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Correlation between medial longitudinal arch height of foot and static, dynamic balance in cricketers

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Abstract
Background: Cricket is one of the most favoured and practised team sport in India and world wide. It involves physical activities such as running, throwing, batting, bowling, catching and diving inspite of being noncontact sport.
Dr. Paul stated that a stable base and dynamic balance is necessary for optimal performance in cricket. Balance is defined as the process of maintaining center of gravity within the body's base of support and a measure of lower extremity function.
Central and peripheral nervous system works together to maintain center of gravity within body's base of support and thereby to maintain balance. Balance is classified into static and dynamic balance. Static balance is the ability to maintain the center of gravity of the body at the dependence level while standing and the dynamic balance is the ability to maintain the constant dependence level while doing a movement.
Purpose: To find relation between medial longitudinal arch height of foot and static, dynamic balance especially in cricketers.
Method: Observational study, 70 professional cricketers were selected for the study.
Sampling Method- Convenient Sampling Method.
Inclusion Criteria- Age between 18 to 25 years. At least 1 year of experience in cricket. Practicing cricket with weekly training for minimum 5 days. Normal category of BMI (18.5-23)
Exclusion Criteria- Cricketers with history of recent lower limb injury or surgery. Current foot pain. Any systemic illness.Cricketers receiving any physical therapy intervention.Cricketers with any foot deformity.
Result: There is statistically non-significant weak positive correlation (rho=0.211) between medial longitudinal arch height of foot and static balance with eyes open. There is statistically non-significant weak positive correlation (rho=0.179) between medial longitudinal arch height of foot and static balance with eyes closed. There is statistically non-significant weak positive correlation (rho=0.150) between medial longitudinal arch height of foot and dynamic balance.
Conclusion: The study concluded that there is a weak positive correlation between medial longitudinal arch height of foot and static, dynamic balance in cricketers.

Keywords: medial longitudinal arch height of foot, balance, cricketers

1. Introduction
Cricket is one of the most favoured and practised team sports worldwide. It involves physical activities such as running, throwing, batting, bowling, catching and diving. Balance is defined as the process of maintaining centre of gravity within the body's base of support and a measure of lower extremity function and it can be classified into static, dynamic balance. Both static and dynamic balance are maximally challenged in all activities while playing cricket. Medial longitudinal arch is composed of the first three metatarsals, three cuneiforms, navicular, talus and calcaneus bones of the foot. Normal foot, supinated foot and pronated foot are the common foot posture variation. Since previous studies are giving conflicting results, it is important to correlate medial longitudinal arch height and balance, especially in cricketers.

2. Problem Statement
To find out the correlation between medial longitudinal arch height of foot and static, dynamic balance in cricketers.

3. Objective
To find the correlation between medial longitudinal arch height of foot and static balance.
To find the correlation between medial longitudinal arch height of foot and dynamic balance.

4. Methodology
Research design : observational study
Study population : cricketers
Sample size : 70
Method of sampling : Convenient Sampling
Study Duration : 6 months
Study set-up : PCMC

A. Inclusion Criteria
Age between 18 to 25 years. At least 1 year of experience in professional cricket. Practising professional cricket with weekly training for minimum 5 days. Normal category of BMI (18.5-23)

B. Exclusion Criteria
Cricketers with history of recent lower limb injury or surgery. Current foot pain. Any systemic illness. Cricketers receiving any physical therapy intervention. Cricketers with any foot deformity.

5. Outcome Measures
Navicular drop test (ndt) Single limb balance test (eyes open and closed) Y balance test (ybt)

6. Procedure
Ethical committee clearance was taken. Subjects were selected as per the inclusion criteria. Informed consent was taken. The navicular drop test was performedon the dominant leg of the subject and values was recorded in millimeter.
Then each subject was told to performed single leg static balance test (eyes open and eyes closed)andY balance test for dynamic balance.
The subject was performing each balance test and condition 3 times, and we used the average of the 3 trials for data analysis.

7. Result

Table 1: NDT and Static Balance (Eyes Open)

Variable Y	Eyes_Open
Variable X	NDT
Sample size	70
Spearman's coefficient of rank correlation (rho)	0.211
Significance level	P=0.0797
95% Confidence Interval for rho	-0.0253 to 0.425

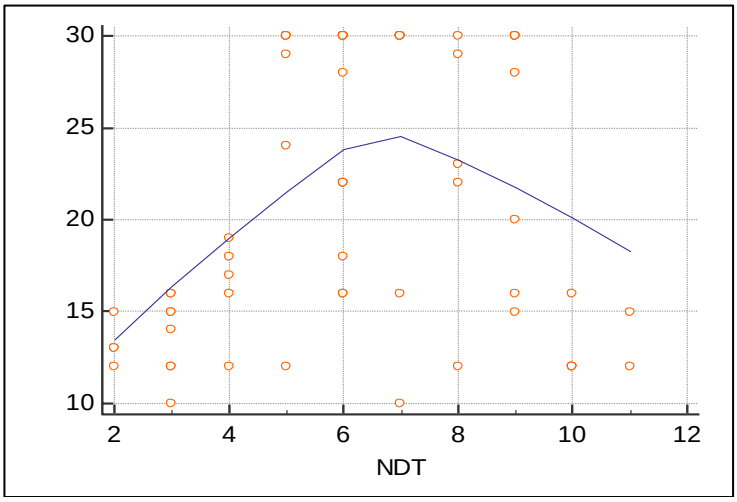

Fig 1: NDT and Static Balance (Eyes Open)

According to Shapiro-Wilk test the data is not normally distributed, therefore Spearman`s coefficient of rank correlation is applied. The Spearman`s correlation coefficient 'rho' is 0.211 which shows weak positive correlation, with the p value of 0.0797 showing statistical non-significance.

Table 2: NDT and Static Balance (Eyes closed)

Variable Y	Eyes_Closed
Variable X	NDT
Sample size	70
Spearman's coefficient of rank correlation (rho)	0.179
Significance level	P=0.1373
95% Confidence Interval for rho	-0.0580 to 0.398

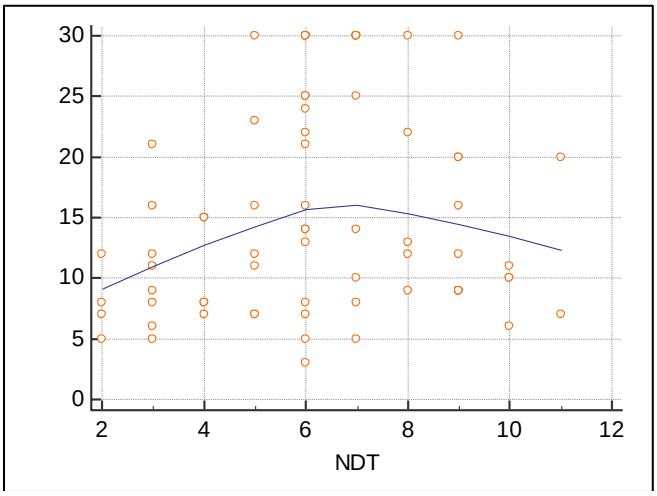

Fig 2: NDT and Static Balance (Eyes closed)

According to Shapiro-Wilk test the data is not normally distributed, therefore Spearman`s coefficient of rank correlation is applied. The Spearman`s correlation coefficient 'rho' is 0.179 which shows weak positive correlation, with the p value of 0.1373 showing statistical non-significance.

Table 3: NDT and YBT (Dynamic Balance)

Variable Y	YBT_
Variable X	NDT
Sample size	70
Spearman's coefficient of rank correlation (rho)	0.150
Significance level	P=0.2137
95% Confidence Interval for rho	-0.0876 to 0.372

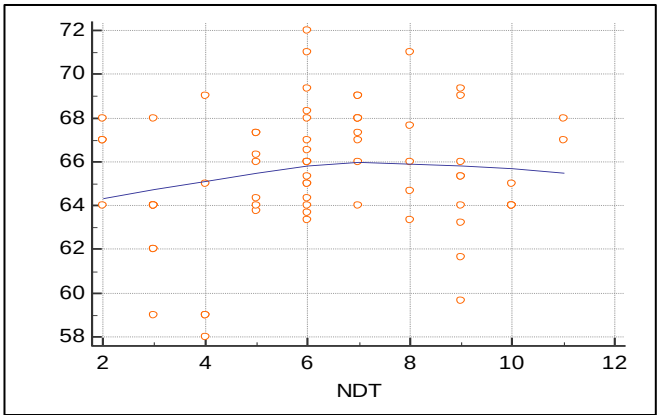

Fig 3: NDT and YBT (Dynamic Balance)

According to Shapiro-Wilk test the data is not normally distributed, therefore Spearman`s coefficient of rank correlation is applied. The Spearman`s correlation coefficient 'rho' is 0.150 which shows weak positive correlation, with the p value of 0.2137 showing statistical non-significance.

From above table and graph it is seen that There is statistically non-significant weak positive correlation (rho=0.211) between medial longitudinal arch height of foot and static balance with eyes open. There is statistically non-significant weak positive correlation (rho=0.179) between medial longitudinal arch height of foot and static balance with eyes closed. There is statistically non-significant weak positive correlation (rho=0.150) between medial longitudinal arch height of foot and dynamic balance.

8. Discussion

In the present study statistical non-significance and there was a weak positive correlation between medial longitudinal arch height of foot and static balance with eyes open was seen i.e. as the values of navicular drop tests were normal there was increased in static balance(eyes open) but when navicular drop values were altered there was a slight decrease in the static balance with eyes open in cricketers. Because when foot posture gets altered it leads to alteration in normal base of support. Altered base of support may push body in the state of non equillibrium because of which person can loose balance.

Tsai L *et al.* in 2006 compared foot types to static balance and stated that the subjects with pronated foot and supinated foot have poor static balance than the normal foot by explaining these results as per particular factor (eg. age, body mass, body height, exercise training and injury history), other factors such as strength, timing of muscle activation, fatigue, history, emotion, motivation, and physical status.

Mika Shimizu in 1999, proposed that increased heel height in 16 healthy women caused supination at the midfoot and shift of pressure towards first metatarsal during single leg standing which partnered balance deficiency. They concluded this on the function of a tightly biased windlass mechanism in the foot with the single leg standing.

And in the present study statistical non-significance and there is a weak positive correlation between medial longitudinal arch height of foot and static balance(eyes closed) and dynamic balancei. e. static balance on single leg with eyes closed and dynamic balance was not affected by the navicular drop values.

Anand Heggannavar and *et al.* studied effect of foot posture over standing balance in 30 healthy individuals and found no statistically significant effect. They concluded the study with the comment that there is no association between foot posture index and standing balance [9].

In the study done by Mahshid Saghazadeh and *et al*, the association between foot arch height and standing balance was checked, which showed similar results supporting current study. They found no association between standing foot arch height and standing balance [22].

Aisyah Mohd and *et al.* concluded no association between balance performance and type of the foot. They supported this finding with the statement that muscular strength and mobility of joint are equally important in maintaining balance of elderly irrespective of their foot posture [20].

In his regards the results of the present study is compatible with Anand Heggannavar and *et al*, Mahshid Saghazadeh and *et al.* and Aisyah Mohd and *et al.* that there is weak correlation between medial longitudinal arch height of foot and static (eyes closed), dynamic balance in cricketers.

9. Conclusion

The present study concludes that there is a weak positive correlation between medial longitudinal arch height of foot and static balance with eyes open and eyes closed. And weak positive correlation between medial longitudinal arch height of foot and dynamic balance. Although the statistical significance was not obtained in any of the case.

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