Original articles

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Comparative study of Tactile Discrimination in Completely Blind Braille Readers & Non blind Non Braille Readers

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ABSTRACT:

Background: Braille readers are encouraged for various task which fosters their finger sensitivity. Tactile discrimination is ability to distinguish between two touch stimuli on skin. The present study was conducted to compare the sense of tactile discrimination in Blind Braille readers who are expertise in braille reading & non blind non braille readers. Method: Tactile discrimination was measured by Weber Compass Aesthesiometer in completely Blind Braille readers & Non blind Non Braille readers. Result & Analysis: Collected data was analyzed by t test. It was found that completely blind Braille readers had better tactile discrimination than non-blind non Braille readers. Conclusion: The present study showed that statistically significant results of higher tactile discrimination in completely blind Braille readers than non-blind non Braille readers. These results may help us in rehabilitation of blind Braille readers.

Key words: - Tactile discrimination, Braille readers, Non Braille readers

INTRODUCTION:

Blind Braille readers are always a matter of curiosity and admiration in the society. A Braille reader deciphers the dots embossed on a special paper (Braille letters) with fingertips. Thus he continuously uses his sense of tactile discrimination while reading. Tactile discrimination which relies on different types of touch receptors is the ability to recognize two touch stimuli on skin as two separate points. This distance varies on different parts of the body as around 65mm on the back and 2 to 5 mm on the fingertip. It is least on the lips.[1] The variation is due to density of skin sensory receptors per sq.mm and connections to brain by dorsal column medial lemniscal system Tactile discrimination for Braille reading is a sequential process. In this, a Braille reader learner starts with three dimensional forms followed by flat shapes, embossed shapes with entire area raised, raised outline shapes & lines and finally Braille letters. They are given various tasks to develop their finger sensitivity and nurture tactile discrimination skills. Lateral inhibition can decrease two-point threshold by reducing the discharge of neuron innervating the receptive field in the center, thus making it apparent to the CNS that two stimuli are present.[2]

The present study was conducted to compare the sense of tactile discrimination in Blind Braille readers who have expertise in Braille reading & non blind non Braille readers.

AIM:

To compare the tactile discrimination at fingertips in blind Braille readers with that in sighted individuals.

METHODOLOGY:

Type of Study: A single observer population based cross-sectional study to compare the tactile discrimination at fingertips in blind Braille readers with that in sighted individuals.

Place of Study: Rajiv Gandhi Medical College, Thane

Sample Size: 20 subjects in group A and 20 in group B

Inclusion Criteria:

Group A: Completely blind individuals within age group 13 to 19 years, proficient Braille readers (have been reading Braille for 6 to 11 years) were selected from a blind girls school.

Group B: Controls of same age group & gender were selected from a secondary school.

Exclusion Criteria:

Partially blind Braille readers

Sighted Braille readers

Exclusion criteria for both groups A and B included history of neurologic disorders known to impair somatosensory function and trauma to the hands or their innervations.

Instrument used: Weber's compass aesthesiometer (range: 0 to 20 mm)

METHOD:

Institutional Ethics committee permission was taken prior to conduction of the study.

The study was conducted in blind Braille readers and persons with normal vision. The method of study was explained to each subject and written informed consent was taken. Subjects who voluntarily participated from Kamla Mehta Dadar School for Blind and Saraswati Secondary School, Thane were included. Each subject from group A (Blind) was confirmed for complete blindness and Braille reading years more than six years from their registered history. They were then asked to read Braille and the finger used for Braille character identification was decided. In all 20 subjects, the dominant reading finger was the index finger. Each subject from group B **(**sighted) was blindfolded.

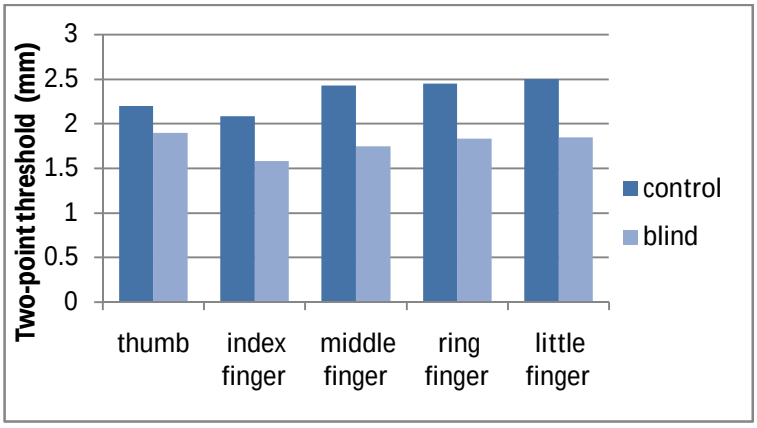
The test for tactile discrimination was performed using same Weber's compass aesthesiometer to all the subjects. While performing the test forearm was relaxed in a supinated position. Two points of the compass were applied perpendicular to distal pads of fingers simultaneously and painlessly.[4]Three consecutive readings for fingers with adequate intervals were recorded. Mode is considered as final reading. Negative tests were also performed in between to reduce bias.

RESULT AND ANALYSIS:

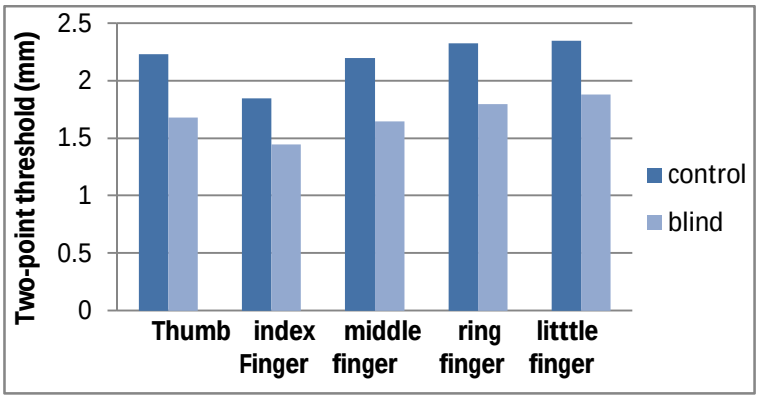
The sample consisted of total 40 girls, 20 each from group A and group B. Group A had completely blind girls within age group 13 to 19 years with mean age of 16.3 years, who were proficient Braille

readers (they have been reading Braille for 6 to 11 years) selected from a blind girls school. Group B had controls selected from a secondary school of same age group with mean age of 16.6 years, female gender not exposed to Braille reading.

GRAPHICAL REPRESENTATION:



The graph above shows comparision of blinds and controls for right hand.



The graph above shows comparision of blinds and controls for left hand.

Mean values & t-test were applied to the data collected.

Table1. Correlates of right & left all hand fingers of blinds & controls

Finger	Right hand (mm)			Left hand (mm)		
	Blind person (n=20)	Control (n=20)	t value	Blind person (n=20)	Control (n=20)	t value
Thumb	1.90 ± 0.48	2.20 ± 0.85	1.36*	1.68 ± 0.47	2.23 ± 0.88	2.39†
Index	1.58 ± 0.54	2.04 ± 0.71	2.5†	1.38 ± 0.56	1.89 ± 0.59	2.22†
Middle	1.75 ± 0.34	2.43 ± 0.71	4†	1.65 ± 0.52	2.20 ± 0.66	3.75†
Ring	1.83 ± 0.44	2.45 ± 0.81	3.1†	1.80 ± 0.47	2.33 ± 0.67	2.79†
Little	1.85 ± 0.40	2.50 ± 0.78	3.25†	1.88 ± 0.74	2.35 ± 0.67	2.13†

*p > 0.05 (Nonsignificant), † p < 0.05 (Significant), Mean ± SD & t value of tactile discrimination

From the above table, it is concluded that the ability of two-point discrimination is enhanced at fingertips in blinds.

DISCUSSION:

This study has demonstrated that the capacity for tactile discrimination at all the fingertips is superior in blind Braille readers as compared to sighted subjects. A similar study performed by R. W. Van Boven et.al contained Grating Orientation Task (GOT).[5] The mean grating orientation threshold was significantly (p = 0.03) lower in the blind group (1.04 mm) compared to the sighted group (1.46 mm). The dominant reading finger in blind subjects had a mean grating orientation threshold of 0.80 mm, which was significantly better than other fingers tested.

K. Sathian and A. Zangaladze in their study say that 'the tactile learning is not location specific like visual learning. Instead it gets generalized across other fingers'.[6] The subjects in present study practiced reading Braille for at least six years. This prolonged and consistent reading leads to various adaptive changes in the neural representation. In blind subjects, the sensory homunculus mainly shows increased area of representation for Braille-reading fingers.[7] This may explain why the present study has positive results in other fingers too, though the dominant reading finger is the index finger. Sadato, N. et. al performed Functional magnetic resonance test on blind subjects while they were told to read Braille letters. Results show activation of the primary visual cortex by Braille reading in blind subjects.[8] It proves the involvement of unused visual cortex in tactile perception by improving present connections of somatosensory and visual cortex to thus support the concept of cortical plasticity.[9]

The conventional test, the two-point discrimination task, does not measure the minute distances accurately and yields variable results in same subject due to his psychological involvement.[10] Statistical insignificance for right hand's thumb may be due to these reason.

These results may help us for rehabilitation of blind Braille readers in occupational tasks involving embossing work, textured surfaces etc. where their enhanced tactile sense is used to its optimum. In today's touch-screen era, if we can make embossed computerized surfaces, it will open new doors to the blinds. As this is a pilot study, further experiments can be performed to determine how to improve the sense of touch which may have many applications in later life.

As Braille reading exercises remodeling of neural connections and increased tactile sense. Appropriate exercises, if designed in future, and performed may enhance other senses in human beings by establishment of new neural connections.

SUMMARY:

The present study was conducted to compare the sense of tactile discrimination in blind Braille readers and sighted subjects using Weber's compass aesthesiometer, by applying its two points simultaneously and painlessly on fingertips. Statistically significant results show that the ability of tactile discrimination in blind Braille readers is superior to that in sighted once. These results may help us in rehabilitation of blind Braille readers.

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