Original Article

ISSN: 2349 - 4891

International
Journal of Recent Research and Applied Studies
(Multidisciplinary Open Access Refereed e-Journal)

Analysis of the Changes in Stride Length and Stride Frequency in Response to Assisted and Resisted Sprint Training among Male Sprinters

Kantheti Bhanu Prasad[1] & Dr. I. Devi Vara Prasad[2]

[1]*Lecturer in Physical Education, Department of Physical Education, P.B.N. Degree College, Nidubrolu, Guntur District, Andhra Pradesh, India.*
[2]*Assistant Professor, Co-ordinator, B.P.Ed., Course, Acharya Nagarjuna University, Ongole Campus, Ongole, Andhra Pradesh, India.*

Received 12th September 2016, Accepted 10th October 2016

Abstract

The purpose of this study was to examine the effect of sprinting under assisted and resisted conditions on stride length and frequency among male sprinters. Forty five male sprinters 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 assisted sprint training exercises included in this training programme was downhill sprinting, assisted towing and high speed treadmill sprinting. The resisted sprint training exercises included in this training programme was weighted vest, sprint parachutes and harness running. The dependent variables selected were stride length and stride frequency and they were assessed by using standard tests and procedures. ANCOVA was used to find out the significant differences. Statistical analysis found significant improvement in stride length and stride frequency of male sprinters due to the effect of assisted and resisted sprint training.

Keywords: Assisted and Resisted sprint training, stride length, stride frequency.

Introduction

There are different methods of specific training programmes available for the development of sprinting speed to its maximum. But before giving training the coaches or physical education teachers should have clear understanding of the method of training to be given to the sports men concerned. Training programme should be designed to suit the specific energy sources needed for athletics, specific event or contest. Moreover, it is generally agreed among coaches and exercise physiologist that everybody does not respond to training in the same manner. There are certain anatomical and sex difference which favour both male and female for specific activities. Coaches and physical education teacher should also have an idea of factors influencing in the pre adolescent and adolescent period during the training period.

Assisted and resisted training are specific types of facilitation and overload. They are concepts that are widely used in other types of training such as whole body vibration (*facilitation*) and weight lifting (*overload*). Speed of movement can best be attained by practicing speed with lighter weight, where as improved strength can best be attained with a maximum overloading of a muscle. 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 (*or over speed*) 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.

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 resisted and un

Correspondence
Dr.I.Devi Vara Prasad
E-mail: idvprasadjyothsna@gmail.com,Ph.+9198857 99506

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 stride length and stride frequency.

Methodology

Subjects and Variables

Subjects were recruited from the various colleges affiliated to Acharya Nagarjuna University, Ongole Campus, Ongole, Andhra Pradesh, India. Forty five male sprinters volunteered to take part in the study (age 21.8 ± 1.6 years). Subjects were instructed in the use of the specific assisted and resisted sprint training devices to be used 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 stride length and stride frequency 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 in addition to their regular programme of the course of study as per their curriculum. The first group concentrated exclusively on assisted sprint training and the second group utilized resisted sprint training. The assisted sprint training exercises included in this training programme was downhill sprinting, assisted towing and high speed treadmill sprinting. The resisted sprint training exercises included in this training programme was weighted vest, sprint parachutes and harness running. More specifically, the training distance comprised of 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. The rest interval between repetitions was 1:1 ratio, where they stay active and between sets they performed other balance or trunk activities in 1:3 work rest ratio.

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. Whenever, the adjusted posttest 'F' ratio value was found to be significant, Scheffe's post hoc test was applied to find out the paired mean differences. The level of significance was accepted at $P < 0.05$.

Results

The pre and post test data collected from the experimental and control groups on stride length and stride frequency are statistically analyzed by analysis of covariance and the results are presented in table-I.

Table I. Adjusted Posttest Mean on Stride Length and Stride Frequency of Experimental and Control Groups

Variable	Assisted Sprint Training	Resisted Sprint Training	Control Group	SoV	Sum of Squares	df	Mean squares	Obtained 'F' ratio
Stride Length	1.68	1.62	1.58	B	0.045	2	0.022	37.99*
				W	0.024	41	0.001	
Stride Frequency	3.35	3.29	3.18	B	0.224	2	0.112	8.09*
				W	0.569	41	0.014	

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 are 37.99 and 8.09 on speed, stride length and stride frequency are 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.

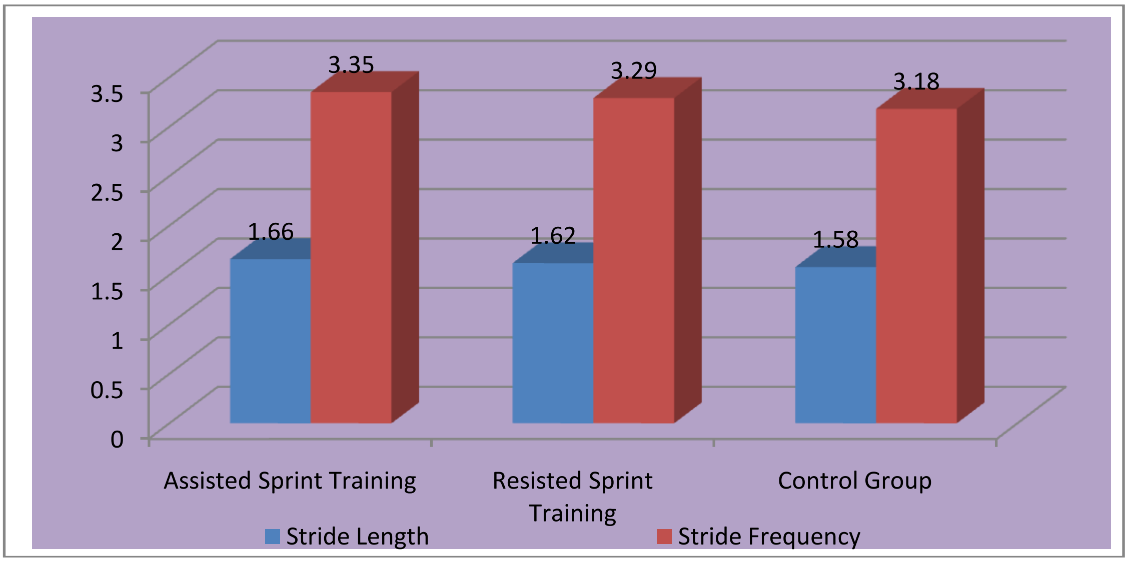
Table II. Scheffe's Post Hoc Test for Paired Mean difference on Stride Length and Stride Frequency

Variables	Adjusted Post Test Mean			Mean Differences	Confidence Interval
	Assisted Sprint Training	Resisted Sprint Training	Control Group		
Stride Length	1.68	1.62		0.06*	0.03
	1.68		1.58	0.10*	0.03
		1.62	1.58	0.04*	0.03
Stride Frequency	3.35	3.29		0.06*	0.10
	3.35		3.18	0.17*	0.10
		3.29	3.18	0.11*	0.10

**Significant at .05 level.*

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

Figure I. Diagram Showing the Adjusted Post Test Mean Values of Experimental and Control Groups on Stride Length and Stride Frequency



Discussion

The results of the present study confirm the findings of previous research that found significant change in stride length and stride frequency during assisted sprinting and resisted sprinting. Studies have shown that uphill and downhill sprint training (Paradisis and Cooke, 2006), and resisted sprint training (Kristensen, et al., 2006; Zafeiridis, et al., 2005) significantly increased acceleration and sprinting speed. In addition, the combination of sprint and resistance training has been shown to be effective for enhancing maximal speed, speed endurance, power, and strength of the lower body (Kraemer, et al., 2000; Ratamess, et al., 2007).

The results of the present study are also in line with the observation by Zafeiridis et al., (2005) 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. 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. 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. 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.

Conclusion

It is concluded from the result of the study that the stride length and stride frequency can be developed by both assisted and resisted sprint training, however assisted sprint training is better than resisted sprint training. Hence, it is suggested that competition exercises with additional loads are “the most specific exercises” and important training means. This seems to be that resisted sprint training techniques will somehow impact on the athlete's nervous system to induce greater stride length and stride rates.

References

1. Corn, RJ & Knudson, D (2003). Effect of elastic-cord towing on the kinematics of the acceleration phase of sprinting. *Journal of Strength and Conditioning Research*, 17(1), pp.72-75.
2. Faccioni, A., (1993) Resisted and assisted methods for speed development. Part 2. *Strength & Conditioning Coach*. 1(3), 7-10.
3. Knicker, A (1997). *Neuromechanics of sprint specific training skills*. In J Wilkerson, K Ludwig & W Zimmermann (Eds.), Biomechanics in Sports XV (pp.17-21). Denton, TX: Texas Woman’s University Press.
4. Kraemer, WJ, Ratamess, NA, Volek, JS, Mazzetti, SA, and Gomez, AL. (2000). The effects of the Meridian shoe on vertical jump and sprint performances following short-term combined plyometric/sprint and resistance training, *J Strength Cond Res* .,14: 228–238.
5. Kristensen, GO, Van Den Tillaar, R, and Ettema, GJC. (2006). Velocity specificity in early-phase sprint training, *J Strength Cond Res.*, 20: 833–837.
6. Letzelter, M., G. Sauerwein, and R. Burger, “Resistance Runs in Speed Development”, *Modern Athlete and Coach*, 33:4, (1995), pp.7-12.
7. Paradisis, GP.; Cooke, CB (2006).The Effects of Sprint Running Training on Sloping Surfaces, *journal of Strength & Conditioning Research*. 20: 767–777.
8. Ratamess, NA, Kraemer, WJ, Volek, JS, French, DN, Rubin, MR, Gomez, AL, Newton, RU, and Maresh, CM. (2007). The effects of ten weeks of resistance and combined plyometric/sprint training with the Meridian Elyte athletic shoe on muscular performance in women, *J Strength Cond. Res.*, 21: 882–887.
9. Zafeiridis, A. et al., “The Effects of Resisted Sled Pulling Sprint Training on Acceleration and Maximum Speed Performance”, *Journal of Sports Medicine Physical Fitness*, 45:3, (2005), pp. 284-90.