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Predominance of Selected Anthropometric Measurements and Motor Fitness Components on Playing Ability of Basketball Players

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Abstract: The study was intended to select the minimum number of determinant variables (*anthropometric measurements & motor fitness components*) that would provide highest multiple correlation co-efficient with the criterion variable (*basketball playing ability*) and to compute a multiple regression equation. Twenty basketball specialization students of Annamalai University, were selected as subjects with an informed consent. The age of the selected subjects ranged from 18 through 22 years. The study was restricted to the objective assessment of selected anthropometric measurements (*neck girth, axillary arm girth, biceps girth, forearm girth, wrist girth, hand length, palm length, shoulder girth, chest girth, waist girth, thigh girth, calf girth, ankle girth, foot length, foot breadth, standing height, weight*) and motor fitness components (*back strength, leg strength, agility, flexibility, power, speed*) and subjective rating of playing ability by judges. The data thus collected have been analyzed by the procedure of Wherry-Doolittle method of multiple correlations as given by Clarke and Clarke. The results show that the obtained multiple correlations co-efficient of 0.9699 is significant at 0.05 level with a forecasting efficiency of 76%. It was also noted that the multiple regression equation derived by this study to assess the basketball playing ability from the selected determinant variables such as leg strength, axillary arm girth and width of the foot has comparatively low standard error of estimate.

Keywords: Motor fitness, basketball, anthropometric, Wherry –Doolittle

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Introduction

In today's age of scientific knowledge man is making rapid progress in all walks of life and it is true in the area of games and sports. Sports performance is indeed an aspect of complex human performance, which has several dimensions. Sports scientists often acknowledge that a world-class performance is the result of several factors, advocating a multidimensional approach in studies on talented players [1,2]. Burwitz *et al*. (1994) [3] also recommend interdisciplinary performance-related sports science research.

Successful performance in sports is influenced by morphological and anthropometric characteristics such as body size and composition, functional parameters (*physical capacity*) [4,5] and fitness (*strength, speed, anaerobic and aerobic capacity, agility*) [6].

The ability of a player in a team game like basketball emanates from various anthropometric and physical fitness parameters of the players. Present day science is very much interested in estimating the optimum anthropometric make-up of a player. So the scanning and selection of a particular player may be achieved successfully to a great extent by measuring anthropometric components.

Anthropometric are dimensions of the structure of the human body taken at specific sites to give measures of girth and width. They include the body size and body proportions. Measurements of body size include such descriptive information as height, weight and surface area, while the measures of body proportions describe relationship between height, weight, among length, width and girths of various body segments. It has been observed that top athletes in some sports tend to have those proportions to biologically aid the performance [7]. Physical fitness is the capacity of an individual to perform a given task requiring muscular force. The greater the physical fitness, the longer can a person work and the more efficient will be his performance and his capacity for recovering from fatigue [8].

It would be of interest to investigate the predominant characteristics that determines playing ability of basketball players, as there has been a scanty of research with regard to it. Hence, the investigator is motivated to determine the anthropometric and fitness characteristics that evolve the sports playing ability. The present paper was proposed to examine the predominance of selected anthropometric measurements and motor fitness components on playing ability of basketball players.

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Methods and Procedures

Twenty basketball specialization students of Annamalai University, were selected as subjects with an informed consent. The age of the selected subjects ranged from 18 through 22 years. The study was restricted to the objective assessment of selected anthropometric measurements (*neck girth, axillary arm girth, biceps girth, forearm girth, wrist girth, hand length, palm length, shoulder girth, chest girth, waist girth, thigh girth, calf girth, ankle girth, foot length, foot breadth, standing height, weight*) and motor fitness components (*back strength, leg strength, agility, flexibility, power, speed*) and subjective rating of playing ability by judges. The anthropometric measurements and motor fitness components were assessed utilizing calibrated instruments, standardized methods, procedures and tests.

The experimental design used in this study was cross sectional design involving purposive sampling. The data thus collected have been analyzed by the procedure of Wherry-Doolittle method of multiple correlations as given by Clarke and Clarke. In all the cases level of confidence was fixed at 0.05 for significance.

Results of the Study

The correlation coefficient between the basketball playing ability and the selected anthropometric and motor fitness variables vary from 0.046 for palm length to 0.890 for leg strength. The basketball playing ability have correlation coefficient of 0.470, 0.624, 0.640, 0.846, 0.890, -0.733, 0.735, 0.665 and –0.632 respectively with shoulder girth, thigh girth, calf girth, back strength, leg strength, agility, flexibility, power and speed. These correlation coefficients were found to be statistically significant at 0.01 level. The basketball playing ability has correlation coefficient of 0.411 and 0.400 respectively with auxiliary arm girth and forearm girth. These correlation coefficients were found to be statistically significant at 0.05 level. However, the determinant variables namely: neck girth, biceps girth, wrist girth, hand length, palm girth, chest girth, waist girth, ankle girth, foot length, foot breadth, height have no significant correlation coefficients with basketball playing ability at 0.05 level.

The correlation coefficients between the criterion and determinant variables and inter-correlations among determinant variables were presented in Table 1.

Table – 1: Inter – Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	C
1	1.00																							
2	0.47	1.00																						
3	0.55	0.41	1.00																					
4	0.49	0.61	0.16	1.00																				
5	0.18	0.72	0.37	0.15	1.00																			
6	0.44	0.25	0.15	0.48	0.13	1.00																		
7	0.21	0.20	0.00	0.25	0.47	0.60	1.00																	
8	0.88	0.47	0.69	0.52	0.20	0.23	0.20	1.00																
9	0.77	0.11	0.45	0.49	-0.10	0.29	-0.05	0.69	1.00															
10	0.1	0.4	0.7	0.3	0.3	0.3	0.	0.4	0.0	1.0														

	6	5	5	7	6	3	21	2	6	0														
11	0.67	0.69	0.83	0.41	0.41	0.04	0.00	0.83	0.42	0.62	1.00													
12	0.71	0.58	0.40	0.54	0.40	0.39	0.49	0.67	0.46	0.25	0.66	1.00												
13	0.34	0.55	0.21	0.53	0.57	0.68	0.88	0.34	0.03	0.47	0.32	0.72	1.00											
14	0.15	0.70	-0.08	0.46	0.69	0.37	0.34	-0.01	-0.04	0.08	0.03	0.13	0.43	1.00										
15	0.70	0.36	0.26	0.50	0.26	0.51	0.37	0.52	0.62	0.03	0.21	0.36	0.33	0.49	1.00									
16	-0.04	0.13	-0.27	0.27	0.44	0.25	0.61	-0.07	0.01	-0.11	-0.33	-0.02	0.39	0.65	0.56	1.00								
17	0.66	0.67	0.89	0.50	0.51	0.29	0.21	0.80	0.47	0.77	0.86	0.34	0.45	0.24	0.52	0.04	1.00							
18	0.26	0.08	0.06	0.26	0.15	-0.23	0.23	0.40	0.39	-0.10	0.32	0.60	0.25	-0.18	-0.04	0.09	0.10	1.00						
19	0.21	0.16	0.21	0.27	0.13	-0.21	0.11	0.39	0.40	0.11	0.43	0.64	0.27	-0.22	-0.07	-0.05	0.23	0.93	1.00					

20	-0.49	-0.51	-0.17	-0.65	-0.43	-0.21	-0.31	-0.46	-0.58	-0.07	-0.41	-0.73	-0.49	-0.37	-0.33	-0.29	-0.33	-0.76	-0.74	1.00			
21	0.03	0.33	-0.34	0.42	0.25	-0.10	0.19	0.04	0.05	-0.23	0.09	0.50	0.34	0.25	-0.16	0.16	-0.18	0.74	0.68	-0.77	1.00		
22	0.67	0.53	0.44	0.62	0.28	-0.04	0.03	0.73	0.72	0.13	0.68	0.70	0.23	0.16	0.51	0.11	0.60	0.66	0.72	-0.77	0.43	1.00	
23	-0.50	-0.32	-0.15	-0.33	-0.26	-0.07	0.01	-0.35	-0.63	0.17	-0.35	-0.60	-0.15	-0.17	-0.17	0.04	-0.14	-0.67	-0.61	0.87	-0.66	-0.64	1.00
c	0.25	0.41	0.29	0.40	0.28	-0.23	0.05	0.47	0.27	0.26	0.62	0.64	0.30	-0.09	-0.21	-0.19	0.33	0.85	0.89	-0.73	0.74	0.67	-0.63	1.00
Mean	35.50	31.80	31.50	26.40	17.10	18.65	9.10	111.7	89.80	77.30	53.50	33.50	22.70	26.25	10.30	169.6	64.40	52.30	36.60	9.04	19.84	2.16	6.86	74.80
SD	2.01	2.33	1.69	1.11	0.97	1.10	0.58	2.79	2.89	2.65	1.75	1.47	2.41	1.27	0.68	3.50	5.31	7.76	6.00	0.36	1.16	0.10	0.53	8.26

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The computation of 'R' using shrinkage formula was presented in Table 2. The results show that the obtained multiple correlations co-efficient of 0.9699 is significant at 0.05 level with a forecasting efficiency of 76%. High multiple correlation results when the determinant variables correlate high with criterion, whereas, low correlation between determinant variables [9].

Table – 2: Wherry-Doolittle Method of Multiple Correlation Computation of R Using Shrinkage Formula

A	B	C	D	E	F	G	
M	$\frac{V^2m}{Zm}$	K^2	$\frac{N-1}{N-m}$	$\overline{K^2}$	$\overline{R^2}$	$\overline{R}$	TEST NO.
0		1.000					
1	0.7921	0.2079	1.000	0.2079	0.7921	0.8900	19
2	0.0740	0.1339	1.0357	0.1387	0.8613	0.9281	2
3	0.0788	0.0551	1.0741	0.0592	0.9408	0.9699	15

The regression equation to assess the criterion from the three selected determinant variables in standard score form is

$\overline{Z}_c = 0.8720 = 0.8720\ Z_{19} + 0.1993Z_2 + 0.2021Z_{15}$

Score Weight: $b_{19} = 1.20$, $b_2 = 0.71$, $b_{15} = 2.45$

The regression equation to assess the criterion from the three selected determinant variables in score form is $\overline{X}_c = 1.20\ X_{19} + 0.71\ X_2 + 2.45\ X_{15} - 16.94$

Where, C denotes basketball playing ability; 19 denotes leg strength; 2 denotes auxiliary arm girth; and 15 denotes foot breadth.

Conclusions

The research findings of this study imply that basketball playing ability can be predetermined as it is predominantly influenced by selected anthropometric measurements and motor fitness components.

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