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Kinanthropometric Profile As A Predictor Of Basketball Players Strength Measures

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Abstract:
The purpose of the present study was to endeavour the relationship between kinanthropometric dimensions with strength measure and further, to develop the regression equation for the prediction of Basketball players strength measure. The research was conducted on University level 42 male basketball players of age ranges 18-25 years. Twenty six kinanthropometric measurements as independent variables and two strength measurement components as dependent variables were evaluated of each subject. SPSS (11.5) computer software was used to analyze the data and it explored that the weight and linear measurements, i.e., body weight, standing height, sitting height, trunk length, arm length, leg length and hand length; body diameters, i.e., elbow, hip and knee diameters; body girth, i.e., shoulder and hip girths ; skin-fold measurements, i.e., biceps, sub-scapular, thigh and calf skin-folds and body composition variables i.e., fat percent, fat weight and lean body mass have significant correlations with strength measures of basketball players. The multiple correlation of six kinanthropometric variables taken together with strength measures of basketball players has been found highly significant and hence the developed equation can be used in the prediction of strength measures of basketball players.

Key words: *Strength measure, Kinanthropometric profile and Basketball players*

1.Introduction

Basketball is an extremely popular sport around the world. More people like to watch and play basketball than any other sport in the world. It is played in driveways, parking lots, back yards, streets, high schools, colleges and professional arenas. Basketball is included among the Olympic sports. Basketball is an athletic sport, usually played on an indoor court in which two competing teams of five layers each attempt to score by throwing an inflated ball. The team scoring the most such throws, through field goals or foul shots, wins the game. Because of its continuous action and frequent scoring, basketball is one of the most popular spectator as well as participant sports in the world.

The size and abilities of the modern Basketball players are found to differ from that of the early years. A tremendous change in the average height of the players is seen. The short fast players have been replaced by towering six and half footers, who can hand the ball into the Basket more easily, due to their abnormal reach. The average height of the present Basketball players, is more than, that of other older sportsmen. The tendency towards, tall and physically fit players are still growing. Sidhu and Grewal, (1982) studied the physique and body composition of Indian Basketball players, playing at different level of competition. They found that the players participated at the highest level of competition, were taller, heavier with bigger trunk, longer upper extremities and broader shoulders, as compared to players of lower levels, though the difference was not statistically significant. Day et.al., (1987) explored that Basketball players have significantly higher height, arm length, leg length, thigh girth and weight than those of the handball, swimming and table-tennis players. Sodhi, (1980) studied the top ranking Indian national Basketballers and recorded the significant correlation between height and performance in competitions. Thus greater the height of a Basketballers leads to better his performance. Hirata, (1966) studied 186 Tokyo Olympic Basketball players who average 189.4 cm in height 84.3 kg. in weight. He stated that it was an obviously favourable conditions for shooters to be a tall and lean type was particularly suitable for prompt action, so they had the most suitable physique. Further, Clarke (1957) has reported the relationship of strength and anthropometrics measures to various arm strength criteria for mesomophy and meso-ectomorphic college men.

From the above related studies, it is clear that physique, body composition and explosive arm and leg strength have significant contribution to the achievement of better performance in a basketball game. So, it is inevitable on the part of the physical educationists and research scientist in the field to investigate such variables, which are essential ingredients for better performance in the game. If

the authors may become able to find significant relationship and to develop a regression equation for the prediction of strength measures then it will be good efforts in the profession without wasting more energy and time, because the suitable physique body composition and strength measures may be evolved for the particular participants in the specific games and sports.

2.Materials And Methods

Forty two male basketball players who participated in the North-East Zone Inter-University tournament between the age group of 18 to 25 years, in the sessions 2005-06 constituted the subjects of the study. The data of the subjects were collected by using the anthropometric rod; vernier calipers, steel tape and skin-fold calipers, according to the instructions given by Weiner and Lourie (1969). Body composition variables i.e., body density, fat percentage; fat weight and lean body mass were calculated by using Durnin and Rehaman's Equation (1967) and Siri's Equation (1961) respectively, whereas strength measures variables i.e., Arm Strength and leg strength were measured from 6Lbs Medicine ball Put and Standing broad jump test, respectively. To get cumulative score of strength measures the score of arm strength and the score of leg strength were merged together. The data were analysed by applying the Pearson Product Moment method for correlation and Warry Do Equation for prediction of strength measures of basketball players with the help of SPSS (11.5) computer software.

3.Results

Sr. No.	Variables correlated with strength measures	Mean	Std. Deviation	Co-efficient of correlation 'r'
	Arm Strength(cm)	1050.74	87.65	
	Leg strength(cm)	206.31	16.53	
	Cumulative Score of Strength measures(cm)	1257.05	104.18	
1	Body Weight (Kg.)	66.82	6.53	.762**
2	Standing Height(cm)	178.13	6.23	.769**
3	Sitting Height (cm)	89.27	4.43	.430**
4	Trunk Length(cm)	57.88	3.98	.422**
5	Total Arm Length(cm)	78.23	3.20	.695**
6	Leg Length(cm)	94.47	4.38	.758**
7	Hand Length(cm)	19.13	0.82	.471**
8	Hand Breath(cm)	8.70	0.44	.223

Table 1: Mean, Standard Deviation And Correlation Value Of Weight And Linear Measurements To Strength Measure Of Basketball Players. (N=42)

***Significant At .01 Level Of Significance = .393 N= 42*

** Significant At .05 Level Of Significance = .304 Df= 40*

Table-1 shows that the correlations of body weight, standing height, sitting height, trunk length, total arm length, leg length and hand length have positive and significant at .01 level of significance, whereas correlation of hand breadth has positive and insignificant with strength measures of basketball players.

Sr. No.	Variables correlated with strength measures	Mean	Std. Deviation	Co-efficient of correlation 'r'
	Strength measures(cm)	1257.05	104.18	
9	Elbow Diameter(cm)	6.76	0.20	.508**
10	Shoulder Diameter(cm)	39.09	8.09	.265
11	Hip Diameter(cm)	30.59	1.82	.487**
12	Knee Diameter(cm)	9.03	0.34	.564**
13	Shoulder Girth (cm)	110.06	5.17	.464**
14	Upper Arm Girth (cm)	26.75	2.06	.227
15	Hip Girth(cm)	91.03	5.64	.453**
16	Thigh Girth(cm)	48.74	4.40	.082

Table 2: Mean, Standard Deviation And Correlation Value Of Body Diameter, Girth Measurements To Strength Measures Of Basketball Players. (N=42)

***Significant At .01 Level Of Significance = .393 N= 42*

** Significant At .05 Level Of Significance = .304 Df= 40*

It is observed from the table- 2 that the correlations of elbow, hip and knee diameters have positive and significant at .01 level of confidence, whereas correlations of shoulder and hip girths have positive and significant at .01 level of significance with strength measures of basketball players, however correlations of shoulder diameter, upper arm girth and thigh girth have insignificant correlation with strength measures.

Sr.No.	Variables correlated with strength measures	Mean	Std. Deviation	Co-efficient of correlation 'r'
	Strength measures(cm)	1257.05	104.18	
17	Biceps(mm)	3.36	0.99	.444**
18	Triceps(mm)	6.79	3.22	.274
19	Sub-scapular(mm)	8.73	3.26	.390*
20	Superailliac(mm)	7.90	3.07	.196
21	Thigh(mm)	26.78	9.22	.347*
22	Calf(mm)	14.00	19.84	.367*

Table 3: Mean, Standard Deviation And Correlation Value Of Skin-Fold Measurements To Strength Measures Of Basketball Players. (N=42)
***Significant At .01 Level Of Significance = .383 N= 42*
** Significant At .05 Level Of Significance = .296 Df = 40*

Table-3 indicates that the correlation of biceps skin-fold has significant at .01 level of confidence, whereas correlations of sub-scapular, thigh and calf skin-folds have positive and significant at .05 level of confidence with strength measures of basketball players.

Sr. No.	Variables correlated with strength measures	Mean	Std. Deviation	Co-efficient of correlation 'r'
	Strength measures(cm)	1257.05	104.18	
23	Body Density	1.06	0.01	-.359*
24	Fat Percentage	15.84	4.02	.367*
25	Fat Weight	10.77	3.58	.484**
26	Lean Body Mass	56.05	4.14	.785**

Table 4: Mean, Standard Deviation And Correlation Value Of Body Composition Variables To Strength Measures Of Basketball Players. (N=42)
***Significant At .01 Level Of Significance = .393 N= 42*
** Significant At .05 Level Of Significance = .304 Df= 40*

From table- 4, it is clearly indicated that the correlations of fat weight and lean body mass have positive and significant at .01 level, however correlation of body density has negative and fat percentage has positive and significant at .05 level of confidence with strength measures of basketball players.

Dependent Variable (Yc)	Selected Independent Variables (X's)	Regression Co-efficient Bx	Multiple Correlation (R)	Determinant of Multiple Correlation (R^2)	Percentage of each Variables
Strength measures of Basketball players	1.Weight (X_1)	2.76	.872	.760	13.18
	2.Total Height (X_2)	2.45			11.27
	3.Arm Length (X_5)	6.94			14.77
	4. Leg Length (X_6)	4.42			14.09
	5. Knee Diameter (X_{12})	43.82			8.06
	6. Lean Body Mass (X_{26})	4.69			14.63

Table 5: Multiple Correlation And Regression Equation Of Selected Kinanthropometric Variables To Strength Measures Of Basketball Players. (N=42, M=7)
Beta Coefficient (Bo)= .613 S.E. Of Estimate = 1.32
Pcx = (Beta Weight) X (R) X (100),
Where: Beta Weight = Bx . SD Of X / SD Of Yc And R = Coefficient Of Correlation Between X And Yc.
***Significant At .01 Level Of Significance = .605 N= 42*
** Significant At .05 Level Of Significance = .538 Df = 35*

From table-5, it is clear that multiple correlation (R= .872) of weight, height, arm length, leg length, knee diameter and lean body mass taken together with strength measures of basketball players were significant at .01 level of significance. It shows that the combined effect of these six independent variables taken together contributes to improve the strength measures of Basketball players.
Table- 5 further illustrates that the multiple regression analysis performed to develop equation for the prediction of strength measures of basketball players on the basis of X_1, X_2, X_5, X_6, X_{12} and X_{26} six kinanthropometric variables.
Resulted multiple regression equation in scores from is:
$Y_c = B_o + B_1.X_1 + B_2.X_2 + B_3.\ X_5 + B_4.\ X_6 + B_5.\ X_{12} + B_6.\ X_{26}$
$Y_c = .613 + 2.76.X_1 + 2.45.X_2 + 6.94.\ X_5 + 4.42.\ X_6 + 43.82.\ X_{12} + 4.69.\ X_{26}$
Where Y_c = predicted strength measure.
X_1 = Weight X_2 = Height X_5 = Arm length
X_6 = Leg length X_{16} = Knee diameter X26= Lean body mass
R^2 = can be broken up as., $R^2 = 76.00 = 13.18+11.27+14.77+14.09+8.06+14.63$
Moreover, the value of multiple coefficient of determinant (R^2= .760) suggests that 76.00 percent of variance of strength measures of Basketball players could be predicted on the basis of regression equation developed by these six kinanthropometric variables. The remaining variance of strength measures scores 24.00 percent were due to other factors. Hence, the developed regression equation could be put in to the prediction of strength measures of Basketball players.
Contribution of weight, height, arm length, leg length, knee diameter and lean body mass individually, towards multiple coefficients of determination (R^2) are 13.18, 11.27, 14.77, 14.09, 8.06, and 14.63 percent, respectively.
The coefficient of multiple correlation is of sufficient size, so the equation developed can be put in to the prediction for the evaluation of the basketball players strength measures.

4.Discussion
By the analysis of data obtained in the study we can see that the body weight, standing height, sitting height, trunk length, arm length, leg length and hand length have highly positive and significant correlations with strength measures of basketball players. It implies that a player having optimum body weight corresponding to the standing height, provide stability to maintain body balance while executing throw. While the linear measurements i.e., sitting height, trunk length, standing height, arm length and leg length provide efficient leverage; so that the ball can be thrown forcefully and accurately. Basketball game involves a ball collecting, ball throwing, different offensive and defensive actions, covering the court in minimum steps, taking lay ups and dunks, rebounding, jumping actions etc., which can be more successful with longer limbs and length of different body segments like arm length, leg length and hand length etc. .The results of the present study clearly underline this relationship. Ruhal (1998) and Bhardwaj (1982) reported that

performance in basketball is significantly related to arm length, hand length and leg length. Clarke, (1957) detected the relationship of strength and anthropometrics measurements with physical performance at the University of Oregon.

Body diameters, i.e., elbow; hip and knee diameters and body girth, i.e., shoulder and hip girths have significant correlations with strength measures of basketball players. It suggests that these diameters provide more range of movements around the joint i.e., flexibility and quickness of joints, which are very important components for efficient throwing performance, whereas girth relationship indicates that the optimum development of these muscle girths contribute to improve the throwing and jumping capacity of players. Mokha and Kaur (1996) concluded that basketball players have more shoulder girth than others except throwers because all players repeat the actions of dribbling, throwing, passing, receiving, shooting and rebounding more or less in their training schedule. Koley, Singh, & Kaur, (2011) reported in their results that the significantly positive correlations with height and all linear measurements of the arm showed proportionality in the basketball players.

Skin-fold measurements, i.e., biceps; sub-scapular, thigh and calf skin-folds and body composition variables i.e., fat percent; fat weight and lean body mass have significant correlations with strength measures of basketball players. These skin-fold variables contribute towards the strength measures, because of the rapid contraction provide more force and generate maximum power, which is essential for the efficient throwing and jumping. Hence, it suggests that the optimum development of subcutaneous tissue thickness of these skin-folds and body composition variable proportions tend to make the throwing and jumping capacity effective for longer time duration without fatigue, whereas, others do not contribute significantly to the throwing and jumping performance due to more fat accumulation. Similar finding reported by Chauhan, M.S. (2009) on volleyball players and Singh K. & Singh, S. (2013) on university level volleyball players.

Further it is obvious that the multiple correlation (R= .872) of six selected kinanthropometric variables i.e., weight, height, arm length, leg length, knee diameter and lean body mass have positive and significant with strength measures. This implies that the combined effect of these six variables taken together directly contributes to improve the strength measures of Basketball players.

Similar and higher correlation values were found in other sports like baseball (Kane, 2003), cricket (Pyne et al. 2006) and soccer (Anthrakidis et al. 2008). However, some studies found no significant correlations between body segment measurement and muscular strength (Bayios et al. 2001). Few studies have examined the correlation between handball throwing ability and medicine ball throwing, although there is evidence that light medicine ball training significantly improves the handball throwing ability (Barata, 1992). Curiously, this improvement was lower in female students (Brylinsky et al., 1992).

Previous results have noted the relationship of the strength measures with kinanthropometric profile of basketball players as a criterion of success that can encourage the access to basketball practice. In fact, these characteristics are very relevant for basketball players because the game entails physical contact in which specific body structure with a high level of strength measures may provide an advantage. Because, a specific size and proportions may constitute an important prerequisite for a particular sport.

5.Conclusion

The weight and linear measurements, i.e., body weight, standing height, sitting height, trunk length, total arm length, leg length and hand length; body diameters, i.e., elbow, hip and knee diameters; body girth, i.e., shoulder and hip girths ; skin-fold measurements, i.e., biceps, sub-scapular, thigh and calf skin-folds and body composition variables i.e., fat percent, fat weight and lean body mass have significant correlations with strength measures of basketball players.

The multiple correlation (R=.872) of weight, height, arm length, leg length, knee diameter and lean body mass with strength measures of basketball players has significant at .01 level of confidence. Moreover, the value of multiple coefficient of determinant (R^2= .760) suggests that 76.00 percent of variance of strength measures of basketball players can be predicted on the basis of a regression equation developed by these six kinanthropometric variables.

A perusal of summary of results shows that the basketball player has a specific body composition, good body structure with broader diameters and optimum girth measures as well as high level strength measures to compete their counterparts. The players who have these types of obligatory attributes may draw success for a team. Application of the findings may provide more useful and effective program to optimize player ability in this competitive era.

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