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Relationship of Anthropometric Measurements and Physical Fitness Components in Football Players

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Abstract – Football is probably the most popular game worldwide but there is still limited scientific information available concerning the physique and performance qualities of elite Indian footballers. Team games are sports where size, shape, body composition and fitness all play an important part in providing distinct advantages for specific playing positions. Hence an attempt has been made to study the various anthropometric parameters, of the different Indian national club footballers and also to compare the above parameters with their international counterparts. The present study was carried out on male Indian footballers of six different national clubs of India. The players were also sub-divided according to their specific field positions. Physical and physiological profiles including height, weight, percentage body fat (%BF), flexibility, agility, explosive power, and VO_2 max were measured by standard procedures. It was noted that the mean values of age, height, weight and %BF were significantly different among footballers of different national clubs. Among the motor ability and physiological qualities only flexibility, agility and VO_2 max were significantly different among the footballers of different national clubs It was also observed that the mean values of height, weight, vertical jump and VO_2 max of Indian national club players were found to be inferior to those of European, American and Australian footballers. So, it can be concluded that the differences among the footballers of present study with their international counterparts and specific playing position is probably the cause of hereditary factors and differences in activity in the game.

Keywords: Anthropometric Measurements, Physical, Fitness, Components, Football Players, etc.

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INTRODUCTION

Football is probably the most popular game worldwide but there is still limited scientific information available concerning the physique and performance qualities of elite Indian footballers. Not many sports physiologist have been attracted to examine the footballer in details because of the lack of adequate experimental models to study the games in the laboratory (Reilly et al, 1990). The game comprises activities like sprint and jumps in attack and defense. It also requires aerobic capacity as the game lasts one and half hour, sometimes even longer than the official time. These short and long lasting activities are performed over the entire game, so, both aerobic and anaerobic capacities are very important to exhibit better performance (Akpınar et al., 2012). Football is a team game. Team games are sports where body size, shape, body composition and level of fitness, all play an important part in providing distinct advantages for specific playing positions particularly at the highest levels of performance where there is a high degree of player specialization. Specific positional roles within each code may demand unique physiological attributes (Bjelica et al., 2012). These are reflected in the physical and physiological fitness of the Football Players (Carvajal et al., 2012). The database of physique and performance qualities of the players of the renowned clubs throughout the country is very important to make a National Team. It is a fact that in India there is still limited information of club footballers regarding physique, physiological profiles and performance except a study on Indian Footballers (Gaurav et al., 2010) in this regard. Hence an attempt has been made to study the physique and physiological qualities of the Indian national club footballers. The aims of the present study are i) to evaluate the various anthropometric and physiological profiles of Indian national club footballers and also to evaluate the above parameters according to their playing positions and, ii) to compare these parameters with Indian national players and also their international counterparts.

REVIEW OF LITERATURE:

For all athletes involved in high professional competitive sports the body is required to perform at optimum capacity in terms of biomechanics and physiology (Zaccagni, 2011). Hence, it is more than logical to expect from top-level athletes to have a physique, optimal strength and endurance suited to the functional requirements of the sport in question. However, selection of gifted athletes into representative teams is often based on the subjective opinion of so-called expert selection coaches (Matthys et al., 2011). Nevertheless, it is widely known that there is a growing interest in improving the human performance of athletes as relates to the characteristics associated with consciousness, awareness and cognitive effort as well as identifying talents, strengths and weaknesses, assigning player positions and helping in the design of optimal training programmes (cited in Hadzic et al., 2012) all over the world, including Western Balkan countries. However, in many places much more time is spent on increasing the physical fitness of athletes without taking into consideration the assessment of their body composition and their nutritional status (Triki et al., 2012). Contemporary sport science is designed to improve the performance of elite players and to discover talents as precisely as possible. Although many studies have shown that specific anthropometric characteristics are significantly associated with success in sports (Malina et al., 2004), this process is very demanding, as various athletic events require differing body types to achieve maximum performance. Therefore, understanding the body composition of top-level athletes, and then assigning corresponding competitive weights for the athletes, has been done for decades and is considered an essential part of the total management process. On the other hand, although children and adolescent sportsmen grow in a manner similar to non-sportsmen (Rexhepi & Brestovci, 2010a), it is widely addressed in the scientific literature that adequate profiles are primarily important in various sports, mostly due to the reason that absolute size contributes a significant percentage of total variance associated with athletic success (Carvajal et al., 2012). Therefore, scientists all over the world are looking for a standard formula that can improve the performance of elite players and discover talents as efficiently as possible (Popovic et al., 2013a).

The anthropometrical characteristics and body compositions of athletes has been the subject of many investigations as many researchers have hypothesized that practicing athletes might be expected to exhibit structural and functional characteristics that are specifically favorable for their specific sport (Singh et al., 2010). Since each sport has its own specific demands, every athlete should have specific anthropometrical characteristics and body composition figures for his or her own sports discipline. Some sports, such as wrestling, require much more knowledge regarding this topic than others, because of its weight limits as well as favoring the selection of athletes with a limited vertical skeletal development. On the other hand, some sports, such as arm-wrestling; require the selection of athletes with the longer bones of the forearm. However, this fact does not decrease the need to investigate the anthropometrical characteristics and body composition numbers of Football Players, as adequate body composition and body mass figures, among other factors, contribute to optimal exercise routines and performance. According to these two authors, body mass can influence an athlete's speed, endurance, and power, whereas body composition can affect strength and agility. In other words, successful participation in Football games, next to the high level of technical and tactical skills, also requires from each athlete suitable anthropometrical characteristics and body composition. Most of the descriptive data concerning characteristics of Football Players come from America and Western Europe, although there is a lack of data from Eastern Europe, especially Western Balkan. Hence, this study aims to check if this is true for Western Balkan countries to follow many previous studies that have evaluated ideal anthropometric profiles of successful Football Players as well as volleyball player that provide insight into the requirements for competing at the zenith of their particular sports.

Indeed, Football is a team sport that is played in an outdoor field and requires a high standard of preparation through the development of physical performance skills, as well as tactical and technical expertise, in order to complete 90 minutes of competitive play. According to Triki et al., Football training is mainly based on movement implementing the endurance qualities consisting of moderate activity alternating with periods of intermittent high intensity, leading to a significant production of metabolic heat, mostly due to the fact that the average work intensity during a Football match is usually about 75–90% of maximum heart rate, respectively 70–85% of VO2 max. On the other hand, volleyball is generally played in an indoor field that is much smaller than that of a Football field, in which two teams of six players are separated by a net. It requires a high standard of preparation in order to complete for three sets of competitive play and to achieve success. In this game, movement patterns significantly differ from Football, as it requires their attack and defense to be much more effective as well as the dominance over the net becomes the most decisive factor for victory. The top-level volleyball players do not possess VO2 max values on the high level as typical endurance trained elite players in other sports, but they possess an optimum level of aerobic capacity that is required for playing this game since it may sometimes continue for longer time. This game also includes large number of spiking, jumping, power hitting, blocking, and setting that is mainly based on a high level of strength and power.

MATERIALS AND METHODS:

The present study was carried out on one hundred fifty (150) male Indian national league club footballers of mean age 23.3 3.50 years. All the footballers were chosen from the six different national league clubs of India including three from Kolkata (East Bengal, Mohan Bagan & Mohammedan Sporting) and three from Goanese clubs (Salgaokar, Vasco & Dempo). The players of East Bengal, Mohan Bagan and Mohammedan Sporting were tested at Sports Authority of India (SAI), Eastern Center, Kolkata and the players of three Goanese clubs were investigated at Nehru Stadium, Margaon, Goa. The players consisted of 23 goalkeepers, 44 defenders, 48 midfielders and 35 strikers. Another 43 Indian national footballers were also investigated for their various physical and physiological profiles (parameters were tested as tested on national league club footballers) at Sports Authority of India (SAI), Eastern Center, and Kolkata. Before the tests all the players were clinically examined by Doctors, specialized in Sports Medicine of Sports Authority of India. Prior to initial testing a complete explanation of the purposes, procedures and potential risks and benefits of the tests were explained to all footballers and consent was obtained from all the players. The player who was found clinically fit, healthy and no history of any heart and lung diseases was finally selected for the following tests.

Maximum aerobic power (VO2 max) was assessed to use an indirect method of multistage fitness test (Beep test) from where VO2 max was predicted. It is a progressive shuttle run test for the prediction of aerobic fitness as well as to estimate a person's maximum oxygen uptake capacity (VO2 max) from the standard chart. The procedures and purpose of the above test were elaborately instructed to all the players. Briefly, players ran back and forth between two lines, spaced 20-m apart, in time with the "beep" sounds from a compact disc (20-m Shuttle Run test CD). Each successful run of the 20-m distance was a completion of a shuttle. The "beep" sounded at a progressively increasing pace with every minute of the test and correspondingly the player must increase his running speed accordingly. The player was warned if he did not reach the end line in time once. The test was terminated when he i) could not follow the set pace of the "beeps" for two successfully shuttles and/or ii) stopped voluntarily. Typically the scores in the test are expressed as levels and shuttles, which estimate a person's maximum oxygen uptake capacity (VO2 max) from the standard chart. The laboratory tests were performed at a room temperature varying from 23 C to 25 C with the relative humidity varying between 50 and 60%. The field test was performed at temperature about 30 C with relative humidity of maximum about 70-80%.

STATISTICAL ANALYSIS:

Software, SPSS (Ver. 9.0) was used to analyze the collected data. Mean, standard deviation and one-way ANOVA were performed to see whether any significant differences among footballers and also according to their playing positions. After completion of the one-way ANOVA, Scheffe's F test was also used for multiple comparisons between clubs.

RESULTS:

The various anthropometric, motor ability and physiological parameters of Indian National League club footballers were presented in table 1 and table 2a respectively. The mean age, height, weight, BMI and %BF were significantly different among footballers of different national clubs (table 1). Regarding motor qualities, flexibility, agility and VO2 max were also found to be significantly different among the footballers of different clubs ($P<0.01$) No such significant difference was observed in case of Standing Vertical Jump (SVJ) and 20 m sprint.

Table 1. Comparison of Physical Characteristics and Body Fat% of Indian National League Club Footballers

Variables	East Bengal (n=23)	Mohan Bagan (n=23)	Mohammedan Sporting (n=31)	Salgaokar (n=25)	Vasco (n=23)	Dempo (n=25)	F value with level of significance
Age (yrs)	24.6 ±3. 61	22.5 ±2.76	22.7 ±3.02	21.6 ±3.42	23.3 ±3.51	24.7 ±3.90	3.18**
Height (cm)	171.9 ±5.60	170.9 ±5.47	170.5 ±5.07	174.2 ±5.12	172.8 ±5.21	169.0 ±5.53	2.65*
Weight (kg)	67.3 ±5.48	66.4 ±5.40	64.5 ±5.53	63.9 ±5.46	63.4 ±5.47	61.0 ±5.75	2.64*
BMI	22.8 ±1.82	22.5 ±1.46	21.9 ±1.54	20.9 ±1.43	21.2 ±1.81	21.2 ±1.80	4.82**
% Body fat	13.5 ±2.75	12.2 ±2.76	11.6 ±2.28	14.3 ±1.27	14.2 ±2.02	15.1 ±1.93	9.62**

Table 2. Comparison of Selected Motor Ability Parameters and Physiological Profiles of Indian National League Club Footballers

Variables	East Bengal	Mohan Bagan	Mohammedan Sporting	Salgaokar	Vasco	Dempo	*F* value with level of significance
Flexibility (cm)	35.4 ±6.88	38.9 ±4.05	35.3 ±5.62	37.8 ±4.98	36.1 ±7.26	36.3 ±7.77	3.94**
Standing vertical jump (cm)	44.1 ±4.34	42.6 ±4.91	43.8 ±4.74	42.2 ±4.63	43.1 ±4.73	45.6 ±4.72	1.11^{ns}
Speed ability-20m sprint (sec)	3.0 ±0.12	3.0 ±0.10	2.9 ±0.15	3.0 ±0.11	2.9 ±0.12	3.1 ±0.16	0.90^{ns}
Semo agility (sec)	12.2 ±0.61	11.9 ±0.51	12.3 ±0.55	11.6 ±0.34	11.6 ±0.43	12.2 ±0.67	9.49**
VO_2 max (ml.kg^{-1}.min^{-1})	52.3 ±4.27	52.6 ±4.90	51.4 ±4.04	55.2 ±4.18	55.0 ±4.10	54.4 ±3.89	3.36**

CONCLUSION:

It is clear from the above study not only the anthropometric measures but also the various motor abilities and physiological parameters were less in case of Indian national club footballers and as well as Indian national players. Genetic factors determine body size and also to some extent physiological

qualities. Body size does bestow and advantage to the goalkeeper, center back and the forward. Usually strength, stamina, power and skills are important factors for success in football. However, the motor abilities and aerobic power are found to be poor in Indian footballers as compare their International counterparts. Although in this study the specific football skills are not performed but on the basis of specific motor qualities and maximum aerobic power it can be said that Indian footballers are lagging behind as compare to European, American and Australian footballers not only in success in winning the medal but also physical fitness. So, it may be concluded that the less physical and physiological qualities of Indian soccer players as compare to their International counterparts may be due to genetic influence and also the difference among the players of various playing positions may be due to their activity in the game and difference in training regimen.

REFERENCES:

Akpınar, S.; Zileli, R.; Senyüzlü, E. & Tunca, S. (2012). Predictors Affecting the Ranking in Women Armwrestling Competition. Monten. J. Sports Sci. Med., 1(1): pp. 11-4.

Bjelica, D.; Popovic, S.; Kezunovic, M.; Petkovic, J.; Jurak, G. & Grasgruber, P. (2012). Body Height and Its Estimation Utilizing Arm Span Measurements in Montenegrin Adults. Anthropol. Noteb., 18(2): pp. 69-83.

Carvajal, W.; Betancourt, H.; León, S.; Deturnel, Y.; Martínez, M.; Echevarría, I.; Eugenia Castillo, M. & Serviat, N. (2012). Kinanthropometric Profile of Cuban Women Olympic Volleyball Champions. MEDICC Rev., 14(2): pp. 16-22.

Gaurav, V.; Singh, M. & Singh, S. (2010). Anthropometric characteristics, somatotyping and body composition of volleyball and basketball players. J. Phys. Educ. Sport Manag., 1(3): pp. 28-32.

Hadzic, R.; Bjelica, D. & Popovic, S. (2012). Comparative study of anthropometric measurement and body composition between elite basketball and volleyball players. Research in Physical Education, Sport and Health, 1(1): pp. 103-8.

Malina, R. M.; Bouchard, C. & Bar-Or, O. (2004). Growth, maturation, and physical activity. Champaign, Human Kinetics.

Matthys, S.; Vaeyens, R.; Vandendriessche, J.; Vandorpe, B.; Pion, J.; Coutts, A.; Lenoir, M. & Philippaerts. R. (2011). A multidisciplinary identification model for youth handball. Eur. J. Sport Sci., 11(5): pp. 355-63.

Popovic, S.; Akpinar, S.; Jaksic, D.; Matic, R. & Bjelica, D. (2013a). Comparative Study of Anthropometric Measurement and Body Composition between Elite Soccer and Basketball Players. Int. J. Morphol., 31(2): pp. 461-7.

Rexhepi, A. & Brestovci, B. (2010a). Differences in bodily growth between young footballers and basketball players. Int. J. Morphol., 28(2): pp. 415-20.

Singh, S.; Singh, K. & Singh, M. (2010). Anthropometric measurements, body composition and somatotyping of high jumpers. Braz. J. Biomotricity, 4(4): pp. 266-71.

Triki, M.; Rebai, H.; Abroug, T.; Masmoudi, K.; Fellmann, N.; Zouari, M. & Tabka, Z. (2012). Comparative study of body composition and anaerobic performance between football and judo groups. Sci. Sports, 27(5): pp. 293-9.

Zaccagni, L. (2012). Anthropometric characteristics and body composition of Italian national wrestlers, Eur. J. Sport Sci., 12(2): pp. 145-51.

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