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Effect of resisted sprint versus plyometric training on stride frequency of male sprinters

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Abstract
The purpose of the study was to find out the effect of resisted sprint versus plyometric training on stride frequency of male sprinters. To achieve the purpose of the study the researcher selected thirty inter collegiate level male sprinters as subjects. They divided into three equal groups of ten sprinters. Group-I performed resisted sprint training (N=10), group-II performed plyometric training (N=10) and group-III acted as control (N=10). The age of the selected subjects were ranged from 18 to 22 years. The result of the study showed that resisted sprint versus plyometric training had improvements on stride frequency of sprinters. Among the training groups resisted sprint training had more improvement than the plyometric training group sprinters on stride frequency.

Keywords: Resisted sprint, plyometric and stride frequency

Introduction
Resisted sprint training involves wearing a harness over the shoulders or around the waist and a form of resistance is applied backwards as you propel yourself forwards. This can be in the form of a parachute, sled, bungee or a partner with a resistance band. The idea is that you need to overcome the inertia of your own body plus the external load from your method of resistance. Therefore, creating higher forces with each step than if you were unresisted. Research has shown mixed results with different methods but as a rule, resisted sprint training has been shown to improve an athlete's acceleration over the first 10-20m of a sprint when performed properly.

This external load creates a requirement for increased force production with each step to propel yourself and the additional load. When you take the harness off and sprint with no external load, you have the potential to produce the same forces during each step but the resistance will be lower, resulting in further distance travelled with foot contact. Let's look at the kinetics, mechanics, and kinematics, forces, of acceleration. Everybody has seen sprinters come out of the blocks with their head down and a huge knee drive. This is to increase the forward lean of the body from their foot all the way to their head. This forward lean puts their centre of mass in front of their base of support. Ehen they apply force into the ground behind them, their body is propelled forwards. As the athlete gains speed, their lower body will start to catch up to the upper body and the angle in relation to the ground will increase, creating a more upright position. This transition from a forward lean to an upright position happens when the athlete can no longer accelerate any faster. The upright position then is to maintain the speed created in the acceleration phase and apply force into the ground vertically to keep the body "up" at the given speed. The more power an athlete generates when pushing off against the ground, the faster they will propel themselves away from the ground. It's the key to sprinting (Prieske *et al*., 2018) [3].

Methodology
The purpose of the study was to find out the effect of resisted sprint versus plyometric training on stride frequency of male sprinters. To achieve the purpose of the study the researcher selected thirty inter collegiate level male sprinters as subjects. They divided into three equal groups of ten sprinters. Group-I performed resisted sprint training (N=10), group-II performed

plyometric training (N=10) and group-III acted as control (N=10). The age of the selected subjects were ranged from 18 to 22 years. Stride frequency was measured by the 50 m running. Analysis of covariance was used to determine the significantly difference existing between pretest and posttest on stride frequency. When the obtained ‘F’ ratio value in the analysis of covariance test was significant the Scheffe’s test was applied as post hoc test to determine the paired mean differences, if any.

Training protocol
The resisted sprint training group carried out the resisted sprint based on the HRR, intensity of load once in two weeks 5% of HRR increased. Repetitions from 5 to 8 and the sets from 5 – 3. Plyometric jump training based on the foot counts of jumps, intensity of load once in two weeks 5% increased of maximum no of jumps. Repetitions from 5 to 8 and the sets from 5 – 3.

Results

Table I: Ancova on stride frequency of resisted sprint and plyometric training groups

	Resisted Sprint	Plyometric	Control	SoV	Sum of Squares	df	Mean squares	‘F’ ratio
Pre-test Mean	3.74	3.75	3.68	B	0.26	2	0.13	1.08
SD	0.12	0.13	0.28	W	3.42	27	0.12	
Post-test Mean	4.21	4.02	3.75	B	1.09	2	0.55	14.68*
SD	0.04	0.17	0.29	W	1.01	27	0.037	
Adjusted Post-test Mean	4.21	4.02	3.74	B	1.11	2	0.55	46.87*
				W	0.30	26	0.012	

(The required table value for significance at 0.05 level of confidence with degrees of freedom 2 & 27 and 2 & 26 are 3.35 and 3.37 respectively)

The adjusted post test means on stride frequency of resisted sprint, plyometric training and control groups are 4.21, 4.02 and 3.74 respectively. The obtained ‘F’ ratio value of 46.87 for adjusted post test means on stride frequency of resisted sprint, plyometric training and control groups were higher than the required table value of 3.35 for the degrees of freedom 2 and 26 at 0.05 level of confidence. It is observed from this finding that significant differences exist among the adjusted post test means of experimental and control groups on stride frequency. Due to the resisted sprint, plyometric training the stride frequency of the subject’s is significantly improved. Since, the adjusted post test ‘F’ ratio value is found to be significant the Scheffe’s test is applied as post hoc test to determine the paired mean differences, and it is presented in table-II.

Table II: Scheffe’s Test for the difference between the adjusted post test paired means of stride frequency

Adjusted post-test means			DM	CI
Resisted sprint	Plyometric	Control group		
4.21	4.02		0.19*	0.12
4.21		3.74	0.47*	0.12
	4.02	3.74	0.28*	0.12

*significant

Table - II shows the Scheffe’s test results that there are significant differences between the adjusted post tests means of resisted sprint and plyometric training groups; resisted sprint training and control groups; plyometric training and control groups on stride frequency. Moreover resisted sprint training has more impact to increase on stride frequency of the sprinters.

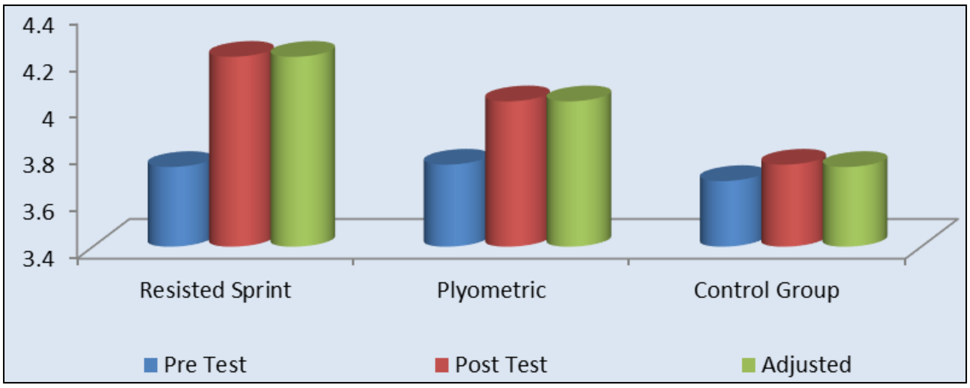

Fig I: Cylinder diagram on stride frequency resisted sprint, plyometric training and control groups

Discussion

The result of the study stated that the resisted sprint, plyometric training on stride frequency of the subject’s is significantly improved. The following studies are supporting the current result. Recent systematic reviews recommended that resistance and power training result in improvements in measures of sprint performances (Bolger *et al.*, 2015; Rumpf *et al.*, 2016) [1, 5]. In accordance with the principle of training specificity, resisted sprint training (RST) protocols have become popular training regimes to specifically improve sprint performance. More specifically, inclined surfaces, weight vests/belts, parachutes, sleds, and/or treadmills were introduced as adequate means to increase the load/ resistance during running (Zafeiridis *et al*., 2005; Paradisis and Cooke, 2006; Spinks *et al*., 2007) [6, 2, 4].

Conclusion

The conclusion of the study stated that the resisted sprint, plyometric training on stride frequency of the subject's is significantly improved. Moreover resisted sprint training has more impact to increase on stride frequency of the sprinters.

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