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Effects of the Combination of Plyometric and Specific Training with Skill Training in the Development of Anaerobic Capacity, Leg Explosive Power and Over All Playing Ability of the Volleyball Players

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Abstract

The purpose of the study was to find out the effects of the combination of plyometric and specific training with skill training in the development of anaerobic capacity, leg explosive power and over all playing ability of school level volleyball players. Eighty volleyball players from the various schools of Dakshina Kannada in Karnataka were selected as subjects and their age ranged from 14 to 17 years. The subjects were divided into four equal groups. The first group underwent plyometric and specific training with skill training (n=20), the second group underwent plyometric training with skill training (n=20), the third group underwent skill training (n=20) and the fourth group acted as the control group they did not practice any specific training. The selected variables were assessed by the anaerobic capacity (Margariakalamen test), leg explosive power (vertical jump test) and over all playing ability (judges rating test) conducted before and after the 12 weeks of training regimen. The data was analyzed by the analysis of co-variance. The plyometric and specific training with skill training group showed greater improvement in the anaerobic capacity, leg explosive power and overall playing ability than the other three groups of the plyometric training with skill training group, skill training group and control group.

Keywords: Anaerobic capacity, Leg explosive power, Overall playing ability, Plyometric training, Specific training and Skill training.

Introduction

Plyometric training is considered to be more effectively used to improve performance in a wide variety of track and field events. Plyometric training may also have a long lasting influence which can be performed on wooden boxes, resilient surface with only body weight, medicine ball for upper body and legs. It includes bounce, hops, jumps, leaps, skips and ricochets that significantly improve speed, explosive strength and anaerobic power (David. W. Thomas, 1988). A well-structured volley ball training program requires the explosive power, vertical jump height, stamina, speed and agility in the court. Skill training such as practicing spikes, will not develop the physical traits which necessary to play with athlete's full potential(Gabbett T et al 2006) Power in the legs is needed to jump explosively in the ground to spike, block, set and dive (Smith DJ 1992, Fleck SJ, 1985). Several studies used the plyometric training and have shown the improvement power output and increases explosiveness (Adams, et. al., 2000) by training the muscles to do more work in a shorter time (Holcomba, 1996).Wallace BJ, et al,(2010).

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The purpose of the study was to identify the Quantification of vertical ground reaction forces of the popular bilateral plyometric exercises. To quantify the vertical ground reaction forces (VGRFs) developed during the performances of the popular bilateral plyometric movements. Fourteen powers oriented track and field men of collegiate and national level were randomly performed in the 3 trials of 9 different bilateral plyometric exercises in a single testing session. Three depth drops (DD) and3 depth jumps (DJ) conditions from 30, 60, and 90 cm heights DD30, DD60, and DD90 and DJ30, DJ60, and DJ90) were tested, in addition to the vertical jump (VJ), standing long jump (SLJ), and 2 consecutive jump (2CJ) conditions. Peak impact VGRFs were normalized to the body weight. Additionally, all the conditions were compared against the VJ in an intensity index. The SLJ condition resulted in a significantly higher peak VGRF than the 2CJ condition ($p <$ or $=$ 0.05). 90DD, 90DJ, 60DD, and SLJ significantly had a greater peak VGRF (5.39, 4.93, 4.30, and 4.22 time's body weight, respectively) than the VJ condition (3.34times body weight). The 30DJ condition insignificantly had an smaller peak VGRF (2.78 times body weight) when compared with the VJ. Practitioners may use these findings to more 39 effectively progress athletes in these movements based on their intensities. On each skip, lift the upper leg as high as possible

(Beginners Guide to plyometrics-Art of manliness 21 may 2010, Retrieved 11 April 2014).

Methodology

Randomly eighty school level volleyball male players from various schools representing inter school level tournaments were selected as subjects for the study from Dakshina Kannada district, Karnataka. The subjects were divided into four equal groups. The first group (n=20, plyometric and specific training with skill training group) performed the plyometric and specific training with skill training, the second group (n=20, plyometric training with skill training group) performed the plyometric training with skill training, the third group (n=20, skill training group) performed the skill training alone, and the fourth group (n=20, control group) they did not perform any training. The variables such as anaerobic capacity was measured by the Margaria kalamen test, the leg explosive power was measured by the vertical jump test and the overall playing ability was measured by judges rating test. The test was occurred before and after 12 weeks regimen.

Analysis of the data and result of the study

A paired sample of student's t-test was used to determine the significance of the mean differences between the Pre-test and Post-test values of a variable in the same group. Analysis of variance (ANOVA) was used to know the significant differences among the groups. Statistical significance was accepted as $p \leq 0.05$ level of confidence.

Table I. Results of t-test between the Pre-test and Post-test of the plyometric and specific training with skill training group

Variables	Pretest		Posttest		S_{Ed}	MD	t-value
	Mean	SD	Mean	SD			
Anaerobic capacity	1237.77	181.93	1774.24	255.74	70.18	536.47	7.64*
Leg explosive power	33.30	2.08	40.60	2.54	0.73	7.30	10.00*
Overall Playing ability	4.60	0.59	6.66	0.65	0.20	2.06	10.30*

From the results of the above table, it can be seen that, the Pre-test and Post-test differ statistically in the anaerobic capacity, leg explosive power and overall playing ability scores (t=7.64*, 10.00*, 10.30*, $p \leq 0.05$) greater than the table value 2.093at 95% level and it was significant.

Table II. Results of t-test between the Pre-test and Post-test of the plyometric training with skill training group

Variables	Pretest		Posttest		S_{Ed}	MD	t-value
	Mean	SD	Mean	SD			
Anaerobic capacity	1158.16	207.93	1744.06	285.93	79.05	585.90	7.41*
Leg explosive power	33.65	1.85	38.45	2.31	0.66	4.80	7.27*
Overall Playing ability	4.41	0.49	5.10	0.56	0.17	1.69	9.94*

From the results of the above table, it can be seen that, the Pre-test and Post-test differ statistically in the anaerobic capacity, leg explosive power and overall playing ability scores (t=7.41*, 7.27*, 9.94*, $p \leq 0.05$) greater than the table value 2.093at 95% level and it was significant.

Table III. Result of t-test between the Pre-test and Post-test of skill training group

Variables	Pre-test		Post-test		S_{Ed}	MD	t-value
	Mean	SD	Mean	SD			
Anaerobic capacity	1189.88	294.95	1726.29	294.49	93.20	536.41	5.76*
Leg explosive power	33.15	2.03	37.00	2.46	0.71	3.85	5.42*
Overall Playing ability	4.56	0.51	6.23	0.63	0.18	1.67	9.28*

From the results of the above table, it can be seen that, the Pre-test and Post-test differ statistically in the anaerobic capacity, leg explosive power and overall playing ability scores (t=5.76*,5.42*, 9.28*, $p \leq 0.05$) greater than the table value 2.093 at 95% level and it was significant.

Table IV. Result of t-test between the Pre-test and Post-test of control group

Variables	Pre-test		Post-test		S_{Ed}	MD	t-value
	Mean	SD					
Anaerobic capacity	1140	189.30	1150.19	205.57	62.49	10.19	0.16
Leg explosive power	32.70	1.82	33.25	2.19	0.64	0.55	0.86
Overall Playing ability	4.35	0.42	4.51	0.76	0.19	0.16	0.84

From the results of the above table, it can be seen that, the Pre-test and Post-test do not differ statistically in the anaerobic capacity, leg explosive power and overall playing ability scores (t=0.16, 0.86, 0.84, $p \leq 0.05$) lower than the table value 2.093 at 95% level and it was not significant. It means that, the pretest value was equal to posttest value.

Table V. Results of test of the four groups (plyometric and specific training with skill training group, plyometric training with skill training group, skill training group and control group) at the school level volleyball male players in respect of anaerobic scores

	Source of variation	Degrees of freedom	Sum of squares	Mean sum of squares	F-value
Pre-test	Between groups	3	110074.05	36691.35	0.70
	Within groups	76	3983250.09	52411.19	
Post-test	Between groups	3	5387684.98	1795894.99	24.71*
	Within groups	76	5522898.64	72669.72	

Table IV shows that the Pre-test means of anaerobic capacity for the plyometric and specific training with skill training group, plyometric training with skill training group, skill training group and control groups were 1237.77+ 181.93,1158.16+ 207.93, 1189.88+ 294.95 and 1140+ 189.30 respectively. The obtained F ratio value of 0.70 for Pre-test scores of four groups on the anaerobic capacity was less than the required table value 2.73 hence it was not significant. The Post-test means of anaerobic capacity for the plyometric and specific training with skill training group, plyometric training with skill training group skill training group and control groups were 1774.24+ 255.74, 1744.06+ 285.93, 1726.29+ 294.49and1150.19+ 205.57 respectively. The obtained F ratio value of 24.71* in the Post-test scores of four groups on anaerobic capacity was greater than the required table value 2.73 was significant with df 3 and 76 at 0.05 level of confidence.

Table V. Results of test of the four groups (plyometric and specific training with skill training group, plyometric training with skill training group, skill training group and control group) at the school level volleyball male players of respect to leg explosive power scores

	Source of variation	Degrees of freedom	Sum of squares	Mean sum of squares	F-value
Pre-test	Between groups	3	9.20	3.07	0.77
	Within groups	76	303.32	3.99	
Post-test	Between groups	3	574.06	191.35	32.16*
	Within groups	76	452.47	5.95	

Table V shows that the Pre-test means of leg explosive power for the plyometric and specific training with skill training group, plyometric training with skill training group, skill training group and control groups were 33.30+ 2.08,33.65+ 1.85,33.15+ 2.03 and 32.70+ 1.82 respectively. The obtained F ratio value of 0.77 in the Pre-test scores of four groups in the leg explosive power was less than the required table value 2.73, hence it was not significant. The Post-test means of leg explosive power for the plyometric and specific training with skill training group, plyometric training with skill training group, skill training group and control groups

were 40.60+ 2.54,38.45+ 2.31,37.00+ 2.46 and 33.25+ 2.19 respectively. The obtained F ratio value of 32.16* in the Post-test scores of four groups was greater than the required table value 2.73 was significant with df 3 and 76 at 0.05 leg explosive power level of confidence.

Table VI. Results of test of the four groups (plyometric and specific training with skill training group, plyometric training with skill training group, skill training group and control group) at the school level volleyball male players in respect of overall playing ability scores

	Source of variation	Degrees of freedom	Sum of squares	Mean sum of squares	F-value
Pre-test	Between groups	3	0.86	0.28	1.04
	Within groups	76	20.52	0.27	
Post-test	Between groups	3	59.13	19.71	43.80*
	Within groups	76	34.20	0.45	

Table VI shows that the Pre-test means of overall playing ability for the plyometric and specific training with skill training group, plyometric training with skill training group, skill training group and control groups were 4.60+ 0.594.41+ 0.49,4.56 + 0.51 and 4.35+ 0.42 respectively. The obtained F ratio value of 1.04 in the Pre-test scores of four groups in the overall playing ability was less than the required table value 2.73, hence it was not significant. The Post-test means of overall playing ability for the plyometric and specific training with skill training group, the plyometric training with skill training group, skill training group and control groups were 6.66+ 0.65,5.10+ 0.56,6.23 + 0.63 and 4.51+ 0.76 respectively. The obtained F ratio value of 43.80 in the Post-test scores of four groups on overall playing ability was greater than the required table value 2.73 was significant with df 3 and 76 at 0.05 level of confidence.

Discussion

The statistical analysis of significance of the means gains or losses made in three experimental groups namely Plyometric and Specific training with Skill training, Plyometric training with Skill training and Skill training groups were significantly ($p>0.05$) improved in performance variables such as Leg explosive power, Anaerobic power. The statistical analysis of significance of the means gains or losses made in three experimental groups namely Plyometric and Specific training with Skill training, Plyometric training with Skill training and Skill training groups were significantly ($p>0.05$) improved in skill performance variables such as Over all playing ability. The statistical analysis of significance of the means gains or losses made in Control group were not significantly ($p>0.05$) improved in performance variables and Skill performance variables of the school level male volleyball players.

Conclusion

1. The study found the effects of the plyometric and specific training with skill training group, the plyometric training with skill training and the skill training groups were effective in the development of the anaerobic capacity, leg explosive power and overall playing ability of volleyball players.
2. The plyometric and specific training with skill training group performed significantly better than the plyometric training with skill training group, the skill training group and the control group in the anaerobic capacity, leg explosive power and overall playing ability.
3. The plyometric training with skill training group performed significantly better than the skill training group and the control group in the anaerobic capacity, leg explosive power and overall playing ability.
4. The Skill training group performed significantly better than the control group in anaerobic capacity, leg explosive power and overall playing ability.

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