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ANALYSIS OF THE CHANGES ON SELECTED SPEED RELATED PARAMETERS IN RESPONSE TO ASSISTED AND RESISTED SPRINT TRAINING

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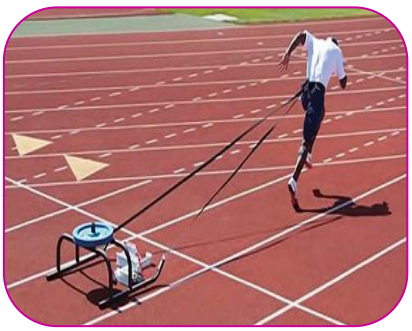
ABSTRACT



The purpose of this study was to examine the effect of sprinting under assisted and resisted conditions on selected speed related parameters. Forty five volunteer subjects were selected and they were divided into three equal groups of fifteen each. The first group concentrated exclusively on assisted sprint training and the second group utilized resisted sprint training and third group acted as control. The duration of the training programme was restricted to twelve weeks. The dependent variables selected were speed, stride length, stride frequency and acceleration and they were assessed by using standard tests and procedures. ANCOVA was used to find out the significant differences. Statistical analysis found significant improvement on selected speed related parameters due to the effect of assisted and resisted sprint training.

KEY WORDS : *Resisted sprint, assisted sprint, speed, stride length, stride frequency and acceleration.*

INTRODUCTION

Sprinting can be defined as the ability to run at maximum speed for a short duration. Maximum running speed is an important factor for success in many sports. Different modalities of training have been employed in the development of maximum running speed. Two commonly used forms of speed training are assisted and resisted sprinting. During assisted sprinting, the athlete runs while being pulled along by some type of device, often an elastic cord or a rope-and-pulley system. There are other forms of assisted running which are safer and less expensive, such as sprinting with the wind and sprinting downhill. Unfortunately, it is impossible to control either the velocity or availability of wind, and, therefore, this technique has major limitations. Further, since the wind velocity is never constant, it is hard to keep sprinters within the 10% window.

Downhill sprinting is a method of developing sprinting speed following the acceleration phase. A hill with a maximum of a 15° decline is most suitable. The athletes should run 40 meters to 60 meters to build up to full speed and then maintain the speed for a further 30 meters. A session could comprise of 2 to 3 sets of 3 to 6 repetitions. The difficulty with this method is to find a suitable hill with a safe surface.

Downhill sprinting provides a very good horizontal plyometric stimulus. As long as the slope is no greater than one percent, even inexperienced athletes can run with optimum sprinting mechanics. The elevation of the center of mass is greater at takeoff than it is at touchdown, and this means that the vertical distance through which the center of mass travels also increases. Thus, athletes sprinting down the hill experience greater vertical velocity. Because decline sprinting is an over speed stimulus in both a vertical sense as well as a horizontal sense, it places a great demand on the nervous system. It is a safe and reliable form of assisted training, provided that the grade remains low and that athletes stay within their 10% zone.

Resisted sprint training has been the basic training practice of some very successful sprinters. It is a common training method for improving sprint-specific strength. The bibliography, however, does not provide information on how much weight the athletes used as a resistance, or what distances they covered. The resistance sprint training helped the athlete to improve the starting phase and acceleration (Letrelter et al., 1994).

Different resisted speed strategies include, towing, uphill sprints, sand sprints, and weighted sprints. In fact, resisted towing can involve an athlete towing a weighted sled, tire, speed parachute, or some other device over a set distance (Faccioni, 1994). Various studies have demonstrated that the assisted and resisted sprint training can produce significant changes in running speed and running kinematics. However the longer-term training adaptations after assisted and resisted sprint training on speed parameters remain unclear. Hence, the investigator was much interested to conduct a study to compare the effect of different sprint training, such as assisted and resisted sprint training on speed related parameters.

METHODOLOGY

Subjects and Variables

Subjects were recruited from SCSVMV University, Kanchipuram, Tamilnadu state. Forty five male subjects volunteered to take part in the study. Once the study had been explained to the subjects, signed consent was obtained. The selected subjects were randomly assigned into three equal groups of 15 subjects each. The experimental group-I underwent assisted sprint training and experimental group-II underwent resisted sprint training and group-III acted as control. The selected dependent variables such as speed, stride length, stride frequency and acceleration were assessed by using standard testing procedures.

Training protocol

The training programmes were scheduled for one session a day. During the training period the experimental groups underwent their respective training programme three days per week (alternate days) for twelve weeks. The first group concentrated exclusively on assisted sprint training and the second group utilized resisted sprint training. The assisted sprint training exercise included in this training programme was downhill running. The resisted sprint training exercises included in this training programme was weighted vest. More specifically, the training distance comprised of 30-50 meters and the initial intensity was fixed at 75% and it was increased once in two weeks by 5%. The subjects performed these runs at maximum relaxed speed with the specified intensity. Both groups performed the same volume, intensity and frequency of training.

Statistical Technique

The pre test data were collected prior to the training programme and post test data were collected immediately after the twelve week of assisted and resisted sprint training programmes from both the experimental groups and a control group. Analysis of covariance was used for statistical analysis to identify trends across the two conditions.

Results

The pre and post test data collected from the assisted and resisted sprint training groups on selected speed parameters were statistically analyzed and the results are presented below.

Table –I: Adjusted Posttest Mean on selected Speed related parameters of Experimental and Control Groups

Variable	Assisted Sprint Training	Resisted Sprint Training	Control Group	SoV	Sum of Squares	df	Mean squares	Obtained 'F' ratio
Speed	7.19	7.51	7.85	B	3.25	2	1.63	147.82*
				W	0.44	41	0.01	
Stride Length	1.77	1.68	1.57	B	1.06	2	0.53	6.63*
				W	3.29	41	0.08	
Stride Frequency	4.26	4.22	4.13	B	0.129	2	0.0645	54.17*
				W	0.048	41	0.0012	
\ Acceleration	3.65	3.74	3.94	B	0.682	2	0.341	42.62*
				W	0.329	41	0.008	

The required table value for significance at 0.05 level of confidence with degrees of freedom 2 and 41 is 3.23.

The result of this study shows that there was significant difference existing between experimental and control groups, since the obtained 'F' ratio on adjusted posttest means were 147.82, 6.63, 54.17 and 42.62 on speed, stride length, stride frequency and acceleration were greater than the required table value of 3.23 for given degrees of freedom at 0.05 level of confidence. Since, the adjusted posttest 'F' ratio value was found to be significant, Scheffe's post hoc test was applied to find out the paired mean difference, if any.

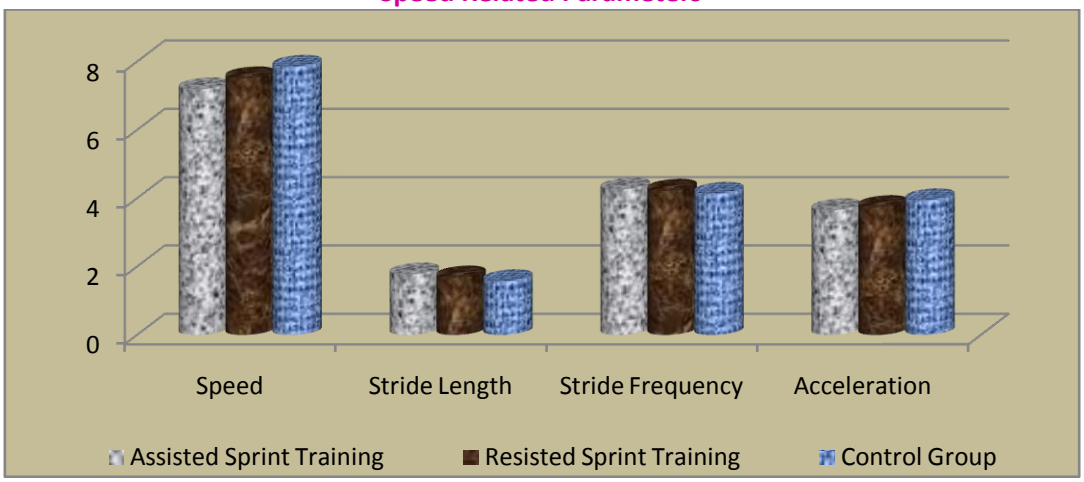
Table II: Scheffe's Post Hoc Test for Paired Mean Difference on Selected Speed Related Parameters

Variables	Adjusted Post Test Mean			Mean Differences	Confidence Interval
	Assisted Sprint Training	Resisted Sprint Training	Control Group		
Speed	7.19	7.51		0.32*	0.10
	7.19		7.85	0.66*	0.10
		7.51	7.85	0.34*	0.10
Stride Length	1.77	1.68		0.11*	0.06
	1.77		1.57	0.20*	0.06
		1.68	1.57	0.11*	0.06
Stride Frequency	4.26	4.22		0.04*	0.03
	4.26		4.13	0.13*	0.03
		4.22	4.13	0.09*	0.03
Acceleration	3.65	3.74		0.09*	0.08
	3.65		3.94	0.29*	0.08
		3.74	3.94	0.20*	0.08

**Significant at .05 level.*

Table-2 shows that both the training groups were significantly contributing to the improvement of selected speed related parameters, however assisted sprint training has better impact on speed, stride length, stride frequency and acceleration than that of the resisted sprint training.

Figure I: Bar Diagram Showing the Adjusted Post Test Mean Values of Assisted and Resisted Sprint Training and Control Groups on Selected Speed Related Parameters



DISCUSSION:

The results of the present study confirm the findings of previous research that found significant change in speed, stride length, stride frequency and acceleration during resisted sprinting and assisted sprinting. Studies have shown that downhill sprint training (Paradisis and Cooke, 2006) significantly increased acceleration and sprinting speed. Speeds above 106% of maximal lead to an increased stride length which in turn increases the braking phase of each ground contact, resulting in a slower rate of stride (Mero & Komi, 1987; Mero & Komi, 1990). Mero and Komi (1987) found that running at supramaximal speeds resulted in marked increases in horizontal and vertical force production during impact when compared to non-assisted values. These forces were due to an increase in distance from foot placement to centre of gravity as compared to unassisted speed running.

Letzelter et al., (1995) compared the movement characteristics shown in a 30 meters 'free sprint' with those shown in sled towing loads did not only produce slower times but also changed stride frequency and even more stride length. Zafeiridis et al., (2005) concluded that sprint training with 5 kg sled pulling for 8 weeks improves acceleration performance, while un-resisted sprint training improves performance in maximum speed phase in non-elite athletes. Knicker (1997) examined the effects of external resistance on sprinting mechanics and found that even small resistance loads could result in considerable changes in kinematics and coordination of muscular activity. Corn and Knudson (2003) found that towing with an elastic cord during the acceleration phase resulted in significant differences in running speed, stride length and touchdown distance of the contact foot between the free sprint and the assisted sprint.

CONCLUSION:

It is concluded from the result of the study that the speed related parameters can be developed by both assisted and resisted sprint training, however assisted sprint training was better than resisted sprint training. Hence, it is suggested that for long-lasting change, there needs to be a systematic administration of a sufficient stimulus, followed by an adaptation of the individual, and then the introduction of a new, progressively greater stimulus.

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