

Assessment of Two Point Discrimination on Hand in Adult Population: An Observational Study

Shriprabha Thube¹, Mayuri Rajesh Shah², Parita Hardik Kothari², Vidhi Shah²

¹Intern, ²Assistant Professor,
Dr. D.Y. Patil College of Physiotherapy, Pimpri, Pune

Corresponding Author: Shriprabha Thube

ABSTRACT

Background: The normal ability to distinguish two points from one is the two point discrimination sense. Two point discrimination is extensively used clinically in evaluating injuries to the nerves that supply hands & to assess outcome of surgical manipulations such as digital replantation, skin grafting and peripheral nerve repairs. Normative values are extremely useful in interpreting test result from sensory assessments.

Method: A total of 100 patients (50 males & 50 females) are assessed to find out normative values using aesthesiometer to assess tactile sensitivity in normal individuals, ranging from age 40-59 years. The normative values were calculated on five digits of both hand, midpalm, thenar, hypothenar & dorsum of hand regions.

Results: The two point discrimination values vary according to different regions of hand. According to the study values for digits are between range of 3-5mm while for other hand regions they are like for midpalm region 12-13mm, for thenar 11-12mm, for hypothenar 11-13mm & for dorsum of hand 15-17mm.

Conclusion: The study concluded that fingertips were more sensitive than midpalm, thenar, hypothenar regions & dorsum of hand & women have more two point discrimination ability than men.

Keywords: Two point discrimination, Hand

INTRODUCTION

Two point discrimination is the term introduced by Weber in 1853. He defined it as distance between compass points necessary to feel two contacts. [1] Two point discrimination is a simple, inexpensive functional test widely used to assess tactile sensitivity.

Two point discrimination test assesses ability to perceive two points applied to skin simultaneously. It is measure of smallest distance between two stimuli applied simultaneously & with equal pressure. [2] The quality of two point discrimination sense indicates density of innervation of skin & somatosensory cortical representation. This sense is conducted via posterior column medial

lemniscus pathway to central nervous system.

Aesthesiometer and the circular two point discriminator are among the most common devices used for measurement. The two reshaped paper clips can also be used. But however, this requires the assistance of second examiner to measure the distance between two points using a small ruler. [3]

Aesthesiometer is the instrument used to determine two point discrimination values. It is a small hand held instrument designed to measure shortest distance that two points of contact on skin can be distinguished. It consists of small ruler with two movable tips coated with vinyl. Vinyl coverings help to minimize impact of temperature on perception of contact. [2]

Two point discrimination is originated and continued to be extensively used clinically in evaluating injuries to the nerves that supply hands & to assess outcome of surgical manipulations such as digital replantation, skin grafting and peripheral nerve repairs.

Purpose of study: Normative values are extremely useful in interpreting test result from sensory assessments. Availability of normative values for comparison is imperative for objective interpretation of two-point discrimination threshold tests. Two point discrimination addresses the sensitivity of overlapping receptive fields on the body surface. In evaluating nerve injuries of hand and post-surgical cases, its help is immense. [2] Sensory functions are important for a patient's rehabilitation to restore impaired motor function. Two point discrimination testing has been found to be particularly helpful in the assessment of injuries to nerves distributed to the hand sensor. Two point discrimination has been demonstrated to be a valid measurement of functional sensibility in the hand with good test. [4] At present, there is paucity of data on the normative values of two-point discrimination threshold distances in Indians.

Many studies on two point discrimination have been performed in Western countries, but not much has been reported in India. In particular, very few two point discrimination tests for various parts of the bodies of young adults have been conducted. The present will be attempted to measure the two point discrimination values of the hand in adult population with the hope that they might provide baseline data for objective evaluation of sensory functions. [5]

Aims and Objectives:

Aim: To find out normative values of two point discrimination on hand in adult population.

Objectives: 1.To find out normative values of two point discrimination on hand in adult population using aesthesiometer.

2. To compare values of two point discrimination on hand between right and left hand in adult population.

3. To assess values of two point discrimination on hand between males and females hand in adult population.

MATERIALS AND METHODOLOGY

The study design was observational and was carried out in outpatient department of Dr. D.Y. Patil College of Physiotherapy in Pimpri, Pune. The sampling method was Purposive and sample size was 100. The target population was 50 males & 50 females between 40-59 years of age. The study duration was for 6 months.

Materials used: 1.Aesthesiometer 2.pen 3.consent form

Inclusion criteria:1. Normal individuals between age group 40-59 years

2. Both males & females

Exclusion criteria:1 Individuals with any recent fracture of upper extremity

2.Individuals with diagnosed cases of neuropathy, nerve injuries, diabetes mellitus, spinal cord injury, head injury, intracerebral haemorrhage, GBS, leprosy, hypothyroidism, opioid abuse, lead poisoning, meningitis, compartment syndrome, brain tumor, chronic kidney diseases.

PROCEDURE:

The study was approved by ethical committee of the institute. Individuals fulfilling the inclusion and exclusion criteria were selected in the study. The procedure was explained to the participants. Participants were allocated in 2 groups mainly males (50) & females (50).Best of 3 readings was taken.

Steps -:

1. Participant was instructed to respond to each touch, with eyes closed by saying 'one point' or 'two points'.

2. Participant's hand was supported to avoid movement of fingers when touched by the points.

3. Began according to the distances given in below. Touch the client's fingers & hand with one or two points randomly applied.
4. The force of touch pressure was just to point of blanching, in a longitudinal direction, perpendicular to the skin.
5. Distance was increased or decreased.
6. If participant was able to discriminate two points correctly at given distance, the distance was decreased & continued to get the smallest distance at which participant could discriminate two points.

Hand region Distance

Digits: 5mm

Midpalm: 11mm

Thenar: 10mm

Hypothenar: 10mm

Dorsum of hand: 7-12mm

The data was collected & put in an excel spread sheet. Appropriate statistical test was applied & results were analyzed. Both groups were compared i.e. males & females.

RESULTS

Table 1: Values of two point discrimination in females

Females	Digit 1		Digit 2		Digit 3		Digit 4		Digit 5	
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
Upper limit (In mm)	5	5.74	5	4.94	5	4.93	5	4.94	5	4.94
Lower limit (In mm)	4	3.33	3	2.37	3	2.34	3	2.37	3	2.37

Females	MIDPALM		THENAR		HYPOTHENAR		DORSUM OF HAND	
	Right	Left	Right	Left	Right	Left	Right	Left
Upper limit (In mm)	12.20	13.11	11.72	12	9.51	10.57	14.66	15.66
Lower limit (In mm)	7.51	8.52	7	8	5.72	6.70	9.41	10.45

Table 2: Values of two point discrimination in males

Males	Digit 1		Digit 2		Digit 3		Digit 4		Digit 5	
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
Upper limit (In mm)	5.59	5.92	4.73	5.05	4.73	5.05	4.88	5.17	4.73	5.05
Lower limit (In mm)	3.32	3.31	2.5	2.5	2.5	2.5	2.43	2.46	2.5	2.5

Males	Midpalm		Thenar		Hypothenar		Dorsum of hand	
	Right	left	Right	left	Right	left	Right	Left
Upper limit (In mm)	12.26	13.40	11.80	12.42	12.72	10.92	16.12	17.42
Lower limit (In mm)	8.05	8.99	7.71	8.69	5.27	6.39	9.79	10.73

DISCUSSION

The objective of the study was to find out normative values of two point discrimination on hand in middle age adults. Two point discrimination test demonstrates the integrity of tactile stimulation. [Table 1] shows normative values of two point discrimination in females. According to the graph there is no much significant difference between two point discrimination values of digits of right & left hand. There is difference of 1-2mm in midpalm, thenar, hypothenar & dorsum region of right & left

hand. Right hand shows lower values of two point discrimination than left. So right hand is more sensitive than left. As right hand is dominant hand, its ability to carry sensations is more than left hand. There is significant difference between two point discrimination values of digits & other regions of hand.

In [Table2] normative values of two point discrimination in males are shown. According to present study normative values of digits are between range of 3-5mm while of other hand regions they are like for

midpalm region it is 12-13mm, for thenar region 11-12mm, for hypothenar region 11-13mm, for dorsum of hand 15-17mm. which suggest that fingertips were the most sensitive part than palm of hand. A study supporting my result was “Normative values of two point discrimination test among students of Princess Noura Bint Abdulrahman University in Riyadh” which suggest that fingertips were the most sensitive part than palm of hand [6] When compared two point discrimination values between males & females, males are showing two point discrimination values higher than females which means tactile sensitivity is more in females than males. Study supporting this result was “Two point discrimination of upper extremities of healthy Koreans in their 20’s” which suggest that women possesses more two point discrimination ability than men [5]

CONCLUSION

The study concluded that fingertips were more sensitive than midpalm, thenar, hypothenar regions & dorsum of hand & women have more two point discrimination ability than men.

Limitations: 1. Study conducted in limited area.

Future Scope of Study: 1. Study can be carried out in other populations & age group.

2. Study can be done for other body parts.

3. Comparison between two different age groups can be done.

REFERENCES

1. Won SY, Kim HK, Kim ME, Kim KS. Two-point discrimination values vary depending on test site, sex and test modality in the orofacial region: a preliminary study. *Journal of Applied Oral Science*. 2017 Aug;25(4):427-35.
2. Shibin K, Samuel AJ. The discrimination of two-point touch sense for the upper extremity in Indian adults. *Int. J. Health Rehabil. Sci*. 2013;2:38-43
3. *Physical Rehabilitation*, 6th Edition, F.A. Davis Company, Philadelphia, ISBN:978-0-8036-25759-2
4. Kim JS, Yi SJ. Comparison of two-point discrimination perception in stroke patients with and without diabetes mellitus. *Journal of physical therapy science*. 2013;25(8): 1007-9.
5. Koo JP, Kim SH, An HJ, Moon OG, Choi JH, Yun YD, Park JH, Min KO. Two-point discrimination of the upper extremities of healthy Koreans in their 20’s. *Journal of physical therapy science*. 2016;28(3):870-4.
6. Alsaeed S, Alhomid T, Zakaria H, Alwhaibi R. Normative values of two-point discrimination test among students of Princess Noura Bint Abdulrahman University in Riyadh. *Int J Advanced Physiol Allied Sci*. 2014 Oct 18;1(1):42-52.

How to cite this article: Thube S, Shah MR, Kothari PH et.al. Assessment of two point discrimination on hand in adult population: an observational study. *Int J Health Sci Res*. 2020; 10(5):60-63.
