

Vertical jump to female & male volleyball players in Albania

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Abstract

Aims: The reason of this study is the evaluation of the “Vertical Jump” and other parameters of the Albanian National Championship volleyball players female & male. The performance profiling of volleyball players is important to distinguish the anthropometric and physical characteristics from other sports. **Methods:** Volleyball players were tested in different periods before and after the training with their coaches. Subjects were 10 Female (F) mean age 19.1 years old and 10 Male (M) mean age 19.8 years old. They evaluated us; Body Height (BH), Body Mass (BMI %), Body Weight (BW), Squat Jump(SJ), Countermovement Jump(CMJ) and Drop Jump 40cm (DJ). **Result:** Differences were seen to individual volleyball players between two periods, before and after the testing. From the obtained data of the test was observed even the effect of the training that these athletes have done for the jumping level, assessment of explosive strength and maximum power. **Conclusions:** The obtained results suggest changes in sporting performance of “vertical jump” in the force settings, speed and power. The evaluation of these tests is one of the key features of a vertical jump as one of the specific technical element in the game on air in the sport of volleyball.

Keywords: volleyball, drop jump, female & male, squat-countermovement jump.

Introduction

Volleyball is one of the most popular sports in the world but also quite developed in our country Albania. Various studies have been conducted in volleyball according to different age groups on the technical elements of volleyball. Evaluations are conducted in support of this sport and the individual and we have realized that the vertical jump is a necessary element for the volleyball players. To developed this study, we have used the facilities of the University of Sports in Tirana and its respective laboratories of Physiology and Biomechanics where tests are developed with advanced equipment and GFRP “Leonardo” platform. In collective sports as volleyball, football, basketball besides other technical elements that these kind of sports contain it is seen even the functioning of the element “vertical jump”. The effects of jump trainings have been studied by various authors; they have found out that many high jumps can be greatly improved using plyometric jumps. The better perfection of a “vertical jump” can be achieved by training with the certain order to increase the height of the jump, the high level of the muscular activity by increasing the growth of cargo in the stretch faze of the vertical jump. One of the training methods that the coaches use during the preparatory period of the athletes are the plyometric exercises. These exercises include rapid eccentric and concentric movement to increase muscle strength so they can perform an efficient jump (Komi&Bosco,1978). The main purpose of this study is to evaluate the changes and the effects that training with the coaches caused to

volleyball players using the tests squat jump (SJ), countermovement jump (CMJ) and drop jump (DJ). We are focused on vertical jump as a basic element to achieve the proper high of the sportive performance in volleyball players without compromising other technical elements. (Komi&Bosco,1978) have compared the performance of vertical jump in male and female athletes in these three cases. Volleyball players must possess and increase, by training, the ability for the development of the maximum power and explosive force and also to reuse the elastic energy. Individual differences in physical fitness parameters among players have been attributed to long-term sport training specificity (Izquierdo et al., 2002). To assess the vertical jump is needed the application of Bosco tests such as Drop Jump (Cometti G&D,2009), that made possible the definition of the height of the optimum fall from which the player takes \ wins the maximum jumping and the connection between the height of the fall, the time of contact and flight-time. Some authors have reported (Mathias et al., 2012) that commanded plyometric training shows that exercises are effective to increase the jumping, speed and skill of players. Plyometric is a form of resistance exercise that refers to the stretch-shortening cycle (SSC) such as jumps or doing vertical or horizontal jumps (Fleck, S. J., & Kraemer, W. J. 2004). Plyometric training (Wilt, 1975) is widely used in order to improve jumping ability, especially in sports such as volleyball and basketball (Blattner&Noble, 1979; Brown et al., 1986; Fatouros et al., 2000). Plyometric exercises contain fast and continuous eccentric and concentric movements to increase muscle strength in effect to perform the performance of a jump as efficiently as possible (Bosco, 1990). Taking into account the importance of this activity for the result of the dance performance as well as the frequency in which it takes place during a game of volleyball, the types of jumping exercises in place, jumping with counter-movement in motion, fall-jump-fall where in adaptation to foreign terminology are respectively specific protocol tests to assess the jump in volleyball and they are; Squat Jump-SJ, Countermovement Jump-CMJ and Drop Jump-DJ.

1. Methodology

In understanding with coaches of the volleyball teams we based our study on the female volleyball team "Tirana Volley" in the period before and after a preparatory mini faze and on the male volleyball team "Farka Volley" in the period before and after the second phase of the National Championship. During the study players have been under our observation for the performance of the training program with their coaches. Training sessions have been regular, 5 times a week with duration of 1 hour and 30 min each time. In this study participate these volleyball players and they were tested in these parameters:

Table.1:

Nr;10x 2(G+B)	FEMALE(F)	MALE(M)
Mean Age	19.1	19.8
Body Height (BH) cm	177.4	187.9
Body Wight (BW) kg	67.8	70.2
Body Mass (BMI)%kg/m ²	21.55	20.37

2.1. Protocols of the Test Performed

- SJ (squat jump) - The vertical jump from the initial position starts when the athlete has his/her legs refracted to 90° and hands positioned on the waist. There have been realized 3 jumps and has been taken the best.
- CMJ (Countermovement Jump) is similar to SJ, but the athlete begins the testing by staying right and then he/she takes off by refracting his/her lower limb to 90 ° and hands placed on the waist (3 jumps). Tests were developed on Muscle Lab Jump
- DJ (drupe jump) from 40 cm cube in Leonardo® Ground Force Reaction Plate (GRFP-NovotecMedical,Pforzheim,Germany).
- Calculation $(CMJ-SJ) \times 100/CMJ$. The capacity of reusing the accumulated energy as a result of the elastic stretch that precedes the muscular contraction. During squat jumps with a knee flexion to 90° players were instructed to perform a maximal vertical jump and were not allowed to use any motion, forward flexion before jumping. All volleyball players were tested in the same conditions, with a preliminary general stretching of 10 min. The volleyball players then developed an individual warm-up of 10 min before starting the specific vertical jump performance test in the Squat Jump-SJ, Countermovement Jump-CMJ and Drop Jump-DJ at the throw height from 40cm cubes (Bosco,1990). Volleyball players are initially recommended for each performance of the jump test how it should proceeded.

2. Results

Table 2 shows the average team data of female and male volleyball players taken under observation. The values obtained clearly show the level of young volleyball players in Albania.

Table2. Data obtained from Ergo Jump Muscle Lab Jump (female & male)

Volleyball	FEMALE		MALE	
	Test 1	Test 2	Test 1	Test 2
Squat Jump	27.7	29.7	29.4	31.8
Countermovement Jump	33.9	35.2	36.2	36.9
$(CMJ-SJ) \times 100/CMJ\%$	18.07	15.50%	18.10%	14%

Table.3. Data of the tests done with GFRP "Leonardo" (female & male)

	Squat Jump Test				Countermovement Jump Test			
	Test 1 Fmax	Test 2 Fmax	Test 1 Pmax	Test 2 Pmax	Test 1 Fmax	Test 2 Fmax	Test 1 Pmax	Test 2 Pmax
FEMALE	1.38	1.48	2.73	2.97	1.46	1.53	2.81	2.96
MALE	1.55	1.6	3.52	3.57	1.51	1.75	3.32	3.71

Discussion – Analysis

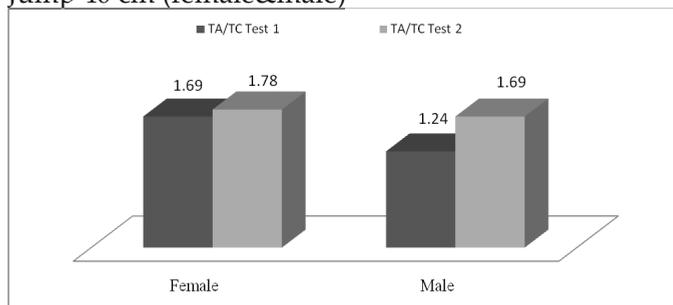
From the data shown in tab.2,3 it seems clear in comparison and with different references from the foreign literature, female and male volleyball players have low jumping levels ; (refers Bosco, 1992) (SJ 37cm ,CMJ 41cm for girls)) (SJ boys 47cm

,CMJ-53). But in both teams there have been male and female individuals who have improved during the training with the coaches. It is clearly seen in younger athletes. For a long time, we thought that CMJ jump would provide the muscle elasticity measure, while today it is found that this test provides the rapid force measure of the jump. The differences between the two tests CMJ-SJ of the athletes in teams is the "elasticity index". Good capacity used by the elastic energy corresponds to 8-10 cm. Difference between these two tests is called "The index of fast power" (Bosco,1992). The difference in % of (CMJ-SJ) the calculation of the elasticity index. Elastic energy (CMJ-SJ) x100/CMJ the capacity for subsequent reuse of accumulated elastic energy resulting from the elastic stretch preceding muscular contraction. From the data obtained before and after the training of the volleyball players there is still exploited elastic energy. We think that there is more to be clarified and developed in the training plan that the coaches use to increase the vertical jump to young volleyball players. Vertical jump assessment has been widely used as an alternative to the maximum straightforward assessment of strength and power of the lower extremities (Hara et al., 2006).It has previously been reported (C.Bosco,2006) an average relationship between strength / measuring power in squat jump performance from place to place and CMJ counter-action jump (movement) in the volleyball team. This platform consists in obtaining more data to the evaluation of the volleyball players, force (F max kN) and power (P max kW), during the vertical jump. This platform clearly shows and identifies all the testing protocol of the vertical jump. Technical good used efficiency (EFI %) during the vertical jump highlights the general preparation that this sports has in lower extremities (legs) and the usage of the elastic energy of the muscle complex. From the observation and the conversation with the coaches of these two teams we realized that despite the general athletic-technical-tactical preparation they used different plyometric exercises to increase the vertical jump.

Table.4" Data of the tests done with GFRP "Leonardo" (female & male) DJ 40cm

Players	F max kN		P max w/kg		Time Contact(TC)s		Air Time(TA) s		TA/TC s	
	Test 1-	Test 2	Test 1-Test 2		Test 1-Testi2		Test 1-Test 2		Test 1-Test2	
FEMALE	3.31	3.18	30.8	33.4	0.304	0.303	0.48	0.934	1.69	1.78
MALE	3.31	3.12	14.45	33.63	0.419	0.328	0.499	0.512	1.24	1.69

Graffic.1.Drop Jump 40 cm (female&male)



The Drop Jump test offers a progressive increase of the height of the falling cube

from 20cm, 40cm, 60cm and 80cm near a force platform GRFP. This is a jump that is standardized to fall from a height, contact with the falling ground and knees at an angle of 90 °, without interruption, in a vertical jump to the maximum with a minimum foot contact with the GRFP force platform (Specific plyometric indicator). This test assesses the explosive strength of the lower limbs. The test represents the "Explosive-Reactive-Ballistic Force" and in particular, the neuromuscular capacity to develop very high values of force during the stretch-contraction cycle (Cometti & D, 2009). In this test we used fall from 40 cm high cube in both volleyball teams. The test provides as an objective the progressive increase in the decline faze, contact time (TCs), the residence time on air (TAs) and has also the objective to show the highest determining result of the vertical jump. Bosco has come to the conclusion that to have significantly results TA/TC on DJ test. The results of the study as outlined above for women and men show that using the DJ test we can improve the vertical jump. By comparing the first and second DJ test, the results show the higher increase of the sportive performance in maximal force and maximal power in male volleyball players than female, especially in particular individuals. As a result of improved power and force is also increased the vertical jump shown in the declining contact DJ faze with the time of flight, expressed in seconds. DJ exercises are plyometric exercises commonly used to increase explosive power through stretching-shortening cycle muscle activity. Thus it helps to gain the greatest power output and energy output in the concentric phase (Komi, 1992). Optimal determination of DJ jump height is important in training volleyball players. Despite the large number of plyometric studies, few studies on exercise have directly compared the effectiveness of plyometric, DJ training and CMJ training. Various authors have found that high jumps can be improved through plyometric exercises. Some authors have reported (Voelzke et al., 2012) that commanded plyometric training shows that plyometric exercises are effective in increasing the volleyball, speed and dexterity of volleyball players. Statistical analysis was performed using IBM Statics 20. As a working environment between groups: ANOVA with repeated measurements with time factor and/or group. The results of descriptive statistical analysis for the dependent variable "TA / TC" presented in table 4 showed that there is progress in increasing performance in this test of both groups of volleyball players. In Test 2 measurements there is an average significant increase in seconds for both females and males.

Conclusions

From the obtained results of the study we have arrived on these conclusions: Vertical jump SJ and CMJ done in Ergo jump and with the implementation of the method Bosco test 1 and test 2 training shows that tested volleyball players have yet untapped and well-used energy. We think that there is more to be clarified and developed in the training plan that coaches use to improve the vertical jump to volleyball players. The ability in jumping is an important factor of success in the volleyball but it is associated with the general and specified training to develop the muscular max force and max power. DJ test evidence that is a more effective way to increase the output power and the jumping performance. We think that in terms of training from

coach's plyometric exercises to increase the explosive power in vertical jump have not been done regularly with a detailed program. But for female and even for male players the training has been efficient. Max force (F max) and max power (P max) are relatively poor values (low) compared with the results that a volleyball player should have during a vertical jump. Practicing these tests, we think that in the sport of volleyball they are a necessity of a coaching advancement for the ages to have a better performance of their volleyball dancing for both men and women.

References

- Browen, M.E., J.L. Mayhew & M.A. Boleach, 1986. Effect of plyometric training on vertical jump performance in high school basketball players. *J. Sports Med. Phys. Fitness* 26:1–4.
- Blattner, S., & L. Noble, 1979. Relative effects of isokinetic and plyometric training on vertical jumping performance. *Res Q.* 50:583–588.
- Carmelo Bosco, 2006. Ph.D. "La forza muscolare" - Aspetti Fisiologici ed Applicazioni Pratiche" Capitolo IV, La Forza Esplosiva, pg103-110.
- Carmelo Bosco. 1990. New test for training control of athletes. In: *Technique in athletes, conference proceedings of the first inter conference.* Cologne, Vol. I: 264-295.
- Cometti G., & Cometti D., (2009). *La Pliometria (origini, teorie, allenamento)* (2nd ed.) Tivoli: Italy. 60-67.
- Fatouros, G.I., Z.A. Jamurtas, D. Leontsini, K. Taxildaris, N. Aggelousis, N. Kostopoulos, & P. Buckenmeyer, 2000. Evaluation of plyometric exercise training, weight training, and their combination on vertical jumping performance and leg strength. *J. Strength Cond. Res.* 14:470–476.
- Fleck, S. J., & Kraemer, W. J. 2004. *Advanced Training Strategies.* In S. J. Fleck & W. J. Kraemer (Eds.), *Designing Resistance Training Programs* (3rd ed., pp.209-239). Champaign, IL: Human Kinetics.
- Hewett, T.E., A.L. Stroupe, T.A. Nance & F.R. Noyes, 1996. Plyometric training in female athletes. Decreased impact forces and increased hamstring torques. *Am. J. Sports Med.* 24: 765–773.
- Hara, M., Shibayama, A., Takeshita, D., & Fukashiro, S., 2006. The effect of arm swing on lower extremities in vertical jumping. *J Biomech* 39: 2503–2511.
- Izquierdo, M., K. Hakkinen, J. Gonzalez-Badillo, J. Ibanez & E.M. Gorostiaga, 2002. Effects of long-term training specificity on maximal strength and power of the upper and lower extremities in athletes from different sports. *Eur. J. Appl. Physiol.* 87:264–271.
- Komi, P.V., & C. Bosco, (1978). Utilization of stored elastic energy in leg extensor muscles by men and women. *Med. Sci. Sports* 10: 261-265.
- Komi, P.V., 1992. Stretch-shortening cycle. In: P.V. Komi (ed.) *Strength and Power in Sport.* Blackwell Scientific Publications, Oxford, pp.169-179.
- Mathias V., Norman S., & Thorhauer, Alexander H., & Granacher Urs, 2012. Promoting lower extremity strength in elite volleyball players: Effects of two combined training methods. *Journal Sciences Medicine Sport*, Vol. 15, No. 5; 457–462 pp.
- Matavulj, D., M. Kukolj, D. Ugarkovic, J. Tihanyi and S. Jaric, 2001. Effects of plyometric training on jumping performance in junior basketball players. *J. Sports Med. Phys. Fitness* 41: 159–164.
- Voelzke, Mathias & Stutzig, Norman and Thorhauer, Hans-Alexander and Granacher, Urs. 2012. Promoting lower extremity strength in elite volleyball players: effects of two combined training methods. *J Sci Med Sport*, Volum 15, Nr 5; page 457–462.
- Wilt, F., 1975. Plyometrics – What it is – How it works. *Athl. J.* 55(76):89–90.