Research Paper Physical Education

Anthropometric Evaluation of Predictive Equations in Youth Basketball Players

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Keywords :

Introduction

Anthropometric characteristics of athletes determine the success in particular sports events in various ways. The knowledge of these characteristics is necessary to establish their importance for the success in competitive sport. The research on the influence of these characteristics in sports and games are of particular complexity, because the success in the game depends, among other things, on how the individual characteristics of some players fit into the whole, thus creating a coherent team. Basketball is one of the complex technical team based games and differences in performance between players of different region and varying ability levels are quit nature. The game of basketball requires the application of variety of different abilities (Angyan et al., 2003; Jelicic et al., 2002).

Basketball is a sport that consists of activities of short duration but high intensity during the course of the game. It is the game where all the possible loco motions are involved. Predicting the playing ability at elite level, variety of areas must be addressed. Specifically speaking the role played by the player in relation to the position in which he played is different from others. Further on, Basketball is the game where size, shape and body composition play an important part in providing distinct advantage for specific playing positions. A significant role also belongs to the individual features of the players' body build. Until now, only a relatively small number of variables such as height, weight (Tsunawake, 2003), proximal, mean and distal thigh circumferences (Hakkinen, 1993), and skinfolds to determine the total mass of adipose tissue (Thissen-Milder, Mayhew, 1991; Smith et al., 1992: Hakkinen, 1993) have been studied. There is no clarity about the significance of other anthropometric characteristics and anthropometric structure of the body, as a whole, for successful game performance.

There fore, there is a need for more detailed research involving the anthropometry of youth basketball players. The aim of the present study was to predict the role of a number of anthropometric characteristics in performance of under 16 years old youth basketball players at competitions. By this an attempt was made to obtain a description of physical dimensions of players those who are playing high level competitions (National level) through anthropometric profiling and then assess the relative importance of these body dimensions by comparing with regional classification of the players with special reference to their field positions in which they play in the game of basketball.

Materials and Methods

To achieve the purpose of this study, 276 youth basketball players (boys) from 23 states of India participated in the 26th Lakadawala Youth National Basketball Championship for Boys & Girls at Mastan YMCA, Mumbai from 9th to 16th May 2009, were selected as the subjects. The selected subjects were divided into three groups according to their playing positions in which they play in this competition namely Guard (GD), Forward (FD) and Centre (CR). Further, for regional classification, all the players were divided into four regions namely East, West, North and South on the basis of their respective states (Table - 1). Their ages ranging from 13 to 16 years with mean age of 15.1 years. The selected anthropometric variables namely Body weight, Skinfold measurements - Biceps, Subscapular, Triceps, Supraspinale, Abdominal, Illiac Crest, Front Thigh and Medial Calf; Girth measurements - Arm girth relaxed, Arm girth flexed and Calf girth; Length measurements - Standing height, Arm span, Arm length, Leg length; and Breadth measurements - Humerus breadth and Femur breadth (biepicondylar) as the independent variables were taken for this study. The criterion variable, playing ability of the selected basketball players are assessed by three qualified basketball coaches. The data were collected by following standard techniques of Weiner & Lourie (1969) during the competition by scientifically approved equipments (Table - 2). To determine the relationship between the selected anthropometric variables and the coaches rating on playing ability, the coefficient of correlation was used. Anthropometric variables that statistically correlated with performance were used to form respective linear predictive models (stepwise argument selection) with special reference to their playing positions and regional classifications.

Table - 1 Regional Classification

East India	West India	North India	South India
Jharkhand	Gujarat	Jammu & Kashmir	Tamil Nadu
Orissa	Maharashtra	Himachal Pradesh	Kerala
West Bengal	Madhya Pradesh	Punjab	Karnataka
Manipur	Rajasthan	Uttaranchal	Andhra Predesh
Mizoram		Haryana	Pondicherry
Chhattisgarh		Uttar Pradesh	
		Delhi	
		Chandigarh	

Table - 2 Instruments Used

S.No	Variables	Instruments
1	Skinfold Measurements	Harpendens Skinfold Caliper
2	Length Measurements	Lufkins Anthropometric Tape
3	Girth Measurements	Lufkins Anthropometric Tape
4	Breadth Measurements	Anthropometer

Results and Discussions

The present study attempted to link the coaches rating as measure of playing ability with the anthropometric characteristics of basketball players of elite youth group, correlation analysis was made. Table – 3 shows that there is a strong correlations (r = 0.9) exists between the playing ability versus height, weight, arm length, arm span, leg length and flexed arm girth. These variables turned to be leading characteristics with reference to the playing ability – determinants of youth basketball players as the whole. Each variable represented not only a concrete measurement of the anthropometric characteristics of basketball players, but also particularly represented body type as the whole. Thus, the peculiarities of the whole body can be represented by height, weight, arm length, arm span, leg length and flexed arm girth, as well as by different combinations of other variables or in combinations with other measurements.

Table – 3 Inter-Correlation of Selected Anthropometric Variables with the Playing Ability of Youth Basketball Players

V	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}
C	.90	.92	.30	.43	.61	.23	.86	.59	.62	.12	.89	.90	.90	.81	.84	.60	.96	.88
X_1		.97	.25	.45	.69	.12	.747	.49	.53	.06	.91	.98	.86	.70	.77	.46	.94	.76
X_2			.31	.50	.72	.17	.73	.51	.57	.30	.89	.97	.90	.68	.75	.45	.96	.76
X_3				.96	.73	.95	.35	.72	.73	.62	.35	.23	.61	.37	.29	.32	.31	.40
X_4					.83	.88	.42	.73	.77	.54	.15	.44	.72	.45	.39	.35	.47	.49
X_5						.59	.39	.59	.65	.12	.38	.62	.77	.34	.35	.10	.70	.45
X_6							.36	.72	.72	.72	.21	.17	.52	.39	.28	.38	.21	.41
X_7								.68	.69	.44	.79	.78	.84	.97	.96	.88	.79	.98
X_8									.73	.52	.35	.49	.75	.68	.62	.61	.56	.71
X_9										.53	.38	.55	.78	.68	.62	.58	.59	.71
X_{10}											.58	.78	.33	.52	.41	.63	.28	.45
X_{11}												.93	.74	.74	.83	.56	.92	.80
X_{12}													.86	.75	.82	.55	.92	.88
X_{13}														.81	.83	.63	.91	.88
X_{14}															.97	.93	.72	.97
X_{15}																.89	.79	.97
X_{16}																	.47	.87
X_{17}																		.82

C - Playing Ability; X_1 - Height; X_2 - Weight; X_3 - Biceps Skinfold; X_4 - Subscapular skinfold; X_5 - Triceps skinfold; X_6 - Supraspinale; X_7 - Abdominal; X_8 - Illiac Crest; X_9 - Front Thigh; X_{10} - Medial Calf; X_{11} - Arm length; X_{12} - Arm span; X_{13} - Leg length; X_{14} - Humerus breadth; X_{15} - Femur breadth; X_{16} - Arm girth relaxed; X_{17} - Arm girth flexed; X_{18} - Calf girth

Next, by means of stepwise selection, the best models of linear regression for predicting the playing ability of the game basketball were found with special reference to the playing positions as well as in general and to the regional classifications. As shown in the table - 4, anthropometric characteristics were essential for all the playing positions of the players since the role played by position is different to the other, determining their playing ability with in 94 to 98 percent.

Table – 4
Optimum Anthropometric Models for Prediction of Playing Ability in different Classifications of Youth Basketball Players

No	Classifications	Regression Equations	R-square
1	General	$- 48.45 + 2.986 X_{17} – 0.334 X_7 – 3.457 X_4 – 2.916 X_{15} + 3.495 X_{14} + 0.43 X_2 + 0.812 X_3 + 0.86 X_6 + 1.039 X_{16} + 0.341 X_{11} – 0.706 X_{18}$	0.92
2	East Region	$47.425 + 2.197 X_7 + 1.809 X_6 – 0.593 X_2 – 1.702 X_{10} + 0.591 X_{11}$	0.98
3	West Region	0.69 + 3.566 x17 + 1.902 x16 + 0.311 x10 – 0.656 x11 – 0.133 x13 + 0.438 x2 – 2.158 x15 + 0.815 x11 + 0.19 x9	0.93
4	North Region	$- 253.135 + 3.71 X_{14} – 3.623 X_{15} + 0.827 X_4 + 0.947 X_{11} – 2.936 X_8 + 2.529 X_7 + 1.123 X_{18} – 3.202 X_4 + 2.539 X_{17} – 1.245 X_{10} + 2.245 X_{16}$	0.94
5	South Region	$- 213.948 + 3.254 X_{14} – 3.126 X_{15} + 0.538 X_4 – 3.12 X_8 + 2.423 X_7 + 2.437 X_{18} – 3.37 X_4 + 2.143 X_{17} – 0.347 X_{13} + 3.198 X_{16} + 0.37 X_{12}$	0.98
6	Guard	$28.459 + 1.422 X_4 – 0.856 X_6 – 1.161 X_7 + 0.423 X_{11} – 0.528 X_{13} + 1.647 X_{14} + 1.384 X_{17} + 0.088 X_{18}$	0.94
7	Forward	$- 213.948 + 3.254 X_{14} – 3.126 X_{15} + 0.538 X_4 – 3.12 X_8 + 2.432 X_7 + 2.437 X_{18} – 3.337 X_4 + 2.143 X_{17} – 0.347 X_{13} + 3.198 X_{16} + 0.37 X_{12}$	0.94
8	Center	$180.91 + 2.102 X_7 + 1.732 X_6 – 0.491 X_2 – 0.683 X_1 + 0.859 X_5 – 1.348 X_{10} + 1.184 X_{17}$	0.98

All parameters in the models are significant ($p < 0.05$)

X_1	- Height	X_6	- Supraspinale	X_{11}	- Arm length	X_{16}	- Arm girth relaxed
X_2	- Weight	X_7	- Abdominal	X_{12}	- Arm span	X_{17}	- Arm girth flexed
X_3	- Biceps Skinfold	X_8	- Illiac Crest	X_{13}	- Leg length	X_{18}	- Calf girth
X_4	- Subscapular skinfold	X_9	- Front Thigh	X_{14}	- Humerus breadth		
X_5	- Triceps skinfold	X_{10}	- Medial Calf	X_{15}	- Femur breadth		

The result of the study showed that the playing ability of the guard players significantly related to predictors on skinfold measurements namely subscapular, supraspinale, and abdominal skinfold sites; length measurements namely leg length and arm length; breadth measurement namely humorous breadth and girth measurements namely calf girth. For the forward players, playing ability is significantly related to predictors on skinfold measurements namely iliac ceast, abdominal and subscapular sites; length measurements namely height and leg length; breadth measurement namely humerus and femur breadth and girth measurements namely calf girth, arm girth flexed, arm girth relaxed and arm span. The center players, playing ability is significantly related to predictors on weight; skinfold measurements namely abdominal, supraspi-

nale triceps and calf; length measurements namely height; girth measurements namely medial calf girth and there was no significant relations on any breadth measurements.

For regional classification, the playing ability of the eastern region players have significantly related to predictors on skinfold measurements namely abdominal, supraspinale, medial calf; length measurements namely arm length and there was no significant relations with any breadth measurement and girth measurements. The playing ability of the western region players significantly related to predictors on weight; skinfold measurements namely medial calf, front thigh; length measurements namely arm length, leg length; breadth measurement namely femur breadth; girth measurements namely both arm girth flexed and relaxed. The playing ability of the southern region players significantly related to predictors on skinfold measurements namely iliac crest, abdominal, subscapular; length measurements namely height, leg length, arm span; breadth measurement namely humerus, femur breadth; girth measurements namely calf, arm girth both flexed and relaxed. The playing ability of the northern region players significantly related to predictors on skinfold measurements namely iliac crest, abdominal, subscapular, medial calf; length measurements namely height, arm length breadth measurement namely humerus and femur breadth girth measurements namely calf girth, arm girth both relaxed and flexed.

The playing ability of basketball players in general have significantly related to predictors on weight; skinfold measurements namely abdominal, subscapular, biceps, supraspinale; length measurements namely arm length; breadth measurement namely femur breadth and humerus; girth measurements namely calf girth, arm girth flexed and relaxed.

Conclusions

1. The predictor variables for basketball players in general namely abdominal, subscapular, biceps, supraspinale, arm length, femur breadth and humerus, calf girth, arm girth flexed and relaxed.

2. The predictor variables for eastern region players namely abdominal, supraspinale, medial calf and arm length.

3. The predictor variables for western region players namely weight, medial calf, front thigh, arm length, leg length, femur breadth, arm girth flexed and relaxed.

4. The predictor variables for southern region players namely iliac crest, abdominal, subscapular, height, leg length, arm span, humerus, femur breadth, calf, arm girth both flexed and relaxed.

5. The predictor variables for northern region players namely iliac crest, abdominal, subscapular, medial calf, height, arm length, humerus and femur breadth, calf girth, arm girth of both relaxed and flexed.

6. The predictors variables for guard players namely subscapular, supraspinale, abdominal skinfold sites, leg length, arm length, humorous breadth and calf girth.

7. The predictor variables for forward players namely iliac ceast, abdominal, subscapular sites, height, leg length, humerus and femur breadth, calf girth, arm girth flexed, arm girth relaxed and arm span.

8. The predictor variables for center players namely abdominal, supraspinale triceps, calf, height and medial calf girth.

The results of this investigation indicate the need for more comprehensive anthropometric studies of young basketball players. The available literature did not contain any analogous data that could have been used for comparison. In the future, the analysis of young basketball players' anthropometric characteristics by various other complex testing programs will facilitate the better selection of promising players and help to evaluate the development of the whole team.

REFERENCES

Angyan L, Teczely T, Zalay Z, & Karsai I, (2003) "Relationship of anthropometrical, physiological and motor attributes to sport-specific skills", Acta Physiol. Hung. 90(3), P.225-23 1. | | Apostolidis N, Nassis GP, Bolatoglou T, Geladas ND., (2004) "Physiological and technical characteristics of elite young basketball players", The Journal of Strength and Conditioning Research: Vol. 22, No. 8, pp. 951-968. | | Fitness Testing (2008) in oxford university press http://www.topendsports.com/testing| | Green, J. J., Mc Guine, T.A; Leverson, G. and Best, T.M. (1998) "Anthropometric and performance measures of high school basketball players, Journal of Athletic Training 33 (3) : 229 - 232. | | Hakkinen, K. (1993). Changes in physical fitness profile in female volleyball players during the competitive season. J. Sports Med. Phys. Fitness, 33, 223 – 232. | | Jelicic M, Sekulic D, & Marinovic M, (2002) "Anthropometric characteristics of high level European junior basketball players", Faculty of Natural Sciences, Mathematics and Education, University of Split, Split, Croatia. | | Jerry V. Krause, (2000) "Basketball Skills & Drills (Nivia)", Human Kinetics Publishers Inc., Champaign, IL P. 19 - 5 1. | | Sallet P, Perrier D, Ferret JM, Vitelli V, Baverel G., (2005) "Physiological differences in professional basketball players as a function of playing position and level of play."Medical-Sports Centre, Lyon, France. pierresallet@aol.com. | | Smith, D.J., Roberts, D., Watson B. (1992). Physical, Physiological and performance differences between Canadian national team and universiade volleyball players. J. of Sports Sciences, 10, 131 – 138. | | Spurgeon, J. H; Spurgeon, N.L. and Giese, W. K. (1981) "Measures of body size and form of elite basketball players", Medicine Sports 15: 192 - 200. | | Thissen-Milder, M., Mayhew, I.L. (1991). Selection and Classification of high school volleyball players from performance tests. J. Sports Med. Phys. Fitness, 31(3), 380 – 384. | | Tsunawake N, Tahara Y, Moji K, Muraki S, Minowa K, & Yukawa K, (2003). Body Composition and Physical Fitness of Female Volleyball and Basketball Players of the Japan inter-high school championship teams. Department of Nutrition and Health Sciences, Siebold University of Nagasaki, Japan. Tsunawake@sun. ac. jp |