Analysis of Volleyball Playing Ability from Selected Anthropometrical Variables among College Level Players

F.A.Juliance Rajasingh

Director of Physical Education, C.S.I. Jayaraj Annapackiam College, Nallur, Tirunelveli, Tamilnadu, India.

Abstract

   The purpose of the study was to analyse the Volleyball playing ability from the selected anthropometrical variables among College level players. To achieve the purpose two hundred and fourteen inter - collegiate Volleyball players were randomly selected from various colleges in Tamilnadu state, India and their age ranged from 17 to 25 years. The subjects had past playing experience of at least three years in Volleyball and only those who represented their respective college teams were taken as subjects. The anthropometrical variables namely – Body weight; Length measurements – Standing Height, Arm length, Arm span, Leg length, Hand length, Hand breadth, Palm length; Breadth measurements – Humerus breadth and Femur breadth; Girth measurements – Arm girth relaxed, Arm girth flexed, Chest, waist, Hip, Thigh and Calf. The multiple regression was used. The results revealed that an Inter – relationship exists significantly between the anthropometrical variables among male inter - collegiate Volleyball players. The size of multiple correlation is sufficiently large and hence regression equation developed by nine strength measures and anthropometric variables can be put in to prediction equation of volleyball players. The results revealed that the anthropometric characteristics body weight, waist, hand length, femur breadth, palm length, leg length and arm span become the common characteristics which can predict the playing ability in Volleyball players.

Keywords: Volleyball, Anthropometrical Variable, Analysis.

Introduction

   Sports are universal appeal has led to sport gaining recognition as a simple, low cost and effective medium for achieving key developmental goals. Sport form an inspirable part of the system of physical education. Physical education offers opportunity in competitive situation for physical, social, emotional and moral development. Sports and games are the best ways to earn social recognition and acquire a status in the modern society. Sports and games in the modern era occupy a very prominent and important place in the life of people and also in every sphere of life. Sport consists of physical activity carried out with a purpose for competition, for self-enjoyment, to attain excellence, for the development of a skill, or more often, some combination of these. Sports differ in their dependence upon a set of individuals or team skills, as well as in the ways in which they have their participants compete. As fitness and sports go hand in glove there is a need to develop the ability in an individual to play the game with good skill and perform consistently well.

   Volleyball is played by millions of people around the world. In many countries, it has been ranked as top-level competitive sports. It is a fascinating game, which everybody will accept. It is a well-known fact that volleyball is a thrilling game. It is one of the recreational games with in a small area. It is a game where not only the hands are engaged in receiving and spiking the ball, but the whole body and mind are engaged in this game. Volleyball is probably the leading ball game in the world as far as action and accuracy are concerned. Regarding the result of this game anything many happen at any time. Anthropometric properties of athletes represent important prerequisite for successful presence at the same sport, effecting athlete's performance and are necessary in order to gain excellent performance of sports skills. The term motor ability is used synonymously with general athletic ability. There are many factors that contribute to successful performance in athletic skill. In most of the advanced and developed countries, the awareness for motor learning and skill developed among volleyball players is very much scientific and prolonged which perhaps helped them to level of general fitness with motor abilities like power, speed, agility, balance, reaction time etc. are essential qualities required to be develops in the players (Chen, 2005)**.**

Methodology

   The purpose of the study was to analyse the Volleyball playing ability from the selected

---

Correspondence
F.A. Juliance Rajasingh
E-mail: thangaraja52@gmail.com, Ph. +9194891 07210

anthropometrical variables among College level players. To achieve the purpose two hundred and fourteen inter - collegiate Volleyball players were randomly selected from various colleges in Tamilnadu state, India and their age ranged from 17 to 25 years. The subjects had past playing experience of at least three years in Volleyball and only those who represented their respective college teams were taken as subjects. The anthropometrical

variables namely – Body weight; Length measurements – Standing Height, Arm length, Arm span, Leg length, Hand length, Hand breadth, Palm length; Breadth measurements – Humerus breadth and Femur breadth; Girth measurements – Arm girth relaxed, Arm girth flexed, Chest, waist, Hip, Thigh and Calf. The multiple regression was used.

Results
Table I. Descriptive statistics of selected anthropometrical variables among college level players

S.No	Variables	Range	Minimum	Maximum	Mean	SD (±)
1	Body Weight	20.30	58.50	78.80	69.19	6.25
2	Height	22.70	160.70	183.40	169.98	6.47
3	Arm Length	16.52	70.26	86.78	77.49	5.05
4	Arm Span	34.84	159.41	194.25	172.09	10.65
5	Leg Length	29.15	90.03	119.18	107.78	8.18
6	Hand Length	3.57	18.38	21.95	20.22	0.92
7	Hand Breadth	1.87	5.81	7.68	6.6396	0.56
8	Palm Length	2.05	9.86	11.91	10.78	0.57
9	Humerus Breadth	1.96	5.70	7.66	6.59	0.65
10	Femur Breadth	2.15	7.96	10.11	9.04	0.67
11	Arm Girth Relaxed	8.96	21.93	30.89	25.97	2.60
12	Arm Girth Flexed	10.30	24.21	34.51	29.38	3.61
13	Chest	22.34	76.01	98.35	85.79	6.84
14	Waist	27.97	64.61	92.58	79.71	7.51
15	Hip	24.36	75.09	99.45	87.51	7.91
16	Thigh	38.65	43.35	82.00	63.94	13.09
17	Calf	9.20	30.12	39.32	34.09	2.85

Table – 1 showed the descriptive statistics – Range, Minimum, Maximum, Mean and Standard deviation of anthropometrical, motor fitness variables and playing ability of inter collegiate Volleyball Players. The present study attempted to link the coaches rating as

measure of playing ability with the anthropometrical and motor fitness variables of collegiate Volleyball Players, Pearson product moment correlation analysis was made and results were presented in Table – II.

Table II. Inter-correlation of selected anthropometrical and motor fitness variables with the playing ability of inter collegiate volleyball players

S.No	C.R	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_1	0.66	1																
X_2	0.57	0.80	1															
X_3	0.33	0.47	0.68	1														
X_4	0.27	0.34	0.42	0.20	1													
X_5	0.18	0.40	0.30	0.06	0.73	1												
X_6	0.01	0.16	0.15	0.20	0.05	0.10	1											
X_7	0.14	0.20	0.24	0.05	0.67	0.76	0.09	1										
X_8	0.10	30.01	0.12	0.08	0.61	0.60	0.22	0.66	1									
X_9	0.01	0.09	0.12	0.12	0.17	0.02	0.13	0.11	0.10	1								
X_{10}	0.01	0.18	0.25	0.25	0.20	0.20	0.15	0.19	0.21	0.01	1							
X_{11}	0.01	0.10	0.05	0.02	0.01	0.16	0.09	0.17	0.46	0.22	0.34	1						

X_{12}	0.08	0.20	0.22	0.13	0.20	0.15	0.01	0.19	0.17	0.15	0.17	0.12	1				
X_{13}	0.04	0.05	0.01	0.12	0.10	0.12	0.05	0.01	0.04	0.18	0.19	0.01	0.27	1			
X_{14}	0.09	0.01	0.02	0.01	0.05	0.12	0.09	0.14	0.04	0.12	0.24	0.30	0.02	0.28	1		
X_{15}	0.23	0.28	0.12	0.02	0.04	0.15	0.11	0.01	0.03	0.10	0.07	0.04	0.33	0.17	0.13	1	
X_{16}	0.40	0.68	0.54	0.30	0.06	0.13	0.21	0.07	0.26	0.05	0.10	0.02	0.32	0.05	0.02	0.19	1
X_{17}	0.57	0.85	0.63	0.42	0.12	0.22	0.09	0.01	0.09	0.05	0.01	0.18	0.24	0.05	0.02	0.27	0.58	1

It was evident from the Table – II that there was significant relationship between Volleyball playing ability (CR) and body weight (X_1), height (X_2), Arm length (X_3), Arm span (X_4), Leg length (X_5), Hand breadth (X_7), Hip (X_{15}), Thigh (X_{16}), Calf (X_{17}) in each variables separately.

The result proved that the selected anthropometrical variables body weight (r = 0.66), height (r = 0.57), Arm length (r = 0.33), Arm span (r = 0.27), Leg length (r = 0.18), Hand breadth (r = 0.14), Hip (r = 0.23), Thigh (r = 0.40) and Calf (r = 0.57) were significantly correlated with the Volleyball playing ability were greater than the required table 'r' value of 0.133 to be significant at 0.05 level. And there was no significant relationship between Volleyball playing ability and Hand length (r = 0.01), Palm length (r = 0.10), Humerus breadth (r = 0.01), Femur breadth (r = 0.01), Arm girth relaxed (r = 0.01), Arm girth flexed (r = 0.08), Chest (r = 0.04), Waist (r = 0.09).

Table III. Analysis of variance for the influence of independent variables on playing ability of volleyball players

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6502.300	1	6502.300	163.381	.000[b]
	Residual	8437.270	212	39.798		
	Total	14939.570	213			
2	Regression	6871.419	2	3435.709	89.851	.000[c]
	Residual	8068.151	211	38.238		
	Total	14939.570	213			
3	Regression	7148.990	3	2382.997	64.235	.000[d]
	Residual	7790.580	210	37.098		
	Total	14939.570	213			
4	Regression	7392.759	4	1848.190	51.183	.000[e]
	Residual	7546.811	209	36.109		
	Total	14939.570	213			
5	Regression	7581.224	5	1516.245	42.860	.000[f]
	Residual	7358.346	208	35.377		
	Total	14939.570	213			
6	Regression	7823.374	6	1303.896	37.928	.000[g]
	Residual	7116.196	207	34.378		
	Total	14939.570	213			
7	Regression	8208.222	7	1172.603	35.885	.000[h]
	Residual	6731.348	206	32.676		
	Total	14939.570	213			
8	Regression	8678.044	9	964.227	31.414	.000[j]
	Residual	6261.526	204	30.694		
	Total	14939.570	213			

It is clear from table – III that the obtained F value 163.381, 89.851, 64.235, 51.183, 42.860, 37.928, 35.885 and 31.414 respectively are significant at 0.05 level. It reveals that all the independent variables are collectively influenced on the playing ability of Volleyball players. As the F ratio is significant multiple regression is computed. Multiple regressn equation was computed only because the multiple correlation were sufficiently high to warrant prediction from it. Then, the correlation identified the independent variables

40

to be included and their order in the regression equation. Multiple correlations were computed by step wise argument method on data of Volleyball players and the results were presented in Table – IV.

Table IV. Step wise multiple regression between playing ability and independent variables of volleyball players

Model	Variables	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	Body Weight	.660[a]	.435	.433	6.309
2	Co-ordination	.678[b]	.460	.455	6.184
3	Waist	.692[c]	.479	.471	6.091
4	Hand Length	.703[d]	.495	.485	6.009
5	Femur Breadth	.712[e]	.507	.496	5.948
6	Palm Length	.724[f]	.524	.510	5.863
7	Leg length	.741[g]	.549	.534	5.716
8	Arm Span	.762[i]	.581	.562	5.540

From Table – IV, it is found out that the multiple correlations co – efficient for predictors, such as body weight, co-ordination, waist , hand length, femur breadth, palm length, leg length and arm span was 0.762 which produce highest multiple correlations with volleyball playing ability. 'R' square values show that the percentage of contribution of predictors to the Volleyball playing ability (Dependent variables) is in the following order.

1. About 66% of the variation in the Volleyball playing ability was explained by the regression model with one predictor body weight.
2. About 68% of the variation in the Volleyball playing ability was explained by the regression model with two predictors, body weight and co-ordination. An additional 2% of the variance in the Volleyball playing ability is contributed by co-ordination.
3. About 69% of the variation in the Volleyball playing ability was explained by the regression model with three predictors, body weight, co-ordination and waist. An additional 1% of the variance in the Volleyball playing ability is contributed by waist.
4. About 70% of the variation in the Volleyball playing ability was explained by the regression model with four predictors, body weight, co-ordination, waist and hand length. An additional

1% of the variance in the Volleyball playing ability is contributed by hand length.
5. About 71% of the variation in the Volleyball playing ability was explained by the regression model with five predictors, body weight, co-ordination, waist, hand length and femur breadth. An additional 1% of the variance in the Volleyball playing ability is contributed by femur breadth.
6. About 72% of the variation in the Volleyball playing ability was explained by the regression model with six predictors, body weight, co-ordination, waist, hand length, femur breadth and Palm length. An additional 1% of the variance in the Volleyball playing ability is contributed by Palm length.
7. About 74% of the variation in the Volleyball playing ability was explained by the regression model with seven predictors, body weight, co-ordination, waist, hand length, femur breadth, Palm length and leg length. An additional 1% of the variance in the Volleyball playing ability is contributed by leg length.
8. About 76% of the variation in the Volleyball playing ability was explained by the regression model with nine predictors, body weight, co-ordination, waist, hand length, femur breadth, Palm length, leg length and arm span. An additional 1% of the variance in the Volleyball playing ability is contributed by arm span.

Table V. Regression analysis of prediction equation of volleyball players

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.	Partial Correlations	Collinearity Statistics
		B	Std. Error	Beta			
Step1	Constant	7.210	4.804		.135		
	Body Weight	.884	.069	.660	.000	.660	1.000
Step 2	Constant	25.254	7.477		.001		
	Body Weight	.853	.068	.637	.000	.651	.979
	Co-ordination	-.542	.174	-.159	.002	-.209	.979
Step 3	Constant	16.030	8.100		.049		
	Body Weight	.849	.067	.634	.000	.656	.979
	Co-ordination	-.639	.175	-.187	.000	-.244	.939
	Waist	.155	.057	.139	.007	.185	.959
Step 4	Constant	-6.462	11.781		.584		
	Body Weight	.872	.067	.651	.000	.668	.961
	Co-ordination	-.740	.177	-.217	.000	-.277	.894
	Waist	.148	.056	.133	.009	.180	.957
	Hand Length	1.207	.465	.133	.010	.177	.919
Step 5	Constant	2.530	12.294		.837		
	Body Weight	.908	.068	.678	.000	.678	.912
	Co-ordination	-.735	.176	-.215	.000	-.279	.894
	Waist	.113	.058	.101	.052	.134	.888
	Hand Length	1.439	.471	.159	.003	.207	.877
	Femur Breadth	-1.492	.646	-.121	.022	-.158	.862
Step 6	Constant	33.497	16.823		.048		
	Body Weight	.904	.067	.675	.000	.682	.911
	Co-ordination	-.801	.175	-.235	.000	-.303	.876
	Waist	.105	.057	.094	.065	.128	.886
	Hand Length	1.243	.470	.137	.009	.181	.855
	Femur Breadth	-1.833	.650	-.149	.005	-.192	.829
	Palm Length	-1.958	.738	-.135	.009	-.181	.889
Step 7	Constant	12.742	17.481		.467		
	Body Weight	1.037	.076	.774	.000	.688	.678
	Co-ordination	-.658	.176	-.193	.000	-.253	.826
	Waist	.125	.056	.113	.025	.155	.876
	Hand Length	1.215	.458	.134	.009	.182	.855
	Femur Breadth	-1.751	.634	-.142	.006	-.189	.828
	Palm Length	-3.889	.913	-.268	.000	-.284	.551
	Leg Length	.245	.072	.240	.001	.233	.448
Step 8	Constant	51.402	20.079		.011		
	Body Weight	1.122	.085	.838	.000	.679	.512
	Co-ordination	-.821	.176	-.240	.000	-.310	.770
	Waist	.128	.054	.115	.019	.164	.875
	Hand Length	1.578	.455	.174	.001	.236	.815
	Femur Breadth	-1.923	.617	-.156	.002	-.213	.823
	Palm Length	-3.015	.948	-.208	.002	-.217	.481
	Leg Length	.385	.080	.376	.000	.321	.339
	Agility	-3.692	1.214	-.169	.003	-.208	.663
	Arm Span	-.162	.057	-.207	.005	-.195	.388

In the Table – V, the following regression equations were derived for playing ability of Volleyball players with dependent variables. Regression Equation in obtained scores form = CR

Playing Ability (CR) = 7.210+1.122(X_1) -0.821(X_{22}) +0.128(X_{14}) +1.578(X_6) -1.923(X_{10}) -3.015(X_8) +0.385(X_5) -0.162(X_{16}).

Conclusions

1. The results revealed that an Inter – relationship exists significantly between the anthropometrical variables among male inter - collegiate Volleyball players.
2. The size of multiple correlation is sufficiently large and hence regression equation developed by nine strength measures and anthropometric variables can be put in to prediction equation of volleyball players.
3. The results revealed that the anthropometric characteristics body weight, waist, hand length, femur breadth, palm length, leg length and arm span become the common characteristics which can predict the playing ability in Volleyball players.

References

1. Ackland, T.R., Ong, K.B., Kerr, D.A. & Ridge, B. (2003). Morphological characteristics of Olympic sprint canoe and kayak paddlers. *Journal of Science and Medicine in Sport*. 6:285-294.
2. Agostini, V, Chiaramello, E, Canavese, L, Bredariol, C, Knaflitz, M. (2013). Postural sway in volleyball players. *Hum Mov Sci.* 32(3):445-56.
3. Alar Rikberg and Lennart Raudsepp (2011). Multidimensional Performance Characteristics in Talented Male Youth Volleyball Players. *Pediatric Exercise Science,* 23, 537-548
4. Alvarez JC, D'Ottavio S, Vera JG, Castagna C. (2009). Aerobic fitness in futsal players of different competitive level. *J Strength Cond Res.* 23:2163–2166.
5. Chamari, K., Ahmaidi, S., Blum, J.Y., Hue, O., Temfemo, A., Hertogh, C., Mercier, B., Prefaut, C. & Mercier, J.S. (2001). Venous blood lactate increase after vertical jumping in volleyball athletes. 85(1-2):191-4.
6. Chen, X.R. (1989). *Handbook of Volleyball*, Si Chuan Dictionary Press.
7. Chen, X.R. (2005). *Volleyball.* Beijing: Higher Education Press.
8. Claessens, A.L., Lefevre, J., Beunen, G. & Malina. R.M. (1999). The contribution of anthropometric characteristics to performance scores in elite female gymnasts. *Journal of Sports Medicine and Physical Fitness.* 39:355-360.
9. Coleman, SG, Benham, AS, Northcott, SR. (1993). A three-dimensional cinematographical analysis of the volleyball spike. 11(4):295-302.
10. Cortell-Tormo, J.M., Perez-Turpin, J.A., Chinchilla, J.J., Cejuela, R. & Suarez, C. (2011). Analysis of movement patterns by elite male players of beach volleyball. 112(1):21-8.
11. Koley, S. & Satinder, P. K. (2011). Correlations of Handgrip Strength with Selected Hand-Arm-Anthropometric Variables in Indian Inter-university Female Volleyball Players *Asian Journal of Sports Medicine,* Volume 2, 4, Pages: 220-226.
12. Laffaye, G & Choukou, MA. (2010). Gender bias in the effect of dropping height on jumping performance in volleyball players. *J Strength Cond Res.*24(8):2143-8.
13. Lamontagne-Lacasse, M, Nadon, R. & Goulet, E.D. (2011). Effect of creatine supplementation on jumping performance in elite volleyball players. 6(4):525-33.
14. Le Gall, F., Carling, C., Williams, M. & Reilly, T. (2010). Anthropometric and fitness characteristics of international, professional and amateur male graduate soccer players from an elite youth academy. *Journal of Medicine and Science in Sports.*13(1):90-5.
15. Li, A.G. (1995). *Modern Volleyball*, Peoples' Sport Press.