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Research Article

ASSESSMENT OF PAIN THRESHOLD AND TWO POINT DISCRIMINATION IN PERCUSSIONISTS

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ABSTRACT

Aim: To assess the pain threshold and two-point discrimination in percussionists.

BACKGROUND: Percussionist's are exposed to continuous precise repetitive fine finger movements which results in musculoskeletal trauma such as altered sense of touch and pain. Pressure algometer and handheld aesthesiometer has been used to assess pain threshold and two-point discrimination.

Methodology: It was an observational study. Total 30 percussionist and 30 normal subjects between age group of 21 to 35 were selected. Pressure algometer and handheld aesthesiometer has been used to assess pain threshold and two-point discrimination.

Results:

1. Data was not normally distributed in Two Point Discrimination values in both group.
2. Data was normally distributed for Pain Threshold values in both group
3. Comparison of pain Threshold in Experimental group and Controlled Group was found to be significant.
4. Comparison of Two Point Discrimination in Experimental group and Controlled Group was found to be not significant.
5. Calculated level of significance in two point discrimination between Experimental group and Controlled Group at Thumb (0.312), Index (0.604) and Middle (0.098) Fingers respectively.
6. Calculated level of significance in Pain threshold between Experimental group and Controlled Group at Thumb (0.0051), Index (0.0371) and Middle (0.0416) Fingers respectively.

Conclusions: At the end of the study, we concluded that two-point discrimination is unaffected and pain threshold is affected in percussionists. expiratory capacity gets reduced in post menopause women.

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INTRODUCTION

Playing percussion instruments involves highly coordinated, repetitive use of the hands to master complex patterns of finger motion necessary to produce rapid musical passages. According to Hand Sensibility, Strength, and Laxity of High-Level Musicians Compared to Non-Musicians literature, percussionists will often need to produce as many as 1400 notes per minute or 72 finger shifts per second, requiring a staggering amount of digital precision and velocity. ^[1] A player's direct contact with the instrument can be very brief. This implies that whatever striking force and dampening effect a player is aiming for needs to be integrated in the entire

striking movement. A player's movement defines the velocity and effective mass at impact, and the same striking gesture will also determine the contact duration.

The prevalence of playing related musculoskeletal disorders of music college freshmen playing string instruments. Korean J Occup Environ, have found out high prevalence of work-related musculoskeletal disorders in musicians, ranging from 73.4% to 87.7% ^[2] In a study at the University of Texas, the prevalence of these injuries among brass instrument players (French horn, trombone, trumpet and tuba) was 61%.

Musculoskeletal disorders in percussionists include chief complains like pain, weakness, numbness, tingling and other symptoms that interfere with their ability to play their

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instrument at the level they are accustomed to. Pain is an unpleasant, subjective experience that consists of sensory and emotional aspects (Rainville, *et al.*, 2002). According to Indian culture it has been found that percussionist plays instruments like Tabla with bare hands, exposing them to direct and repetitive trauma. Also, other symptoms like pain and weakness. In a literature by Anke Steinmetz¹, Andrew Claus², Wolfram Seidel³, Paul Hodges² and Gwendolen Jull² has found alteration in Pain threshold using pressure algometer in violinist pain threshold is defined as the lowest intensity of a painful stimulus at which the subject perceives pain.

Individuals with low pain thresholds experience pain much sooner and faster than those with higher thresholds; individuals' reactions to stimulation of pain receptors vary.^[3] Also Pressure algometer is most reliable device (0.95 – 0.96) used for assessing pain threshold.

It has been found that percussionist playing instruments using drumsticks or tools are prone for musculoskeletal injuries with alteration of sensation. One study of sensation in the fingers of string players did not find a statistically significant difference in the two-point discrimination and light touch sensation as measured by Semmes-Weinstein monofilaments between string players and non-musicians. However, the study was limited to 10 subjects in each group. An Aesthesiometer is a device for measuring the tactile sensitivity of the skin. The measure of the degree of tactile sensitivity is called aesthesiometry. Aesthesiometer has been found the most reliable device (0.8 to 0.87) to assess two-point discrimination. The purpose of this study was to assess pain threshold and two-point discrimination in percussionists. As there is lack of research done on percussionist's players recurrent injuries.

Experimental Section

MATERIALS AND METHODS

Study Design: It was an observational study with the duration of 1 year and was done in metropolitan city.

Sample Design: Convenient sampling was done with the sample size of 60 and sampling population were 30 percussionist and 30 normal subjects

Material Used: Pressure algometer, Aesthesiometer, Chair and table, Pen, Paper were used during the study.

Inclusion Criteria

- Subjects willing to participate in the study.
- Percussionists both male and females included.
- 21 to 35 years old individuals
- Main musical activity students, professional orchestra musicians
- Musical teachers and soloists
- Musicians who have practiced for at least 4 years
- Percussionist playing bare hands

Exclusion Criteria

Any History of

- Pain
- Musculoskeletal disorder
- Hand trauma less than 6 months
- Hand surgery

- Callus formation
- Diabetic neuropathy
- Nerve injuries or entrapment: carpal tunnel syndrome
- Congenital disorder
- Neurological impairment
- Psychologically ill patient

Procedure

60 subjects who were willing to participate was included in the study. All participants were screened as per inclusion and exclusion criteria. Purpose of the study and procedure was explained to the subject prior to the study. A written informed consent was taken from the entire selected subject prior to participation. Demographic data of the subjects was taken. Subjects were randomly divided into following groups:

- Group A- percussionists
- Group B - non-musicians (control group)
- All the participants were assessed for pain threshold and two-point discrimination. Data was collected and analyzed using student T- test and Mann-whitney u test.

Method to Assess Pain Threshold

- Patient was in sitting position with hand supported.
- The algometer has 1cm small rounded tip which was placed on the fingertip to provide the stimulus.
- The stimulus was applied perpendicular and the stimulus was slow and steady.
- The patient was instructed to indicate verbally as soon as the sensation becomes painful.
- The test was applied for 20-30 seconds and the best of 3 readings was noted down.

Procedure to Assess two Point Discrimination

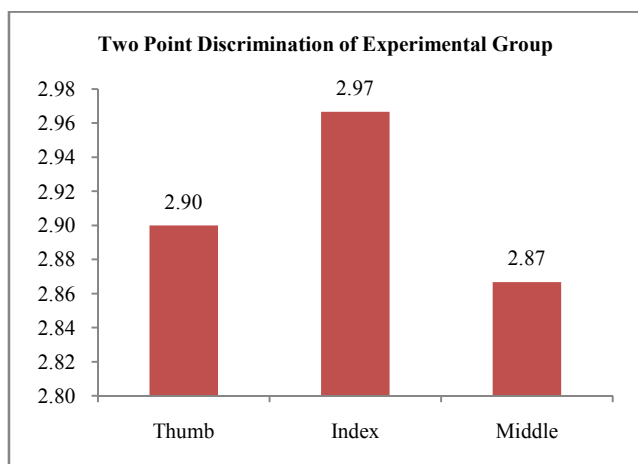
- Explanation of the procedure to the patient with his/her eyes open was given. For example, "I am going to touch your fingertips with this instrument. I will touch you with either one or two points, and tell me if you feel one or two points when you feel the touch."
- Demonstration of the procedure with the patient's eyes open until the patient understood the procedure.
- The patient was asked to close his/her eyes.
- The test was beginning with the points of the aesthesiometer opened greater than the mean value for the body part being tested.
- Stimulus was given by applying light and equal pressure across the two points.
- Patient had identified if they feel one or two points.
- Then the two points were moved closer together across consecutive trials until the patient cannot distinguish the two points as separate.
- Distance were measured between the two points using the aesthesiometer ruler.
- Repetition of procedure was done throughout suspected areas and document findings were noted.

RESULTS AND DISCUSSION

RESULT

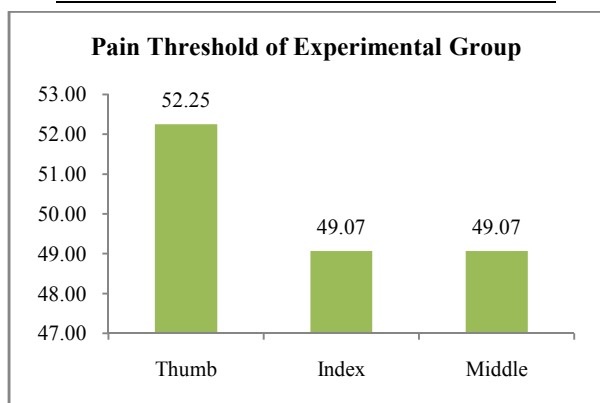
Demographic data of age, BMI, year of practice and daily hour of practice

Subjects	MEAN	SD
Age	28.51	±3.19
Bmi	22.42	±1.73
Years of practice	5.46	±1.41
Daily hours of practice	3.5	±1.24



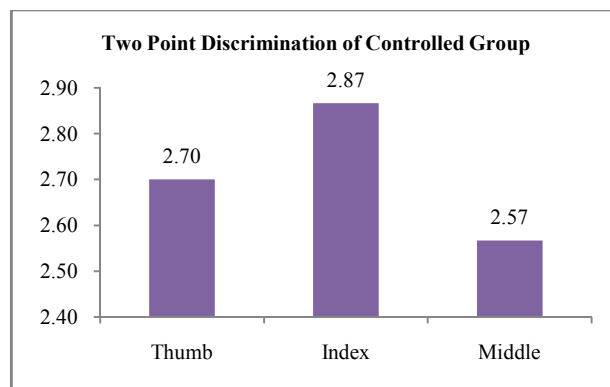
Graph 1 Assessment of two point discrimination in experimental group

Two Point Discrimination of Experimental Group		
Finger	Mean	Standard Deviation
Thumb	2.90	0.83
Index	2.97	1.02
Middle	2.87	0.92



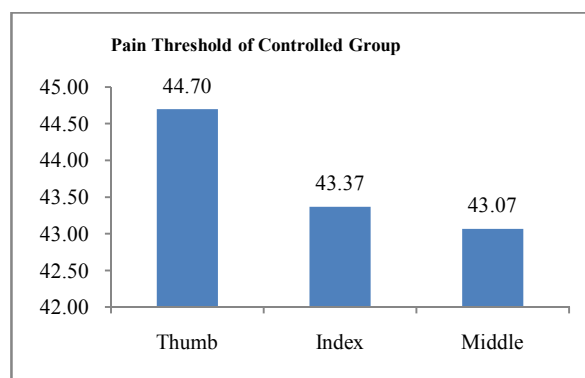
Graph 2 Assessment of pain threshold in experimental group

Pain Threshold of Experimental Group		
Finger	Mean	Standard Deviation
Thumb	52.25	10.84
Index	49.07	10.54
Middle	49.07	9.36



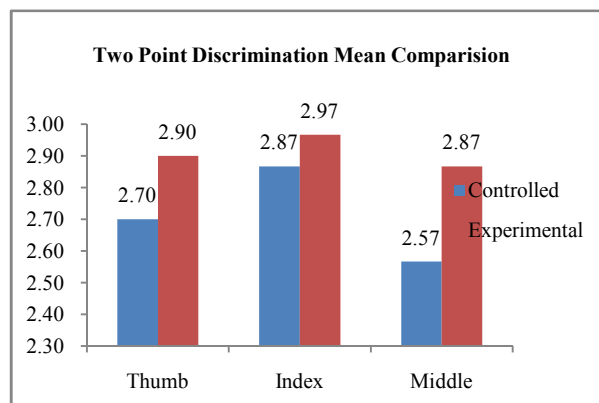
Graph 3 Assessment of two point discrimination in controlled group

Two Point Discrimination of Controlled Group		
Finger	Mean	Standard Deviation
Thumb	2.70	0.53
Index	2.87	0.50
Middle	2.57	0.62



Graph 4 Assessment of pain threshold in Controlled group

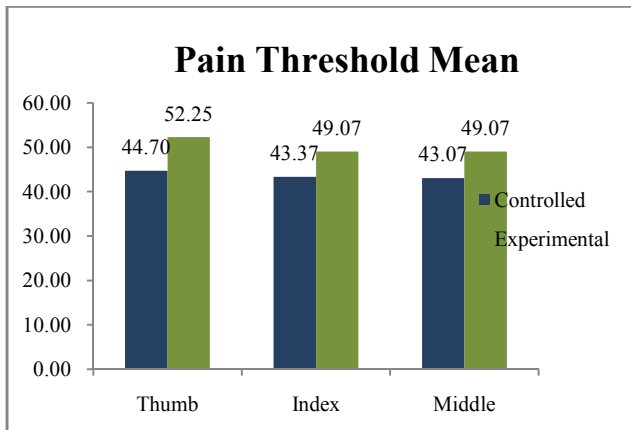
Pain Threshold of Controlled Group		
Finger	Mean	Standard Deviation
Thumb	44.70	9.63
Index	43.37	9.78
Middle	43.07	12.37



Comparison Graph: Assessment of two point discrimination in experimental group Vs Controlled Group

Two Point Discrimination					
Finger	Experimental Group		Controlled Group		P-Value
	Mean	Standard Deviation	Mean	Standard Deviation	
Thumb	2.90	0.83	2.70	0.53	0.312
Index	2.97	1.02	2.87	0.50	0.604
Middle	2.87	0.92	2.57	0.62	0.098

This shows comparison of two point discrimination values of Thumb (0.312), Index (0.604) and Middle (0.098) Fingers of experimental group Vs Controlled group respectively.



Comparison Graph: Assessment of Pain threshold in experimental group Vs Controlled Group

Two Point Discrimination					
Finger	Experimental Group		Controlled Group		P-Value
	Mean	Standard Deviation	Mean	Standard Deviation	
Thumb	52.25	10.84	44.70	9.63	0.0051
Index	49.07	10.54	43.37	9.78	0.0371
Middle	49.07	9.36	43.07	12.37	0.0416

This shows comparison of pain threshold values of Thumb (0.0051), Index (0.0371) and Middle (0.0416) Fingers of experimental group Vs Controlled group respectively.

Interpretation: Data was normally distributed Mann-Whitney U test was applied to calculate level of significance at $P < 0.05$ it was found to be statistically not significant.

DISCUSSION

Playing percussion instruments involves highly coordinated, repetitive use of the hands to master complex patterns of finger motion necessary to produce rapid musical passages. According to Hand Sensibility, Strength, and Laxity of High-Level Musicians Compared to Non-Musicians literature, percussionists will often need to produce as many as 1400 notes per minute or 72 finger shifts per second, requiring a staggering amount of digital precision and velocity.^[1]

Musculoskeletal disorders in percussionists include chief complains like pain, weakness, numbness, tingling and other symptoms that interfere with their ability to play their instrument at the level they are accustomed to.

Individuals with low pain thresholds experience pain much sooner and faster than those with higher thresholds; individuals' reactions to stimulation of pain receptors vary.^[3] Also Pressure algometer is most reliable device (0.95 – 0.96) used for assessing pain threshold.

It has been found that percussionist playing instruments using drumsticks or tools are prone for musculoskeletal injuries with alteration of sensation. An Aesthesiometer is a device for measuring the tactile sensitivity of the skin. The measure of the degree of tactile sensitivity is called aesthesiometry.

Aesthesiometer has been found the most reliable device (0.8 to 0.87) to assess two-point discrimination.

The purpose of this study was to assess pain threshold and two-point discrimination in percussionists. The sample consisted of 60 subjects, age between 21-35 years. As there is lack of research done on percussionist's players recurrent injuries.

In this study Thumb, Index And middle fingers were taken as the testing area because it has been found that these areas are more prone for callus formation^[1]. Also, it was found that precision areas in percussionist which are in repetitive use were radial side of the hand.^[7] hand percussion technique requires the hand to be out of neutral position, which compresses the radial side of the wrist. After continued play, it can create stress in the radial part of hand.^[7]

In this study we have tested the right-hand fingers because the right hand was found to be more dominant among the both groups and the comparison was done between non-percussionist and percussionist having the right-hand dominancy.

In the comparison of pain threshold values were done between controlled and experimental groups it was found to be significant. Calculated level of significance in Pain threshold between Experimental group and Controlled Group at Thumb (0.0051), Index (0.0371) and Middle (0.0416) Fingers respectively. Our hypothesis was thus partially accepted, as we proposed there will be significant effect pain threshold in percussionists. Also, in previous studies it has been found that there is significant effect on pain threshold due to repetitive use and micro trauma over the hand.^[1]

Lastly comparison of two-point discrimination values were done between controlled and experimental groups it was found to be not-significant. Calculated level of significance in Two-point discrimination between Experimental group and Controlled Group at Thumb (0.312), Index (0.604) and Middle (0.098) Fingers respectively. Therefore, the proposed hypothesis was not Accepted. There was no significant difference in these characteristics. We also gathered data regarding instrument played, years played, hours per day spent in personal practice, and years at current practice level for the experimental group. An additional weakness was the lack of controlling for sex, which may have been a potential source of bias. Further study is needed to ascertain the cause of not significant difference observed in two-point discrimination

CONCLUSION

Thus, our study to assess two-point discrimination and pain threshold in percussionists concluded that two-point discrimination is unaffected and pain threshold is affected in percussionists.

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