Analysis of Selected Anthropometric, Motor Fitness, Physiological, Psychological Variables and Playing Ability among Different Levels of Handball Players

Thomas George

C.M.I Asst. Prof. St. Joseph's College, Moolamattom, Idukki Dt. Kerala-685591, India

Abstract

Team handball is a complex intermittent game, which requires players to have well developed aerobic and anaerobic capacities, psychological and physiological capacities, motor ability, sprinting, jumping, flexibility and throwing velocity represent physical activities that are considered as important aspects of the game and contribute to the high performance of the team. **Competition offers individual growth and development**. A talented young athlete is considered to be someone who performs better than his or her peers during training and competition, and who has the potential to reach the elite level. **In team games like handball, however, the prediction of long-term success in young players is complex because multidimensional characteristics are needed.**

Competition is a moment when athletes have to face others, to compare, to recognize their own potential, **to self-assess and self-evaluate**, and to realize what they have achieved as the results of their efforts in training. **The youth mature faster through sport participation and that the experience of competition may nurture a sense of responsibility and moral values.** The study is delimited to the variables namely: **anthropometrical** (standing height, weight, arm length & leg length), **motor fitness variables** (speed, explosive strength, agility, cardio respiratory endurance, & **muscular endurance**), physiological variables (resting pulse rate & recovery pulse rate) and psychological variables (self-esteem, activation, stability, **emotional maturity & achievement motivation**).

Sport experiences often foster citizenship, social success, positive peer relationships, leadership skills, and a sense of initiative in participants. **This study intends to investigate and derive a new scientific approach for boosting up performance of handball players.** Therefore, the focus of this study is on the characteristics of selected **anthropometric, motor fitness, physiological variables and playing ability among handball players with different levels** of success in sports participation to know about the contribution of these variables in the achievement excellence in handball performance.

KEYWORDS: Team Handball, anthropometrical fitness, motor fitness, emotional maturity and Muscular endurance.

INTRODUCTION

Sports scientists often acknowledge that a world-class performance is the result of several factors, advocating a multidimensional approach in studies on talented players (Regnier *et al*., 1993; Reilly *et al*., 2000). Thus, the handball player's characteristics of anthropometric, motor fitness, physiological, psychological variables and playing ability should be measured in a sports-specific way.

A talented young athlete is considered to be someone who performs better than his or her peers during training and competition, and who has the potential to reach the elite level (Howe *et al.*, 1998; Helsen *et al.*, 2000). In team games like handball, however, the prediction of long-term success in young players is complex because multidimensional characteristics are needed.

Until now, only a few multivariate approaches focusing on identifying talent in team sports have been completed (Deshaies *et al.*, 1979; Pienaar *et al.*, 1998). In these studies, elite players have been compared to their non-elite counterparts. Reilly *et al.* (2000) used a multidisciplinary approach to distinguish between elite and sub-elite soccer players on the basis of performance on test items. They recommended a study with a pool of already selected talented athletes who were exposed to systematic training. For this reason, the present study focuses on handball players who were all considered to be talented.

This study intends to investigate and derive a new scientific approach for boosting up performance of handball players. Therefore, the focus of this study is on the characteristics of selected anthropometric, motor fitness, physiological, psychological variables and playing ability among handball players with different levels of success in sports participation to know about the contribution of these variables in the achievement excellence in handball performance.

ANALYSIS OF DATA AND RESULTS OF THE STUDY

The data collected on selected criterion variables in this study were subjected to statistical analysis and the results thus obtained are tabulated. The data on selected criterion variables tested for significant difference among different levels of players, utilizing analysis of variance, and the results thus obtained were given in Tables. Further, the data were subjected to multiple regression analysis in order to unveil the predominant characteristics which have decisive role to determine the playing ability of the handball players. In this study, the data was also evaluated for verifying the authenticity of the classification of players at different levels of participation, and to determine the playing ability based on anthropometric, motor fitness, physiological and psychological characteristics, and also to categorize the player's capability of achievement consequently.

Analysis of the Data

The influence of the independent variables were individually and statistically analysed and its details are presented below.

Standing Height

The data collected on standing height for the handball players of different levels of participation were statistically analysed and the results are given in Table given below.

Analysis of variance on standing height for college district university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	F ratio
College	26	174.31 ± 7.02	Between Groups	452.25	3	150.75	3.37*
District	29	171.55 ± 6.66					
University	60	172.45 ± 6.93	Within Groups	7302.31	163	44.80	
State	52	175.74 ± 6.25					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

The table denotes that the mean and standard deviation on standing height of college, district, university and state level men handball players are 174.31 ± 7.02, 171.55 ± 6.66,172.45 ± 6.93 and 175.74 ± 6.25 respectively. These descriptive values denote that state level players have more standing height compared to other categories confined to this study, whereas, district players have less standing height. The obtained *F* ratio of 3.37 for the df of 3 and 163 at 0.05 level of confidence is greater than the required table value of 2.67, indicates that there is significant difference between various categories of players on standing height. Since, the obtained *F* ratio for the analysis of variance on standing height is significant, the Scheffé S post hoc test has been applied and it is given in Table given below.

Scheffé S post hoc test on standing height of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
174.31	171.55			2.76	5.116
174.31		172.45		1.86	4.448
174.31			175.74	1.43	4.550
	171.55	172.45		0.9	4.284
	171.55		175.74	4.19	4.390
		172.45	175.74	3.29	3.589

* Significant at the 0.05 level of confidence interval.

The above table reveals that no significant difference exists on standing height among players of different categories.

Weight

The data collected on weight of the handball players of different categories were statistically examined and the results obtained are presented in Table given below.

Analysis of variance on weight for college, district, university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	F ratio
College	26	65.88 ± 7.99	Between Groups	1280.40	3	426.80	6.29 *
District	29	69.14 ± 7.87					
University	60	64.39 ± 7.18	Within Groups	11065.38	163	67.89	
State	52	70.77 ± 9.60					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on weight is significant, the Scheffé S post hoc test has been applied and it is given in Table given below.

Scheffé S post hoc test on weight of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
65.88	69.14			3.26	6.298
65.88		64.39		1.49	5.475
65.88			70.77	4.89	5.601
	69.14	64.39		4.75	5.274
	69.14		70.77	1.631	5.404
		64.39	70.77	6.38*	4.418

* Significant at the 0.05 level of confidence interval.

Leg length

The data collected on leg length of handball players of different categories were statistically analysed and its results are presented in Table given below.

Analysis of variance on leg length for college district university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	95.88 ± 1.51	Between Groups	66.42	3	22.14	2. 41
District	29	95.38 ± 2. 38					
University	60	94.50 ± 3.76	Within Groups	1497.00	163	9.18	
State	52	95.90 ± 2.97					

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Analysis of variance on arm length for college district university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	78.46 ± 4.18	Between Groups	128.59	3	42.86	2.04
District	29	78.86 ± 4.07					
University	60	77.10 ± 5.60	Within Groups	3427.83	163	21. 03	
State	52	79.10 ± 3.65					

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Speed

The datas collected on speed were statistically analysed and the obtained result is presented in Table given below.

Analysis of variance on speed for college district university and state level men handball players

Categories	N	Mean ± SD	S O V	Sum of Squares	df	Mean Squares	*F* ratio
College	26	7.56 ± 0.15	B. G	0.404	3	0.14	0.97

District	29	7.55 ± 0.33					
University	60	7.56 ± 0.36	W. G	22. 67	163	0.14	
State	52	7.45 ± 0. 47					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Muscular Endurance

The datas collected on muscular endurance were statistically analysed and the results thus obtained are furnished in Table given below.

Analysis of variance on muscular endurance for college district university and state level men handball players

Categories	N	Mean ± SD	S O V	Sum of Squares	df	Mean Squares	*F* ratio
College	26	46.54 ± 8.58	B	3554.96	3	1184.99	14.42*
District	29	39.00 ± 2.45					
University	60	50.13 ± .014	W	13399.45	163	82.21	
State	52	52.13 ± 8.20					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on muscular endurance is significant, Scheffé S post hoc test has been applied and it's given in the Table given below.

Scheffé S post hoc test on muscular endurance of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
46.54	39.00			7.538*	6.930
46.54		50.13		3.595	6.025
46.54			52.13	5.596	6.163
	39.00	50.13		11.133*	5.803

	39.00		52.13	13.135*	5.947
		50.13	52.13	2.001	4.862

* Significant at the 0.05 level of confidence interval.

Agility

The data collected on agility were systematically analysed and its results are presented in Table given below.

Analysis of variance on agility for college district university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	11.23 ± .0069	Between Groups	16.59	3	5.528	10163.87*
District	29	10.80 ± .0082					
University	60	10.37 ±. 032	Within Groups	.089	163	.001	
State	52	10.41 ± .022					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on agility is significant, the Scheffé S post hoc test has been applied and it's been given in Table given below.

Scheffé S post hoc test on agility college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
11.23	10.80			0.43*	0.024
11.23		10.37		0.86*	0.021
11.23			10.41	0.82*	0.021
	10.80	10.37		0.43*	0.020
	10.80		10.41	0.39*	0.021
		10.37	10.41	0.04*	0.017

* Significant at the 0.05 level of confidence interval.

The data obtained on agility and analysed for paired mean differences reveals that significant difference exists among all categories of players on agility.

Cardio Respiratory Endurance

The datas collected on cardio respiratory endurance were statistically analysed and the results obtained is given in Table given below.

Analysis of variance on cardio respiratory endurance for college district university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	74.74 ± 18.02	Between Groups	4676.769	3	1558.923	5.567*
District	29	66.20 ± 18.83					
University	60	74.24± 18.02	Within Groups	45648.354	163	280.051	
State	52	81.80 ± 12.86					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on cardio respiratory endurance is significant, the Scheffé S post hoc test has been applied and it is given in Table given below.

Scheffé S Post Hoc Test on cardio respiratory endurance college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
74.74	66.20			8.54	12.792
74.74		74.24		0.50	11.120
74.74			81.80	7.06	11.376
	66.20	74.24		8.04	10.712
	66.20		81.80	15.6*	10.977
		74.24	81.80	7.56	8.974

* Significant at the 0.05 level of confidence interval.

From the above table it is obvious that there is a significant difference only between district players and state players in the case of cardio respiratory endurance.

Explosive Strength

The datas collected on explosive strength were scientifically and statistically analysed and its results are furnished in Table given below.

Analysis of variance on explosive strength for college district university and state level men handball players

Categories	No. of Subjects	Mean & SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	60.50 ± 1.196	Between Groups	287.775	3	95.925	10.780 *
District	29	61. 38 ± 2.62					
University	60	62. 45 ±2. 87	Within Groups	1450.421	163	8.898	
State	52	59. 29 ±3. 80					

* Significant at 0.05 level.

Since, the obtained *F* ratio for the analysis of variance on explosive strength is significant, Scheffé S post hoc test has been applied and it is given in Table given below.

Scheffé S post hoc test on explosive strength of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
60.50	61. 38			0.88	2.280
60.50		62. 45		1.95	1.982
60.50			59. 29	1.21	2.028
	61. 38	62. 45		1.07	1.909
	61. 38		59. 29	2.09*	1.957
		62. 45	59. 29	3.16*	1.600

* Significant at the 0.05 level of confidence interval.

The datas analysed for paired mean differences on explosive strength exhibits that there is a considerable variation between the explosive strength of state players with that of district and university players.

Resting Pulse Rate

The data collected on pulse rate were statistically analysed and its results are presented in Table given below.

Analysis of variance on resting pulse rate for college district university and state level men handball players

Categories	N	Mean & SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	66. 50 ±.51	Between Groups	118.046	3	39.35	128.64*
District	29	65.79 ± .41					
University	60	64.55 ±.70	Within Groups	49.859	163	.306	
State	52	64.25±.44					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on resting pulse rate is significant, Scheffé S post hoc test has been applied and it is given in Table given below. The datas thus analysed for paired mean differences on resting pulse rate exhibits that there is considerable variation among the resting pulse rate of players of all the categories.

Scheffé S post hoc test on resting pulse rate of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
66.5	65.79			0.71*	0.423
66.5		64.55		1.95*	0.368
66.5			64.25	2.25*	0.376
	65.79	64.55		1.24*	0.354
	65.79		64.25	1.54*	0.363
		64.55	64.25	0.3*	0.297

* Significant at the 0.05 level of confidence interval.

Recovery Pulse Rate

The datas collected on recovery pulse rate were scientifically and statistically analysed and its results are presented in Table given below.

Analysis of variance on recovery pulse rate for college district university and state level men handball players

Categories	N	Mean & SD	Source of Varianc	Sum of Squares	df	Mean Squares	*F* ratio

			e				
College	26	85.19 ± 7.55	Between Groups	508.721	3	169.574	6.49*
District	29	84.41 ± 3.914					
University	60	82.48 ± 5.12	Within Groups	4256.979	163	26.116	
State	52	80.46 ± 4.10					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on recovery pulse rate is significant, Scheffé S post hoc test has been applied and it is given in Table given below.

Scheffé S post hoc test on recovery pulse rate of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
85.19	84.41			0.78	3.906
85.19		82.48		2.71	3.396
85.19			80.46	4.73*	3.474
	84.41	82.48		1.93	3.271
	84.41		80.46	3.95*	3.352
		82.48	80.46	2.02	2.740

* Significant at the 0.05 level of confidence interval.

The datas thus analysed for paired mean differences on recovery pulse rate exhibits that state players are considerably better in recovery pulse rate compared to college and district players.

Self Esteem

The datas collected on self esteem was statistically analysed and its results are presented in the table given below.

Analysis of variance on self-esteem for college district university and state level men handball players

Categories	N	Mean ± SD	SOV	Sum of Squares	df	Mean Squares	*F* ratio
College	26	34. 19±2.58	B	91.316	3	30.439	6.29*

District	29	35.21±2.09					
University	60	35.98±2.55	W	789.22	163	4.84	
State	52	36.33±1.52					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on self esteem is significant, the Scheffé S post hoc test has been applied and it is given in Table given below.

Scheffé S post hoc test on self esteem of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
34. 19	35.21			1.02	1.682
34. 19		35.98		1.79*	1.462
34. 19			36.33	2.14*	1.496
	35.21	35.98		0.77	1.408
	35.21		36.33	1.12	1.443
		35.98	36.33	0.35	1.180

* Significant at the 0.05 level of confidence interval.

The datas thus analysed for paired mean differences on self-esteem exhibits that state and university players are having considerably higher self-esteem compared to that of college players.

Activation

The datas collected on activation were statistically analysed and its results are exhibited in the Table given belowgiven below.

Analysis of variance on activation for college district university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	36.62 ± 1.06	Between Groups	32.516	3	10.84	4.707*
District	29	37.24 ± 1.35					
University	60	37.22 ± 1.63	Within	375.34	163	2.30	

State	52	37.92 ± 1.66	Groups	0			

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on activation is significant, the Scheffé S post hoc test has been applied and it's given in Table given below.

Scheffé S Post Hoc Test on activation of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
36.62	37.24			0.62	1.160
36.62		37.22		0.60	1.008
36.62			37.92	1.3*	1.032
	37.24	37.22		0.025	0.971
	37.24		37.92	0.68	0.995
		37.22	37.92	0.70	0.814

* Significant at the 0.05 level of confidence interval.

The datas thus analysed for paired mean differences on activation exhibits that state players are having considerably higher activation levels compared to that of college players.

Stability

The datas collected on stability were statistically examined and presented in Table given below.

Analysis of variance on stability for college district university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	43.12 ± 2.30	Between Groups	55.377	3	18.459	2.875 *
District	29	43.55 ± 1.74					
University	60	44.28 ± 2.69	Within Groups	1046.68	163	6.421	
State	52	44.71 ± 2.81					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on stability is significant, the Scheffé S post hoc test has been applied and it is given in Table given below.

Scheffé S post hoc test on stability of college district university and state men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
43.12	43.55			0.43	1.937
43.12		44.28		1.16	1.684
43.12			44.71	1.59	1.723
	43.55	44.28		0.73	1.622
	43.55		44.71	1.16	1.662
		44.28	44.71	0. 43	1.359

* Significant at the 0.05 level of confidence interval.

The findings of study on stability for paired mean differences exemplifies that there is no significant difference among various categories of players.

Emotional Maturity

The datas collected on emotional maturity were statistically analysed and the results thus obtained are presented in Table given below.

Analysis of variance on emotional maturity for college district university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	177.77 ± 9. 44	Between Groups	930.89	3	310.297	2.875 *
District	29	179.56 ± 7.15					
University	60	182. 56 ± 11.019	Within Groups	17594.73	163	107.943	
State	52	184.32 ± 11.52					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on emotional maturity is significant, the Scheffé S post hoc test has been applied and it is given in Table given below.

Scheffé S post hoc test on emotional maturity of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
177.77	179.56			1.79	7.942
177.77		182. 56		4.79	6.904
177.77			184.32	6.55	7.063
	179.56	182. 56		5.091	6.650
	179.56		184.32	4.76	6.815
		182. 56	184.32	1.76	5.571

* Significant at the 0.05 level of confidence interval.

The findings of study on emotional maturity for paired mean differences exemplifies that there is no significant difference among various categories of players.

Achievement Motivation

The datas collected on achievement motivation scale were statistically examined and its results are exhibited in Table given below.

Analysis of variance on achievement motivation for college district university and state level men handball players

Categories	N	Mean ± SD	Source of Variance	Sum of Squares	df	Mean Squares	*F* ratio
College	26	169.77 ± 4.78	Between Groups	658.458	3	219.486	4.707 *
District	29	172.59 ± 6.09					
University	60	172.48 ± 7.32	Within Groups	7600.63	163	46.630	
State	52	175.65 ± 7.45					

* Significant at 0.05 level.

Since, the obtained *F* ratio for the analysis of variance on achievement motivation is significant, the Scheffé S post hoc test has been applied and it is given in Table given below.

Scheffé S post hoc test on achievement motivation of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		

169.77	172.59			2.82	5.220
169.77		172.48		2.71	4.538
169.77			175.65	5.88*	4.642
	172.59	172.48		0.11	4.371
	172.59		175.65	3.06	4.479
		172.48	175.65	3.17	3.662

* Significant at the 0.05 level of confidence interval.

The findings of study on achievement motivation for paired mean differences show that achievement motivation of state players considerably better than that of college players.

Playing Ability

The data collected on playing ability were statistically examined and its results are exhibited in Table given below.

Analysis of variance on playing ability for college district university and state level men handball players

Categories	N	Mean & SD	S O V	Sum of Squares	df	Mean Squares	*F* ratio
College	26	64.31 ± 4.20	Between Groups	2370.17	3	790.057	27.601*
District	29	69.31 ± 4.84					
University	60	71.22 ± 5.76	Within Groups	4665.70	163	28.642	
State	52	75.65 ± 5.62					

* Significant at 0.05 level.

The table value required for significance at 0.05 level for the df of 3 and 163 is 2.67.

Since, the obtained *F* ratio for the analysis of variance on playing ability is significant, Scheffé S post hoc test has been applied and it's been given in Table given below.

Scheffé S post hoc test on playing ability of college district university and state level men handball players

Categories				Mean Difference	Confidence Interval
College	District	University	State		
64.31	69.31			5.003*	4.090
64.31		71.22		6.909*	3.555

64.31			75.65	11.346*	3.637
	69.31	71.22		1.906	3.425
	69.31		75.65	6.344*	3.509
		71.22	75.65	4.437*	2.869

* Significant at the 0.05 level of confidence interval.

The finding of study on playing ability for paired mean differences reveals that significant differences exist among players of various categories, with an exemption between district and university level players. The obtained correlation coefficient for standing height, weight, arm length, leg length, speed, explosive strength, agility, cardio endurance, muscular endurance, resting pulse, recovery pulse, self esteem, activation, stability, achievement motivation, and emotional maturity with playing ability are .144, .242, .102, .053, -.031, -.063, -.503, .156, .097, -.446, -.251, .209, .217, .259, .217, and .259 respectively.

The multiple regression analysis was utilized to select the minimum number of criterion variables that could determine playing ability with the highest multiple co-efficient.

Regression analysis on playing ability of handball players

Predictors	**R**	**R Square**	**Adjusted R Square**	**Std. Error**	**%Common Variance**	**F**
Agility	.503	.253	.249	5.64264	14	55.980
Agility, Weight	.558	.311	.303	5.43651	17	37.028
Agility, Weight, Stability	.571	.327	.314	5.39155	18	26.347
Agility, Weight, Stability, Achievement motivation	.585	.343	.326	5.34378	19	21.097

In the process of computing multiple correlations on the playing ability, the predominant criterion variables agility, weight, stability, and achievement motivation were selected with the zero-order correlation coefficient of –0.503, 0.242, 0.259 and 0.217 with playing ability.

The obtained R^2 value of 0.253 denotes that the agility is having 14% common variance with playing ability and the corresponding *F* ratio of 55.980 is significant at 0.05 level. While the obtained R^2 value of 0.311 represents that the agility and weight are having 17% common variance with playing ability and the corresponding *F* ratio of 37.028 is significant at 0.05 level. Per se, the agility, weight, and stability are having 18% common variance with playing ability and the corresponding *F* ratio of 26.347 is significant at 0.05 level. Furthermore, the findings establishes that agility, weight,

stability, and achievement motivation are having 19% common variance with playing ability and the corresponding *F* ratio of 21.097 is significant at 0.05 level.

The results of the study indicate that the handball playing ability can be predetermined by agility, weight, stability, and achievement motivation of the players.

Thereby, the equations that derive playing ability are as follows:

a) Playing ability = 180.686 – 10.339 (Agility)

b) Playing ability = 168.237 – 10.319 (Agility) + 0.181 (Weight)

c) Playing ability = 149.810 – 9.822 (Agility) + 0.163 (Weight) + 0.326 (Stability)

d) Playing ability = 119.484 – 9.158 (Agility) + 0.154 (Weight) + 0.391 (Stability) + 0.122 (Achievement motivation)

In order to realize the criterion variables that contribute to the classification of players at different levels of participation, discriminant analysis was appraised, and thereby unstandardized canonical discriminant function coefficients is used to derive the regression equation that classifies players to the categories namely: college, district, university and state levels based on their basal characteristics. Further, multiple correlation was computed to know the collective influence of determinants on level of achievement and then multiple regression equation was derived.

Regression analysis of data on selected criterion variables

Step	Number of Variables	Variable	Tolerance	F to Remove	Wilks' Lambda
1	1	Agility	1.000	10163.868	
2	2	Agility	.973	10356.204	.834
		Explosive Strength	.973	12.337	.005
3	3	Agility	.901	3575.735	.248
		power	.971	11.513	.004
		Resting pulse	.926	9.681	.004
4	4	Agility	.899	3408.337	.203
		Explosive Strength	.969	11.253	.004
		Resting pulse	.849	13.239	.004
		Cardio endurance	.901	9.062	.004
5	5	Agility	.852	3532.508	.186
		Explosive Strength	.890	15.302	.004
		Resting pulse	.837	14.109	.003
		Cardio endurance	.898	8.486	.003
		Achievement motivation	.882	7.378	.003

6	6	Agility	.848	3497.036	.167
		Explosive Strength	.885	14.714	.003
		Resting pulse	.837	13.723	.003
		Cardio endurance	.854	5.606	.003
		Achievement motivation	.881	7.347	.003
		Muscular Endurance	.934	5.917	.003
7	7	Agility	.831	3535.648	.152
		Explosive Strength	.884	14.031	.003
		Resting pulse	.831	11.693	.003
		Cardio endurance	.770	8.745	.003
		Achievement motivation	.880	7.195	.003
		Muscular Endurance	.876	7.369	.003
		Recovery pulse	.785	5.991	.002

Regression analysis of data on selected criterion variables ... Continued

8	8	Agility	.824	3539.046	.138
		Explosive Strength	.884	13.417	.003
		Resting pulse	.830	11.670	.002
		Cardio endurance	.770	8.362	.002
		Achievement motivation	.880	6.908	.002
		Muscular Endurance	.874	7.447	.002
		Recovery pulse	.784	5.686	.002
		Weight	.984	5.562	.002
9	9	Agility	.804	3562.236	.136
		Explosive Strength	.883	13.183	.002
		Resting pulse	.830	11.570	.002
		Cardio endurance	.757	7.476	.002
		Achievement motivation	.849	6.033	.002
		Muscular Endurance	.874	7.398	.002
		Recovery pulse	.769	4.914	.002
		Weight	.960	4.877	.002
		Stability	.867	1.664	.002

In the above table, the tolerance level is a measure of linear dependency between one variable and others. The tolerance value of < .001 indicates high level of linear dependency, which will prevent that variable from entering into the equation. The above

table shows which variables were included in the final discriminant function. The variables included in the analyses have higher the acceptable tolerance level (.001) and have F values greater than 1.15. Wilks' Lambda is a step wise operation that is based on minimizing the Wilks' Lambda after each new variable has been entered into the regression equation. The criteria for entry into regression equation is F > 1.15 and the criteria for removal from equation once a variable has been entered if its contribution to the equation drops below a designated level of F < 1.00. Wilks' Lambda is designed to indicate whether a particular variable contributes significantly to explaining additional variance in the dependent variable.

Table XXXVI further reveals the number of variables in the discriminant equation at each step. Thereby, the multivariate analysis of included variables in the analyses is tested for significance, and it is not the variance of each new variable's unique contribution.

Table - XXXVII
Test of equality of group covariance matrices using Box's M

GROUP		Rank	Log Determinant	Box's M	Approx. F	df1	df2	Sig.
1	College	9	9.361	400.560	2.624	135	28133.631	.000
2	District	9	10.339					
3	University	9	16.105					
4	State	9	14.088					
Pooled within-groups		9	15.907					

Table XXXVII reveals the test of the multivariate normality of the data. The Rank (9) of the covariance matrix indicates that this is a 9 x 9 matrix, the number of variables in the discriminant equation. The natural log of the determinant of handball players at different levels of participants covariance matrices are 9.361, 10.339, 16.105 and 14.088 respectively. Pooled within groups covariance matrix composed of the means of each corresponding value within the four 9 x 9 matrices of the college, district, university and state level male handball players is 15.907.

The Box's M value of 400.560 is a measure of multivariate normality, based on the similarities of the determinants of the covariance matrices for the handball players at different levels of participation. The approximate F value of 2.624 reveals that the determinants from the four levels of the dependent variable (*college, district, university and state level male handball players)* differs considerably as the significance value is p < 0.001, and thereby it suggests that the obtained data is not found to be multivariate normal.

Analysis of unstandardized canonical discriminant function coefficients

Variable	Function		
	1	2	3
Agility	-.008	.030	-.067
Explosive strength	-.074	-.190	.143
Resting pulse	47.488	3.997	1.518
Cardio endurance	-.009	.033	.013
Achievement motivation	.002	.035	.079
Muscular endurance	-.322	-1.142	-.277
Recovery pulse	.030	-.080	-.050
Weight	-.073	.022	-.019
Stability	.027	.054	-.053
(Constant)	-480.320	33.550	7.086

Table XXXVIII shows the list of coefficients and the constant of the discriminant equation. Each subject's discriminant score would be computed by entering their variable values for each of the 9 variables in the equation. The discriminant equation was as follows:

D = – 480.320 – 0.008 (Agility) – 0.074 (Explosive strength) + 47.488 (Resting pulse) – 0.009 (Cardio endurance) + 0.002 (Achievement motivation) – 0.322 (Muscular endurance) + 0.030 (Recovery pulse) – 0.073 (Weight) + 0.027 (Stability)

Table - XXXIX
Eigenvalues and Wilks' Lambda

Eigen value	% of Variance	Cumulative %	Canonical Correlation	Test of Function	Wilks' Lambda	Chi-square	df	Sig.
223.626(a)	99.5	99.5	.998	1 through 3	.002	995.894	27	.000
.858(a)	.4	99.9	.680	2 through 3	.436	132.292	16	.000
.233(a)	.1	100.0	.435	3	.811	33.448	7	.00

								0

a First 3 canonical discriminant functions were used in the analysis.

The Eigen value of 223.626 is the proportion of variance explained by each factor for the first (1 through 3) canonical discriminant function. The % of variance and cumulative % of the function accounts for 99.5%. The correlation among different levels of players for discriminant scores is extremely high as the obtained canonical correlation is 0.998, which indicates that canonical discriminant function discriminates the four different levels of dependent variables (*college, district, university and state level male handball players*) well.To conduct a discriminant analysis that predicts membership into four groups based on the dependent variable categories (*college, district, university and state level male handball players*) and creating the discriminant equation with inclusion 9 of 16 independent variables selected by step wise procedure based on the minimization of Wilks' lambda at each step with an F-to-enter of 1.15 and an F-to-remove of 1.00.

The Chi-square value of 995.894 is higher than the table value of 40.113 required for significance at 27 degrees of freedom, denotes that there is a significant difference among college, district, university and state level male handball players based on the discriminant function.

Table - XL
Functions at group centroids

GROUPS	Function		
	1	2	3
College	29.993	.374	.508
District	9.806	-.924	-.867
University	-10.621	-.766	.359
State	-8.210	1.212	-.185

Table XL reveals the unstandardized canonical discriminant functions evaluated at group means. The college, district, university and state level male handball players mean values for the function 1 were 29.993, 9.806, -10.621 and -8.210 for college, district, university and state players respectively.

Table XLI
Classification results

	Level	Predicted Group Membership				Total
		College	District	University	State	
Original Count	College	26	0	0	0	26

	District	0	29	0	0	29
	University	0	0	51	9	60
	State	0	0	2	50	52
%	College	100.0	.0	.0	.0	100.0
	District	.0	100.0	.0	.0	100.0
	University	.0	.0	85.0	15.0	100.0
	State	.0	.0	3.8	96.2	100.0

a 93.4% of original grouped cases correctly classified.

Table XLI summarizes the number and percentage of subjects classified correctly and incorrectly as college, district, university and state level male handball players. It is found that all of the college and district players were correctly classified, whereas fifty-one (51) of sixty (60) subjects classified as university players is correct, while nine (9) of them were incorrect as the analysis predicts them to be as state players. Furthermore, it is found that fifty (50) of fifty-two subjects classified as state players were correct, and two of them were incorrect as the analysis predicts them to be as university players. Thereby 93.4% of original grouped cases (*players*) were correctly classified.

Discussion on Findings

The results of the study denote that there is a significant influence of selected variables such as anthropometrical, motor fitness, physiological, psychological and playing ability among different levels of handball players. The research on handball game has undergone unbelievable growth and development during the last fifteen years. Most of the investigations have become milestones in its progress towards professional and elite handball performance.

Regular practicing and participating in handball game have great impact on excellent athletic performance. Regular practice makes sub elite players elite players and good performance excellent performance. Playing together in a team for its greater glory and name, fame and success has tremendous retrospective influence and effect on the personal, social and family life of the athlete

Discussion on Hypotheses

The first research hypothesis formulated was there may be significant difference on selected criterion variables among handball players with different levels of participation. This alternative research hypothesis is accepted as true in the case of standing height, weight, explosive strength, agility, cardio respiratory endurance, muscular endurance, resting pulse rate, recovery pulse rate, self-esteem, activation, stability, emotional maturity and achievement motivation. And, thus the null hypothesis is

rejected with regard to these variables. However, the alternative research hypothesis is rejected and null hypothesis is accepted in the case of arm length, leg length and speed.

Secondly, it was hypothesized that the selected anthropometric measurements, motor fitness, physiological and psychological variables may significantly predict the playing ability of handball players. This research hypothesis is held as true as agility, weight, stability, and achievement motivation were considered to the predominant variables in determining the playing ability of the handball players with a common variance of 19%. Though the variance is not large enough, it is adequate to significantly predict the capability of playing among handball players. Hence, the research hypothesis is accepted and the null hypothesis is rejected.

Thirdly, it was hypothesized that the selected criterion variables may contribute to the classification of handball players with different levels of participation. on the basis of discriminant analysis, it is found that the determinants from the four levels of the dependent variable (*college, district, university and state level male handball players)* differs considerably in determining the playing ability of handball players, by establishing an equation for computing the discriminant score. Consequently, the research hypothesis is accepted and the null hypothesis is rejected.

Summary &Conclusions

A group of all talented players is relatively homogeneous with regard to their performance level. As a consequence, measures of general performance characteristics are usually not sensitive enough to detect differences between elite and sub-elite players. Tests therefore have to measure components that represent the specific demands of the sport in question involving sports-specific variables. Sports scientists often acknowledge that a world-class performance is the result of several factors, advocating a multidimensional approach in studies on talented players. Thus, the handball player's characteristics of anthropometric, motor fitness, physiological, psychological variables and playing ability should be measured in a sports-specific way.

In 1970s and 1980s scientists focused mainly on the detection of talented athletes and developed sport talent-detection models, however recently there has been a shift in emphasis from talent detection to talent guidance and development. Talent development is based on the prediction of performance and consequently on the assumption that underlying factors determining excellence in sports really do exist. In team games like handball, however, the prediction of long-term success in young players is complex because multidimensional characteristics are needed.

Only few studies have focused on identifying talent in team sports, some of the early researchers recommended a study with a pool of already selected talented athletes who were exposed to systematic training. For this reason, the present study focuses on handball players who were all considered to be talented.

The main aim of this investigation is to compare the characteristics of selected anthropometric, motor fitness, physiological, psychological variables and playing ability among different levels handball players. Correspondingly, the objectives of the study were framed a) to evaluate the existence of significant difference on selected criterion measures among handball players with different levels of successful participation, b) to

derive an equation that predicts handball playing ability, and c) to identify the criterion variables that classifies the handball players with different levels of success in sports participation.

The investigator identified and selected 167 male handball players as subjects from those participated at different levels such as college (*N = 26*), district (*N = 29*), university (*N = 60*) and state (*N = 52*), during the academic year 2010-11. The criterion measures confined to this study for evaluation are the anthropometrical measurements (*standing height, weight, arm length & leg length*), motor fitness variables (*speed, explosive strength, agility, cardio respiratory endurance, & muscular endurance*), physiological (*resting pulse rate & recovery pulse rate*), psychological (*self-esteem, activation, stability, emotional maturity & achievement motivation*), and handball playing ability. The standardized testing procedures, methods, instruments and questionnaires were administered to collect the relevant data on selected criterion variables. The playing ability was assessed subjectively using expert ratings. The experimental design used in this study was stratified random group design, and the data collected on selected anthropometric, motor fitness, physiological, psychological variables and playing ability have been statistically analyzed using one-way analysis of variance. Then, Scheffé S test was applied as post hoc test to determine the paired mean differences. In all the cases, α value of 0.05 was set for statistical significance. Moreover, multiple correlation was computed and multiple regression equation was derived to know the collective influence of determinants on playing ability. Above all, the discriminant analysis was appraised, and the unstandardized canonical discriminant function coefficients were used to derive the regression equation that classifies players to different categories based on their basal characteristics.

Conclusions

1. In this study, it is ascertained that the standing height, weight, explosive strength, agility, cardio respiratory endurance, muscular endurance, resting pulse rate, recovery pulse rate, self-esteem, activation, stability, emotional maturity and achievement motivation were differed significantly among handball players with different levels of successful participation, whilst the arm length, leg length and speed were not found to be significantly differed among handball players of different categories as confined to this study. Hence, it is inferred that most of the basal characteristics of the players do vary considerably among different levels of achievement and successful participation of the handball players.

2. Based on the research findings, it is also inferred that the handball playing ability can be predominantly determined by the basal characteristics such as: agility, weight, stability, and achievement motivation of the players, and thereby an equation to derive playing ability was:

$$\text{Playing ability} = 119.484 - 9.158\,(\text{Agility}) + 0.154\,(\text{Weight}) + 0.391\,(\text{Stability}) + 0.122\,(\text{Achievement motivation})$$

3. Furthermore, the research findings paved way to classify players on the basis of canonical discriminant function as that of college, district, university and state

level male handball players by establishing the discriminant equation in order to compute the discriminant score by entering the variable values for each of the 9 variables in the equation. And the discriminant equation was as follows:

D = – 480.320 – 0.008 (Agility) – 0.074 (Explosive strength) + 47.488 (Resting pulse) – 0.009 (Cardio endurance) + 0.002 (Achievement motivation) – 0.322 (Muscular endurance) + 0.030 (Recovery pulse) – 0.073 (Weight) + 0.027 (Stability)

BIBLIOGRAPHY

Ajmeer Singh, et.al. (2005). *Essential of Physical Education*, New Delhi: Kalyani Publication, P. 66.

Alagaonkar, J. (1997). *Sports Psychology*, Pune: Vidyarthi Griha Prakashan Publishers, P.157.

Allport, G. (1961). *Pattern and Growth in Personality*. New York: Holt, Rinehart & Winston.

Apitzsch, E. (1995). *Psychodynamic theory of personality and sport performance, European perspectives on exercise and sport psychology*. United Kingdom: Human Kinetics, pp. 111-127 .

Ashok, R. Lohar. (1998). *Handball Basic Techniques*, Paper back, Patiala: Prakash Publications, P. 64.

Atkinson, J. & Feather, N. (1966). *A theory of achievement motivation*. New York: Wiley and Sons.

Atkinson, J. W. (Ed.). (1958). *Motives in fantasy, action and society*. Princeton, NJ: Van Nostrand.

Author's Guide .(1993). *The World Book Encyclopedia*, London: World Book, Inc, Vol.15, P.212.

Author's Guide. (1988). *Oxford dictionary*, Delhi: Oxford University Press P.608

Auweele, Y.V., Cuyper, B.D., Mele, V.V., & Rzewnicki, R. (1993). *Elite performance and personality: From description and prediction to diagnosis and intervention*. In A Handbook of Research on Sports Psychology, 257-292. New York: Macmillan.

Auweele, Y.V., Mele, V.V., Nys, K., & Rzewnicki, R. (2012). *Personality and (elite) sport: Towards a reconceptualizing of the personality concept in sport psychology*. In A Handbook of Research on Sports Psychology (2nd edn.) New York: Macmillan.

Baker, J., & Côté, J. (2006). *Shifting training requirements during athlete development:* The relationship among deliberate practice, deliberate play and other sport involvement in the acquisition of sport expertise. Essential processes for attaining peak performance . Germany: Meyer and Meyer. 93-110.

Bar Or, O. (1983). *Pediatric sports medicine for the practitioner: From physiologic principles to clinical application*. New York: Springer Verlag.

Barlow, D. H. (1988). *Anxiety and its disorders*. New York: Guilford Press.

Basel, Karger., & Seco, R. (1993). *Seguimiento antropometrico* . Comite Tecnico, RealFederacion Espanola de Balonmano.

Baumeister, R. F. *The self*. The handbook of social psychology (4th ed., Vol. 1, pp. 680–740). New York: McGraw-Hill.

Baumgartner, T. A., & Jackson, A.S. (1987). *Measurement for Evaluation in Physical Education and Exercise Science*, (3rd Ed.), Dubeque, Iowa: W.Mc. Brown Publishers, P. 12.

Becker, E. (1973). *The denial of death*. New York: Academic Press.

Benson, P. L., Galbraith, J., & Espeland, P. (1998). *What kids need to succeed: Proven, practical ways to raise good kids*. Free Spirit Press.

Bill Tancred, (1987), *Health Related Fitness*, London: Hodder and Stoughton Limited, P. 42.

Blaine, B., & Crocker, J. (1993). *Self-esteem and self-serving biases in reactions to positive and negative events: An integrative review*. Self-esteem: The puzzle of low self-regard . Hillsdale, NJ: Erlbaum, pp. 55-85.

Bompa, T. O. (2000). *Total training for young champions*. Champaign: Human Kinetics.

Bredemeier, B.J., & Shields, D.L. (1987). *Moral growth through physical activity: A structural developmental approach*. Advances in pediatric sport sciences, vol. 2. (pp. 143-165). Champaign, IL: Human Kinetics.

Brown, A,L., & Shaw. (1975) .*The development of memory:* knowing, knowing how and knowing and about knowing, vol. No. 10, New York.

Buckworth, J., & Dishman, R. K. (2002). *Exercise psychology*. Champaign, IL: Human Kinetics.

Buss., & Perry. (1992). *Measurement of Aggression*, New York: W.B.Saunders Company, P. 68.

Cairns, E., McWhirter, L., Duffy, U., & Barry, R. (1990). *The stability of self-concept in late adolescence*: Gender and situational effects. Personality and Individual Differences, 11.

California Task Force to Promote Self-esteem and Personal and Social Responsibility. (1990). *Toward a state of self-esteem*. Sacramento, CA: California State Department of Education.

Carter J. (1984). *Age and body size of Olympic athletes*.

Carter, J.E.L. (1985). *Morphological factors limiting human performance. In Limits of Human Perform*ance: American Academy of Physical Education Papers No. 18, 106-117. Champaign, IL: Human Kinetics.

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control theory approach to human behavior*. New York: Springer- Verlag.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. Cambridge, England: Cambridge University Press.

Chatzisarantis, N. L. D., & Hagger, M. S. (2007). *Intrinsic motivation and self-etermination in exercise and sport:* Intrinsic motivation and self-determination in exercise and sport. Champaign, IL: Human Kinetics, pp. 281–296.

Clarke, H., & Clarke, D.H. (1987). *Application of Measurement in Physical Education,* (6th Ed.), Englewood Cliffs, New Jersey, U.S.A: Prentice Hall Inc., P. 63.

Clarke, H., &Clarke, D.H. (1989). *A Physical and Motor test in the Melfort Boys*

Comfrey, A. L., & H.B. Lee's, A. (1992). *First Course in Factor Analysis*, Lawrence Erlbaum, New Jersey.

Côté, J, & Fraser-Thomas, J. (2007). *Youth involvement in sport. Introduction to sport psychology*: A Canadian perspective (pp. 266-294). Toronto: Pearson Prentice Hall.

Côté, J, Baker, J., & Abernethy, B. (2012). *Practice and Play in the Development of Sport Expertise*. Handbook of sport psychology (3rd edition). Hoboken, NJ: Wiley.

Côté, J., & Hay, J. (2002). *Children's involvement in sport: A developmental perspective*. Psychological foundations of sport (pp. 484-502). Boston: Allyn & Bacon.

Côté, J., Baker, J. & Abernethy. B. (2005). *From play to practice: A developmental framework for the aojuisiiion of expertise in team sports*. Expert performance in sports: Advances in research on sport expertise. Champaign. IL: Human Kinetics, pp.89-110

Cox, R. H. (1994). Social psychology of sport. *Sport psychology con - cepts and applications*. Dubuque, IA: Brown & Benchmark, 3rd ed., pp. 265 – 351.

Cox, R.H. (2002). *Sports psychology concepts and application*, 5th edition NY: McGraw Hill

Danilov, A. (1985). *Motoricke predispozicije za priridno bacanje kaoosnova efikasnosti obucavanja sutiranja kod mladihrukometasa*. Rukomet . Teorja praktika fiz. koultouri, Beograd, pp 4-6.

Dawes, R. M. (1994). *House of cards: Psychology and psychotherapy built on myth*. New York: Free Press.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Press.

Deci, E. L., & Ryan, R. M. (1995). *Human autonomy: The basis for true self-esteem*. In M. Kernis (Ed.), Efficacy, agency, and self-esteem (pp. 31–49). New York: Plenum Press.

Diamant, L., Byrd, J.H., & Himelein, M.J. (1991). *Personality traits and athletic performance*. Mind-body maturity: Psychological approaches to sports, exercise, and fitness (pp. 227-236). New York: Hemisphere Publishing Corporation.

Diane, L. Cell. (1972). *Psychological Dynamics of Sports*, Illinois: Haman Kinetics Publications, Inc., P.13.

Donald, K. Mathews. (1978*).* *Measurement in Physical Education*, (5th Ed) Philadelphia: W.B. Saunders company, P.5

Durand Bush, N. & Salmela, J.H. (2012). *The development of talent in sport*. In A Handbook of Research on Sports Psychology (2nd edn.). New York: Macmillan.

Dweck, C. S., & Elliott, E. S. (1983). *Achievement motivation. Handbook of child psychology*, New York: Wiley. 3rd ed., Vol. 4, pp. 643–691.

Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). *Motivation to succeed*. In W. Handbook of child psychology (5th ed., Vol. III, pp. 1017–1095). New York: Wiley.

Eckert Helan, M. (1974). *Practical Measurement In Physical Performance*, Phiadelphia: Lea and Febiger, P.36.

Eiben O.G. (1982). *The role of human biology in modern athletic competition.* On the physique of female athletes, based on anthropological and proportional analysis. International Olympic Academy. Twenty second session, Lausanne,Switzerland

Ekman, P., & Friesen, W. (1976). *Pictures of facial affect*. Consulting Psychologists Press: Palo Alto, CA

Eva Lurie Weinerb. (1984). *Anatomy & Physiology*, London: Addison Wesley Publishing Company, P.394

Fulkozi, K. (1994). *Rukomet- selekcija talenata*. Sportski savez. Beograd.

Garfield and Bennett (1984). *Psychology in Sports.* pp 99-177.

Gill, D.L., & Williams, L. (2008). *Psychological dynamics of sport and exercise* (3rd ed.). Champaign, IL: Human Kinetics.

Glennon, W. (1999). *200 ways to raise a girl's self-esteem*: Conari Press.

Gould, D. (1987). *Understanding attrition in children's sport*. Advances in pediatric sport sciences: Behavioral issues. Vol. 2. (pp. 61-85). Champaign, IL: Human Kinetics.

Gould, D., & Eklund, R. C. (1996). *Emotional stress and anxiety in the child and adolescent athlete*. In O. Bar-Or (Ed.), The encyclopedia of sports medicine: Volume VI. The child and adolescent athlete (pp. 383-398). Oxford: Blackwell Science.

Guyton Arthur, C.(2001). *Physiology of the Human Body*, Philadelphia: Saunders college publishing, PP.162-163.

Hackfort, D., & Birkner, H. (2005). *An action-oriented perspective on exercise psychology*. Handbook of research in applied sport and exercise psychology: International perspectives. Morgantown, WV: Fitness Information Technology, pp. 351-373.

Hanin, Y. L. (2000). *Individual zones of optimal functioning (IZOF) model: Emotion-performance relationships in sport*. Emotions in sport . Champaign, IL: Human Kinetics, pp. 65-89

Hardy, L., Jones, J. G., & Gould, D. (1996). *Understanding Psychological Preparation for Sport and Practice of Elite Performers*. Chichester, UK: John Wiley & Sons.

Hardy., & Nelson. (1992). *Assessment of Self Confidence: Sports Psychology*, Pune: Vidyarthi Griha Prakashan Publishers, P.157

Hardyal Singh. (1991). *Science of Sports Training*, New Delhi: D.V.S Publication, P.112.

Harrison, H. Clarke. (1976). *Application of Measurement to Health and Physical Education*, Englewood cliffs, N.J:. Prentice Hall Inc., P.169

Harter, S. (1990). *Identity and self development*. At the threshold: The developing adolescent . Cambridge, MA: Harvard University Press. pp. 352-387

Hay, J. G., C. L. Vaughan., & G. G. Woodworth, (1980). *Technique and performance: Identifying the limiting factors*. In: A. Morecki et al. (ed.), University Park Press, Baltimore, Biomechanics VII-B, pp. 511-520.

Heckhausen H. (1965). *The anatomy of achievement motivation*, New York.

Holahan, C.J. & Moos, R.H. (1994). *Life stressors and mental health: advances in conceptualizing stress resistance*. Stress and mental health: Contemporary issues and prospects for the future . New York: Plenum, 213-238.

Horney, K. (1937). *The neurotic personality of our time*. New York: Norton.

Hull, C. L. (1984). *Principles of behavior: An introduction to behavior theory*. New York: Appleton--Century--Crofts.

Johnson, B.L., & Nelson, J.K. (1988). *Practical Measurement and Evaluation in Physical Education*, New Delhi: Surjeet Publications, P. 28.

Judge, T. A., & Bono, J. E. (2012). *A rose by any other name… Are neuroticism, self-esteem, locus of control, and generalized self-efficacy indicators of a common construct*? Personality psychology in the work place. Washington, DC American Psychology Association.

Kamlesh,M.L. (1988), *Psychology in Physical Education and Sports*, New Delhi: Metropolitan, P.vii.

Kernis, M. H., & Goldman, B. N. (1999). *Self-esteem. Encyclopedia of human emotions*. New York: Macmillan Library Reference, pp. 593–600.

Kernis, M. H., & Paradise, A. W. (2002). *Distinguishing between fragile and secure forms of high self-esteem*. Handbook of self-determination research. Rochester, NY: University of Rochester Press.

Landers, D.M., & Petruzzello, S.J. (1994). *Physical activity, fitness and anxiety*. Champaign: Human Kinetics. 868-882.

Last, C. G., & Hersen, M. (1988). *Handbook of anxiety disorders*. New York: Pergamon Press.

Laurence, E. Morehouse., & Augustus. T. Miller. (1967). *Physiology of Exercise*, Saint Louis: The C.V.Mosby Company, P. 139.

Leary, M. R., & Baumeister, R. F. (2000). *The nature and function of self-esteem*: Sociometer theory. Advances in experimental social psychology . New York: Academic Press. Vol. 32, pp. 1–62

Leary, M. R., & Downs, D. L. (1995). *Interpersonal functions of the self-esteem motive*: The self-esteem system as sociometer. In M. H. Kernis (Ed.), Efficacy, agency, and self-esteem (pp. 123-144). New York: Plenum.

Maehr, M. L., & Braskamp, L. A. (1986). *The motivation factor*: A theory of persona l investment. Lexington, MA: D. C. Heath

Maehr, M. L., & Nicholls, J. G. (1980). *Culture and achievement motivation*: Studies in cross-culturalpsychology, pp, 221-267. San Diego, CA: Academic Press.

Malina, R.M., & Cumming, S.P. (2003). *Current status and issues in youth sports.* Youth sports: Perspectives for a new century . Monterey: Coaches Choice, pp. 7-25

Marques, A. (2004). *Youth Sporting Competition as a model on Development and Education*. Desporto para crianças e jovens: razões e finalidades . Porto Alegre: Editora Ufrgs, pp. 75-96

Martens, R. (1987). *Coaches guide to sport psychology*. Champaign, IL: Human Kinetics Publishers, Inc.

Martens, R. (1993). *Psychological perspectives*. Intensive participation in children's sports . Champaign, IL: Human Kinetics, pp. 9-18

Martin, G., & Pear, J. (2003). *Behavior modification: What it is and how to do it*. Upper Saddle River, NJ: Prentice Hall.

Maslow, A. H. (1968). *Motivation and personality*. New York: Harper & Row.

Mathews, D.K., & Fox E.L. (1985). *The Physiological Basis of Physical Education and Athletics*, Philadelphia: W.B.Saunders Co., P. 28.

Mcardle, W.D., Katch, F.I., Katch, V.L. (2001). *Exercise physiology*: Energy, Nutrition and Human Performance. Lippincott Williams and Wilkins.

McAuley, E., & Mihalko, S. L. (1998). *Measuring exercise-related self-efficacy.* Advances in sport and exercise psychology measurement. Morgantown, WV: Fitness Information Technology, pp. 371- 390.

McClelland David, C., Atkinson John, W., Clark Russell, A,. & Lowell Edgar, L. (1953). *The achievement motive*. Century psychology series. East Norwalk, CT, US: Appleton-Century-Crofts, xxii, 384 pp.

McClelland, D. C. (1961). *The achieving society*. Princeton, NJ: Van Nostrand.

McElherner, L. N., & Lisovskis, M. (1998). *Jump starters*: Quick Classroom Activities That Develop Self-Esteem, Creativity, and Cooperation: Free Spirit Publishing.

Mecca, A. M., Smelser, N. J., & Vasconcellos, J. (1989). *The social importance of self-esteem*. Berkeley, CA: University of California Press.

Mecca, Andrew, M. et al., (1989). *The Social Importance of Self-esteem* ,University of California Press.

Menninger, C.W. (1999). *Emotional Maturity*. Hickman Associates, New York.

Moos, R.H. & Shaefer, J.A. (1993). *Coping resources and processes: Current concepts and measures*. Handbook of stress: Theoretical and clinical aspects. New York: Free Press. 2, 234-257

Morgan, W.P. (1979). *Prediction of performance in athletics*. Coach, athlete, and the sport psychologist . Toronto: University of Toronto, pp. 173-186

Morris, T. (1995). *Psychological characteristics and sports behaviour*. Sport psychology: theory, applications and issues, pp. 3-27.

Passer, M. W., & Wilson, B. J. (2002). *Motivational, Emotional, and Cognitive Determinants of Children's Age-Readiness for Competition*. Children and Youth in Sport: A biopsychosocial perspective . Dubuque: Kendall/Hunt Publishing, pp. 83-103.

Peter Ryan. (1989). *The Relative Age Effect on Minor Sport Participation*. McGill University, pp.1989 - 220 .

Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education*: Theory, research, and applications. Columbus, OH: Merrill.

Raglin, R. S., & Hanin, Y. L. (2000). *Competitive anxiety*. Emotions in sport. Champaign, IL: Human Kinetics, pp. 93-111

Redenbach, S. (1991). *Self-Esteem, The Necessary Ingredient for Success*. USA: Esteem Seminar Programs and Publications.

Rogers, C. R. (1959). *A theory of therapy, personality, and interpersonal relationships, as developed in the client-centered framework.* study of a science. New York: McGraw-Hill. Vol. 3. A, pp. 184–256.

Rogers, C. R. (1961). *On becoming a person*. Boston: Houghton Mifflin.

Rosenberg, M. (1979). *Conceiving the self*. New York: Basic Books.

Rupesh Patel. (2010). *Performance of a two-foot vertical jump*: What is more important hip or knee dominance? University of Waterloo, Ontario, Canada.

Samulski, D. (2002). *Sport Psychology*. Handbook of Physical Education & Physioterapy. Barueri: Manole.

Scanlan, T.K., & Simons, J.P. (1992). *The construct of sport enjoyment. In: Motivation in sport and exercise*. Ed: Roberts, G.C. Champaign, IL: Human Kinetics. 199-216.

Seco R. (1993). *Seguimiento antropometrico Comite Tecnico*, RealFederacion Espanola de Balonmano.

Seligman, M. E. P. (1998). *The American way of blame*. APA Monitor, 29, 4.

Seligman, M. E. P., Reivich, K., Jaycox, L., & Gillham, J. (1995). *The optimistic child*. Boston: Houghton Mifflin.

Shaver Larry.G. (1982). *Essentials of Exercise Physiology* , New Delhi: Surjeet publication, P. 22.

Sheilds, D.L.L., & Bredemeier, B.J.L. (1995). *Character development and physical activity*. Champaign, IL: Human Kinetics.

Shephard, R. (1987). *Exercise Physiology*. B.C. Decker Inc., Philadelphia, PA, USA.

Singer, R. N., Hausenblas, H. A., & Janelle, C. M. (Eds.). (2001). *Handbook of sport psychology* (2nd ed.). New York: Wiley.

Slovik, J., Horvat, R., & Zafkova, V. (1989). *Hadzana. Sportovy trening*, Bratislava.

Smitson, W.S. (1974). *The meaning of emotional maturity*. MH, Winter 58, 9-11.

Smoll, F. L., & Smith, R. E. (2002). *Children and Youth in Sport*: A biopsychosocial perspective. Dubuque: Kendall/Hunt Publishing Company.

Solomon, S., Greenberg, J., & Pyszczynski, T. (1991). *Terror management theory of self-esteem*. Handbook of clinical and social psychology: Vol. 162. The health perspective . Elmsford, NY: Pergamon Press, pp.21–40.

Strukic, P.J, (1981), *Basic Physiology*, New York: Spring Ervellong Inc., P.23.

Sullivan, H. S. (1953). *The interpersonal theory of psychiatry*. New York: Norton.

Tesser, A. (1988). *Toward a self-evaluation maintenance model of social behavior*. Advances in experimental social psychology. San Diego, CA: Academic Press. Vol. 21, pp. 181–227.

Thomas, J.R., & Nelson, J. K. (1990). *Research Methods in Physical Activity*, Illinois: W.B.Saunders Co., P. 33..

Treasure, D. C. (2001). *Enhancing young people's motivation in youth sport*: An achievement goal approach, Motivation in sport and exercise . Champaign, IL: Human Kinetics, 2nd ed., pp. 79-100.

Tuma, A. H., & Maser, J. D. (Eds.). (1985). *Anxiety and the anxiety disorders*. Hillsdale, NJ: Erlbaum.

Uppal, A.K (2001), *Principles of sport training*, Baroda: Friends Publication, P.62.

Uppal, A.K. (1992) *Foundations of Physical Education*, Baroda: Friends Publications, P.2

Vallerand, R.J. (2001). *A hierarchical model of intrinsic and extrinsic motivation in sport and exercise*. In G.C. Roberts (Ed.), Advances in motivation in sport and exercise . Champaign, IL: Human Kinetics. pp. 263-319.

Vealey, R.S. (1992). *Personality and sport: A comprehensive overview*. In T. S . Horn (Ed.), Advances in sport psychology pp.25-59). Kingswood: Human Kinetics.

Warren, D. H. D. (1983). *The runtime environment for a prolog compiler using a copy algorithm*. Technical Report 83/052, Suny and Stone Brook, New York, 1983.

Weinberg, R., & Gould, D. (2001). *Fundamentals of Sport and Exercise Psychology* (Trad. Maria Cristina Monteiro). 2nd Ed. Poa: Artmed Editoral.

Weiss, M.R., & Stuntz, C.P. (2004). *A little friendly competition: Peer relationships and psychosocial development in youth sport and physical activity contexts*. Developmental sport and exercise psychology: A lifespan perspective . Morgantown: Fitness Information Technology. pp. 165-196.

Wigfield, A., & Eccles, J. S. (2002). *Children's motivation during the middle school years*. Improving academic achievement: Contributions of social psychology. San Diego, CA: Academic Press.

Wigfield, A., Eccles, J. S., Schiefele, U., Roeser, R., & Davis-Kean, P. (2006). *Development of achievement motivation. Handbook of child psychology*, Hoboken, NJ: Wiley. 6th Ed., Vol. 3.

Williams J (1986) *Applied sport psychology*, Palo Alto, CA: Mayfield.

Williams, J. M., & Krane, V. (2001). *Psychological characteristics of peak performance*. Applied sport psychology: Personal growth to peak performance . Mountain View, CA: Mayfield. 4th ed., pp. 137-147

Willmore J.H. and Costill D.L. (1999) *Psychology of sports and exercise*, 2nd edition.