

A COMPARATIVE STUDY ON ANTHROPOMETRIC PARAMETERS BETWEEN ELITE AND NON-ELITE INDIAN ARCHERS

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ABSTRACT

For this study 20 male archers (13 elite and 7 non-elite) were selected. The Anthropometric Characteristics Namely Standing Height, St. Height, Body Weight, Total Arm Length, Forearm Length, Upper Arm Length, Hand Length, and Finger Length were selected as variables of the study. All the Anthropometric Characteristics were measured by an anthropometric kit. To answer the research questions, are there any anthropometric differences between elite and non-elite archers? Descriptive statistics and student t Test were used; the difference is also found to be statistically significant. Mean value of Mid Upper Arm circumference relaxed and flexed and wrist breadth are found to be significantly higher in elite archers.

Keywords: Archery, Anthropometric, Elite, Non-Elite

INTRODUCTION

Archery is a modern sport with ancient roots that has grown in recent years to become one of the world's fastest-growing Olympic sports. Those who participate in the sport are offered a wide range of equipment options and ways to enjoy the sport. Nearly every culture

in the world has created some form of archery in its history—for survival, combat, and competition. Archery became an official Olympic sport in 1900, and a flaming arrow was used to light the Olympic flame during the opening ceremonies of the Barcelona Summer Olympics in 1992.

Archery is the art, sport, practice or skill of using a bow to shoot arrows. The word comes from the Latin *arcus*. Historically, archery has been used for hunting and combat. In modern times, it is mainly a competitive sport and recreational activity. A person who participates in archery is typically called an archer or a *bowman* and a person who is fond of or an expert at archery is sometimes called a *toxophilite*. Archery was highly developed in Asia.

Anthropometric measurement has revealed correlation between body structure, physical characteristics and sport capabilities. In all the games, height, weight, and other Anthropometric variables play a vital role in the player's performance. The physical structure, especially the height and arm length, have definite and decisive advantages in many games. Similarly, segmental length of individual body parts, the arm length specifically, is of considerable advantage in selected events in athletics and in certain games. In all the games, height, weight, and other Anthropometric variables play a vital

ANTHROPOMETRY AND OLYMPIC ARCHERY

Anthropometry has a special importance because of the emergence of complex work systems where knowledge of the physical dimensions of man with accuracy is important. One application of anthropometric measurement in ergonomics is the design of working space and the development of industrialized products such as furnishing, cars, tools, etc. With advances in technology, the precision and automation of measurement techniques will

increase, improving definition of human size, and the mechanics of workspaces, clothing and equipment. Anthropometry is the branch of human science that studies the physical measurement of the human body, particularly size and shape. Ergonomics is the science of work: of the people who do it and the way it is done; the tools and equipment they use, the places they work in, and the psychological aspects of the working environment. In a simplified way can be understood as the adaptation of work to man.

LONDON 2012 OLYMPIC GAMES

Here is some information from the analysis of the anthropometric data from the archery participants at the London 2012 Olympic Games.

	Age	Height (cm)	Weight (kg)	BMI
OVERALL AVERAGE (all sports)	26.1	176.9	72.8	23.3
Archery (all)	26.1	173.7	71.9	23.8
Archery (females)	25.8	167.2	63.1	22.5
Archery (males)	26.4	180.2	80.7	24.9

Rio 2016 Olympic Games

Here is some information from the analysis of the anthropometric data from the archery participants at the Rio 2016 Olympic Games.

	Age	Height (m)	Weight (kg)	BMI
OVERALL AVERAGE (all sports)	26.8	1.77	72.0	22.9
Archery (all)	26.1	1.74	72.2	23.8
Archery (females)	26.4	1.68	64.3	22.9
Archery (males)	25.9	1.80	80.1	24.8

MATERIALS AND METHODS

SELECTION OF SUBJECTS

20 males (13 elite, who have participated in international level competition and 7 non- elite, who have participated national level competition) were selected from SAI, NSEC, Kolkata and senior national archery championship, Jamshedpur, Jharkhand.

Different Category of Archery	Male
Elite	13
Non-Elite	7
Total	20

SELECTION OF VARIABLES

Keeping in the mind about specific purpose of the study the following variables will be selected:

- 1) Anthropometric Characteristics:
 - i) Standing Height
 - ii) Body Weight
 - iii) Sitting Height
 - iv) Upper Extremity Measurements

ADMINISTRATION OF ANTHROPOMETRIC MEASUREMENTS

Standing Height

Subjects were made to stand erect without shoes against a marked scale on the wall. The heels, buttocks and back were made touching the wall

Sitting Height

The subject sits with both feet on the floor, the lower back and shoulders against the wall, looking straight ahead. Distance can be measured from the floor, and the height of the box measured and subtracted from the total distance.

Body Weight

The subjects were made to stand at the Centre of the weighing machine. The weight was recorded from the indicator of the dial to a nearest half of kilogram (Kansal, 1996).

Hand Length

Subjects were instructed to place the hand on the table with palm facing upward and fingers close with wrist extension and elbow flexion in a relaxed position.

Arm Length

Arm Length was measured with the flexible steel tape. The subjects were made to stand erect, arm completely hung, relaxed by the side of the body and arm length were taken from the acromion process, the point just above the shoulder joint to the tip of the middle finger.

Palm Length

Subjects were instructed to place the hand on the table with palm facing upward and fingers close with wrist extension and elbow flexion in a relaxed position. The palm length was taken with steel tape in the nearest half centimeter.

Finger Length

Subjects were instructed to place the hand on the table with palm facing upward and fingers close with wrist extension and elbow flexion in a relaxed position. The finger length was taken with steel tape in the nearest half centimeter.

Mandibular Body Length:

Mandibular Body Length is the linear distance between Gonion and Pogonion. It Was measured by a segmometer in cm.

Anchor Length:

The straight length from DIP (distal interphalangeal) joint of index finger to Basilar joint of thumb was measured and recorded.

Wrist Girth: Wrist Girth included wrist width (distance between the outer borders of radial and ulnar styloid processes). It was measured by a segmometer in centimeters.

ANALYSIS OF DATA AND RESULTS OF THE STUDY

The statistical analysis of data has been presented in this chapter. The anthropometric characteristics namely Standing Height, St. Height, Body Weight, Total Arm Length, ForeArm Length, Upper ArmLength, Hand Length and Average Finger Length, Arm Span, Shoulder Breadth and Wrist Breadth were collected on 20 male archers.

Table: 1 Comparison of mean of Height, St. Height, Weight and BMI between Elite and Non-Elite Archers:

Anthropometric Parameters	Elite	Non-Elite	Level of
	Mean \pm SD	Mean \pm SD	Significances
Height(cm)	174.60 \pm 7.25	172.70 \pm 6.59	0.784
St. Height(cm)	88.40 \pm 7.85	84.70 \pm 5.24	0.32
Weight(kg)	77.99 \pm 10.58	66.42 \pm 7.32	0.01*
BMI	25.59 \pm 3.25	22.27 \pm 2.37	0.02*

From Table 1, it is revealed that the mean (\pm SD) value of Standing Height of elite and non-elite male is 174.60 (\pm 7.25) and 172.70 (\pm 6.59) respectively. But the difference is not statistically significant.

The mean (\pm SD) value of St. Height of elite and non-elite Archers is 88.40 (\pm 7.85), and 84.70 (\pm 5.24) respectively and is higher in elite archers.

The mean (\pm SD) value of weight of elite and non-elite Archers is 77.99 (\pm 10.58), and 66.42 (\pm 7.32) respectively and is higher in elite archers. The difference is also statistically significant.

The mean BMI of elite and non-elite Archers is found 25.59 \pm 3.25 and 22.27 \pm 2.37 and is higher in elite archers which are also found to be statistically significant.

Table: 2 Comparison of mean of Total Arm Length, Total Arm Length, ForeArmLength and Arm Span between Elite and Non-Elite Archers:

Anthropometric Parameters	Elite Mean \pm SD	Non-Elite Mean \pm SD	Level of significances
Total Arm Length(cm)	82.37 \pm 2.74	80.10 \pm 2.55	0.08
Upper Arm Length (cm)	35.05 \pm 1.24	33.40 \pm 1.82	0.09
ForeArm Length(cm)	28.01 \pm 1.24	26.92 \pm 1.82	0.12
Arm Span(cm)	181.26 \pm 1.83	181.37 \pm 3.18	0.43

From Table 2, it is observed that the mean (\pm SD) value of Total Arm Length of elite and non-elite is 82.37 (\pm 2.74) and 80.10 (\pm 2.55) respectively and is higher in elite archers. But the difference is not statistically significant.

The mean (\pm SD) value of Upper Arm Length of elite and non-elite Archers is 35.05 (\pm 1.24), and 33.40 (\pm 1.82) respectively and is higher in elite archers. But the difference is not statistically significant.

The mean (\pm SD) value of ForeArm Length of elite and non-elite Archers is 28.01 (\pm 1.24), and 26.92 (\pm 1.82) respectively and is higher in elite archers. But the difference is not statistically significant.

The mean Arm Span of elite and non-elite Archers is found 182.26 ± 1.83 and 181.37 ± 3.18 and is higher in elite archers. But the difference is not statistically significant.

DISCUSSIONS OF FINDINGS

In the present study significant differences were found on different selected anthropometric characteristics. Study further revealed that significant differences are found between elite and non-elite Archers as it is a challenging outdoor discipline in which the archer takes on the terrain as well as the target. Giampietro, Pujia, and Bertini (2003) concluded that group 1 is characterized by a slightly prominent vertical development of the skeletal frame. This could be an anthropometric characteristic that is best suited to meet the specific functional requirements of this sport. Moreover, both groups of athletes are characterized by a low percentage of fat mass, particularly the elite group. Greene, McGuine, Levenson, and Best (1998) found that significant anthropometric and performance sex differences between players. Laborde, Dosseville, Leconte and Margas (2009) suggested the interaction of hand preference and eye dominance might influence accuracy of the novice archers (uncrossed patterns were more accurate) when the bow was used without sights, but the use of sights by practitioners seemed to eliminate this effect. Palao, Gutierrez, and Frideres (2008)

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