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Comparative Study of Touch Perception in Normal and Blind People

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Abstract:

Aim
To compare the perception of touch sensation in normal and blind people.

Objective
Blind individuals mostly rely only on their sense of touch for pattern perception; where as normal people use their vision. If a blind person has been trained in using Braille or spatial orientation, then we might expect increased skill as a consequence. This is called sensory compensation hypothesis.

Background:
The tactile task stimulus like, shape, size discrimination and recognition are more superior in visually challenged than compared to normal sighted individuals.

Reason:
Brain adapts to the absence of vision by accelerating the sense of touch which enhances the quality of life of blind individuals who rely on non visual senses**.**

INTRODUCTION:

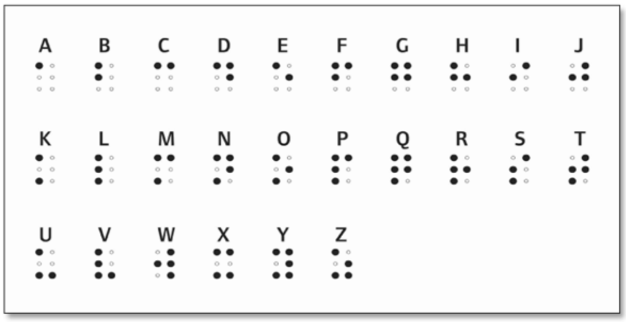
Braille is a tactile writing system used by people who are blind or visually impaired. It is traditionally written with embossed paper.[3].Most of the studies reveal that brain accelerates the sense of vision by accelerating the sense of touch.[4]Richard Held, PhD, of Massachusetts Institute of Technology, an expert in the brain and visual development who was unaffiliated with the study, said the results suggest that a lack of visual experience changes how information acquired by touch is processed. When sighted participants undergo intensive training on a tactile task, their performance on that task improves on the trained finger, and to a lesser degree (if at all) on adjacent and contralateral fingers.

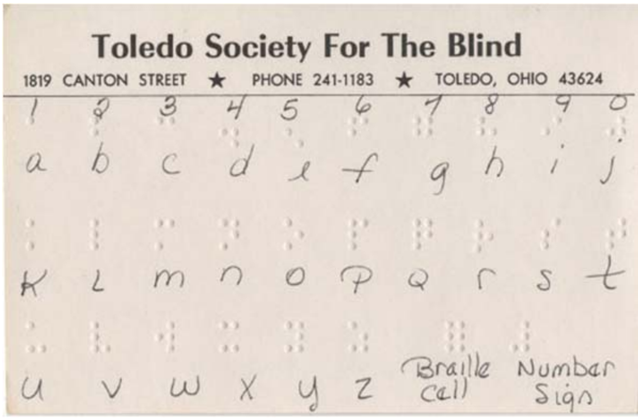
The sense of touch is the first sense to be developed during one's life .It continues to be the primary means of experiencing the world through infancy and well into childhood. [1]Sensory substitution means a change of the characteristics of one sensory modality into stimuli of another sensory modality. It is hoped that sensory substitution systems can help people by restoring their ability to perceive certain defective sensory modality by using sensory information from a functioning sensory modality.[2]The sense of touch is remarkably complex, and involves the detection of everything from pressure, to itchiness, to temperature. Most of these sensations and their mechanisms remain poorly understood, but are thought to involve a range of nerves in the skin capable of responding to various forms of stimuli. So-called merkel disk receptors for example the ones involved in the perception of pressure mechanoreceptors whileruffinicorpuscles are believed to detect the sensation we associate with stretching**.** The development of touch and the tactile sense in a child with visual impairments or deafblindness can be impacted in both positive and negative ways.[5]

Beyond basic textures and patterns there is pictorial comprehension, the ability to understand a shape or pictogram. It is theorized that such abilities are quite similar between sighted and blind individuals. It is thought that in some situations of pictorial recognition blind individuals with tactile sensation can identify more shapes more quickly than their sighted counterparts because of their self-guided tactile exploration skills[6]

MATERIALS AND METHOD:

50 normally sighted student and 40 blind students. 28 of the visually challenged people are boys and the rest of the students were girls. Among the visually challenged people there were different categories. The blind participants had no more than residual light perception, but their visual histories were quite different. At one extreme were participantswho were born with normal vision who then progressedthrough a stage of low vision (definedhere as the ability to read print only by using magnification devices) to reach residual light perception. Ten participants were congenitally blind (residual light perception or less at birth), sevenas early blind (normal or low vision at birth declining to residual light perception or less by the end of childhood), and ten as late blind (normal or low vision throughout childhood, declining to residual light perception or less in adulthood). Nine participants had residual light perception at the time of testing and 4 had no light perception.





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The above mentioned letters were embossed in the Braille card and the visually challenged people as well the normal people were subjected to the test of decoding the letters. The normal people were blind folded before subjecting to the test.

RESULT:

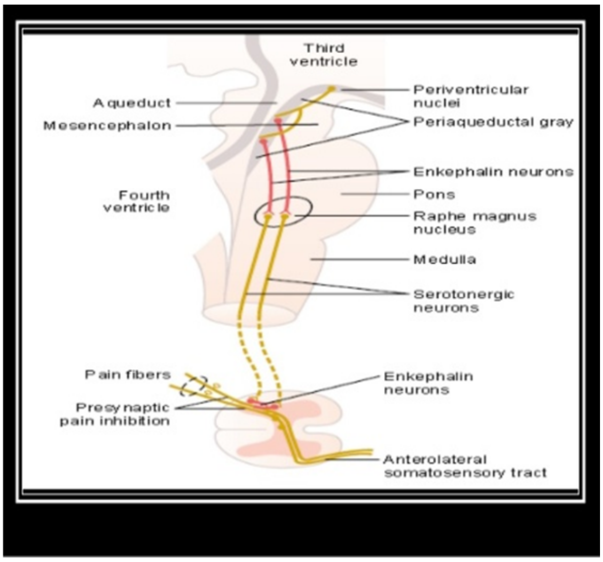
	Total no of People (50 Normal People)		
	<10 alphabets	10-20 alphabets	all 26 alphabets
No of people who are aware about Braille alphabets	7 people	24 people	19 people
Frequency of the alphabets	6 alphabets	17 alphabets	26 alphabets
Percentage awareness about the alphabets	14 percent	48 percent	38 percent

	Total no of people (40 Blind people)		
	<10 alphabets	10-20 alphabets	all 26 alphabets
No of people who are aware about Braille alphabets	nil	nil	40 people
Frequency of the alphabets	nil	nil	26 alphabets
Percentage awareness about the alphabets	nil	nil	100 percent

Among the normal people only very few people were not able to identify lessthan ten letters which accounts for 14 % of the normal people, 24 people were able to identify 10 - 20 alphabets with a frequency of alphabets being 17 and percentage of awareness among the people being 48%. 19 normal people were able to identify all the 26 alphabets accounting for 38%.
The blind people were able to read all the 26 alphabets accounting for 100 %.

DISCUSSION:

Touch is our oldest, most primitive and pervasive sense – in general, the first sense we experience in the womb and the last one we lose before death. Touch is a proximal sense, i.e. we feel things close to us or actually contact us – some exceptions occur, e.g. heat radiation & deep bass tones – touch can be extended with special tools (e.g. a long cane provides vibratory and pressure information for a blind).[8]Among the normal people who were able to read less than 10 letters ,in their regular visual system the data is collected by the retina which is converted into an electrical stimulus in the optic nerve and relayed to the brain, which re-creates the image and perceives it. Because it is the brain that is responsible for the final perception, sensory substitution is very least possible. the blind people as well the people who were able to read all the 26 alphabets , sensory substitution takes place. During sensory substitution an intact sensory modality relays information to the visual perception areas of the brain so that the person can perceive to see. With sensory substitution, information gained from one sensory modality can reach brain structures physiologically related to other sensory modalities. Touch-to-visual sensory substitution transfers information from touch receptors to the visual cortex for interpretation and perception.[9] To understand tactile sensory substitution it is essential to understand some basic physiology of the tactile receptors of the skin. There are five basic types of tactile receptors:Pacinian corpuscle, Meissner's corpuscle, Ruffini endings, Merkel nerve endings, and free nerve endings. These receptors are mainly characterized by which type of stimuli best activates them, and by their rate of adaptation to sustained stimuli.[10]Because of the rapid adaptation of some of these receptors to sustained stimuli, those receptors require rapidly changing tactile stimulation systems in order to be optimally activated.[11] Among all these mechanoreceptors Pacinian corpuscle offers the highest sensitivity to high frequency vibration starting from few 10s of Hz to a few kHz with the help of its specialized mechanotransduction mechanism. Various non-visual inputs produce cross-modal responses in the visual cortex of early blind subjects.[12]



CONCLUSION:

The test conducted in the normal and blind people by using a Braille card which bears the alphabets concludes that visually challenged people were able to perceive the tactile stimulus faster and better than the normal people who were blind folded. The research clearly states that we can train the normal people to use the tactile stimuli as a sensory substitution when people are prone to accidents or in situationswhere they lose their eye sight ,because visual impairment is compensated by development of tactile sensation over a period of time. Brain will start adapting itself to the loss of vision by enhancing the response of merkel nerve endings,Merkel disk receptors, meissian corpuscles, Ruffini endings, Pacinian corpuscle, enhancing the life of the visually challenged.[7]

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