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# RELATIONSHIP OF LONG JUMP PERFORMANCE ON SELECTED ANTHROPOMETRIC AND BIOMECHANICAL VARIABLES

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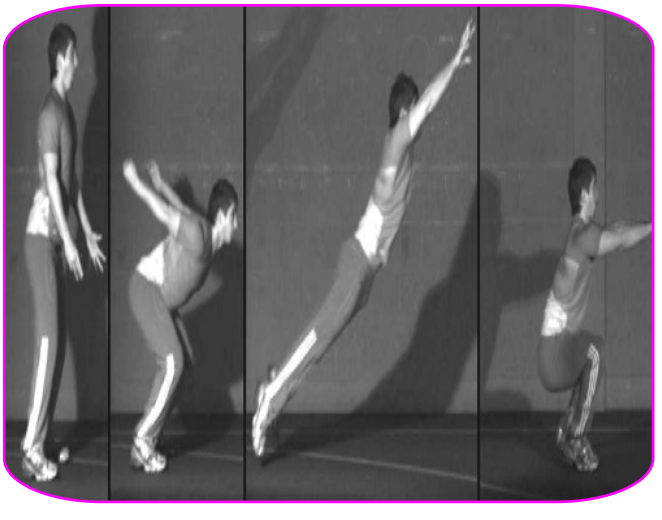
ABSTRACT

*The purpose of the study was to find out the relationship of selected anthropometric and bio mechanical variables in long jump 5 University level long jumpers from the Coimbatore District of 18 to 24 years were selected for this study. They had undergone training for a considerable period in order to acquire good level of technique of long jump. The selected bio mechanical variables recorded at the moment of take off were Angle at ankle, Angle at knee, Inclination of torso, Height of C.G. The selected anthropometric variables chosen were Height, Weight, Leg Length, Lower leg length. The criterion measures chosen for the study were the horizontal distance jumped by the subject using running long jump and recorded in mts. Angle at knee at the moment of take off and recorded in degrees. Angle at ankle at the moment of take off and recorded in degrees. Angle of inclination of torso at the time of take off and recorded in degrees. Height of the C.G at the moment of take off board and recorded in cms. Height of the subject taken with the help of the stadiometer and recorded in cms. Weight of the subject measured using a weighing machine and recorded in kgs. Leg length and lower leg length measured with the help of flexible steel tape and recorded in cms. With the help of standarad Nikon model EM with motor drive camera Sequential photography was employed for filming the subjects. The frequency of the camera was 4 frames /second. The relationship of selected anthropometric and bio mechanical variables with the performance of long jump was calculated by using Pearson's Product Moment Correlation. The level of significance chosen was .05.*



KEYWORDS: *Long Jump Performance , Biomechanical Variables , anthropometric variables.*

## INTRODUCTION :

Modern long jump technique can be effectively broken down into five aspects- the approach run, preparation for takeoff, flight and landing. One of the areas of modern sports science is biomechanics and it is applied form of mechanics, and consequently the methods used to investigate it must be derived from those of mechanics. However, bio mechanics have not developed in the wake of mechanics, but as a bordering science in other scientific disciplines such as anatomy, physiology and the technique of sport. The role that bio mechanics can play is becoming more widely understood in sports community and the demand for service increasing, researchers in sports bio mechanics will have to consider carefully how much time they can devote to a provision of scientific services without impairing their performance as scholar researchers. The anthropometric measurements focuses on three areas; growth measure, body type and body composition which helps for classification, prediction of growth patterns and prediction of success in motor activities as well as assessment of obesity. It has been found that top athletes in some

sports tend to have those proportions that bio mechanically aid the particular performance. The jumping events like long jump require a great amount of leg power. The long jumper's size and structure of the body and bio mechanical variables may play an important role in their success in the event. So it is feasible to have some sort of invention, which may contribute in selecting right kind of athlete for that event as well as help to isolate the factors that may contribute to the development of the jumping events

## METHODOLOGY:-

Five male inter varsity long jumpers of 18 to 24 years were selected for this study. They had undergone training for a considerable period in order to acquire good level of technique of long jump. The criterion measures chosen for the study were the horizontal distance jumped by the subject using running long jump and recorded in mts. Angle at knee at the moment of take off and recorded in degrees. Angle at ankle at the moment of take off and recorded in degrees. Angle of inclination of torso at the time of take off and recorded in degrees. Height of the C.G at the moment of take off board and recorded in cms. Height of the subject taken with the help of the stadiometer and recorded in cms. Weight of the subject measured using a weighing machine and recorded in kgs. Leg length and lower leg length measured with the help of flexible steel tape and recorded in cms.

## RELIABILITY OF DATA:-

Stadiometer, Weighing machine and steel tape were purchased from the reputed firms so they were considered reliable and accurate. Camera was used for filming the subjects. Anthropometric measurements were taken 3 times. The first and third measurements were correlated using zero order correlation. The coefficients of correlation of various measurements are given in Table 1

TABLE-1
COEFFICIENTS OF CORRELATION OF ANTHROPOMETRIC MEASUREMENTS

| Variable | Coefficient of correlation |
|---|---|
| Height | 1.00 |
| Weight | 1.00 |
| Leg Length | 0.99 |
| Lower leg length | 0.99 |

## Long jump performance of the subject:-

The performance of each subject was measured by using standard procedures where the subject ran from a certain distance with optimum speed and took take off with one leg on the board and landed in the pit ,which was observed by three persons and measured with the help of steel tape in meters.

## Filming protocol and analysis:-

With the help of standard Nikon model EM with motor drive camera Sequential photography was employed for filming the subjects. The frequency of the camera was 4 frames /second. But only three photographs at the time of take off were selected for analysis. The camera was placed 7 mts away from the subject.

On the basis of sequence photographs , stick figures were developed from which various bio mechanical variables were calculated. The stick figures were developed by using joint point method. The centre of gravity of each subjects was located by using segmentation method.

## Procedure for location of centre of gravity:-

On the photograph the reference points associated with each segment were be marked.A stick figure representation of the subject by rating straight lines between appropriate reference points was prepared.(The

trunk line as obtained by joining the midpoint of the line between the right and left hip joints to the midpoint of the trunk at the level of the suprasternal notch).The length of each segment line was measured and divided into appropriate ratios as indicated in Table 2

TABLE 2
LOCATION OF C.G OF BODY SEGMENTS.

| S.No | segment | C.G location expressed as percentage of total distance between reference points |
|---|---|---|
| 1. | Head | 46.4% to Vertex; 53.6% to chin-neck intersect |
| 2. | Trunk | 38% to supra Sternal notch; 62% to Hip axis |
| 3. | Upper arm | 51.3% to shoulder axis; 48.7% to Elbow axis |
| 4. | Forearm | 39% toElbow axis; 61% to Wrist axis |
| 5. | Hand | 82% to Wrist axis; 81% to knucke III |
| 6. | Thigh | 37.2% to Hip axis; 62.8% to Ankle axis |
| 7. | Calf | 37.1% to Knee axia; 62.9% to Ankle axis |
| 8. | Foot | 44.9% to Heel; 55.1% to Hip of longest toe |

Two arbitrary axis (oy and ox) ,one to the left and one below the stick figure were ruled out. A form was prepared and in (Column I) the weights were of the segment were entered. For each segment, the perpendicular distance from the C.G to the line oy was measured and entered in the appropriate place on the form (Column-II). To find the moment about oy, the weight of each segment was multiplied by the distance of its C.G from the line oy and these values were entered inn that appropriate places on the form(Column III)The sum of the moments about oy was found out by adding the contents of (Column III) on the form. Imaginary line oy parallel to oy was ruled at distance x from it,(x= sum got from step Steps from 5 to 9 were repeated, taking moments ox instead of oy, A o'x' line parallel to ox was ruled at a distance x from ox (x=sum got from step 8).Since the C.G. lies on both o'y' and o'x' and these two lines have only one point in common (the point where they intersect) it is that the C.G. is situated.

## ANTHROPOMETRIC VARIABLES:-

The height of the subject was taken with the help of stadiometer. The subject was asked to stand erect on the platform of the stadiometer, bare footed with heels, buttocks and back of the head touching the vertical stand of the stadiometer. The jaw of the stadiometer was placed parallel to the apex of the head and the measurement was recorded to the nearest half cm. Leg length was measured with a flexible steel tape, from the greater trochanter (Head to the Fumer) to the outside edge of the centre of the foot. Measurement was recorded to the nearest half cm. The fore leg length was measured with the flexible steel tape vertically from the bottom outside of the centre of the foot to the protuberant part of the patella. Measurement was recorded to the nearest half cm Weight of each subject was recorded by using a weighing machine. The subject wore a swimming costume, and asked to stand on the weighing machine. The weight was recorded to the nearest half kilogram.

TABLE-3
RELATIONSHIP OF SELECTED ANTHROPOMETRIC VARIABLES
TO PERFORMANCE IN LONG JUMP

| S.No | Variables | Coefficient of correlation |
|---|---|---|
| 1. | Height | 0.91 |
| 2. | Weight | 0.96 |
| 3. | Leg length | 0.70 |
| 4. | Lower leg length | 0.67 |

TABLE-4
RELATIONSHIP OF SELECTED BIOMECHANICAL VARIABLES
TO PERFORMANCE IN LONG JUMP

| S.No | Variables | Coefficient of correlation |
|---|---|---|
| 1. | Angle at ankle | -0.58 |
| 2. | Angle at knee | -0.26 |
| 3. | Inclination of Torso | 0.10 |
| 4. | Height of the C.G | 0.15 |

## CONCLUSION:-

Based on the analysis, and within the limitations of the present study the following conclusions are drawn. The height and weight of the person have a positive influence on performance in long jump. Leg Length and lower leg length are not found to be significant contributors to long jump performance The bio mechanical variables namely angle at ankle, angle at knee, inclination of torso, height of C.G at the moment of takeoff have not been found to be significantly related to performance in long jump.

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