An Assessment and Comparison of State, National and International Basketball Players in Relation to (2D:4D) Digit Ratio in Right Hand

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ARTICLE DETAILS	ABSTRACT
Research Paper **Keywords:** (2D:4D) Digit Ratio, index finger and ring finger and right hand *DOI :* **10.5281/zenodo.14395921**	**Purpose:** The study aimed to evaluate and compare State, National, and International Basketball Players in Relation to (2D:4D) Digit Ratio in right hand. **Methods:** For the purpose of the study (N=90) professional Basketball players from India i.e. State (n=30), National (n=30) and International (n=30) Basketball players were selected. The players age ranged from 14 to 45 years. The variables selected for the study were (2D:4D) Digit Ratio in right hand Basketball players. To assess and Compare among state, national and international Basketball Players in Relation to (2D:4D) Digit Ratio in right hand from India. To analyze the data, descriptive statistics such as mean, standard deviation, skewness, and kurtosis were employed, along with analysis of variance (ANOVA) for comparison. The level of significance at 0.05 level. level. **Conclusion:** There were significant differences found among state, national and international Basketball Players in Relation to (2D) Digit Ratio and (4D) Digit Ratio in right hand. Whereas, the international Basketball players was found greater (2D) and (4D) Digit Ratio in right hand than State and National Basketball Players.

Introduction

To know the relationship of digit ratio with basketball performance data was calculated which was collected from Ninty male basketball players (Elite and non-elite). Elite players have represented Indian basketball team in different international tournaments, while non-elites were the players who have represented state teams. To find out the relationship thirty male Indian Basketball players was selected. The data was examined to know the status of subjects in relation to selected dependent variables i.e. linear speed, agility, leg explosive strength, recovery and repeated sprinting ability. The data was examined to know the status of subjects in relation to selected criterion and predictor variables as well as to know the relationship between criterion variable (Basketball performance) and predictor variables (2D:4D) Digit Ratio along with to predict the Basketball performance on basis of predictors. Data was also examined to compare the digit ratio of elite and non-elite basketball players in respect to their playing position.

The connection between the ring and index finger lengths is known as the 2D:4D ratio. To calculate the 2D:4D ratio, divide the length of the index finger (the second digit) by the length of the ring finger (the fourth digit).

The palm side is frequently measured by researchers by measuring the distance between the fingertip and the crease closest to the palm (see Figure 1). Since they are all the same length, the ratio for the majority is 1.0. However, the range of this ratio can be roughly 1.05 for a longer index finger and 0.85 for a longer ring finger.

Figure: 1

Material and Methods

Subjects

The purpose of the study (N=90) professional Basketball players from India i.e. State (n=30), National (n=30) and International (n=30) Basketball players were selected from different parts of the
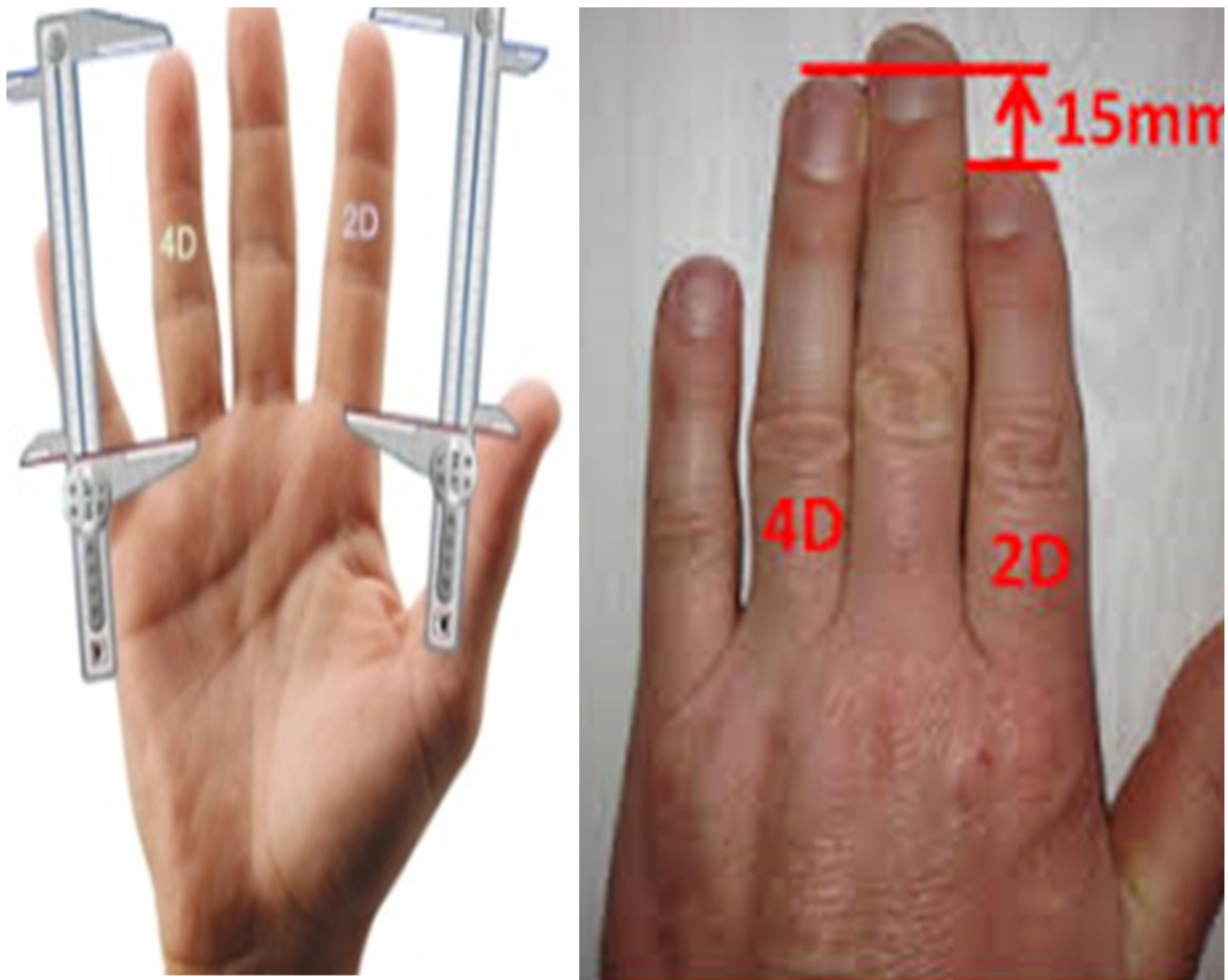
country. The players age ranged from 14 to 45

years. The variables selected for the study Right Digit Ratio 2D (Length of the index finger) and (4D Length of the ring finger) in Relation to Basketball players were assessed by Digital Vernior Caliper.

Criterion Measures

Performance was measured through the match video analysis of selected players. To assess the performance of players a panel of three experts was constituted, they assessed the performance of players on the basis of 30 point rating scale. Experts assess the performance on following basis: **Field Goal Shooting**: 2 Point Field Goal and 3 Point Field Goal **Free Throw:** 1 Free Throw, 2 Free Throw and 3 Free Throw **Rebounding:** Offensive Rebounding and Defensive Rebounding **Blocks:** Blocked Shots and Blocks against Foul**:** Offensive Foul and Defensive Foul **Violation, Volume of Play Efficiency** and **Double Dribble.**

Statistical Analysis

For all the statistical analyses, IBM SPSS (version 20.0.0) was used. The data for the (2D:4D) Digit Ratio in the right hand of 90 professional basketball players from the state, national, and international levels in India were analysed using Analysis of Variance (ANOVA), as indicated in Tables No. 1 and 2.

Table: 1
Descriptive Statistics of State, National and International Basketball Players in Relation to Digit Ratio (2D:4D) in right hand

Level	State		National		International	
Variables	**Right Hand Digit Ratio (2D)**	**Right Hand Digit Ratio (4D)**	**Right Hand Digit Ratio (2D)**	**Right Hand Digit Ratio (4D)**	**Right Hand Digit Ratio (2D)**	**Right Hand Digit Ratio (4D)**
Mean	0.952	0.959	0.952	0.955	0.954	0.975
Std. Deviation	0.020	0.019	0.025	0.024	0.023	0.024
Skewness	-.258	-.106	-.348	-.190	-.243	-.456
Kurtosis	-.080	-.657	-.140	-.714	-.567	-.453

The above table: 1 shown the descriptive statistics of the State, National and International Basketball Players in Relation to Digit Ratio (2D:4D) in right hand. The mean and standard deviation

values of Digit Ratio (2D:4D) in right hand are as follows: State (0.952 ± .020 : 0.959 ±.019), National (0.952 ± 0.025 : 0.955 ±.024) and International (0.954 ± .023 : 0.975 ±.024) level Basketball players, respectively.

Table:2

Comparison among State, National and International Basketball Players in Relation to Digit Ratio (2D) in right hand

Source of variation	Sum of squares	df	Mean square	F- value
Between groups	6715.58	2	3357.79	
				76.78 *
Within groups	918.38	87	43.73	

Significant at 0.05 level of significance   F0.05 (2, 87) = 3.11

At the 0.05 level with (2,87) degrees of freedom, Table: 2 showed a significant difference between state, national, and international basketball players in relation to the right-hand Digit Ratio (2D). The derived F-ratio was 76.78, which was greater than the tabulated value of 3.11. Consequently, post hoc analysis was utilised, and the LSD test was used to determine how the paired averages of state, national, and international basketball players differed in relation to the right-hand Digit Ratio (2D).
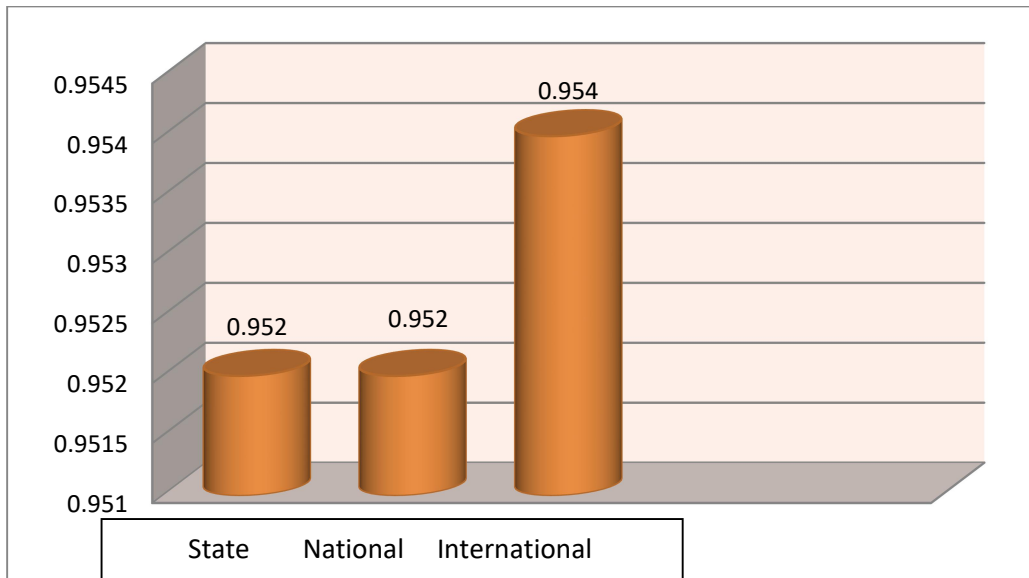
Table: 3

Least Significance (LSD) Post Hoc Test for the Paired Means Among State, National and International Basketball Players In Relation To Digit Ratio (2D) in right hand

Digit Ratio (2d) at State Level	Digit Ratio (2d) at National Level	Digit Ratio (2d) at International Level	Mean Difference	Critical Difference
.952	.952		0.00	
.952		.954	.002	6.88
	.952	.954	.002	

Significant at 0.05 level of significance

Table: 3 showed that there was no significant difference between state, national and international Basketball Players in Relation to Digit Ratio (2D) in right hand, as mean difference of (0.00), (.002) and (.002), which was lower than the critical difference value of (6.88).

Graph: I

Graphical Representation of comparison of means of state, national and international Basketball Players in Relation to Digit Ratio (2D) in right hand

The international basketball player was found greater than state Basketball Players as well as national Basketball Players in Relation to Digit Ratio (2D) in right hand.

Table: 4

Analysis of variances of state, national and international Basketball Players in Relation to Digit Ratio (4D) in right hand

Source of variation	Sum of squares	df	Mean square	F- value
Between groups	6432.67	2	3165.23	
				72.60 *
Within groups	888.34	87	42.45	

Significant at 0.05 level of significance   F0.05 (2, 87) = 3.11

State, national, and international basketball players differed significantly in relation to the Digit Ratio (2D), as shown in Table 4. The resultant F-ratio was 72.60, higher than the tabulated value of 3.11, at the 0.05 level with 2,87 degrees of freedom.

Therefore, Post hoc applied in which LSD test used to find out the difference of the paired means among state, national and international Basketball Players in Relation to Digit Ratio (4D) in right hand

Table: 5
Least Significance (LSD) Post Hoc Test for the Paired Means among State, National and International Basketball Players In Relation To Digit Ratio (4D) in right hand

Digit Ratio (4d) at State Level	Digit Ratio (4d) at National Level	Digit Ratio (4d) at International Level	Mean Difference	Critical Difference
.959	.955		0.04	
.959		.975	.006	5.77*
	.955	.975	.020	

Significant at 0.05 level of significance

Table: 5 showed that there was insignificant difference between state, national and international Basketball Players in relation to Digit Ratio (4D) in right hand, as mean difference of (0.04), (.006) and (.020), which was lower than the critical difference value of (5.77).

Graph: II
Graphical Representation of comparison of means of state, national and international Basketball Players in Relation to Digit Ratio (2D) in right hand
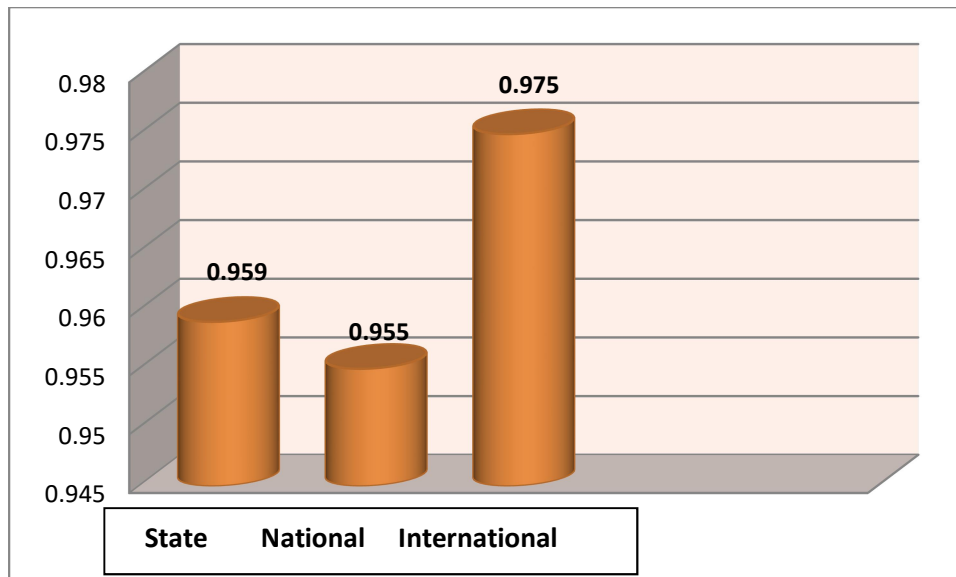
The international basketball players was found greater than state Basketball Players as well as national Basketball Players in Relation to Digit Ratio (4D) in Right hand

Discussion and finding

Basketball players predictor indicator the physical variable Digit ratio in right hand players played a significant role into their performance in the competitions. The relationship between digit ratio 2D:4D in the right hand basketball found negligible. The purpose of the study (N=90) professional Basketball players from India i.e. State (n=30), National (n=30) and International (n=30) Basketball players were selected from different parts of the country. The players age ranged from 14 to 45 years. The variables selected for the study Right Digit Ratio 2D (Length of the index finger) and (4D Length of the ring finger) in Relation to Basketball players were assessed by Digital Vernior Caliper.

The descriptive statistics of the study also shows the normality of the data, in which all the values lies within the threshold. For the comparison among the level of participation of the athletes the one way Analysis of Variance (ANOVA) applied. According to the study's findings, basketball players from different states, countries, and countries differed significantly in their right-handed Digit Ratio (2D) and (4D). Other research also indicated that, after Bonferroni correction, there were significant differences in competitive standards for the left 2D:4D but not for the right, with basketball players who met higher standards typically having lower left 2D:4Ds (Nathan A. Frick, Melissa J. Hull, John T. Manning, Grant R. Tomkinson, 2016).

 Finally The international basketball players was found greater than state Basketball Players as well as national Basketball Players in Relation to Digit Ratio (2D) in right hand and other hand The international basketball players was found greater than state Basketball Players as well as national Basketball Players in Relation to Digit Ratio (4D) in right hand also.

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