JOURNAL OF INTERNATIONAL ACADEMIC RESEARCH FOR MULTIDISCIPLINARY
Impact Factor 1.625, ISSN: 2320-5083, Volume 3, Issue 6, July 2015

IMPROVING THE ABILITY OF VERTICAL JUMPING UNDERTHE INFLUENCE OF DJ, CMJ, SJ EXERCISES

DHIMITRAQ PRIFTI*
ENKELEIDA LLESHI**
ROBERT CINA***

*Department Medicine of Sports, Sports University of Tirana, Albania
**Sport Sciences Research Institute, Sports University of Tirana, Albania
**Department Medicine of Sports, Sports University of Tirana, Albania

ABSTRACT

This study aims to identify some of polymeric technical exercises that affect the improvement of vertical jumping skills, in the production of the positive energy given to the use of elastic energy of youths in volleyball. The data were taken before and after 12 weeks of jumping exercise and were analyzed by ANOVA. Two men volleyball teams (N = 20) were the subjects. It was assigned the control and experimental group that performed in three different tests squat-Jumps (SJ), Countermovement Jump (CMJ) and 40cm Drop Jump (DJ) in Ergo jump test and "Leonardo" platforms. Each individual was measured the body height, body weight and BMI. The 12-week program was implemented by the experimental group 2 times a week and resulted in a significant increase in vertical jumps in the value of force and maximum power of control group. This plyometric study proved that exercises improve physical qualities especially those of muscular force and consequently the vertical jumping skills. Also it serves to integrate them as an integral part of a whole program for volleyball for younger age groups.

KEYWORDS: Elastic Energy, 40cm Drop Jump, Countermovement & Squat Jump

INTRODUCTION

Volleyball is characterized by the activity of jumping performance in attack and block. Considering the importance of this activity for the outcome of the performance as well as the frequency in which they occur during a game of jump types SJ, CMJ and DJ are an important indicator in volleyball. We have implemented the usage of these types of jumps in a volleyball training program to youths in Albania during a 12 weekly training with 2 sessions of exercises in week. The usage of DJ polymeric exercises during training in volleyball have shown that the performance increases during the concentric phase of the muscle contraction. Observing during the concentric phase, this improvement is known to discharge the elastic energy stored in elastic elements sequences (of the transversal links and

connective tissues) of the muscle during the eccentric contraction, the length of the extension (1). Komi & Bosco have compared the performance of vertical jump in males and females in these three cases, SJ, CMJ and DJ where men have performed higher than women but women had a good use of elastic energy stored. (2).With ago Sheppard. Et. Al has reported an average interaction between force / measuring power in jumping (squat jump) and CMJ performance in elite volleyball team. (3). Several researchers have found that jumping in height can be greatly improved between plyometric jumps (1. 2). Blattner and Noble (4) have compared an exercises group DJ, an exercises group with is ok in etic exercises, and a control group. They found that both DJ and is ok in ethic group evidently jumped higher compared to the control group. A group of researchers (5) have compared CMJ training with DJ training in weights training. They found no significant changes between the DJ and CMJ group, both groups improved their vertical jump ability by 8.4 cm after 4 weeks of trainings. Despite the large number of plyometric studies, few studies on training have compared directly the effectiveness of plyometric, DJ training and CMJ training. This study proved that plyometric exercises to young volleyball players as part of a 12-week program served for improving the vertical jumping skills and force and strength performances of the lower extremities.

EXPERIMENTAL APPROACH TO THE PROBLEM

To assess the relationship between strength, power and anthropometric variables in CMJ and SJ, were conducted correlative analyses to see changes in variables such as DJ test to that CMJ . The data were collected from Standard preparations of volleyball players in an conditional period of 12weeks with 2 sessions per week, January 2014 and April 2014. Subjects of this study were volleyball players who participated in the national volleyball championship in Albania, trained 10 hours per week, the experimental group has developed three hours in the gym in plyometric exercise development and 7 hours of general technical-tactical exercises, the control group has developed only 10 hours of general technical-tactical exercises per week. The 12-week training that included two trainings per week was designed to improve vertical skills.

SUBJECT

In this study attended two volleyball teams with men with 10 athletes, whose physical characteristics are presented in Table 1. All volleyball players were part of the Championship. All participants were given clear explanations on the study, including the

benefits and risks of participating and if after these explanations, they refused to participate in the study, their decision would not cause elimination in the team's matches. All participants gave their written consent to participate in the testing and data collection.

PROCEDURES AND METHODS

24 hours before starting the test, the participants were not included in any activity that would result invalid for study. Volleyball players testing was done 24 hours after a day of absolute rest. In the beginning were conducted anthropometric measurements and later on the tests in vertical jump performance of the three protocol tests (6.7.) and DJ, SJ,CMJ where chosen a height of 40 cm, all participants were informed about the tests on which was focused the research, it was also decided for a repetition of measurements for specific testing. All sportsmen had 3 chances to retry during the test. According to the protocol of group testing, participants had done their individual warm-up before each test section. Then they performed in maximum 3 vertical jumps with hands on their hips following an ordinary rule for all of these disciplines: CMJ, DJ and SJ. Tests of SJ and CMJ were conducted in Ergo test Technology Ergo jump in order to define the use of elastic energy but also their platform Leonardo® Ground Force Response Plate (GRFP-Novotec Medical, Pforzheim, Germany) for determining the extremity force and power. Tests have been conducted in laboratory environments in the University of Sports in Tirana.

RESULTS

In the following table are presented the data for anthropometric measurements taken of both groups in the study also the data of SJ and CMJ tests obtained from the protocol test (6.7) in Ergo test Technology Ergo jump.

Tab.1.General Table of SJ & CMJ Test Pre & Post (Ergo test Technology Ergo jump)

No	Groups	Age	Body Height (BH)	Body Weight (BW)	BMI %	Jumping				(CMJ-SJ) X 100 / CMJ	
						SJ PRE POST		CMJ PRE POST			
			LT	PT	Kg/m^2	SJ	SJ	CMJ	CMJ	PRE	POST
10	Experiment	18	185.3	76.3	22.19	30.47	30.49	36.14	38.06	15.68	19.88
	SD	*1.1*	*7.3*	*12.1*	*2.4*	*3.4*	*4.9*	*3.2*	*5.2*	*4.3*	*2.4*
10	Control	17	187.9	70.2	20.37	29.4	36.2	31.8	36.9	16.14	17.23
	SD	*0.9*	*9.47*	*10.08*	*2.06*	*5.5*	*5.7*	*4.6*	*4.9*	*6.6*	*2.9*

ANALYSIS

In Table 1 we presented in general the average tests data practiced on the volleyball players of the two study groups where the experimental group compared to the control group and they differentiate in body height 185.3 ± 3, ± 5 body weight 76, and BMI 22:19% ± 2. Jumps in the performance of the tests, the positive energy, and elastic energy were calculated by the method Komi and Bosco (2). The Positive energy (EPOS) provided by gathered feet/squat jumps represents the contractual performance over clean concentric contraction. Squat Jump Test (SJ) provides a measure of the ability of fast jump to develop a rapid explosive strength. Test "jump with countermovement" Countermovement Jump (CMJ) provides quick measure of the strength of the jump (8) . Pearson correlation shows for SJ and CMJ tests a strong and positive correlation between the two group. Although SJ correlation is technically in positive value of R = 0, 0032 the relation between variables is closer to zero value and the value of R2, coefficient of determination is 0. Whereas CMJ correlation between the two groups in the time value of R = -, 1168 even though technically it is a negative correlation relationship between variables is weak, closer to zero value. The value of R2, the coefficient of determination, is 0.0136. From what we see in Table 1 the experimental group had a significant increase compared to the control group. According to C.BOSCO the difference between CMJ and SJ test proposed the assessment of "elastic qualities" of athletes in teams using the concept of "elasticity index" that comes from the differences of these tests. Good capacity using elastic energy corresponds to 8-10 cm. The difference between these two tests is called the index of fast power. And through the application of the formula (CMJ-SJ) x100 / CMJ (9) the coefficient of elasticity expressed in% is an indicator of the capacity

of the accumulated energy as a result of muscle elastic extension (eccentric contraction) that precedes muscle contraction (concentric contraction) showing the team values. CMJ and SJ jumps are necessary and whether these athletes do not demonstrate these features it means that they need a good exercise to develop the index of fast strength. This index shows the untapped elastic energy reserves of the muscles of young volleyball players compared to other previous studies.

Tab.2.General table of SJ&CMJ tests in "Leonardo" Platform of Fmax and Pmax

	Groups	SJ Pre and Post				CMJ Pre and Post			
		F max kN _ pre	F max kN _post	P max kW _pre	P max kW _post	F max kN _pre	F max kN _post	P max kW _ pre	P max kW _ post
10	Experiment	1.81	1.64	3.67	3.59	1.84	1.90	3.71	3.70
	SD	*0.2*	*0.2*	*0.5*	*0.4*	*0.4*	*0.3*	*0.5*	*0.4*
10	Control	1.58	1.60	3.52	3.57	1.51	1.75	3.32	3.71
	SD	*0.2*	*0.2*	*0.5*	*0.5*	*0.1*	*0.2*	*0.4*	*0.4*

DATA ANALYSIS

The data of Fmax and Pmax of the lower extremities in volleyball players were recorded by "Leonardo" Platform through an interconnected microcomputer. Participants used their maximum strength to jump the higher possible. During the execution of jumping the players remained on the platform of force used in the study. Two ANOVA factors of measurement were used to test the group's training differences and timing, before the test and after the test. The varieties of differences were jumping in height in force and maximum power. The alpha level was $p < 0.05$ for all comparisons. Therefore tests were used to assess differences in the max strength and the max power during 12 weeks of plyometric exercise training. Pearson system was used to calculate the differences in percentage of CMJ and SJ jumping tests in strength and force between the two groups. The correlation was value $R = 0.7806$ between Fmax and Pmax in SJ test and this shows that it is a strong positive correlation, which means that Fmax results are variable in the results of Pmax (and vice versa). The amount of $R2 = 0.6093$, determination coefficient. Whereas the correlation coefficient of Fmax and Pmax in CMJ test has technically a negative correlation with $r = -0.3063$, the relation between variables is closer to zero value. The value of the coefficient of determination is $R2 = 0.0938$.

Tab.3. General Table of 40cm Drop Jump Test in "Leonardo" Platform of Fmax&Pmax

Nr	Groups	Fmax kN		P max w/kg		Time Contact(TC)		Air Time(TA)s		TA/TC s	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
10	Experimenta	2.50	2.54	32.92	30.07	0.363	0.397	0.552	0.519	1.52	1.39
	SD	*0.7*	*0.4*	*6.02*	*6.4*	*0.08*	*0.1*	*0.03*	*0.04*	*0.3*	*0.3*
10	Control	2.44	3.12	27.05	33.63	0.419	0.328	0.499	0.512	1.24	1.69
	SD	*0.5*	*0.7*	*5.9*	*9.5*	*0.12*	*0.09*	*0.08*	*0.04*	*0.2*	*0.5*

DISCUSSION

DJ vertical jump is a training style prevalent to improve strength, power and speed. The result of this study showed that the experimental group has significantly improved the vertical jump in height compared to the control group. The improvement can be attributed to an increase in the production of the positive energy. Our result suggests that the CMJ and DJ training are equally effective to improve vertical jump skills. Bartholomew (10) also found that plyometric training isn't more effective than CMJ training to improve vertical jump skills. Anyway, we believe that CMJ tests are just as effective as DJ training in this regard.

Results of this study specify that the mechanism to improve the vertical jump skills must follow DJ training which belongs to the plyometric training. DJ training might increase the neuromuscular factors affecting the training peculiarities. As it is shown in Table 1 and 2, the groups presented in SJ and CMJ test improved only vertical jump in height and the production of positive energy in jumping. While the experimental group trained by plyometric exercises of 40cm DJ improved the jump in height and max strength and max power.

Our results support the hypothesis that DJ training is superior to the 12 weeks experimental training developed to the experimental group, quite different from the control group that did not develop in a programmed manner the exercises of the type of 40cm DJ plyometric test.

Most of the training studies didn't assess other variability that may be influenced by training programs. Adams (11) in 7 week training study measured the vertical jump skills through Sergeant jump and didn't assess the differences of positive energy or effects on the elastic energy. Brown et al. (12) in the 12 week study evaluated the subjects / persons with a

specific program but he presented only vertical jumps in height and did not discuss the differences in the positive energy or the effects of elastic energy.

CONCLUSION

The result of the current study showed that 12-week program evidentially improved the vertical jump in height and produced positive energy for both trained groups. The 12 week training of plyometric exercises resulted sufficient in these groups. Individual characteristics of the players' power, and observations of changes in the process of training, enables coaches to choose the correct loads and at the same time to improve their training. Plyometric training is related to the production of lower extremities' strength and is applicable to DJ test and players perform a greater power in "drop jump" than in "countermovement jump". Coaches need to include exercises that spend less time and at the same time help improve the players to jump, without including the risk of injury. "Drop Jumping" is thought to meet these requirements. Recommendations for the development of the vertical jump ability in volleyball: Coaches should (a) include plyometric exercises in the annual training program (b) and the vertical jumping performance should be tested throughout the semester.

REFERENCES

1. Bosco, C., Komi,P.(1981) Prestretch potentiation of human skeletal muscle during ballistic movement.Acta Physiol. Scand. 111:135-140.
2. 10. Bartholomew, S.A.(1985). Plyometric and vertical jump training. Unpub-lishedmasters thesis, UNC Chapel Hill,
3. 11. Adams, T. (1984).An investigation of selected plyometric training exercises on muscular leg strength and power. Track Field Qnar.Rear. 84(1):36-41.
4. 12. Brown, M.,1. Mayhew, and L. Boleach. (1986).Effect of plyometric train ing on vertical jump performance in high school basketball players. J. Sports Mcd. Phys. Fitn. 26(1):1-4.
5. Komi, P.V., and C. Bosco. (1978)Utilization of stored elastic energy in leg extensor muscles by men and women. Med. Sci. Sports 10: 261-265..
6. Sheppard, Jeremy M. & Chapman, Dale W.& Gough, Clare Mc Guigan, Michael R. & Newton Robert U. (2009) Twelve-month training-induced changes in elite international volleyball players. Journal Strength Cond Res2009*volum 23nr 7 pg 2096—2101 JSC. 0b013e3181b86d98
7. Blattner, S.E., and L. Noble.(1979) Relative effects of isokinetic and plyometric training on vertical jumping performance. Res. Quar. 50: 583-588..
8. Clutch, D., M. Wilton, C. McGown, and G.R. Bryce. (1983).The effect of depth jumps and weight training on leg strength and vertical jump. Res. Q. Exerc. Sport 54:5-10.
9. Gilles Cometti, Dominique Cometti.(2009). "La Pliometria (origini, teorie, allenamento)2a edizioneitaliana Capitolo V; I TEST. Test di Bosco fq60-78.
10. MarioMarell-Monica Risalti. (2007).Il librodeiTest,Le prove di valutazionefisica per tuttigli sport;pg 80-85.
11. CarmeloBoscoPh.D.(2006) "Laforza muscolare"-Aspetti Fisiologici ed Applicazioni Pratiche"(Rome 2006) Capitolo IV, La ForzaEsplosiva fq103-110.
12. Bosco C., (1985)Elasticita muscolare e forza esplosiva nelle attivita fisico sportive, Societa Stampa Sportiva Roma.