

DIFFERENTIATION OF SELECTED ANTHROPOMETRIC AND PHYSIOLOGICAL VARIABLES IN HIGH AND LOW PERFORMANCE GROUPS OF BASKETBALL PLAYERS

DR ARCHANA CHAHAL

Department of Physical Education, Allahabad University, Allahabad, India

ABSTRACT

The study sought to differentiate the selected anthropometric and physiological measures in high and low performance groups in senior female Indian basketball players. The study measured anthropometric measures (height, weight, arm length, palm length, leg length, girths of the upper arm, wrist, thigh and calf and skin folds at biceps, triceps, sub scapular and suprailiac) and physiological variables (anaerobic power, peak flow rate, vital capacity and BF%) of 96 female players competing at the Senior National Basketball Championship. The high and low performance groups divided according to the team performance in the championship. The first four teams were called the high performance group (HPG) and the remaining four teams were placed in low performance group (LPG). To collect the data of selected variables were taken on each subject individually during rest hours with the help of standard scientific instrument and under scientific guidelines. Significant differences were found in HPG and LPG in relation to age (2.387), leg length (1.991*), thigh girth (2.641*), anaerobic power (3.463*), peak flow rate (2.193*), vital capacity (3.011*) and body fat% (2.240*). On the basis of the results, it was concluded that the significant anthropometric measures i.e. palm length, leg length, upper arm girth, thigh girth and physiological distinctiveness such as anaerobic power, peak flow rate, vital capacity and BF% highly contributed to performance in Basketball.*

Keywords: - High & Low performance groups, anaerobic power, peak flow rate, vital capacity, body fat%

INTRODUCTION:

Differentiation in performance is mostly liked by the performers, coaches and also spectators. Performance is the consequence of different attributes of the talent. In many organization and top level teams, science-based support systems are now fundamental to the preparation of elite athletes. However, due to the lack of scientific grounding for most talent identification programmes,

many scholars have suggested that research efforts should be transferred from talent identification and detection to talent development TDE and guidance (Vaeyens, et al., 2008).

Talent development is widely based on understanding the anthropometric and physiological characteristics. Being aware of these characteristics is important for comparing an athlete's results as high performers or low performers. It is generally thought that the technique of skilled athletes is identically same especially at higher level and anthropometric and physiological measures are played vital role here.

Angyan et al., (2003) stated more precisely and strongly recommended the associations of these attributes to playing elements of basketball. It is generally thought that the technique of skilled male and female athletes is identical; that elite females will perform a skill almost exactly the same as elite males. A common belief is that skilled athletes have uniform technique, and over time top athletes will develop similar technique, regardless of their sex (Alexander, 2003).

This endeavor will contribute to the little but increasing delves into the role of anthropometric and physiological measures between high and low performance groups of senior female basketball players. It is also an attempt to find out the selected measures at this stage of performance where mostly players have to reach their stage of maturity as well as sound techno tactical abilities.

METHODOLOGY:

Participants

A total number of ninety-six senior Indian female basketball players of eight teams who represented their state at the senior National Basketball Championship were selected as the subjects for the study

Variables and Materials

To collect the data were taken on each subject individually during rest hours with the help of standard scientific instruments and standard technique of Lohman, Roche, & Martorell (1991); and Bachle (1994) as mentioned in table 1.

Table 1 Selected Anthropometric, Physiological variables, their Tests and Units of Measurement

Variables	Test/Equipment Used	Unit
Age	Competition Records	Years
Height	Herpenden Anthropometer, Pfister Imp. Exp , Inc. Holtain Ltd	Centimeter
Weight	Standard Weighing Machine	Kilogram
Arm Length	Herpenden Anthropometer	Centimeter
Palm Length	Herpenden Anthropometer	Centimeter

Leg Length	Herpenden Anthropometer	Centimeter
Upper Arm Girth	Gulic Measuring Tape ,Count Tec, In. WI	Centimeter
Wrist Girth	Gulic Measuring Tape	Centimeter
Thigh Girth	Gulic Measuring Tape	Centimeter
Calf Girth	Gulic Measuring Tape	Centimeter
Anaerobic Power	Vertical Jump Test & Lewis Nomogram	Kg-m/s
Peak Flow Rate	Peak Flow Meter (Clement Clarke Int. Ltd Edinburgh)	Lit/min
Vital Capacity	Dry Spiro Meter (Spiro pet Windmill VN 53 KW DS)	Liter
Body Fat % (Bicep, Tricep,Subscapular, Suprailliac Skinfolds)	Harpenden skinfold caliper (British Ind. Ltd.) & Durnin & Womerselay equation table (1967)	Millimeter

Data Collection

The correlation co-efficient also indicated the reliability of the tests selected, as very high correlations were obtained, when the tests were repeated. Data on date of birth as mentioned in official records indicating that they were ranging in age from 16 to 30 years with mean age of 22.666. This study also investigated the difference between high and low performance groups, which were divided according to the team performance in the championship. The first four teams were called the high performance group (HPG) and the remaining four teams were placed in low performance group (LPG).

Statistical Analysis

Statistical analysis performed with SPSS software. Test of significance was used for comparison between high and low performance groups at the level of significance of 0.05 level.

ANALYSIS & DISCUSSION:

Mean scores of variables

Mean scores of total senior players, high and low performance groups of seniors are presented in table 2 followed by Fig. 1.

Table 2 Mean Scores of Selected Variables of Senior Basketball Players

Variables	Total Seniors	HPG	LPG
Age	22.260	23.062	21.458
Height	165.218	164.854	165.583
Weight	55.531	55.145	55.910
Arm Length	55.989	56.270	55.708
Palm Length	18.401	18.437	18.364
Leg Length	90.364	91.500	89.229
Upper Arm Girth	23.703	23.500	23.906
Wrist Girth	14.708	14.822	14.593
Thigh Girth	48.78	47.916	49.465
Calf Girth	32.500	32.497	32.520
Anaerobic Power	77.322	81.125	73.520
Peak Flow Rate	425.572	442.708	408.437
Vital Capacity	2.496	2.662	2.331
Body Fat %	19.031	19.510	18.552

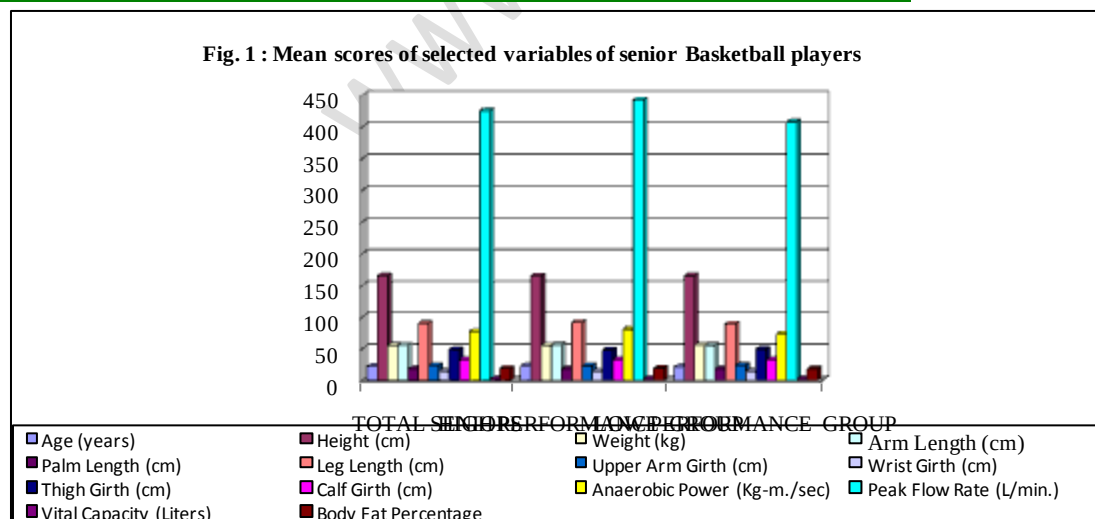


Fig. 1: Mean scores of total seniors, high and low performance groups of Basketball Players

In table 2 mean scores of total senior players, high and low performance groups of seniors are presented. The mean value of age was maximum in HPG (23.06) followed by total senior players (22.26) and LPG (21.45). In height mean values were very close in all groups but highest in LPG (165.58) followed by total senior players (165.21) and HPG (164.85). In variables namely weight, palm length, upper arm girth, wrist girth, calf girth mean values were approximately same in all groups. In arm length, leg length means values are slightly different that is highest in HPG (56.27, 91.50) followed by total senior players (55.98, 90.36) and least in LPG (55.70, 89.22) respectively. Mean value of thigh girth was maximum in LPG (49.65) followed by total senior players (48.78) and least in HPG (47.91). In other variables i.e. anaerobic power, peak flow rate, vital capacity and body fat percentage mean values were found higher in HPG (81.12, 442.70, 2.66, 19.51) followed by total senior players (77.32, 425.37, 2.49, 19.03) and least values were observed in LPG (73.52, 408.43, 2.33, 18.55).

Comparisons of Variables (T Ratio)

The comparison between means of HPG & LPG of senior players in relation to selected variables is presented in table 3.

Table 3 Significant Difference of Means between HPG & LPG in relation to Selected Variables

Variables	HPG		LPG		MD	T-Ratio
	Mean	S.D.	Mean	S.D.		
Age	23.062	2.876	21.458	3.66	1.604	2.387*
Height	164.854	7.328	165.583	8.91	0.728	0.437
Weight	55.145	4.849	55.910	7.01	0.771	0.626
Arm length	56.270	4.119	55.708	3.91	0.562	0.684
Palm length	18.437	1.074	18.364	1.42	0.072	0.283
Leg length	91.500	5.555	89.229	5.63	2.272	1.991*
Upper arm girth	23.500	3.225	23.906	1.73	0.406	0.767
Wrist girth	14.822	0.695	14.593	0.87	0.228	1.415
Thigh girth	47.916	2.894	49.465	3.49	1.729	2.641*
Calf girth	32.497	1.458	32.520	1.99	0.041	0.114
Anaerobic power	81.125	9.038	73.520	12.23	7.605	3.463*
Peak flow rate	442.708	57.639	408.437	91.61	34.271	2.193*
Vital capacity	2.662	0.484	2.331	0.58	0.330	3.011*
Body fat percentage	19.510	1.467	18.552	2.57	0.958	2.240*

*Significant at 0.05 level Tabulated T_{0.05} (94) = 1.98

Table 3 clearly shows that significant differences between high and low performance groups were present in relation to age (2.387), leg length (1.991), thigh girth (2.641), anaerobic power (3.463), peak flow rate (2.193), vital capacity (3.011) and body fat percentage (2.240).

Table 3 also indicates that there were no significant differences between high and low performance groups of senior players in relation to height (0.437), weight (0.626), arm length (0.684), palm length (0.283), upper arm girth (0.767), wrist girth (1.415) and calf girth (0.114).

DISCUSSION:

The analysis of data revealed that the senior high performance and low performance groups of basketball players showed significant differences in few anthropometric variables and all selected physiological variables.

Anthropometric Measures

Distinctive body dimension and proportions may constitute significant prerequisite for each and every sports. Cureton (1951) reported that structure and compositional differences could be related to the sports specialty. The HPG were older than LPG. They may have sound knowledge, more experience of playing ability and greater performance age. HPG were found significant differences in leg length and thigh girth than LPG. It may be attributed that longer extremities and powerful muscles in lower extremities are helpful in basketball for offensive as well as defensive actions to cover the court in minimum steps and lay up the different shots along with jumping actions in rebounding and so on. The HPG have greater leg power and thigh girth. Nonetheless the results seem reasonable in view of the fact that basketball involves explosive jumping actions. Sodhi and Sidhu (1984) reported that longer extremities in Basketball make players suitable to catch the ball jump, capture the ball in held ball, rebounding in offence and defense and make easier for them while throwing the ball into basket.

Physiological Variables

Basketball is a sport that consists of activities of short duration but high intensity during the course of the game. Great physiological demands necessarily influence the anthropological characteristics (Duncan et al., 2008). Moreover it is also observed that the regular training participation in same activity, HPG contribute towards the better anaerobic power, peak flow rate and vital capacity.

In anaerobic power significant differences were found. Januszewski (2009) proved that the high anaerobic system is required in all defensive and offensive movement in basketball players. Fox and Mathew (1985) observed that basketball play has been classified with 85% of its energy of expenditure from the phosphate stores (ATP and CP). Basketball is being a game that requires huge amount of energy consumption (It is being second fastest game next only to ice hockey) because it requires short sprints, jumping, rebounding actions with explosive movement. In this study anaerobic power of senior players of had a mean value of 77.3 kg m/sec, which is better than Brazilian national female basketball players have 66.8 ± 8.3 kg m/sec (Soares et al., 1986).

In peak flow rate significant differences were found in both groups. When basketball players of this study were compared with their international counterparts (Vaccaro et al., 1979) i.e. American National basketball players have lesser peak flow rate (367 L/min) than senior (444.7 L/min) of this study. Ghosh et al. (1984) reported that mean forced expiratory volume (FEV) is higher in National University Basketball players than the other sports persons.

In vital capacity significant differences were found. It may be due the reason that pulmonary volume and capacities are generally dependent on age, body surface area and state of training. As Ghosh et al., (1984) reported that mean vital capacity is greater in basketball players than other sports persons of volleyball and soccer. When the basketball players of present study were compared with their other counterparts, they showed better scores, indicating a trend towards an increase in the intensity of training and conditioning program for women basketball players. Singh (1994) reported that lung capacities could be predictor factor in basketball.

In BF % significant differences were found between high and low performance groups of senior players. It clearly justified that high performance group of senior players have well-developed and proportional fat percentage. And low performance group of players might not have regular, scientific training and nutritional diet.

Sodhi (1980) reported that it is evident that as the fat reduced the muscle skeletal tissue in the limbs increased but without change in the body weight. Nonetheless the results seem reasonable in view of the fact that basketball involves explosive jumping actions where any excess of body weight carried in the form of fat would lead to a lowered jumping ability (Mokha & Sidhu, 1987). As compared in Indian context the players of present study have less value of fat percentage than university level basketball player (23.48%) and (Grewal, 1983) state basketball players (22.46%) so it is evident that trend is developing towards the more scientific training.

CONCLUSION:

The coaches and physical education teachers should pick up the subjects for training in basketball at an appropriate age, because particular age period and duration of performance are an important factor in competitive sports. The result of study has clearly indicated this factor. The HPG were older than LPG. They have good experience of playing ability and performance age. They may be in their peak performance age. As the performance age for every game is different so the starting age of training should also be different.

Basketball is basically an anaerobic type of activity with some context (long duration with pause) to aerobic. More anaerobic power with aerobic content means large pulmonary and lung capacity, thus justifying the findings of the present study. Anaerobic power, peak flow rate and vital capacity are essential in basketball players, as the game requires short sprints, jumps, turns, rebounding defensive action, lead with the ball etc with repeated action.

Longer extremities in Basketball make players suitable to catch the ball jump, capture the ball in held ball, rebounding in offence and defense and make easier for them while throwing the ball into basket.

This also helps in guarding the ball and impeding the action of their opponent. It is a fact that the genetic variables cannot be easily changed in training. However the girth measures of different regions of the body, body composition variable and physiological variables can be changed and improved with appropriate training and nutritional diet. So, the coaches and sports teachers should prepare the training plan for the player accordingly keeping in mind her amount of fat percentage, circumferences of various body parts, anaerobic power, peak flow rate and vital capacity to achieve maximum performance.

Acknowledgments

I greatly appreciate the cooperation and enthuse of the participants of our study and their coaches and associations. I am especially thankful to Prof (Mrs.) Sushma Ghildyal and Dr Vijay Chahal to their valuable suggestions.

References

- Alexander, M.J.L. (2003). Comparison of biomechanical aspects of performance in elite male and female track athletes ISBS - Conference Proceedings Archive, 15 *International Symposium on Biomechanics in Sports* (1997) retrieved on 4 oct 2010 [http // www.ub.uni-konstanz.de/cpa/index](http://www.ub.uni-konstanz.de/cpa/index)
- Angyan, L., Teczely, T., Zalay, Z., & Karsai, I. (2003). Relationship of anthropometrical, physiological and motor attributes to sport-specific skills. *Acta Physiologica Hungarica* 90 (3), 225-231.
- Baechle, T.R. (1994). *Essentials of strength training and conditioning*. Champaign: Human kinetics.
- Cureton, M. (1951). *Physical fitness of Champion athletes*. Urbana: The University of Illinois Press.
- Fox, E.L., & Mathew, D.K. (1985). *The Physiological basis of Physical Education and Athletics*. New York: Sounders College Publishing Comp.
- Ghosh, A.K., Khanna, G.L., & Ahuja, A. (1984). Pulmonary capacities of sportsmen involved in ball games. *Society of National Institute of Physical Education & Sports Journal* 7 (1), 96-101.
- Grewal, R. (1983). *Physique and body composition of Indian sports women with special reference to their participation*. Unpublished Ph.D. Thesis, Patiala: Panjabi University.
- Januszewski, M. (2010). mJanuszewski.files.wordpress.com/2010/the-physiology-of-basketball.
- Lohman T.G., Roche, A.F. & Martorell, R. (1991). *Anthropometrical Standardization. Reference Manual*. Champaign: Human Kinetics.
- Mokha, R., & Sidhu, L.S. (1987). Body fat in various sportive groups. *Journal of Sports Medicine* 376-378.
- Singh, B. (1994). *Physiological variables as predictors of performance in Basketball*. Unpublished Thesis, Patiala: Punjabi University.
- Soares, J., Mendes, O.C., Neto, C.B. & Matsudo, V.K.R. (1986). Physical fitness characteristics of Brazilian national basketball team as related to game functions. In J.A.P. Day (Ed.), *Perspectives in Kinanthropometry*. Human Kinetics, Champaign, 127-133.
- Sodhi, H.S. (1991). *Sports Anthropometry- A Kinanthropometric approach*. Mohali: Anova Publication.
- Sodhi, H.S., & Sidhu, L.S. (1984). *Physique and selection of Sportsmen*. Patiala: Punjab Publishing House.
- Vaeyens R., Lenoir, M., William, A.M., Philippaerts, R.M. (2008). Talent Identification and Development Programmes in Sport Current Models and Future Directions. *Sports Med* 38 (9), 703-714.
- Voccaro, P., Clarke, D.H., Wrenn, J.P. (1997). Physiological Profiles of Elite Women basketball players. *Journal of Sports Medicine* 19, 45-54.