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Research Paper

An Assessment of Strength, Power and Agility in Volleyball Players

Medical Science

KEYWORDS : Volleyball players, Strength, Power, Agility

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ABSTRACT

Volleyball is one of the most played games in the world. It is the game of power, agility and speed. But the levels of performance of the Indian volleyball players lag far behind the international standards. Physical fitness is of paramount importance in this game Objective : Strength, Power and Agility of volleyball players was assessed, analysed and compared with non volleyball players. Also, findings of the volleyball players were compared with that of the international norms from available literature. Study Design/Methods: Forty male volleyball players of state /national level were taken as subjects and 40 age matched non volleyball players as controls. Their strength was assessed using bench press and bench squat, power by vertical jump and agility by Burpee Test, Shuttle Run and Quadrant Jump. Results: Almost all parameters included were found to be statistically significant in the subjects when compared with the controls. But, when compared with the international standards it was found that our subjects were far behind than the recommended norms for the elite volleyball players. Conclusions: Subjects in our study had more strength, power and agility as compared to controls. But our subjects lag far behind in these parameters when compared with international standards.

Introduction

Medallist performances in international sports events no longer occur a random or as a result of chance alone. Performance depends on skills, training, motivation and physiological factors.The poor performance of Indian athletes and sportsmen at the international competition has been of great concern, especially to the coaches, physical educationists and sports scientists. Efforts have been made to improve the standards of out sportsmen since long; however, little success has so far been achieved in this respect.

Volleyball is one of the most played games in the world, but the level of performance of the Indian volleyball players lag far behind the international standards. It is the game of power, agility as well as speed. Physical fitness is of paramount importance in this game. Surprisingly few studies on physical fitness parameters have been done in male volleyball players in India. So, this present study is aimed to find out the lacunae in the physical fitness level and to measure certain important physiological determinants like strength power and agility in volleyball players, so that we can come up with some valuable suggestions to improve the performance level of volleyball players

Aims and Objectives:

1) To assess, analyze and compare strength, power and agility of state level and national level volleyball players and age matched controls.
2) To compare the results with national/international standards available from the literature.
3) To give suggestions for improvement of their performance.

Material and Methods:

The present study was carried out in the sports physiology laboratory of physiology department Dr. Vaishampayan Memorial Government Medical College, Solapur after taking approval of the ethical committee. This study included 40 male volleyball players aged between 17 to 26 years, playing at state level or national level. This was our study group. All the players belonged to the same socio-economic group. Informed written consent was taken from all the players. The control group consisted of 40 age matched male students of Dr. Vaishampayan Memorial Government Medical College, Solapur.

Exclusion criteria for subjects:

1) Those players who were not regularly practicing were excluded from the study.
2) Those players who were injured during practice or during matches were excluded. Minor injuries included sprains and strains and major injuries included recurrent shoulder dislocation, fracture ankle joint, fracture patella, ligament injuries etc.
3) Players with major respiratory illness or cardio-vascular illness in past were excluded from the study.

The following parameters were studied:

1. Strength Testing

a) Bench press_____Kgs
b) Bench squat_____Kgs

2. Power Testing (Vertical Jump)

a. Vertical Jump without approach_____Cms
b. Vertical jump with approach_____Cms

3. Agility Testing

a. Burpee Test (Squat Thrust) _____ parts executed
b. Shuttle Run _____ sec.
c. Quadrant Jump _____parts executed

Observations and Results

Table No.1: Strength Testing

Strength Test	Subjects or Controls	Mean	Std. Deviation	Std. Error of Mean	P Value	S/NS
Bench press (Relative)	Subjects	0.708	0.164	0.026	<0.05	S
	Controls	0.542	0.139	0.022		
Bench squat (Relative)	Subjects	1.009	0.172	0.027	<0.05	S
	Controls	0.694	0.156	0.024		

S: Significant, NS: non-significant

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Strength tests like Bench press and Bench squat scores are found to be significantly more in subjects when compared to the controls.

Table No.2: Power Testing

Power testing	Subjects or Controls	Mean	Std. Deviation	Std. Error of Mean	P Value	S / NS
Without approach (Cms.)	Subjects	51.450	9.556	1.511	< 0.05	S
	Controls	39.125	8.585	1.357		
With approach (Cms.)	Subjects	62.60	9.737	1.540	< 0.05	S
	controls	48.30	11.407	1.804		

S: Significant, NS: non-significant

Explosive power in legs in the form of vertical jump without approach and vertical jump with approach is significantly more in subjects than in controls.

TABLE NO. 3: Agility Testing:

Test	Subjects & Controls	Mean	Std. Deviation	Std. Error of Mean	P Value	S / NS
Burpee squat (parts)	Subjects	21.08	2.625	0.415	<0.05	S
	Controls	17.45	1.811	0.286		
Shuttle run (sec)	Subjects	9.043	0.378	0.059	<0.05	S
	controls	10.403	0.458	0.072		
Quadrant Jump (parts)	Subjects	22.86	2.663	0.421	<0.05	S
	controls	18.93	2.277	0.360		

S: Significant, NS: non-significant

Difference in agility in subjects and in controls when measured by Burpee squat, Shuttle run and Quadrant jump is found to be statistically significant.

Discussion

Today, a sportsman has to pass through various stages to come up to the highest level of competition. He has to excel to make himself eligible for a higher level of competition. In team games the judgement of performance is not an easy task. Thus there is need to evolve some methods which may make the task of selection easier and free from subjectivity.

During any given volleyball match, it is not unusual for a player to jump over 100 times. Over the course of dawn to dusk tournament with several matches, this can translate into several hundred jumps, thus for the training program to optimize performance and decrease the likelihood of injury, it must incorporate the specific demands associated with the sport. For this, the muscles must be strong so that for higher level performance, reserve energy which may be utilized in an emergency, is most essential. This energy is used in spiking, blocking, diving, digging etc.Relative strength for bench press was found to be 0.708 in subjects and 0.542 in controls with statistically significant difference between the values. But, when the values of subjects were compared with the raw score norms for bench press it was found that they came under the performance category of Beginner [0.0—0.84] where as adv. Performance category athletes had values of 1.33 and above. [(1)] Lower body strength was measured using bench squat test. In our study, the relative strength by bench squat test was found to be 1 .00 in subjects and 0.694 in controls, the difference being statistically significant. But, when the values of subjects were compared with the raw score norms, the subjects were in adv. Beginner category [0.91—1.18]. The advanced category subjects had scored 2.09 and above. This means that, the strength scores of subjects were very low as compared to raw score norms of elite players both for bench press test and bench squat test.(1) Rajen K (2). et al found that weight training exercises in the form of half squats, bench press and leg press when given with specific exercises, the volley ball playing ability of the players improved significantly. This means, strength training helps to improve spiking, blocking and digging skills. Buligen M.A. (3) et al, suggested evaluation of physical fitness for proper selection of the volleyball players. Thus, various researches have emphasized the importance of weight training to improve strength.

Power may be defined as the ability to release maximum force in the fastest possible time as in jumping and throwing activities. The game of volleyball is a game of power. For peak performance in volleyball, the muscles which are the source of power must be strong. It is important for a volleyball player to have explosive power in legs because he has to jump hundreds of times during the match or tournament for executing spiking skill or blocking skill. Thus, a good vertical jump during the spike and block depends on strength, speed and technique.

We found that vertical jump without approach was 51.45 Cms in subjects and 39.12 Cms in controls. The difference was statistically significant. Also, vertical jump that three stride approach was found to be 62.60 Cms. in subjects and 48.30 Cms. in controls which again was statistically significant. Fleck S.J. et al (4) found vertical jumping distance of 54.4 +\- 4.5cms. in National team volleyball players so our finding are consistent his findings. S.K Saggar et al (5)found vertical jump with approach score for the international volleyball players as 76.00 Cms where as in our study, the same was 62.60 Cms. Berger et al (6)studied effects of dynamic and static strength training and concluded that those subjects trained dynamically improved significantly more in vertical jump than those trained statically or strictly by jumping vertically. Uppal et al (7) found that vertical jump could be increased significantly by administering a training program of rope skipping and ankle strengthening exercises. Newton R .U et al (8) found that ballistic resistance training produced significantly increase in standing vertical jump and approach vertical jump in already trained jump athletes. Lawrence Grey, Kumar V et al (9) emphasized the importance of plyometric exercises (high intensity exercises to enhance speed, agility and power), weight and sprint training in volleyball players. He found huge improvements in speed, agility and power. Thus, increasing the vertical leap for volley ball. Archana singh et al (10) compared anaerobic power in toppers of all India inter zonal female volleyball players and university level female volleyball players and found anaerobic power in the form of vertical jump to be significantly more in the toppers. Chandrashekhar Adhikari et al(11) found positive relationship between power and agility in block jumps and three stride jump in elite volleyball players. Mac Colloway et al (12) stressed that most important type of training needed for a volleyball player was power and core strength. He stated that power involves the simultaneous reaction of the hips, knees and ankles white the abdominals and low back are used for the support. He suggested hang cleans, push press/jerks, power shrugs along with plyometrics (jumps, hops, bounds etc) for development of power. Exercises like weight training, rope skipping, ankle strengthening exercises, ballistic resistance training, sprinting and most of all plyometrics help in improvement of vertical jumping ability for spiking and block skills development in the game of volley ball.

Agility is defined as the physical ability of an individual to rapidly change the body position and direction in a precise manner. In the game of volleyball, players have to cover different distances in different direction to perform dive, roll and fall to receive the ball frequently. During the attack hit [defensive block], the ball may change its movement in an uncertain direction and go far away from the player in a different trajectory. Further, while receiving the different kinds of service the application of force on the ball at different level of contact results the ball to travel in different paths with different speed. All such tasks demand an agile body to orientate quickly and take a decision in a second or fraction of it. So to fulfil the required demand, agility was selected in the present study. In our study, subject mean score for Burpee test was found to be 21.08 and for controls it was 17.45, which showed that the difference was statistically significant. But when the scores of subjects were compared with elite athletes [32- above], the subjects were in intermediate category [17-281, this means, even though, the difference between subjects and controls was significant, still the agility of subjects was less when compared that elite athletes. (1)The mean time taken by the subjects for Shuttle run was 9.04 sec. and that by the controls was 10.40. The difference found was statistically significant. The subject's agility was in 85th percentile while that of controls was in 25th percentile. This clearly shows a vast difference in the agility between the subjects and controls. This implies that agility as measured by the shuttle run is an important factor for excellence in given sport. (1) For Quadrant Jump the mean score of subjects was 22.86 and for controls, it was 18.93. The correlation found was statistically significant. But when compared with the raw score norms for quadrant jump, our subject were in intermediate group [13-24] whereas the elite athletes had scores of 31 and above advanced performance level. (1) Thus, overall we can say that the agility of subjects is less than those of national or international [high performance] athletes. Thissen Milder et al (13) showed that varsity level volleyball players were better in agility and ball handling tests than freshman volleyball players, thus agility can be included in general physical tests for successfully selecting and classifying high school volleyball players.

Mohr et al (14) found significant association between volleying skills in volleyball and agility emphasizing the importance of agility in volleyball. Mac Calloway et al (15) trained the elite volleyball players of university of Miami using multiple cone drills, ladder, drills, and reaction drills. Lawrence Gray Kumar V et al (16) emphasized the importance of plyometrics exercises [High intensity exercises] in improving speed, agility and power of volleyball players. Thus, we can conclude that regular plyometric exercises and multiple cone drills or ladder drills can have beneficial effect in improving the performance of volleyball players.

Conclusions:

Subjects in our study had more strength, power and agility as compared to controls. But our subjects lag far behind in these parameters when compared with international standards

Suggestions:

Strength, power and agility are most important physical parameters needed for the game of volleyball. So, these parameters should be included in selection criteria.Also, testing should be done periodically in order to see what deficiencies are there and in what areas so that we can determine the correct course of action to take in designing a program for that particular individual. It will help an individual player to improve his own performance.

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