’s bones, muscles, and other soft tissues.

The skin is the sensory organ for touch. It is the largest organ of the body with an area of eighteen square feet and a weight of nine pounds (Field). Sensory neurons densely enervate the skin; in each square inch of skin there are hundreds of sensory nerve endings (Gardner). Each sensory neuron in the skin has a specialized capsule on its peripheral end which physically links the nerve ending to the surrounding skin tissue. The sense of touch is then based on mechanical deformations of the skin and soft tissues of the body, which cause a change in the shape of the capsule surrounding the nerve ending. The nerve ending, called a mechanoreceptor, then detects this change in shape and produces an action potential which is propagated to the rest of the nervous system. The action potential codes for the touch's location on the skin, the amount of force, and its velocity. Other touch receptors in the skin produce action potentials in response to the object's temperature and to the presence of chemicals on the skin (Gardner).

The sensory neurons transmit their signals to the thalamus and to several parts of the cerebral cortex. The specific location in the brain at which each sensory neuron synapses determines how the touch signal is interpreted. All peoples' brains are similar in the broad arrangement of these sensory neurons, but "the details of the somatotopic map characterize each individual and are determined largely by experience" (Gardner). The types of touches that a person experiences throughout his or her life affect the architecture of his or her brain, which in turn affects that person's interpretation of and response to different types of touch.

A general statement about neuronal communication is that "repetitive activation of a pathway strengthens those synapses, making it easier to pass information forward" (Gardner). Thus, the more often a person experiences a type of touch, the better able to interpret that information his or her brain becomes.

However, if there is a lack of touch the sensory neurons will not be activated and the synapses in that neuronal pathway will never strengthen.

Through its effect on the development of neuronal pathways and communication, the amount and type of touch an individual receives can greatly affect that person's behavior and health. Starting at the turn of the twentieth century, psychologists and doctors have discovered that affectionate touch is necessary for the physical, mental, and emotional development of children. For example, doctors throughout the first half of the twentieth century were puzzled by a phenomenon called failure to thrive syndrome. In hospitals and orphanages the majority of infants and children did not develop normally and/or died, despite being given proper medical care, good food, and a clean environment (Hatfield).

During the nineteen fifties the psychologist Harry Harlow conducted studies of the effects of isolation on infant monkeys. He separated monkeys at birth from their parents and siblings, keeping them in clean cages with adequate food. He then put two "surrogate" mothers in the cages. One was a wire mother with a milk bottle and one was a wooden mother covered in terrycloth without a milk bottle. The infant monkeys clung desperately onto the terrycloth mothers for hours, ignoring the desire for food in exchange for the softness of the terry cloth (Hatfield). This demonstrates that the desire for touch is stronger than any other desire, and implies that mother-infant bonding is more dependent on affectionate touch than on the fact that the mother provides food to the infant.

The touch deprived monkeys in Harlow's studies all experienced stereotypic abnormalities in their development and behavior. These monkeys engaged in self-clasping and rocking behaviors and were disinterested in their environment.

They avoided socializing with other monkeys, were timid, and disliked being touched. When they did interact with other monkeys they were very aggressive. They had difficulty finding sexual partners, often were unable to mate properly, and abused their mates and offspring (Hatfield). In the years since Harlow's studies of monkeys others have conducted further studies on the affect of touch deprivation on development.

The current consensus is that adequate affectionate touch is necessary for an individual's proper development.

There is strong evidence that a lack of affectionate touch causes depression, violence, memory deficits, and illness. The question is how something as simple as touch can affect one's body so greatly. One possibility, referred to as Attachment Theory, has to do with the relationship between affectionate touch and parent-child bonding (Hatfield). If a child does not receive adequate affectionate touch because his or her parents are emotionally neglectful, then the child and parents will not form a proper emotional bond. The lack of bonding will, consciously or unconsciously, cause unhappiness and a lack of trust on the child's part. As a child grows older this will manifest itself as an inability to relate to other people, which will cause further unhappiness and stress. This theory has definite merit, but it does not provide a clear cause and effect for touch deprivation and abnormal development. More research is needed to backup the claims of this theory.

Another possible explanation for the effects of touch on behavior and health focuses specifically on the relationship between touch and stress. Affectionate touch lowers an individual's stress and anxiety levels, while touch deprivation raises stress levels (Hatfield). With stress comes an increase in the levels of stress hormones, such as cortisol and norepinephrine, in the blood. Chronically high levels of cortisol prevent normal brain tissue development in children and damage existing brain tissue, especially the hippocampus (Field).

The hippocampus is involved in memory and learning, so this might explain why children who do not receive affectionate touch experience learning difficulties.Chronic stress also wreaks havoc on one's immune system. Immune systems weakened by stress may contribute to the poor health and abnormal growth seen in children who experience extreme touch deprivation (Hatfield). Finally, the stress caused by touch deprivation might eventually change an individual's brain chemistry so as to cause depression, although the exact mechanism is unknown.

In contrast to the effects of touch deprivation, affectionate touch "is associated with enhanced learning, language processing, improved problem solving, increased physical recovery speeds" (Hatfield), decreased stress, physical growth in infants and children, less cardiovascular disease in adults, and a decrease in pain experienced by those suffering from chronic diseases such as arthritis or fibromyalgia (Field). Massage therapy, a form of pleasurable touch, is gaining acceptance among the medical community as an effective treatment for a multitude of physical and psychological problems.

Due to the difficulty in isolating and studying the sense of touch, little research has been done on it. However, the studies that have been done have highlighted the importance and power of affectionate touch on development and health. Most studies to date have used observation and case study more than experimentation, so no definite mechanisms can yet be drawn. However, there is no doubt that affectionate touch is vital to life. Hopefully, future research will more clearly demonstrate the relationship between the two.

Works Cited

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