Indian Journal of Medical Case Reports ISSN: 2319–3832(Online)
An Open Access, Online International Journal Available at http://www. cibtech.org/jcr.htm
2014 Vol. 3 (3) July-September, pp. 67-71/Khatoon
Case Report

TACTILE SENSITIVITY IN THE VISUALLY CHALLENGED AND NORMAL SUBJECTS – A COMPARATIVE STUDY

***Farisa Khatoon**
Department of Physiology, Deccan College of Medical Sciences, Hyderabad, Telangana, India
**Author for Correspondence*

ABSTRACT
Blindness defined as visual activity less than 3/60 by Snellen's chart or its equivalent. The present study shows that there is definitely superior capacity of tactile sensitivity in blind people compared with sighted people. The tactile task like discrimination, recognition, shape and size are more superior in visually challenged than compared to normal sighted subjects. The present study demonstrates that the primary submodalities of somatic sensations (touch, pain, temperature and vibratory sense) in visually challenged are similar to those of sighted person.

Keywords: *Blind, Touch, Pain, Temperature and Vibratory Sense*

INTRODUCTION
The relationship between sight and touch has been for a long matter of debate. Sters *et al.,* (1990) concluded that there is no poly sensory cross modal area, no cross modal region "in which representations formed in one sense would reside and be accessed by another sense", but suggested instead a system in which the senses can access each other directly from their sensory-specific system.
Roland *et al.,* (1991) reveals that in Tactile matching of three dimensional objects the tactile information is of a different nature from that of visual information when the hand is used to palpate an object, the information is sampled in a piece meal manner, such that only a piece of object surface is covered by fingers during sampling path for a truly three dimensional shape and sizes representation.
Chattergee and Millan (1995) first reading by touch differs from reading by print most Braille readers use two hands which influences the left dominance of language areas in blind this possibility is that only one hand reads while the other act as place marker.
Gonzates and Merzenich (1998) suggested that there is expansion of the representation for the Braille reading finger in somato sensory cortex given prior evidence of remarkable plasticity in the cortex. Their study shows that visually challenged had greater difficulty detecting near threshold tactile stimulation of adjacent digit tips normally used in reading Braille.
Boven *et al.,* (1999) reveals that responses centered on post central sulcus coincide with a region modulated by attention to tactile stimulate on right hand, and which lies anterior and lateral to visual attention region within the intrapari etal sulcus (IPS).
Anguille A and Kennedy GM (2000) shows recently that blind multifinger readers mislocalize more than sighted subjects when touched with von freytype nylon filaments.
Gonzales *et al.,* (1998) reported that early onset of blindness (less than 5 years) but not late onset blind Brailee reader can detect a significantly finer offset in the alignment of a row of three embossed dots compared to sighted. Furthermore within the blind group only men performed worse in Grating Orientation task than women.
Grant *et al.,* (2000) reported tactile letter recognition and gap detection task at finger tips using the Optacon stimulator (a device in which the stimuli are an array of pins activated by way of piezoelectrically driving pulse-taps (Tele sensory co. Mountain view, CA) naïve blind Braille readers perform better than naïve sighted subjects in both task.
The above findings Braille reader's spatial perceptual abilities are superior to sighted subjects. Optacon has been shown to engage selectively rapidly adapting and pacinian afferents, and not the responsible for the limits of tactile spatial resolution.

Heller *et al.*, (2002) reported that the spatial response properties of individual fibers to gratings indication that only the SA1 population is sensitive to spatial details at or below the human perceptual limit of grating resolution.
Study done by Sathain *et al.*, (2000) that blind subjects who used their right hand to read Braille are better at detecting accents over Braille characters with their right hand compared to left hand.
The careful study of Van Boven *et al.*, (1998) extends previous reports of tactile superiority in blind compared to sighted Blind Braille readers can identify some kinds of Braille like dot patterns almost 15% accurately detects gaps that are over 15% narrower distinguish the orientation of lines that are nearly 40% shorter.

MATERIALS AND METHODS

In the present study two groups of subjects have been taken. Each group comprising of twenty (20) visually challenged subjects, (10 males & 10 females). The other group comprising of 20 normal subjects (10 males and 10 females), the total subjects numbering forty (40). Due care was taken so that there is no imbalance in the male, female ratio. Age of subjects was between 25-45 years. Subjects were chosen from Government Home for Blind at Dilsukhnagar, Hyderabad. Care was taken that the subjects were not suffering from any major illness at present or in recent past.
Information on various anthropometric indices like height, weight as well as other devices like family size, income, dietary habits, lifestyles were collected at the time of enlistment.
The following different types of sensations are tested.

1. Tactile sensitivity

a) Fine touch
b) Pressure
c) Tactile localization
d) Tactile discrimination

Steps: 1) Proper instructions were given to subjects to raise his fingers when he felt the sensation. The subject was asked to close his / her eyes. With cotton wool the different parts of body of subject were touched lightly. It was enquired whether the subject felt normally or with difficulty. Sensations were elicited dermatome wise on both side and area of hyper anesthesia, parasthesia, anesthesia were noted.

2) Sense of Pressure: Instructions were given to subjects and pressure sense elicited by pressing the skin with Algometer on different dermatomes.

3) **Tactile Localization:** The subject was asked to hold open and close his eyes. Ball pen was used to locate points and the subject was asked to localize the point with pen he was holding, it vaired in different parts of body and corresponded with cone of touch spots which were numerous at finger tips and fewer on back. The localized distance on both sides of body was recorded and compared.

Two point Discrimination: Instructions were given to subject and was asked to say whether he felt one point or two points with anesthisiometer. The least distance between the two points recorded was 2mm and on the tips of fingers.

4) **Stereognosis:** Familiar objects were placed in the hand of the subject and subject was asked to recognize it by palpation by closing his eyes and the subject was able to recognize the objects.

5) **Vibration:** A tuning fork was striked against hypothenar eminence and was placed on mastoid process, tibia, styloid process and subject was able to feel the vibration.

6) **Sense of Pain:** With a pin a light prick was given to the subject on different parts of body, subject was asked whether he felt pain. Pain sensation was elicited in all the dermatomes on both sides of body.

7) **Temperature:** Two test tubes were taken one with water at 45°C and other with water at 5-10°C warm/cold test tubes were applied at different areas and the subject was asked whether he appreciated it. Temperature cone asthesiometer is used to make the cold and warm spots on skin.

RESULTS AND DISCUSSION

A total of 40 subjects are selected for the study. They are classified as 20 Normal sighted subjects and 20 visually challenged subjects.

Out of the normal group had 10 male and 10 female of the group of 20 visually challenged 10 were males and 10 were females. All subjects belong to the age group of 20-40 years.

The study was conducted to show that there is superior capacity of tactile sensitivity in visually challenged compared to sighted people.

The results depicted in Table I shows the age groups of the subjects taken. The Mean values and Standard Deviation are mentioned for both blind and normal subjects

Table I: Average age of subjects

Subjects	Mean	Standard Deviation
Blind	31.8	10.7
Normal	35.7	7.47

In table II shows the Value of Tactile Discrimination compared between the visually challenged and sighted subject. The standard error of mean between visually challenged and sighted subject were 0.4421, 0.425 and mean differences values were 0.001, 0.009 respectively which were statistically significant. (P<0.05).

Table II: Average values of tactile discrimination

Subjects	Mean	Standard deviation	T test	'p' value
Blind	5.48	1.98	3.52	<0.05
Normal	3.52	1.4	3.3	<0.05

Table III shows the systolic Blood Pressure readings before application of Pain structures in visually challenged and blind folded normal sighted individuals.

The standard error of mean between the two groups was 2.11 and mean difference was 0.825 which was statistically non-significant (P>0.05).

Table III: Recording of SBP before pain stimulus

Subjects	No. of subjects	Mean	Standard deviation	Standard error mean	'p' value
Blind	20	113.7	9.4	2.11	>.05
Normal	20	113.7	9.4	2.11	>.05

Table IV shows the recordings of systolic Blood Pressure after application of Pain stimulus in visually challenged and blind folded normal sighted individuals. The standard error of mean between two groups were 1.85, 2.21 ad mean difference values were 0.01 and 0.002 respectively which were statistically significant (P<0.05).

Table IV: Recording of sbp after pain stimulus

Subjects	No. of subjects	Mean	Standard deviation	Standard error mean	'p' value
Blind	20	125	8.27	1.85	>.05
Normal	20	114	6.99	2.21	>.05

Table V shows the recording of Diastolic Blood Pressure before application of pain stimulus in visually challenged and blind folded normal sighted subjects. The standard error of mean between two groups were 1.91, 2.21 respectively and mean difference values were 0.065, 0.035 which were statistically non-significant (P>0.05).

Table V: DBP before pain stimulus

Subjects	No. of subjects	Mean	Standard deviation	Standard error mean	'p' value
Blind	20	77.35	8.55	1.91	>.05
Normal	20	76.0	6.99	2.21	>.05

Table VI shows the recording of the Diastolic blood pressure of the visually challenged and blind folded normal subject after application of pain stimuli. The mean difference values were 0.001, 0.002 respectively which were statistically significant (P<0.05).

Table VI: DBP after pain stimulus

Subjects	No. of subjects	Mean	Standard deviation	Standard error mean	'p' value
Blind	20	85.7	6.74	1.51	>.05
Normal	20	76.5	6.69	2.21	>.05

The primary sense modalities (Vision, touch so on) are generally thought of as distinct. However, Visual imagery is implicated in normal tactile perception of some object properties such as Orientation, shape, and size. Furthermore, certain tactile task such as discrimination of grating Orientation and object recognition, shape and size are associated with activity in areas of visual cortex.

Visual processing similarly facilitates tactile object recognition. Experimental studies support that Visual cortex is necessary for optimal tactile performance in normally sighted subjects.

Present study, it has been evaluated that there is superior capacity of tactile sensitivity in visually challenged subjects.

The tactile task like discrimination, recognition, shape and size were more superior in visually challenged than compared to normal sighted subjects.

The present study, showed that light touch detection have not revealed a significant difference for visually challenged subjects compared with sighted subjects.

In the present study there was no significant difference found for vibratory detection in visually challenged subjects compared with sighted subjects. However, there was significant difference in the Blood Pressure when recorded in visually challenged individuals before and after application of Pain Stimulus when compared to sighted individuals. Blood pressure in visually challenged individual before application of pain stimulus was recorded as 110mm Hg as systolic and 80mm Hg as Diastolic. When pain stimulus was given to the visually challenged subject there was an increase in systolic 120 mm Hg and diastolic as 90mm Hg. when compared to the sighted individual.

In passive stimulation which did not require subjects to discriminate between tactile stimuli there was no activation of Primary Visual cortex in sighted or visually challenged.

There was significant rise in cerebral blood flow in visually challenged subjects in active tactile discrimination condition. There was increase in regional cerebral blood flow bilaterally in primary visual cortex, compared to sighted control subject who showed decrease of blood flow in same region. By tactile activation of Primary Visual Cortex Thalamus would be first level of processing where vision and touch information could come together.

The present study showed that there was no significant difference between the visually challenged and sighted subjects in detection of pressure sensation.

In the present study it was found that the primary sub modalities of somatic sensations (touch, pain, temperature and vibratory sense) in visually challenged were similar to those of sighted person.

The following conclusions are drawn from the present study:
1. There is definitely superior capacity of tactile sensitivity in visually challenged people compared with sighted people.
2. Tactile tasks such as discrimination, recognition shape, size is more superior in visually challenged than normal sighted subjects.
3. Pressure, Temperature vibratory sense in visually challenged subjects is similar to those of sighted subjects.
4. The visually challenged have superior abilities in stereognosis in comparison to normal subjects.

Visually challenged subjects show localized activation of higher tier of visual areas. The lower tier responses in large measure correspond to retinotopically organized visual center. Blind Braille readers use their visual cortex in a novel way, unlike the use of this visual cortex for early vision in sighted people. Thus focusing attention on finger tips when touching Braille might be expected to engage (Pari *et al.*,) attention regions. Minute movements on finger tips when touching cells increases activity in medial frontal premotor area. The present study proves that there is higher tactile sensibility in visually challenged when compared to normal subjects.

REFERENCES

Anguille A and Kennedy JM (2000). Guided exploration enhances tactile picture recognition in blind folded sighted children. *International Journal of Rehabilitation Research* **23**(4) 319-20.

Boven RV, Hamilton BH and Kauffmann BS *et al.*, (1999). Tactile spatial resolution in blind Braille readers. *Neurology* **54** (12).

Chattergel A and Millan (1995). Cortical blindness and visual imagery Neurology **45**(12) 2189-95.

Gonzales GR and Merzenich (1996). Symbol recognition produced by point of tactile stimulation; the illusion of linear continuity. *Mayo Clinic Proceedings* **71**(1) 1039-46.

Gonzales GR, Levis S and Weaver AL *et al.*, (1998). Tactile illusion produced number perception in blind and sighted individual. *Mayo Clinic Proceedings* **73**(12) 1167-70.

Grant AC (2000). Thiagarajal, Sathian KC, tactile perception in blind Braille reader. *Perceptual Psychology* **62**(2) 301-12.

Heller MA, Brackette D and Scrogg G *et al.*, (2002). Tangile pictures view point efforts and linear perceptive in visually impaired people. *Perception Journal* **31**(6) 747-69.

Rosles F, Roden B, Roland, Rumsey and Heil M *et al.*, (1993). Topographic differences of slow event related brain potential in blind and sighted adults during haptic mental rotation. *Cognitive Brain Research* **13**(1) 145-59.

Sathian K (2000). Sharper Tactile perception in blind. *Neurology* **54** 12-27.

Sters A, Muller M and Elbert Thomas (1990). Wilson Perceptual correlation of changes in cortical representation of fingers in blind multifinger braille reader, *Journal of Neuroscience* **18**(11) 4417-4423.

Van Broven RW and Hamilton RH (1998). Spatial acuity in blind subjects is reduced then sighted. *Neurology* **50**(supple.4) A162.