

## **COMPARATIVE STUDY OF STATURE AND BODY MASS INDEX OF MALE ELITE BASKETBALL PLAYERS OF KARACHI AND LAHORE**

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### **Abstract**

Basketball is a game of international fame and the NBA – National Basketball Association, America conducts the drafting of players for every season each year where besides others these two components play an important role in the selection of players. This study aimed to compare the stature and Body Mass Index (BMI) of male Elite basketball Players of the Karachi and Lahore Division. Quantitative research techniques were used to collect and analyze the data. A purposive sampling technique was used to collect the data of 24 players from both teams, i.e. twelve from Lahore and twelve from Karachi. The data was analyzed at SPSS-version 25 and for z-test Microsoft Excel was used. The purpose of this study was to compare these two factors' impact on the performance of two divisional teams of Pakistan representing at the National Level with same technical and tactical skills but differences in results.

**Keywords:** Stature; Body Mass Index; Elite Basketball Players.

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### **Introduction**

Basketball was introduced by Dr. James Naismith in 1891 at Spring Field, Massachusetts. He was a Physical Education teacher at YMCA -Springfield College (Naismith, 1996). His head of Department, Gullick Halsey Luther asked him to devise an indoor game for students to keep their bodies

warm during the winter season when there is snow outside, in Massachusetts. For this purpose, the students were gathered in the assembly-prayer hall and two peach baskets (later iron hoops with net) were affixed to the balcony of the hall at 10 feet (3.05m) height. The game was first played with a soccer ball.

The player who has possession of a ball can move by tapping the ball towards the ground and finally, the ball has to be shot in the peach basket to secure points (Editors, 2021). To prevent physical bullying, players cannot touch the person with the ball. If contact is made, a personal foul is recorded. From Hoop height and game technique, it becomes obvious that this game will be dominated by taller and quicker players (FIBA, 2016). In the 1904 Olympics, it was first introduced as a demonstration sport during the Summer Olympics held in St. Louis, Missouri, USA. It was included as a regular sport in the 1936 Berlin Olympics after the formation of FIBA – Federation Internationale de Basketball Amateur in 1932, now the International Basketball Federation (History.com, 2018). FIBA organizes Olympics, world championships, and other regional events in the Entire world. NBA was born in 1949 (FIBA, 2024).

Stature or Standing height (STH) is a measure of the distance from the floor to the top of the head when a person is standing upright. It is commonly known as the height of an individual. Thus, a Stature with a good wingspan provides a better approach height for offense and defense during games (Zarić et al., 2020).

Body Mass Index (BMI) is a measure that uses height and weight to estimate how much body fat an individual has. It gives a general idea of whether an individual is underweight, normal weight, overweight, or obese. The formula to calculate BMI:

$$\text{BMI} = \text{weight}(\text{kg}) / \text{height}(\text{m})^2$$

A good BMI shows the fitness of players which makes a player capable of moving frequently and can score more at offense and stop the score of the opponent at defense (Masanovic et al., 2019; Torres-Unda et al., 2012).

According to the Encyclopedia of Arab Psychology definition of an Elite athlete and according to Swan et.al (2015) elite athletes were described as professional or amateur athletes who have achieved a high level of success in their sport participating from the Olympics to the National level. They possess various physical and mental attributes that enable them to perform well in their chosen sport (Elite Athlete Definition in Psychology, 2024; Swann et al., 2015).

In this study, elite players are defined as those team members who have qualified after pre-nationals for the Basketball National Championship or in the National games of Pakistan in categories A and B. Therefore, players participating in these categories were

considered elite players.

Thus, better stature and good BMI help players take rebounds and block the player in defense in a better way. The standing height of the Player is a key component to be considered while selection is made. NBA-National Basketball Association America during the draft of players for the season (Hussey, 2021).

### **Purpose of Study**

The purpose of this study was to Compare the stature and body mass index (BMI) of male elite basketball players from Karachi and Lahore divisions, assessing their impact on performance

### **Literature Review**

According to a study by Schwartz J, basketball has become a worldwide and popular sport that attracts fans from different age groups. This popularity has been accompanied by an increase in data availability and innovative methodology that has inspired fans to analyze basketball from a statistical perspective (Schwartz, 2013).

Ackland et al. (1997) surveyed 168 players from 14 national teams. They use standardized methods and a team of trained doctors who can measure many things such as length, width, and girth using 38 body measurements. They were grouped by game

task and task group and performed univariate ANOVAs using data size and parity variables. They found significant differences in the size of guards, fronts, and centers, but also found some similarities in the ratio of fronts and centers, particularly the relative measure of body size. They discuss the different roles of each position in the group to explain the findings (Ackland et al., 1997).

More than 26 million Americans play basketball in the United States today; of these, 15.5 million play recreational/basketball, 4.1 million play on a competitive team, and 5.8 million plays in school or university. Of this large pool of baseball players, a quarter are women and nearly half are under 18 years of age. While basketball is by far the most popular sport in terms of participation compared to the US, basketball is not the number one sport in Serbia. However, in the world's biggest competition, Serbia followed the USA on the podium. Official data of the International Basketball Federation (FIBA) shows that Serbia is the world's largest player exporter, accounting for 81.8% of the players. The important thing is that, according to official documents, since the establishment of the North American Men's Basketball League (NBA), foreigners have received the largest number of players from Serbia in this competition due to their physical

characteristics. and can play basketball. The above-mentioned results are the product of professionalism and hard work and also aim to maintain Serbia's important position in the basketball world (Vukasevic et al., 2018).

Gryko et al. conducted a study examining the relationship between the body structure of youth in various sports activities and the body structure of adult elite baseball players. Weight, height, skin, body shape, and weight of approximately 35 adults (age:  $14.09 \pm 0.30$  years,  $n = 35$ ) and 35 adult baseball players (age:  $24.45 \pm 5.40$  years,  $n = 35$ ) and width was measured. Play in elite teams. They found that pitchers in both age groups performed better than soldiers and defenders ( $p < 0.001$ ). The biggest difference between the different groups is the defender's own height ( $169.36$  to  $186.68 = 17.32$  cm). The height difference between defenders and professional team players is 7.17 centimeters, and the height difference between young players is 13.23 centimeters. Young people are more ectomorphic (2.12-3.75-4.17), while professional workers are more mesomorphic (2.26-4.57-3.04). The ratio of personal height and wingspan is important in choosing the office level. The results show that height and weight measurement, shoulder width, humerus width, and femur width should be taken into account when choosing a

basketball, especially the difference between personal height and arm span for areas (Gryko et al., 2018).

Bjelica et al. (2020) compared the anthropometric characteristics and body compositions of young athletes and basketball players with healthy sedentary individuals. They selected 70 men and divided them into three groups: 25 athletes, 13 basketball players, and 32 sedentary subjects. They measured their height, weight, body weight, bone mass, muscle mass, and fat mass using standard methods. They used ANOVA and LSD post hoc tests to evaluate differences between groups. They found that there were no significant differences between the groups in terms of body mass index and bone content, but there were differences in the groups' height and weight, as well as muscle mass and fat. They suggested that regional coaches should use these findings to improve their talent selection and evaluation approaches (Bjelica et al., 2020)

There is a significant difference in some of the differences between top athletes and basketball players. They examined 39 men and divided them into two groups. The first team includes 26 players who play for the Novi Sad Vojvodina senior football team, while the second team includes 14 players

who play for the Novi Sad Vojvodina basketball team. They measured 20 anthropometric variables that describe bone length and width, body volume and size, and subcutaneous fat. They used a statistical test called a t-test to compare the two groups at a significance level of  $p < 0.05$ . They found significant differences in all variables measuring bone length and width, as well as body volume and weight. They also found significant differences in all variables measuring subcutaneous fat except upper arm skin (Masanovic et al., 2018).

Another study by Borjan et al. 2020 compared the morphological characteristics and body composition of players in the Serbian Premier League and the Serbian Second League. They measured four different variables: height, weight, arms and leg length. They also measured two different dimensions of body composition: body weight and body fat percentage. They studied 48 men and divided them into two groups: 24 players from the Chinese Super League and 24 players from the Second League. They used t-tests to see if there were differences between the two groups. This study aims to describe the physical characteristics and body compositions of athletes and to see how they differ according to activity level. The results showed significant differences between the

two groups in five variables: height, weight, arms, length, and body fat percentage. However, there was no significant difference in body mass index. These findings may help coaches recognize differences between groups based on competitive level (Masanovic et al., 2018)

Nasia et al. A study was conducted to examine the effects of height, weight, and basketball experience on the physical performance of young baseball players. They measured the anthropometric characteristics and physical activities of 50 U-13 male basketball players ( $12.2 \pm 0.4$  years). They used standardized methods to collect anthropometric data and measure physical performance in 20-meter dashes, T-tests, squat jumps, counter-kinematic jumps, and medicine ball throws. They re-evaluated the scale after 10 weeks to measure the growth of change. They used t-tests to compare two measures and multiple regression tests to evaluate the effectiveness of the measures. They found that after 10 weeks, the players' lean body mass increased significantly, and fat did not decrease. They also found significant improvements in all exercise tests. They found that changes in body fat percentage were associated with speed and agility, while grip strength and weight were associated with body composition when

passing, shooting, and dribbling. Tennis experience was a significant predictor for all three sports tests. They concluded that changes in body composition, years of experience, and body weight affect physical performance and athletic performance, especially speed, agility, and broken body (Rinaldo et al., 2020).

Gaetano conducted a study that aimed to find the relationship between different anthropometric variables and the performance of different roles in a group of senior baseball players performing their responsibilities on the team. The sample consisted of 40 basketball players (elite players) divided into four groups: power forward ( $n = 12$ ; age =  $24.5 + 1.4$  years), middle ( $n = 12$ ; age  $24.1 + 1.1$  years); point guard/guard ( $n = 8$ ; age =  $24.4 + 1.3$  years) and small forward ( $n = 8$ ; age =  $23.5 + 1.2$  years). They measured their weight, height, and body mass index and applied the modified Abalakov test. They also measure their strength using the Bosco method: jump jump (SJ), counter jump (CMJ), and arm CMJ (CMJas). They measure jumping and coordination by the difference between the height of a one-handed stroke technical movement (St) and the height of a straight arm (AB1), and the difference between the back working height of the two arms (Rb) and the difference between the

height of the two arms, the difference between the stretching height (AB2). They re-evaluated the scale 10 weeks later. Among the groups, height ( $F = 4.75$ ,  $p < 0.006$ ), height with one arm connected to AB1 ( $F = 3.60$ ;  $p < 0.02$ ), and height with two arms connected to AB2 ( $F = 3.66$ ; They found differences in  $p < 0.02$ ). It is an important difference. . They found no significant difference in Bosco's test between groups. They found significant differences between groups in St ( $F = 7.29$ ;  $p < .001$ ) and Rb ( $F = 3.95$ ;  $p < .01$ ) values. They concluded that the Bosco test measures a player's general jumping ability, while the Abalakov test measures specific jumping ability related to shoot blocking and recovery. They also determined that the anthropometric characteristics of the players directly affected certain variables (Gaetano et al., 2018).

Pena compared different anthropometric and physiological variables in high-level basketball, baseball, and softball. They measured the performance of 46 Spanish Serie A professionals in height, standing height, weight, body fat percentage (using the Jackson and Pollock equation), vertical jump (using the Bosco test), 4 m x 5 m agility test, and bench test. power output depression. They used analysis of variance to determine differences between groups. They found that the athletes were taller and taller

than the other group ( $p < 0.01$ ). They also found that baseball players had the lowest body mass and basketball players had the largest body mass. Body fat percentage was lower in basketball and basketball than in basketball ( $p < 0.05$ ). Basketball players performed better in the vertical jump, especially the arm swing counter jump ( $p < 0.001$ ). Basketball players showed better results in the speed test ( $p \leq 0.01$ ). Basketball players also had higher average power output at all loads during the common bench press exercise ( $p < 0.05$ ), while basketball players had the lowest results during the eccentric phase ( $p < 0.001$ ). They concluded that assessment is important to improve training strategies and skills assessment processes (Peña et al., 2018).

**Material and Methods**

This was a quantitative research study to compare the Height and body mass index of Elite male basketball players of Karachi and Lahore division. A purposive sampling technique was adopted to collect the data from

the selected samples. A sample size of 24 Male basketball players was divided into two categories equally i.e. 12 players – Lahore Division and 12 players - Karachi Division.

All subjects’ stature was assessed as per the Heather-Carter Manual of anthropometric measurement-1990. (15) Where Stature was measured. BMI, or Body Mass Index, is a measure that uses height and weight to estimate how much body fat an individual has. It gives a general idea of whether an individual is underweight, normal weight, overweight, or obese. Here’s the formula (16) to calculate BMI:

$$BMI = weight(kg) / height(m)^2$$

The data collected was analyzed by using simple descriptive statistical tools like mean-X and standard deviation (SD) primarily using an Excel sheet and verified at SPSS. The z-test of two sample means was applied to compare the two means, The z-test of two sample means was applied to calculate z-critical two-tail values.

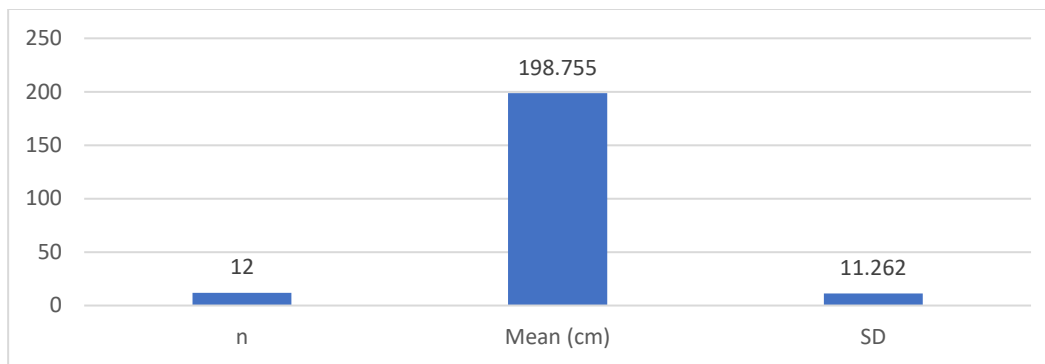
**Results**

Table 1. Stature- (STH) of Male Elite Basketball Players of Lahore Division

n	Mean (cm)	SD
12	198.755	11.262

Source: Self Survey 2023-24

Table 1 shows the Stature (STH) of Male Elite basketball Players of Lahore. The mean score comes out to 197.1 cm and  $\pm$ SD was calculated at 11.262.



Source: Self Survey 2023-24

*Figure 1. Stature (STH) of Male Elite basketball Players of Lahore*

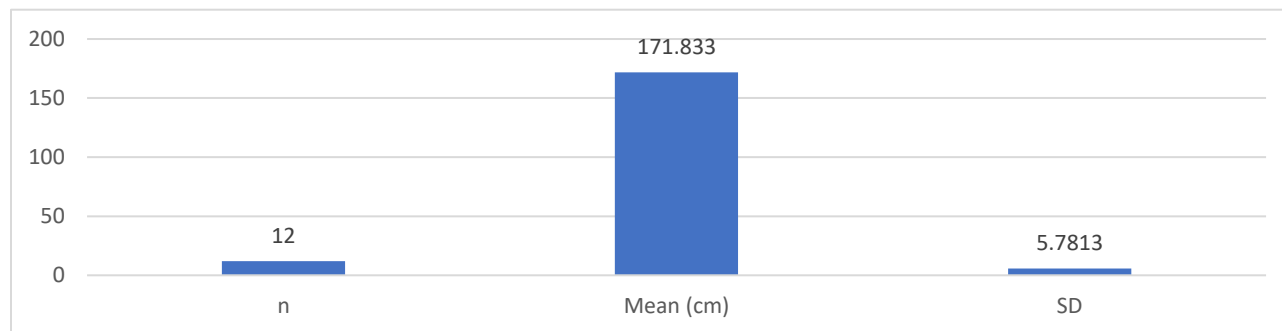
Figure 1. shows the Stature (STH) of Male Elite basketball Players of Lahore. The mean comes out to 198.755 cm and  $\pm$ SD was calculated at 11.262.

**Table 2. Stature- (STH) of Male Elite Basketball Players of Karachi Division**

<b>n</b>	<b>Mean (cm)</b>	<b><math>\pm</math>SD</b>
12	171.833	5.7813

Source: Self Survey 2023-24

Table 2. shows the Stature (STH) of Male Elite basketball Players of Karachi. The mean score comes out 171.833 cm and  $\pm$ SD was calculated at 5.7813.



Source: Self Survey 2023-24

*Figure 2. Stature (STH) of Male Elite basketball Players of Karachi*

Figure 2 shows the Stature (STH) of Male Elite basketball Players of Karachi. The mean score comes out to 171.833 cm and  $\pm$ SD was calculated at 5.7813.

**Table 3. Stature (STH) Comparison of Male Elite Basketball Players of Lahore and Karachi**

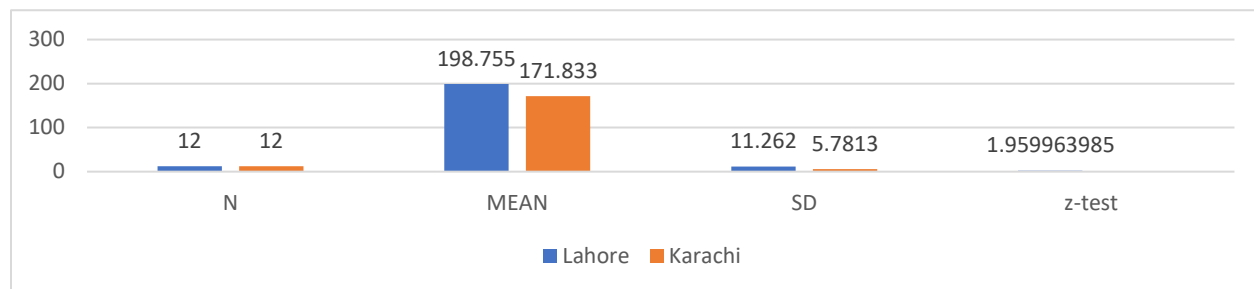
<b>Division</b>	<b>N</b>	<b>MEAN</b>	<b>SD</b>	<b>z-test</b>
Lahore	12	198.755	11.262	1.9599639845
Karachi	12	171.833	5.7813	

Source: Self Survey 2022-23



Table 3 Shows the Stature (STH) i.e. standing height comparison of Male Elite Basketball Players of Lahore and Karachi division players. The mean value shows a significant difference between the STH of male elite

Basketball Players of Lahore and Karachi. By applying the Z-test: two samples of mean, the value for z-critical two-tail value comes out 1.9599639845 at 0.05 level of significance.



Source: Self Survey 2022-23\

Figure 3. Stature (STH) - Standing Height Comparison

Figure 3 Shows the Stature (STH) i.e. standing height comparison of the Male Elite Basketball Players of Lahore and Karachi division players. The mean value shows a significant difference between the STH of

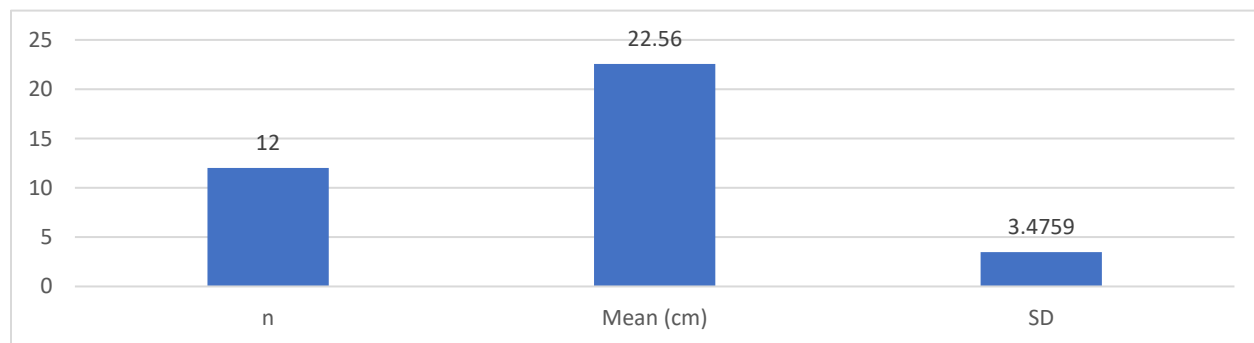
male elite Basketball Players of Lahore and Karachi. By applying the Z-test: two samples of mean, the value for z-critical two-tail value comes out 1.9599639845 at 0.05 level of significance.

Table 4. Body Mass Index (BMI) of Male Elite Basketball Players of Lahore

n	Mean (cm)	±SD
12	22.56	3.4759

Source: Self Survey 2023-24

Table 4 shows the Body Mass Index (BMI) of Male Elite basketball Players of Karachi. The mean score comes out to 22.56 cm and ±SD was calculated at 3.4759.



Source: Self Survey 2023-24

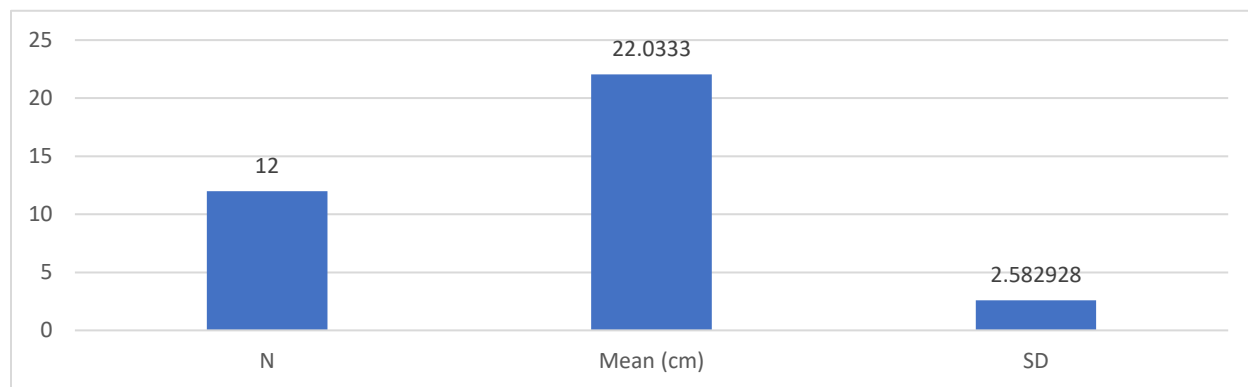
Figure 4 shows the Body mass index (BMI) of Male Elite basketball Players in Karachi. The mean score comes out to 22.56 cm and  $\pm$ SD was calculated at 3.4759.

Table 5. Body Mass Index (BMI) of Male Elite Basketball Players of Karachi Division

N	Mean (cm)	$\pm$ SD
12	22.0333	2.582928

Source: Self Survey 2023-24

Table 5 shows the Body Mass Index (BMI) of Male Elite basketball Players of Karachi. The mean score comes out to 22.0333 cm and  $\pm$ SD was calculated at 2.582928



Source: Self Survey 2023-24

Figure 5 shows the Body Mass Index (BMI) of Male Elite basketball Players in Karachi. The mean score comes out to 22.0333 cm and  $\pm$ SD was calculated at 2.582928.

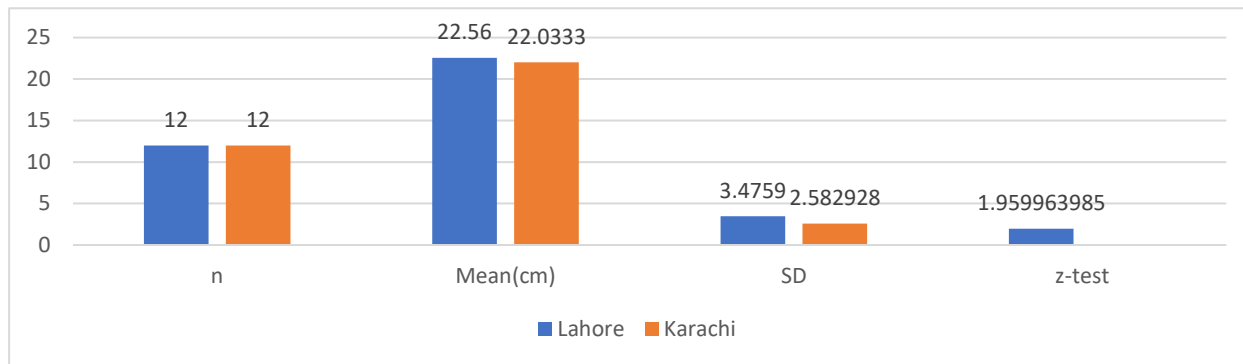
Table 6. BMI Comparison of Male Elite Basketball Players of Lahore and Karachi

Division	N	Mean(cm)	$\pm$ SD	z-test
Lahore	12	22.56	3.4759	1.9599639845
Karachi	12	22.0333	2.582928	

Source: Self Survey 2022-23

Table 6 shows the body mass index (BMI) comparison of Male Elite Basketball Players of Lahore and Karachi division players. The mean value shows a significant difference between the BMI of male elite Basketball

Players of Lahore and Karachi division. By applying the Z-test: two samples of mean, the value for z-critical two-tail value comes out 1.9599639845 at 0.05 level of significance.



Source: Self Survey 2022-23

Figure 6. BMI comparison of Male Elite Basketball Players of Lahore and Karachi.

Figure 6. shows the Body Mass Index (BMI) comparison of Male Elite Basketball Players of Lahore and Karachi players. The mean value shows a significant difference between the BMI of male elite Basketball Players of Lahore and Karachi division. By applying the Z-test: two samples of mean, the value for z-critical two-tail value comes out 1.9599639845 at 0.05 level of significance.

**Discussion**

The key outcomes of the current research indicate that the body dimensions measurements of Stature and Body mass index of elite male basketball players of Lahore and Karachi are statistically dissimilar. Further Outcomes of the present result authenticate the earlier research most of which shows significant differences regarding the dimension descriptors and vital body functions disparity between elite and non-elite male basketball Players. The present

study found that the stature-standing height of elite male basketball players of the Lahore division was significantly higher than the elite male basketball players of Karachi. As the game of basketball needs to reach the ball above the head and tall players with high height help to easily reach the hoop and complete the tasks of attack or defense further, they have a benefit since the ball has to pass a short space from hand to basket. In addition, it gives them the capacity to jump higher than their opponents. It also asserts to easily block the shots and make it hard for the challenger to perform the blocking. A significant difference is also found in the Body mass index of elite male basketball players of Lahore and Karachi. The current study corresponds to the measurement found in earlier studies. According to this, the weight of elite male basketball players of Lahore was also found significantly greater

than the elite male basketball players of the Karachi division, because of their higher height and greater bone mass.

Zarić et al. (2020) conducted a study to assess the relationship between body type physical, and biological maturity, and development of basketball players and observed that adolescent basketball players established lower values of body height, arm span, body mass, body fat, relaxed and flexed arm girth, and calf girth significantly. Immature and professional and non-professional basketball players both had large body types. Whereas in the present study, elite players had greater body mass and larger body type. Matveev also observed that professional players had significant variation regarding body height, the present study also shows identical results.

### **Conclusion**

The current study was conducted to evaluate the dimension descriptors components – stature and body mass index disparity between elite male basketball players of Lahore and Karachi.

To evaluate the body dimensions of elite and non-elite male basketball players, the Heath and Carter somatotype procedure was used to collect the data on body dimensions. The Main components and their

sub-components were assessed. From their procedure of total body dimensions' description, these main components were Stature i.e. standing height, weight, length of upper limbs, length of lower limbs, various skinfolds measurements, and Body Mass Index (BMI) was taken to compare their impact on performance as Lahore division dominates Karachi division in national games.

Height is considered a key component in the game of basketball, and it is found that the standing height of male elite basketball players of the Lahore division was significantly higher than the elite male basketball players of the Karachi division.

The weight and height of male elite basketball players of the Lahore division were significantly higher than the elite male basketball players of the Karachi division. Thus, elite male basketball players of Karachi have lower height and weight than the Lahore division thus players of the Lahore division were found with higher BMI than the elite male basketball players of the Karachi division.

The upper arm, forearm, and hand length were also found larger in the Lahore division than the elite male basket players of the Karachi division. Thus, the total Arm

Length was found to be greater. This greater total arm length provides an edge over the efficiency of those who have lower total arm length in both offenses – while making a shot and defense while guarding a player and checking the ball. The approach height becomes greater due to more total arm length which plays an important role in the performance. Thus, this provides the elite male basketball players of Lahore division, a good edge over the elite male basketball players of Karachi division in the performance.

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