INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN: 2278 – 0211 (Online)

Prediction Of Handball Players Playing Ability On The Basis Of Their Anthropometric Measurements And Physical Fitness Components

Dr. Kuldeep Singh
Assistant Professor in Physical Education, V.V. (Post-Graduate) College, Shamli (U.P.) India
Mange Ram
Assistant Professor in Physical Education, Government College Dujana, Jhajjar (Haryana) India

Abstract:
The purpose of the current study was to correlate anthropometric dimensions and physical fitness components with playing ability and also to develop the regression equation for the prediction of handball players playing ability. The research was conducted on Inter-University level 200 male handball players of age range 18-25 years. Twenty seven anthropometric measurements and six physical fitness components as independent variables and cumulative score of two skill tests as dependent variable were evaluated of each subject. SPSS (11.5) computer software was used to analyze the data and it revealed that the body weight and linear measurements, i.e., standing height, sitting height, total arm length, upper arm length, leg length, thigh length, lower leg length, hand length and hand breadth; body diameter measurements, i.e., elbow and shoulder diameters; body girth measurements, i.e., shoulder, chest and abdomen girths; skin-fold measurements, i.e., biceps, triceps and sub-scapular skin-folds; body composition variables i.e., lean body mass and fat weight and physical fitness components i.e., speed, agility, arm and leg strength have significant correlations with playing ability of handball players. The multiple correlation of highly correlated nine independent variables taken together with playing ability has been found highly significant and hence the developed equation can be used in the prediction of playing ability.

Key words*: Physical fitness, Anthropometric measurements and Playing ability*

1.Introduction

Over 15 million people play the handball game in approximately 140 countries around the world. It is a wonderful mixture of soccer, basketball and a few water polo tactics throw in. It is a fascinating sport fast, dynamic, fun and anyone can play and enjoy it. It requires minimum equipments and 14 people can exercise in it at once; it builds endurance, skills and keeps one fit and strong. Handball is such a highly popular game in the world of sports where sports person requires high level of skills proficiency, psychological conditions, physical standards and obviously appropriate physique and body composition especially high for optimum physical manifestations.

Handball game is fast, dynamic and the players need to be physical fit and they must work for the team. The sport has a relatively rapid learning curve because the basic movements are build on natural human movements such as jumping, running, throwing and the variations of these. These unique elements distinguish handball from all other physical exercises. Handball players need to be fit and skilled. The intensity of the game and the constant physical challenges will help the muscles work better including the central nervous system and the whole body.

Many researchers conducted number of related studies i.e. Stroup (1955) established that those teams scoring high in skill tests are found to be capable of winning high percentage of competitive matches. In team- game like Handball, true assessment of playing ability is done through evaluation of game performance. Rowland (1970) stated that "Handball requires that the performer is able to run, jump, throw and catch all natural and specific skills." Vasques et. al. (2007) reported that the specific hand anthropometric parameters, finger lengths and perimeters of the hand significantly correlated with the maximal handgrip strength. It's control is necessary for the accuracy of different shots, in handball and basketball. Gopinathan (2009) determined the relationship of anthropometric and physical fitness variables with handball performance. They revealed that the height, weight, arm length, leg length, palm span and sum of four skin-folds and physical fitness variables of speed, agility, explosive power, shoulder strength, strength endurance were having significant relationship with handball performance. These researchers, Diez (1978), Shoundell (1968), Rodriguez (2004), Neil and Mezey (1981), Singh, J, Kumar, R., & Singh, K. (2009) and Chauhan (1988 & 2003) etc. also have given the characteristics of various sports person for specific games and relationship of anthropometric measurements and physical fitness components with playing performance of specific discipline.

From the literary review it is evident that there is a clear paucity of research in the area of prediction of playing ability of different game. In Indian context this study helps the coaches to identify and selection of talented handball players.

2.Methodology

Two hundred male handball players who participated in the All India (North-East) Zone Inter-University tournament between the age group of 18 to 25 years, in the sessions 2007-08, 2009-10 & 2010-11 constituted the subjects of the study. The data of the subjects were collected by using the anthropometric rod; vernier calipers, steel tape and skin-fold calipers, according to the instructions given by Weiner and Lourie (1969). Body composition variables i.e., body density, fat percentage; fat weight and lean body mass were calculated by using Durnin and Rehaman's Equation (1967) and Siri's Equation (1961) respectively, whereas variables of physical fitness i.e., Arm Strength, Speed, Endurance, Flexibility, Agility and Leg Strength were measured by 6Lbs Medicine ball Put, 50 yards Dash Run, 600Yards run and walk, Bent and Reach, Shuttle Run and Standing broad jump test respectively. The dependent variable i.e., playing ability was used. The score of I.L.Zinn Team Handball Skill Battery (1981) Ist test item i.e., Nine Meter Front Throw and score of IIIed test Item i.e., Over Head Pass were merged to get a cumulative score of Playing ability. It evaluates the players shooting accuracy in jumping as well as in standing position and also measure the passing and throwing ability/accuracy. The maximum score of both test items is (40+30) 70 (as shown in figure no.1 & 2). The data were analyzed by applying product moment method for correlation and Warry Do Equation for prediction of Playing ability of handball players with the help of SPSS (11.5) computer software.

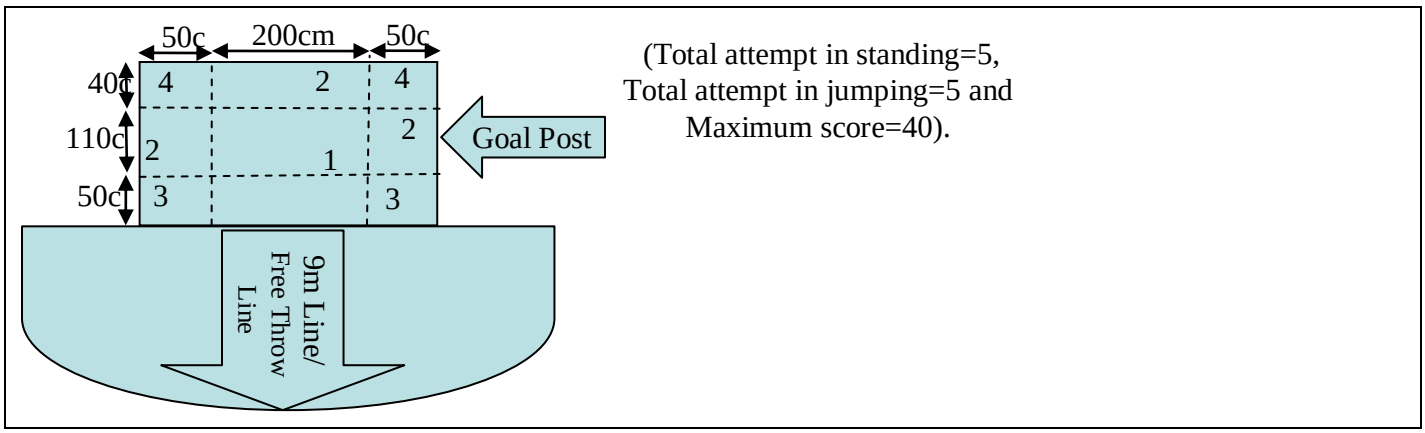

Figure 1: Target Markings For 9M. Front Throw Skill Test Of Zinn Team Handball Skill Battery

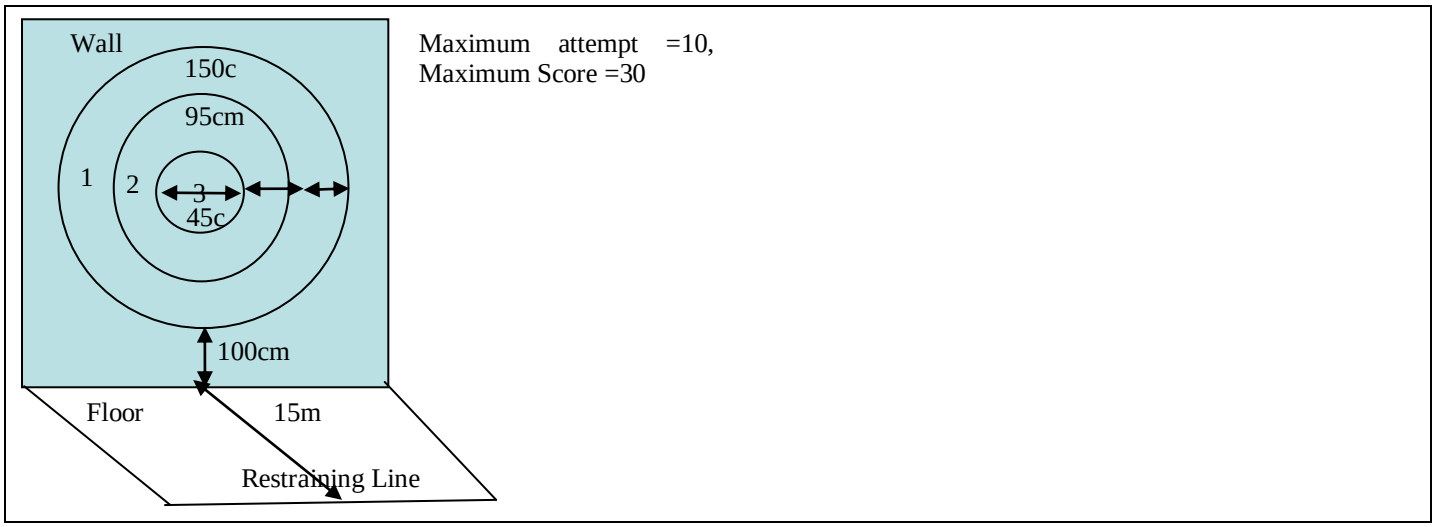

Figure 2: Target Marking Of Over Head Pass Skill Test By Zinn Team Handball Skill Battery

3.Results & Discussion

Sr.No.	Variables correlated with Playing Ability	Mean	Std. Deviation	Co-efficient of correlation 'r'
	Playing Ability(Max.=70)	44.66	9.33	
1	Body Weight	67.51	6.31	.587**
2	Height	176.13	5.72	.705**
3	Sitting Height	87.86	4.35	.659**
4	Total Arm Length	78.21	3.43	.689**
5	Upper Arm Length	32.93	1.91	.300**
6	Fore Arm Length	27.21	2.77	.087
7	Leg Length	93.37	5.09	.704**
8	Thigh Length	45.65	3.78	.499**
9	Lower Leg Length	49.02	3.74	.438**
10	Hand Length	19.12	0.76	.406**
11	Hand Breadth	8.63	0.44	.318**

Table 1: Correlation Of Weight, Linear And Body Diameter Measurements To Playing Ability

Sr.No.	Variables correlated with Playing Ability	Mean	Std. Deviation	Co-efficient of correlation 'r'
	Playing Ability(Max.=70)	44.66	9.33	
12	Wrist Diameter	5.73	0.39	.132
13	Elbow Diameter	6.66	0.25	.632**
14	Shoulder Diameter	41.54	1.86	.412**
15	Knee Diameter	9.18	0.52	.117
16	Shoulder Girth	110.76	5.01	.455**
17	Chest Girth	86.69	5.10	.624**
18	Abdomen Girth	76.52	5.18	.172*
19	Thigh Girth	51.43	3.59	.017

Table 2: Correlation Of Body Diameter And Girth Measurements To Playing Ability

***Significant At 0.01 Level Of Confidence (.181)* *N= 200*

** Significant At 0.05 Level Of Confidence (.138)* *Df= 198*

Table-1 clearly shows that the correlations of body weight, height, sitting height, total arm length, upper arm length, leg length, thigh length, lower leg length, hand length and hand breadth were positive and significant at .01 level of significance with playing ability. It is evident from the table-2 that the correlations of elbow and shoulder diameters and chest and shoulder girths measurements were positive and significant at .01 level of confidence, whereas abdomen girth was positive and significant at .05 level with playing ability. It suggests that optimum weight of player helps both offensive and defensive movements and maintain body balance. Longer strides are possible with longer leg length and it will be helpful to run fast, arms length also helpful to the players in catching, passing, shooting and to do defensive and offensive actions besides the opponent's hindrance. Length and breadth of hands is useful to hold the ball firmly without slipping and jerking while executing passing and shooting. These variables also form the good leverage system and body diameters provide the good range of movements of force in the body. The current evidence is very well supported by the studies of Gopinathan (2009) on Handball players and Singh, K.(2010) on basketball players.

Sr.No.	Variables correlated with Playing Ability	Mean	Std. Deviation	Co-efficient of Correlation 'r'
	Playing Ability(Max.=70)	44.66	9.33	
20	Biceps skin-fold	2.99	0.94	.141*
21	Triceps skin-fold	6.29	2.72	.243**
22	Sub-scapular skin-fold	8.83	2.52	.334**
23	Superailliac skin-fold	6.91	2.88	.046
24	Body Density	1.06	0.01	.097
25	Fat Percentage	16.51	4.52	-.118
26	Fat Weight	11.10	3.12	.152*
27	Lean Body Mass	56.40	6.41	.633**

Table 3: Correlation Of Skin-Fold And Body Composition Variables To Playing Ability
***Significant At 0.01 Level Of Confidence (.181) N= 200*
** Significant At 0.05 Level Of Confidence= (.138) Df= 198*

It is observed from the table- 3 that the correlations of triceps and subscapular skin-folds and lean body mass were positive and significant at .01 level of confidence, whereas biceps skin-fold and fat weight were positive and significant at .05 level of significance with playing ability of handball players. It implies that amount of these variables are optimum and suit to develop the players playing ability. This occurs due to regular participation in the physical activity programme that consumes excess calories of energy. Hence no accumulation of excess fat and makes the body fit for efficient functioning during the execution of skill. Similar findings were reported by Rodriguez-Vicente, G. et al. (2004) on handball players, and Shondell (1972) on Volleyball players.

Sr.No.	Variables correlated with Playing Ability	Mean	Std. Deviation	Co-efficient of Correlation 'r'
	Playing Ability(Max.=70)	44.66	9.33	
28	Speed (Sec.)	6.99	0.468	-.302**
29	Arm Strength (c.m.)	870.80	28.92	.692**
30	Endurance (Sec.)	220.98	19.90	.176*
31	Flexibility (c.m.)	15.55	3.65	-.177*
32	Agility (Sec.)	10.55	0.62	-.145*
33	Leg Strength(c.m.)	202.91	24.17	.702**

Table 4: Correlation Of Physical Fitness Components To Playing Ability

It is evident from results shown in Table- 4 that the correlation of arm and leg strength were significant at .01 level and endurance was positive and significant at .05 level of significance, whereas speed and agility were inverse and significant at .01and .05 level of confidence with playing ability of handball players. Since time is inversely related to performance hence decrease in time indicates higher the performance and vice-versa. Due to this, speed, agility and endurance correlations had inverse correlations with playing ability. Flexibility has the negative and significant correlation at .05 level with playing ability. The results reveal that for successful performance, agility and speed facilitate rapid changes in direction, sudden stops, bends, twist, falls and dives, whereas explosive arms and legs strength help the players to perform a successful throw on goal and throw the ball from longer distance with high speed at the time of initiating the fast break. Similar findings were reported by Chauhan, M.S. (1988) on college women Shot putters, Tanner (1964) on Olympic Athletes and Diez (1978) on Inter-collegiate women athletes of Illinois university.

Dependent Variable (Yc)	Selected Independent Variables (X's)	Regression Co-efficient (Bx)	Multiple Correlation (R)	Determinant of Multiple Correlation (R^2)	Percentage of each Variables
Playing Ability Of Handball players	1.Arm Strength	.076	.889	.790	16.30
	2.Leg Strength	.076			13.82
	3.Sitting Height	.442			13.58
	4.Total Arm Length	.617			15.63
	5.Leg Length	.367			14.09
	6.Shoulder Diameter	-.272			-2.23
	7.Chest Girth	-.066			-2.25
	8.Sub-scapular Skin-Fold	.665			5.99
	9.Lean Body Mass	.096			4.17

Table 5: Multiple Correlation And Regression Equation Of Selected Anthropometric Variables And Physical Fitness Components To Playing Ability.
***Significant At 0.01 Level Of Significance (.307)N= 200*
** Significant At 0.05 Level Of Significance (.271) Df = 200-10=190*

Beta Constant (Bo)= .780 S.E. of Estimate = 4.376
Pcx = (Beta Weight) x (r) x (100), Where: Beta Weight = Bx . SD of X / SD of Yc and r = Coefficient of correlation between X and Yc.

It is obvious from the table- 5 that multiple correlation of arm strength, leg strength, sitting height, total arm length, leg length, shoulder diameter, chest girth, sub-scapular skin-fold and lean body mass taken together with playing ability of handball players were significant at .01 level of confidence as the calculated values of R (.889) was more than the tabulated values of R (.307). It shows that the combined effect of these nine variables taken together contribute to improve the playing ability of handball players.
Table- 5 further illustrates that the multiple regression analysis performed to develop equation for the prediction of playing ability of players on the basis of X_{28}, X_{29}, X_3, X_4, X_7, X_{14}, X_{17}, X_{22} and X_{27} independent variables. Resulted multiple regression equation in scores from is:

$Y_c = B_o + B_1.X_{28} + B_2.X_{29} + B_3.X_3 + B_4.X_4 + B_5.X_7 + B_6.X_{14} + B_7.X_{17} + B_8.X_{22} + B_9.X_{27}$.

$Y_c = .780 + .076.X_{28} + .076.X_{29} + .442.X_3 + .617.X_4 + .367.X_7 + (-.272).X_{14} + (-.066).X_{17} + .665.X_{22} + .096.X_{27}$

Where Y_c = Predicted Playing ability of handball players.

X_{28} = Arm Strength X_{29} = Leg strength
X_3 = Sitting Height X_4 = Total Arm Length
X_7 = Leg Length X_{14} = Shoulder Diameter
X_{17}= Chest Girth X_{22}= Sub-scapular skin-fold
X_{27}= Lean body mass
R^2 = can be broken up as.
$R^2 = 79.0 = 16.30+13.82+13.58+15.63+14.09-2.23-2.25+5.99+4.17$.

Moreover, the value of multiple coefficient of determinant (R^2= .790) suggests that 79 percent of variance of playing ability of handball players could be predicted on the basis of regression equation developed by these nine variables, i.e., arm strength, leg strength, sitting height, total arm length, leg length, shoulder diameter, chest girth, sub-scapular skin-fold and lean body mass. The remaining variance of playing ability scores 21 percent is due to other factors. Hence, the developed regression equation could be put in to the prediction of playing ability of handball players.
Standard error of estimate 4.376 indicates that percentage of obtained playing ability of handball players lies within $\pm$ 4.376 points of the predicted playing ability scores.
Contribution of arm strength, leg strength, sitting height, total arm length, leg length, elbow diameter, chest girth, sub-scapular skin fold and lean body mass individually towards multiple coefficients of determination (R^2) are 16.30, 13.82, 13.58, 15.63, 14.09, -2.23, -2.25, 5.99 and 4.17 percent, respectively.
The coefficient of multiple correlation is of sufficient size so the equation developed can be put in to the prediction for the evaluation of the playing ability.
On the basis of present study we explored that these nine variables are important ingredients in handball game and the physical activities are performed by the body as a whole, but specific activities require specific body structure and fitness to perform the required activities.

4.Conclusion

- The weight and linear measurements, i.e., body weight, standing height, sitting height, total arm length, upper arm length, leg length, thigh length, lower leg length, hand length and hand breadth; body diameter, i.e., elbow and shoulder diameters; body girth measurements, i.e., shoulder, chest and abdomen girth, skin-fold measurements, i.e., biceps, triceps and sub-scapular skin-folds; body composition variables i.e., lean body mass and fat weight and physical fitness components i.e., speed, agility, arm and leg strength have significant correlations with playing ability.
- Fore arm length, wrist and knee diameters, thigh girth, superailliac skin-fold and body density had insignificant relationship, whereas fat percentage, flexibility and endurance had negative relationship with playing ability of handball players.
- The multiple correlation (R=.889) of arm strength, leg strength, sitting height, total arm length, shoulder diameter, chest girth, sub-scapular skin-fold and lean body mass with playing ability of handball players was positive and significant at .01 level of confidence. Moreover, the value of multiple coefficient of determinant (R^2= .889) suggests that 79 percent of variance of handball players playing ability can be predicted on the basis of regression equation developed by help of these nine variables.

5.References

1. Chauhan, M.S. (1988, Feb.). Correlations of Anthropometric Variables with Success in Putting the Shot by College Women. Abstracts, National Seminar on Talent Search in Sports. NSNIS, Patiala.
2. Chauhan, M.S. (2003, Jan.). Prediction of Sprinting Ability of Haryana School Boys in Relation to their Anthropometric Measurements. Journal of sports & Sports Science, NSNIS, Patiala, 26(1).
3. Chauhan, M.S. (2004). Prediction of Performance of University Throwers in Relation to their Anthropometric Measurements. Journal of sports & Sports Science, NSNIS, Patiala, 27(3).
4. Diez, L.K., & Lawman, P.M. (1978). Relationship Among Selected Anthropometric Variables Relative Body Fat on Inter Collegiate Level Women. Illinois University, USA.

5. Durnin, J.V.G.A., & Rehaman, M.M. (1967). The Assessment of the Amount of Fat in the Human Body from Measurement of Skin fold Thickness. British Journal of Nutrition 21, p. 681.
6. Gopinathan, P., & Helina, Grace. (2009). Correlation of Selected Anthropometric and Physical Fitness Variables to Handball Performance. Journal of Sports and Sports Sciences, NSNIS, Patiala, 32(1).
7. Mohan, L., & Sharma, Y.P. (2009). Skill Efficiency Variables of Volleyball Players of Himachal Pradesh in Relation to their Performance. Journal of Sports and Sports Sciences, 32(2), pp. 32-37.
8. Neil, G.I., & Mezey, A. (1981). Modern Team Handball- Beginer to Expert. Physical Education Department, Quebec, McGill University, Montreal.
9. Rodriguez-Vicente, R., & Dorado, C. (2004). Enhanced Bone Mass and Physical Fitness in Young Female Handball Players. Bone, New York, 35 (5), pp.1208-15.
10. Rowland, B.J. (1970). Handball A Complete Guide. Faber and Faber, London. pp. 23-44.
11. Singh, J., Kumar, R., & Singh, K. (2009). Construction and Standardization of Specific Skill Test Battery for Male Handball Players. Journal of Sports and Sports Sciences, NSNIS, Patiala, 32(1).
12. Singh, K., & Chauhan, M.S. (2010, Jan.). Prediction of Explosive Arm Strength of Basketball Players in Relation to their Kinanthropometric Measurements. Journal of Physical Education and Yoga, NCPE, Noida, India, 1(1). pp. 4-13.
13. Siri, W.E. (1961). The Gross Composition of the body' Advances in Biological and Medical Physics. 4, p. 239.
14. Tanner, J.M. (1964). The Physique of Olympic Athletes" London George Allen and Unwin Ltd. p.76.
15. Shoundell, D.S. (1972, April). The Relationship of Selected Motor Performance and Anthropometric Measurements Traits to Successful Volleyball Performance. Dissertation Abstracts International,. 35, p.6496A.
16. Stroup, F. (1955). Game Results as Creation for Validating Basketball Skill Tests. Research Quartely. 8(3).
17. Vasques, G. D., Fatima, & Maria, D. (2007). Morphology of Young Handball Players. Rev. Bras. Cineantropom. Desempenho Hum. 9(2). pp.127-33.
18. Visnapuu, G. D., Fatima, & Maria, D. (2007). Morphology of Young Handball Players. Rev. Bras. Cineantropom. Desempenho Hum. 9(2), pp.127-33.
19. Weiner, J. S., & Lourie, J. A. (1969). Human Biology-A Guide of Field Methods. Blacwell Scientific Publication.
20. Zinn, I.L. (1981). Construction of a Battery of Team Handball Skills Test. (Unpublished Master Thesis). University of Iowa, Iowa City.USA.