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Effect of Resisted Sprint versus Plyometric Training on Leg Strength of Male Sprinters

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Abstract

The purpose of the study was to find out the effect of resisted sprint (RS) versus plyometric training (PT) on the leg strength of male sprinters. To achieve the purpose of the study the researcher selected thirty intercollegiate level male sprinters as subjects. They were divided into three equal groups of ten sprinters. Group-I performed RS training (n = 10), Group-II performed PT (n = 10), and Group-III acted as control (n = 10). The age of the selected subjects was ranged from 18 to 22 years. The statistical procedure was "*t*-test" and percentage changes were used Further, analysis of covariance (ANCOVA) was used to determine the significant difference existing between pretest and posttest on stride frequency. When the obtained "F ratio" value in the ANCOVA test was significant the Scheffe's test was applied as a post hoc test to determine the paired mean differences if any. The results showed that twelve weeks of RS and PT considerably improved the leg strength of the male sprinters, whereas PT was significantly better than RS training. The result produced a 3.71% percentage of changes in leg strength due to RS training and 7.44% of changes due to PT.

Keywords: Leg strength, Plyometric training, Resisted sprint, Sprinters

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Introduction

Resisted sprint (RS) pulling has become a standard training method for many sports teams and athletes. This can involve an athlete towing a weighted sled, tire, speed parachute, or some other device over a set distance.[1] It has been said that such techniques will increase muscular force output, particularly at the ankle, knee, and hip leading to a possible increase in stride length over time. Speed and strength are integral components of fitness found in varying degrees in virtually all athletic movements. Just put the combination of speed and strength as power.[2] For a lot of years, coaches and athletes have been required to develop the power to increase performance. During this era and no doubt long before, jumping, bounding, and hopping exercises have been used in different methods to develop athletic performance.[3] In recent years, this different method of training for power or explosiveness has been termed plyometric. Plyometric training (PT) is a type of exercise made to produce fast, powerful movements, and improve the functions of the nervous system, normally to improve performance in sports.[4] PT is used to develop the speed or power of muscular contractions, providing explosiveness for different sport-particular activities. PT has been revealed across the literature to be helpful to a variety of athletes.[5] Benefits collection from injury avoidance, power improvement, and enhancement in sprint performance. Explosive power is defined as the rate of expenditure of energy. The muscles or group of muscles can overcome resistance with maximum speed and effort. Explosive power mainly depends on strong muscles. The abdominal and leg strength plays a vital role in the performance of jumpers.[6] To improve abdominal muscular strength and leg strength, jumping exercises play the main role. Explosive power denotes one of the most significant features of track and field. Only the enthusiastic aspect of substrate consumption denotes the biological basis as many. Truly, the most peculiar aspects for explosive power improvement must be made in neuromuscular properties.

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Methodology

The purpose of the study was to find out the effect of RS versus PT on the leg strength of male sprinters. To do the purpose of the study the investigator selected thirty intercollegiate level male sprinters as a research participants. The subjects were equally divided into three groups with ten subjects in each group. Performed RS training as Group-I (n = 10), Performed PT as a Group-II (n = 10), and Group-III acted as control (n = 10). Their age ranged between 18 and 22 years. Leg strength was measured by leg press.

Experimental Design and Statistical Technique

Pre and post-test random group designs were used in this study involving thirty-six subjects. They were randomly divided into three equal groups of twelve subjects each. The data collected from the experimental and control groups on selected dependent variables were statistically analyzed by paired "*t*-test" to find out the significant differences if any between the pre and post-test.

Further, the percentage of changes was calculated to find out the changes in selected dependent variables due to the impact of experimental treatment.

All three group participants were selected from the same population. No effort was made to equate the groups before the commencement of the experimental treatment. Hence, to nullify the initial differences the data collected from the three groups before and post experimentation on selected dependent variables were statistically analyzed to find out the significant difference if any, by applying the ANCOVA. Since three groups were involved, whenever the obtained "F ratio" for adjusted post-test means was found to be significant, the Scheffe's test was applied as a post hoc test to determine the paired mean differences.[7] In all the cases, level of confidence was fixed at 0.05 for significance.

Training Protocol

The RS training group carried out the RS based on the Heart Rate Reserve (HRR), the intensity of load once in two weeks 5% of HRR increased. Reps. from 5 to 8 and the sets from 5 to 3. Plyometric jump training based on the foot counts of jumps, the intensity of load once in two weeks 5% increased of maximum no of jumps. Reps. from 5 to 8 and the sets from 5 to 3.

Results

The pre and post-test mean, standard deviation, and mean differences values on leg strength of the RS, PT, and control groups are given in Table 4. In addition, the data were statistically analyzed by paired "t-test" to discover the significant differences between the pre and post-test. The calculated "*t*" values of the RS (8.21) and PT (11.51) groups are better than the necessary table value (df 11 = 2.20) for significance (0.05 level). It exposed that considerable differences be present between the pre and post-test means of RS and PT groups on leg strength. The result produced a 3.71% percentage of changes in leg strength due to RS training, 7.44% of changes due to PT, and 1.21% of changes in the control group. The data (pre and post) collected from the RS, PT, and control groups on leg strength was analyzed using ANCOVA and the resultant outcomes are given in Table 2.

The adjusted means on leg strength of RS (64.53), PT (66.62), and control (61.35) groups result in the obtained "F" ratio value 33.14 which is greater than the necessary table value (df 2 and 32=3.30) for significance (0.05 level). Therefore, it is decided that major variation be present between the adjusted means of the RS, PT, and control groups on leg strength. As the attained "F" ratio value in the adjusted means of the RS, PT, and control groups were found significant, the *post hoc* (Scheffe's) test was applied to discover the paired mean difference, as given in Table 3.

Scheffe's test results established that considerable mean differences be present between RS and PT groups (2.09), RS and control groups (3.18), PT and control groups (5.27) on leg strength, because, these mean differences values are more than the confident interval value (1.68) for significance (0.05 level). It proved that due to RS and PT impact the leg strength of the male sprinters was considerably enhanced whereas PT is significantly better than RS training in developing leg strength of the male sprinters. The leg strength means (pre, post and adjusted) values of the RS, PT, and control group factions are graphically represented Figure 1.

Table 1: Descriptive analysis of data on leg strength of experimental and control groups

Group	*Test*	*Mean*	*Standard deviation*	*Mean difference*	*"t-ratio"*	*Percentage of changes*
RS	Pre	62.75	7.02	2.33	8.21*	3.71%
	Post	65.08	6.93			
Plyometric	Pre	61.58	5.60	4.58	11.51*	7.44%
	Post	66.17	5.02			
Control	Pre	62.00	4.99	0.75	1.01	1.21%
	Post	61.25	3.55			

Needed t-ratio value for degrees of freedom (DF) 11 =2.20 *Significant (0.05 level). RS: Resisted sprint

Table 2: Analysis of covariance result on leg strength of experimental and control groups

Adjusted means of groups			*Source of variance*	*Sum of squares*	*Df*	*Mean squares*	*"F-ratio"*
RS	*Plyometric*	*Control*					
64.53	66.62	61.35	B	169.35	2	84.675	33.14*
			W	81.764	32	2.555	

(Degrees of freedom 2 and 32 = 3.30). *Significant (0.05 level). RS: Resisted sprint

Table 3: Scheffe's test outcomes on leg strength of experimental and control groups

Adjusted means of groups			*Mean difference*	*Confidence interval*
RS	*Plyometric*	*Control*		
64.53	66.62		2.09*	1.68
64.53		61.35	3.18*	1.68
	66.62	61.35	5.27*	1.68

*Significant at .05 level. RS: Resisted sprint

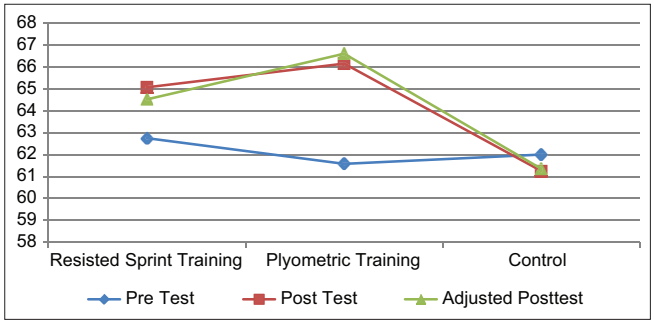

Figure 1: Diagram screening the mean values on leg strength of chosen groups

Discussion

The results of the study stated that twelve weeks of RS and PT considerably improved the leg strength of the male sprinters whereas PT was significantly better than RS training. The result produced a 3.71% percentage of changes in leg strength due to RS training and 7.44% of changes due to PT. Several studies reveal the effectiveness of plyometric compared to non-exercising control groups. Although various training methods, including heavy-resistance training explosive-type resistance training.[8] have been effectively used for the enhancement of vertical jump performance, most coaches and researchers seem to agree that PT is a method of selection when aiming to develop vertical jump ability and leg muscle power. Just one or two types of

plyometric exercises completed 1–3 times a week for 6–12 weeks can significantly improve motor performance. In addition, several studies on PT have demonstrated that a significant increase in vertical jump height of ~10% was accompanied by a similar increase in sport-specific jumping, sprinting, and distance-running performance.[9-11] Furthermore, consistent with previous studies found that plyometric exercises (bodyweight training) with depth jumping and rebound jumping characteristics are best used in developing muscle strength of the lower extremities.

Conclusion

The conclusion of the study stated that twelve weeks of RS and PT considerably improved the leg strength of the male sprinters, whereas PT was significantly better than RS training. The result produced a 3.71% percentage of changes in leg strength due to RS training and 7.44% of changes due to PT.

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