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Insight of volleyball skill test based on anthropometric and motor fitness variables

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Abstract
The purpose of the study was to analyze the degree of relationship between volleyball volleying ability from selected anthropometric measurements and motor fitness components. It was also designed to find out the combined contribution of the selected independent variables to volleyball volleying ability besides developing the multiple regression equation for predicting volleyball volleying ability. Twenty university male volleyball players from Annamalai University, in the age group of eighteen to twenty- three years were selected as participants for the purpose of the study. The criterion variable namely Brady volleyball test and the independent variables namely standing height, weight, arm length, leg length, chest girth, biceps girth, wrist girth, thigh girth, calves girth, explosive power, agility, flexibility and speed were considered in the study. In order to study the relationship among the selected variables, Pearson's product moment correlation was computed and multiple correlations were computed to study the best combination of variable, which highly predicts the criterion variable. The results showed significant relationship of Brady skill performance with agility and arm length, out of thirteen independent variables, three of them were selected to derive the stepwise method of multiple regression equation. The obtained R2 value of 0.792 indicates that agility, explosive power and leg length are having 54% common variance with Brady volleyball test.

Keywords: insight anthropometric, skill test, volleyball

Introduction

Talent identification and its development has become an important area of research in sports. In performance sports due to rapidly increasing participation and performance density, only persons who have talent are having the chance of winning medal in an international competition. In prediction results are anticipated beforehand. Usually the anticipated results are not chance of guesses, but are based upon some known facts of relationship or carefully conceived beliefs (Clarke and Clarke, 1972) [9]. Prediction is based on constant and vigil observation, experience and scientific analysis. It is the results of intelligent association of facts and discovering of patterns. Successful sporting performance at elite levels of competition often depends heavily on the explosive leg power of the athletes involved. In many individual sports such as Track and Field events, Gymnastics and Diving the ability to use high levels of strength as quickly and as explosively as possible is essential to perform at elite levels. Many team sports also require high levels of explosive power, such as Basketball, Volleyball, Netball, Rugby and Football codes for success at elite levels of competition.

Vertical and horizontal jumping, in its many different forms, requires high levels of explosive muscular power. The double legged volleyball spike jump and block jumps are very different in technique, but fundamentally they are similar (Harmen *et al* 1990; Samsan 1976; Sawula,1991) [19]. There have been many research studies that have investigated leg power as it relates to vertical jump (Harmen *et al* 1991; Sawula 1991; Young 1995) [20] and how to develop leg power through various weight training (Adams 1992; Adams1987; Blakey1987; Brezzo 1988; Brown 1986; Eisenman 1978) [2, 3, 4, 5, 7, 13] and plyometric training techniques (Adams 1992; Adams1987; Shorten 1987) [2, 3].

The educationist and the economist predict certain things in the respective fields a person involved very much in sports and games also predict the possible outcome in sports and games. Competent person can do the predictions about the outcome of a match to be played in future. This can be well observed in the selection of players based on their performance to meet their future experiences in a play ground. Further a coach is exploiting the inherent abilities dormant in an individual player. The selection as well as finding out the constitution of a winning team in a challenging task for the selectors and the coaches. Traditionally the members of the team are selected on the basis of subjective observations of the performances of the players during the games. A coach or the selector watches the team, looking for the right types of physical powers that would enable easy shaping of a strong player and a successful team.

The changing nature of the game like volleyball demand the right type of physical abilities on the part of a player.The increasing trend in the professionalism and the acute demand for competitive sports have changed the complexion of the games which had been initially intended as a recreational activity of the villagers. Today with the advent of modern scientific equipments for training and selection of players, it has been now made possible to measure the fundamental performance characteristics which contribute to a player success. Prediction of skill level of players can be determined accurately to a great extent by taking a number of measures in various skills and parameters specific to a particular game or sport. The prediction variables will be the different measures of the independent variables. The criterion variables or the dependent variable will be each player's ability in the particular game or event. Hence a subjective rating by a

number of experts can be made as a measure of criterion variable for prediction of playing ability in a particular game event. Greater the general quality of speed, strength, power, endurance, flexibility and agility the more quickly will be the specific skill he learned and once learned the better will be the performance **(**Belay 1987) [23]. Research has shown international volleyball players to rely primarily upon their anaerobic energy system to supply energy demands during a match (Conlee, et. al. 1982) [10]. However matches can last up to two and a half hours, therefore some aerobic component must be present as well. Volleyball is 90% anaerobic and 10% aerobic, whereas more recent research suggests that it is more like 50% aerobic, 50% anaerobic (10% lactic and 40% alactic) (Sawula, 1991). Elite volleyball players typically show muscle fibre percentages of around 52-60% Fast Twitch muscle fibre composition, which compare favourably to samples from elite level sprinters and jumpers (45-80%FT) (Conlee, et. al. 1982) [10]. Typical VO2max. scores for elite volleyball players are around 50-60 ml/kg.min.-1 for males, 40-50 ml/kg.min-1, for females(Conlee, et. al. 1982) [10]. For elite level volleyball players training's and competitions primarily compose of short duration, high intensity work efforts interspersed with relatively long rest periods, so lactate build up is not intense. High Repetition jumping is also a characteristic of training and competition for volleyball players, who make use of several different jumping techniques, during spiking and blocking. Modern volleyball is characterized by a very high out reach of male and female volleyball players above the set and highball velocity on jump service and spiking. Many authors consider motor abilities, agility and explosive strength, along with pronounced longitudinal selection dimensionality, as the major characteristics for successful volleyball performance. Upon demand the body must be prepared to move with agility, speed and power, after over extended periods of time in order that it will respond at will a high-level of condition are strength speed. Some expects claim that skill is the most important single factor in any performance. Skill in volleyball may be considerable as an important of specific means necessary for the player to participate successfully in the game. Each passé of skill development is related to the fulfillment of concrete tactical tasks that can arise in different game situations. Strength and quickness are the main components of fitness required in the volleyball. Various volleyball skills demand the display of specific strengths.

It has been established that no single variable measures physical fitness, which is a composite factor varying with each sport. A volleyball coach may need to determine if an athlete's basic physical ability in combination with skill development and volleyball training will produce a competitive player. Field tests are also used to identify burnout and over trained athletes. When inappropriate workouts are repeated over time, overtraining is common. Tests need to be arranged in appropriate order with sufficient rest between tests to promote test reliability. Tests that require high skill movements and coordination should not be done immediately after tests that are likely to produce fatigue. Volleyball players require well-developed speed, agility, upper body and lower body muscle power, and maximal aerobic power (VO2max) (Hakkinen, 1993) [18]. Several studies have documented the physiological and anthropometric characteristics of senior volleyball players, (Fleck *et al*, 1985; Hascelik *et al*., 1989; Hosler *et al*, 1978) [15, 21, 22], with the fitness of players typically increasing as the playing level is increased. (Smith *et al*., 1992, Milder and Mayhew, 1991). Smith *et al*, (1992), compared physical, physiological, and performance characteristics of national-level and college-level volleyball players and found significantly higher block and spike jumps, 20-m speed, and VO2max in the national-level players. These findings suggest that physiological capacities play an important role in the preparation and selection of elite volleyball players. In addition, Milder and Mayhew (1991), demonstrated that select physiological and anthropometric characteristics could successfully discriminate among freshmen, junior varsity, and varsity volleyball teams, as well as starting and nonstarting players. Collectively, these findings suggest a relation between physical fitness and the playing level attained.

Methodology

Subjects and Variables

Twenty male volleyball players of Annamalai University took part in the study (age 21.6 ± 1.3 years, height 1.74 ± 0.5 m, mass 68.0 ± 6.3 kg). Brady volleyball test was selected as criterion variables and the independent variables such as anthropometric (standing height, weight, arm length, leg length, chest girth, biceps girth, wrist girth, thigh girth and calves girth) and fitness variables (explosive power, agility, flexibility and speed) were selected and assessed in the study. The selected variables were measured by using standard testing procedures. In order to study the relationship between the criterion and determinant variables and inter relationship between determinant variables were computed, using multiple regression analysis. The level of significance was accepted at $P < 0.05$.

Results

Multiple Regression (Equation) Analysis

Stepwise method of multiple regression analysis was used to find out the best combination of variable, which highly predicts the criterion variable. In this study out of the thirteen independent variables three variables were selected to derive multiple regression equation by obtaining a higher multiple correlations. The process of multiple regression equation is drawn and presented below.

Table 1: Stepwise Method of Multiple Regression Equation for Brady Volleyball Skill Test

Variable	B	SEB	Beta
Constant	501.7	73.826	-
Agility	-34.41	4.903	-0.917
Explosive Power	-58.89	13.29	-0.579
Leg Length	0.752	0.265	0.324

The results of the study indicate that the Brady volleyball test performance can be predicted from agility, explosive power and leg length of the volleyball players. The obtained multiple regression equation is mentioned below.

Brady Volleyball Skill Test = 501.7 – 34.41 (Agility) – 58.89 (Explosive Power) + 0.752 (Leg Length).

Discussion

The results of the present study indicate that the correlation coefficient of Brady volleyball skill performance with arm length and agility was significant at 0.05 level of confidence at 18 degrees of freedom. In the process of statistical analysis, to

derive multiple regression equation due to high multiple correlation, out of thirteen independent variables, three variables were selected to sketch out the multiple regression equation. The multiple correlation of 0.890 was obtained by selecting agility, explosive power and leg length for Brady volleyball test. The obtained R2 value of 0.792 indicates that agility, explosive power and leg length are having 54% common variance with Brady volleyball test.

Lower-body muscular power, agility, and estimated maximal aerobic power with increased playing level, and given the importance of these qualities to competitive performances (Gabbett and Georgieff, 2007) [16] and the combination of bump-set, height, weight, and shoulder flexibility allowed correct classification of 78% of the starters and nonstarters. General and specific tests can successfully select and classify high school volleyball players (Thissen and Mayhew, 1991). Sport scientists and conditioning professionals should take the strength and anthropometric characteristics of volleyball players into account when designing individualized position-specific training programs and the anthropometric factor was significant in the performance of all the elements of the game, being most essential (71-83%) for attack, block and feint. (39%) (Stamm *et al*., 2003). Foot length and dynamic power showed a significant- relationship by jumping ability. Right and left ankle flexibility and agility also showed a significant relationship to jumping ability. Arm Length, leg length and Power are the most reliable variable in prediction of playing ability of men volleyball players Joseph (1983).

Conclusions

From the results obtained after analyzing the data it was concluded that the agility, explosive power and leg length is highly correlated to Brady volleyball skill performance.

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