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Impacts of Twelve Weeks Resistance Training and Sprinting After Resistance Training on Maximum Speed Maximum Leg Power and Elastic Leg Strength of Basketball Players

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Abstract: ***This study was designed to determine impacts of twelve weeks resistance training andsprinting after resistance on maximum speed maximum leg power and elastic leg strength of male basketball players. To achieve the purpose of the study forty five basketball players were selected affiliated colleges from Bharathiar University, Coimbatore. Their age ranged between 19and 25 years. The subjects were divided into three equal groups. The group I was considered as resistance training group (RTG n=15) group II was considered as sprinting after resistance training group(SARTG n=15) and group III was considered as control group (CG n=15). Basketball players were assessed before and after12 weeks training period on maximum speed, maximum leg power and elastic leg strength, maximum speed was measured by 40 meters test, maximum leg power was measured by 1Rm squat test and elastic leg strength was measured by 25m hop test. The data statistically analyzed with't' ratio to find out significant improvement of pre test and post test of each variables and analysis of covariance (ANCOVA) was used to determine whether difference existed between groups in the changes in each variables from the baseline to the post test at 0.05 level of confidence. The results reveal that the 12 weeks resistance training and sprinting after resistance training programme significantly improved the maximum speed, maximum leg power and elastic leg strength of basketball players, Resistance training group performed better maximum leg power compared with SARTG and sprinting after resistance training performed maximum speed and leg elastic strength better than 12 weeks RT.***

Keywords: Resistance, Resistance with Sprint, Maximum speed, maximum leg power and Elastic leg strength.

1. Introduction

In Basketballthe ability to generate maximum strength levels in the shortest period of time (muscular power) has been considered as essential to obtain high sport performance level **(Hedric, A. 1993).** Moreover, strength training is part of basketball preseason programs with a backgroundof related benefits that improve sports performance, reduce injury rate and provide higher motivation level for the athletes **(NBCCA 1997).** Two methods, resistance and sprint training are usually referred in the literature as improving the most powerful strength characteristics (explosive strength) in basketball players.

Speed and sprint is the ability to reach a high velocity of movement in whatever mode locomotion – running, cycling, skating, swimming etc. Another element of fitness closely related to speed training is speed endurance. Many athletes must maintain a high velocity for longer than 6 seconds or produce repeated sprints with minimal rest period. But regardless of the event, there are several modes of training that are integral to developing a fast athlete. **(T.K.Narasimham, 2009)**

Resistanceis the ability to exert maximal force is commonly referred to as the strength of the muscles that control particular body movements. However, the muscles may perform maximal effort as either isometric, concentric, or eccentric actions and the two dynamic actions may be performed at a wide range of velocities. An infinite number of values for the strength of muscle may be obtained with an isolated muscle preparation or for a human movement as related to the type of action, the velocity of the action and the length of the muscle. **(P.V.Komi, 1991)**

2. Methodology

To achieve the purpose of the study forty five basketball players were selected from affiliated colleges of Bharathiar University, Coimbatore. Their age ranged between 19and 25 years. The subjects were divided into three equal groups. The group I underwent resistance training (RTG=15) group II underwent sprinting after resistance training group (SARTG=15) and group III control group was not given any exercise (CG=15). Basketball players were assessed before and after 12 weeks training period on maximum speed, maximum leg power and elastic leg strength, maximum speed was measured by 40 meters test, maximum leg power was measured by 1Rm squat test and elastic leg strength was measured by 25m hop test.

3. Training Protocols

The training protocols include only leg exercise. General warm up and warm down was performed prior to each training session. All training group performed three days per week for the period of 12 weeks. Lower extremities training designed to leg muscles involved in the resistance exercises and sprint movement.Resistance training likeleg press, squat, leg extension and calf raise exercises The training consisted of 2-4 sets of weigh training for 4 stations and at an intensity corresponding to 60 -90 percentage of 1Rm in each station by 6-12 repetitions for 8 weeks. The sprinting after resistance training groupwas fixedlow intensity resistance training with repeated 40 m sprint running with different intensities and duration from week to week for 90 second recovery between repletion and 10 min recovery between sets.

4. Statistical Technique

The collected data on maximum speed, maximum leg power and elastic leg strength statistically analyzed with 't' ratio to find out significant improvement of pre test and post test of each variables, analysis of variance (ANCOVA) was used to determine whether difference existed between groups in the changes in each variables from the baseline to the post test and Scheffee's post hoc test was applied to test the significant difference between the paired adjusted means at 0.05 level of confidence.

5. Analysis of Data and Results of the Study

The result between the pre and post test for maximum speed, maximum leg power and elastic leg strength scores in both groups and result between groups at baseline and after the training program are presented in tables.

Table 1: Computation of 't' ratio between pre test and post test means on maximum speed, maximum leg power and elastic leg strength of resistance, sprinting after resistance and control group of basketball players

S. No	*Variables*	*Pre test Mean*	*Pre test S.D*	*Post test Mean*	*Post test S.D*	*'t' ratio*
Resistance Training Group						
1.	Maximum speed	6.27	0.15	5.86	0.17	7.31*
2.	Maximum power	88.66	11.68	112.40	7.21	6.74*
3.	Elastic leg strength	6.80	0.85	5.69	0.27	5.46*
Resistance With Sprint Training Group						
1.	Maximum speed	6.26	0.18	5.80	0.18	13.85*
2.	Maximum leg power	90.00	11.64	104.30	5.56	4.12*
3.	Elastic leg strength	6.85	0.85	5.24	0.14	7.23*
Control Group						
1.	Maximum speed	6.26	0.13	6.25	0.14	0.29
2.	Maximum leg power	89.66	12.42	91.33	10.93	0.40
3.	Elastic leg strength	6.81	0.63	6.84	0.78	0.20

Significant at 0.05 level (2.14) Table value 1.76

Table I shows that the obtained 't' ratios on maximum speed, maximum leg power and elastic leg strength of resistance training group were 7.31, 6.74, and 5.46respectively. Since the values were higher than the required table value of 1.76, it was found to be statistically significant at 0.05 level of confidence for degrees of freedom 1 and 14.

The obtained 't' ratios on maximum speed, maximum leg power and elastic leg strength of sprinting after resistance training group were 13.85, 4.12 and 7.23 respectively. Since the values were higher than the required table value of 1.76, it was found to be statistically significant at 0.05 level of confidence for degrees of freedom 1 and 14.

Further, it was the obtained 't' ratio on maximum speed, maximum leg power and elastic leg strength of control group were 0.29, 0.40 and 0.02 respectively. Since the values were lower than the required table value of 1.76, it was found to be not statistically significant at 0.05 level of confidence for degrees of freedom 1 and 14.

From the result it was inferred that maximum speed, maximum power and elastic leg strength produced significantly improved due to the influence of 12 weeks resistance training and sprinting after resistance training for basketball players.

Table 4: Analysis of covariance on pre, post and adjusted post test means of resistance training group, sprinting after resistance training group and control group

Maximum Speed								
Test	RTG	SARTG	CG	Source of variance	df	Sum of squares	Mean square	F-ratio
Pre-test mean	6.27	6.26	6.26	B .G	2	0.00	0.00	0.03
				W .G	42	1.10	0.02	
Post-test mean	5.86	5.80	6.25	B .G	2	1.72	0.86	29.75*
				W .G	42	1.22	0.02	
Adjusted post-test mean	5.86	5.81	6.25	B .G	2	1.74	0.87	37.01*
				W .G	41	0.96	0.02	
Maximum Leg Power								
Pre-test mean	88.66	90.00	89.66	B .G	2	14.44	7.22	0.05
				W .G	42	5971.66	142.18	
Post-test mean	112.40	104.30	91.33	B .G	2	3387.74	1693.87	25.10*
				W .G	42	2834.33	67.48	
Adjusted post-test mean	112.4	104.3	91.33	B .G	2	3387.66	1693.83	24.50*
				W.G	41	2833.57	69.17	
Elastic Leg Strength								
Pre-test mean	6.80	6.85	6.81	B .G	2	0.02	0.01	0.01
				W .G	42	26.32	0.62	
Post-test mean	5.69	5.24	6.84	B .G	2	20.42	10.21	43.44*
				W .G	42	9.87	0.23	
Adjusted post-test mean	5.69	5.24	6.84	B .G	2	20.59	10.29	50.29*
				W .G	41	8.39	0.20	

The obtained 'F' ratio for the pre test means of RTG, SARTGand CG on maximum speed was 0.03. Since, the 'F' value was less than the required table value of 2.70,it was found to be not significant. Further,the 'F' ratio for post test means of RTG, SARTGand CG on maximum speed was 29.75. Since, the 'F' value was higher than the required table value of 2.70, for the degrees of freedom 2 and 42, it was found to be statistically and 'F' ratio for the adjusted post test means of RTG, SARTGand CG on maximum speed was 37.01 Since, the 'F' value was higher than the required table value of 2.70 for the degrees of freedom 2 and 41, it was found to be statistically significant at 0.05 level of confidence.

The results revealed that there was a significant difference in post-test means among RTG, SARTGand CG on maximum speed of basketball players.

The obtained 'F' ratio for the pre test means of RTG, SARTGand CG on maximum power was 0.05. Since, the 'F' value was less than the required table value of 2.70,it was found to be not significant. Further,the 'F' ratio for post test means of RTG, SARTGand CG on maximum power was 25.10. Since, the 'F' value was higher than the required table value of 2.70, for the degrees of freedom 2 and 42, it was found to be statistically significant at 0.05 level of confidence and 'F' ratio for the adjusted post test means of RTG, SARTGand CG on maximum power was 24.50 Since, the 'F' value was higher than the required table value of 2.70 for the degrees of freedom 2 and 41, it was found to be statistically significant at 0.05 level of confidence. The results revealed that there was a significant difference in post-test means among RTG, SARTGand CG on maximum power of basketball players.

The obtained 'F' ratio for the pre test means of RTG, SARTGand CG on elastic leg strength was 0.01. Since, the 'F' value was less than the required table value of 2.70, it was found to be not significant. Further,the 'F' ratio for post test means of RTG, SARTGand CG on elastic leg strength was 17.69. Since, the 'F' value was higher than the required table value of 2.70 for the degrees of freedom 2.42, it was found to be statistically significant at 0.05 level of confidence and 'F' ratio for the adjusted post test means of RTG, SARTGand CG on leg elastic strength was 18.29 Since, the 'F' value was higher than the required table value of 2.70 for the degrees of freedom 2 and 41, it was found to be statistically significant at 0.05 level of confidence.

The results revealed that there was a significant difference in post-test means among RTG, SARTGand CG on elastic leg strength of basketball players.

Table 3: Scheffee's post hoc test for the differences between the paired adjusted post-test means of maximum speed, maximum power and leg elastic strength

(RTG)	(SARTG)	(CG)	Mean difference	Confidence Interval
Maximum Speed				
5.86	5.81		0.05	0.10
5.86		6.25	0.39	
	5.81	6.25	0.44	
Maximum Power				
112.4	104.3		8.1	6.09
112.4		91.33	21.07	
	104.3	91.33	12.97	
Elastic Leg Power				
5.69	5.24		0.45	0.33
5.69		6.84	1.15	
	5.24	6.84	1.60	

*Significant at 0.05 level.

Table III revealed that the mean differences between the paired adjusted post test means of all groups.

The mean difference on maximum speed between RTG and CG, SARTG and CG were 0.39and 0.44 respectively. The values of mean difference of adjusted post test means were higher than that of the required confidence interval value of 0.10 and it was found to be significant. Thus, the mean differences of paired adjusted post test means between RTG and SARTG (0.05) was less than the required confidence interval value, it was found to be not significant at 0.05 level of confidence.

From these results it was inferred that SARTG produced significant improvement in maximum speed of basketball players than RTG training and CG groups.

The mean difference on maximum power between RTG and SARTG, RTG and CG, SARTG and CG were 8.1, 21.07 and 12.97 respectively. The values of mean difference of adjusted post test means were higher than that of the required confidence interval value of 6.09 and it was found to be significant at 0.05 level of confidence.
From these results it was inferred that RTG produced significant improvement in maximum power of basketball players than SARTG training and CG groups.

The mean difference on elastic leg strenght between RTG and SARTG, RTG and CG, SARTG and CG were 0.45, 1.15 and 1.60 respectively. The values of mean difference of adjusted post test means were higher than that of the required confidence interval value of 0.33 and it was found to be significant at 0.05 level of confidence. From these results it was inferred that SARTG produced significant improvement in elastic leg strength of basketball players than RTG training and CG groups.

6. Discussion on Findings

In this study the subjects who underwent 12 weeks resistance training and sprinting after resistance training were able to improve maximum speed, maximum power and elastic leg strength of basketball player on t – test. Therefore, it found a positive relationship between this

training and maximum speed, maximum power and elastic leg strength.

Inspection of the data in this study demonstrates that there are clear technical difference between resistance training group and sprinting after resistance training group on maximum speed, maximum power and elastic leg strength. The result shows that the resistance training group (RTG) produced significant improvement over maximum power than sprinting after resistance training group (SARTG) and sprinting after resistance training group produced significant improvement over maximum speed and leg elastic power than resistance training goup(RTG)

The finding of the study correlated with the study carried out by **Konstantinos***et al.*,**(2010)**10-week heavy resistance combined with a running training program improved running speed (RS), and vertical jump performance of young basketball players.

The combined resistance and running-speed program provides better results than the conventional resistance training, regarding the power performance of soccer players. **Kotzamanidis***et al.*,**(2005)**

Progressive strength and sprint training improved maximal isometric and dynamic leg strength, explosive jump performance and force production running in elite master sprinters. **Cristea***et al.*, **(2008).**

Resistance-training interventions can improve muscular power and motor performance skills, such as jumping, are widely stated as indicators of improvements in sporting performance in adolescent athletes. **Simon** *et al.*,**(2012)**

7 weeks of high- and low-velocity resistance training improved strength and sprint running performance of male elite junior sprint runners. **Blazevich and Jenkins (2002)**

The results of the present study indicate that the resistance training and sprinting after resistance training programme is effective method to improve maximum speed, maximum power and leg elastic power of men basketball players.

7. Conclusion

Based on the results of the study the following conclusions have been arrived.

a. It was concluded that 12 week resistance training and sprinting after resistance training produced significant improvement on maximum speed, maximum power and leg elastic strength of men basketball players.
b. Resistance training was found to be better than sprinting after resistance training to produce significant changes in maximum power of men basketball players.
c. Sprinting after resistance training was found to be better than resistance training produce significant changes in maximum speed and elastic leg strength of men basketball players.

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