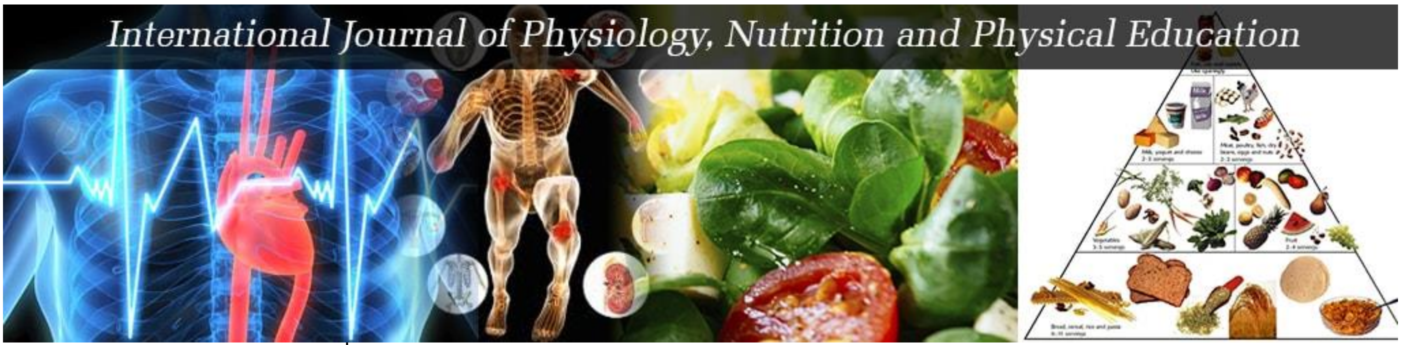

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Relative effect of speed agility and quickness training versus sprint interval training on anaerobic power of male sprinters

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Abstract
SAQ and sprint interval training for any sport is vital to the overall success of a player. With a good foundation to build on, players fully prepared to move into building maximal speed. The purpose of the study was to investigate the relative effect of SAQ training verses sprint interval training on anaerobic power of male sprinters. To achieve the purpose of the study, forty five male inter-collegiate level sprinters from various colleges affiliated to Bharathidhasan University, Trichirapalli, Tamil Nadu, India were selected as subjects. Their age ranged from 18 years to 23 years. The selected subjects were randomly assigned into three equal groups of 15 subjects each. Group-I underwent SAQ training, group-II underwent sprint interval training and group-III acted as control. The selected dependent variable anaerobic power was assessed before and after 12 weeks of training. In order to nullify the initial mean differences the data collected from the three groups prior to and post experimentation on anaerobic power was statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since, three groups are involved, whenever the obtained 'F' ratio value in the adjusted post test mean was found to be significant, the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. The result of the study reveals that due to the effect of SAQ training and sprint interval training the anaerobic power of the subjects was significantly improved. It was also concluded that sprint interval training was significantly better than SAQ training in improving the anaerobic power of male sprinters.

Keywords: SAQ training, sprint interval training, anaerobic power and male sprinters

Introduction
Anaerobic energy is the output of energy when the oxygen supply is insufficient. High speed intense work of short duration requires immediate energy that cannot be attained quickly enough from aerobic sources. In this situation another process termed anaerobic metabolism, is called on for a ready supply of energy. In anaerobic exercise a large portion of the required energy is obtained from the anaerobic energy sources. Anaerobic energy is required in high intensity short-term exercise involving power or speed (Reid & Thomson, 1984) [11]. Sharkey (1986) [13] pointed out that power is an essential quality in many sports for it represents the effective combination of strength and speed. Increase in strength or speed will increase power. When power increases, more work can be done in less time.
High-intensity interval training taxes and maximizes both aerobic and anaerobic fitness, while cardio addresses aerobic only. Aerobic respiration requires oxygen to generate energy in the form of ATP, while anaerobic respiration does not. High-intensity interval training affects muscle tissue at the cellular level, actually changing mitochondrial activity in the muscles themselves. Studies indicate as little as 27 minutes of high-intensity interval training three times per week produces the same anaerobic and aerobic improvement as 60 minutes of steady state cardio five times per week. During the high intensity efforts, the anaerobic system uses the energy stored in the muscles (glycogen) for short bursts of activity. Anaerobic metabolism works without oxygen, but the by-product is lactic acid. As lactic acid builds, the athlete enters oxygen debt, and it is during the recovery phase that the heart and lungs work together to "pay back" this oxygen debt and break down the lactic acid. It is in this phase that the aerobic system uses the oxygen to convert stored carbohydrates into energy.

The Speed Agility and Quickness (SAQ) training method more frequently uses the programmed than random type conditioning after the SAQ continuum. One SAQ session is composed of 7 components, where the main part of the session, explosion and expression of potential, are combinations of programmed and random conditioning. Integral planning and programming is required to progress from fundamental movement patterns to highly positional specific movements. A logical sequence in the learning process must not be neglected because it develops neural structures that are a prerequisite for elite-level upgrade. Consequently, elite players manipulate with their bodies without the loss of speed, balance, strength, and control. Also, with correct movement patterns (technique) and greater muscle power, they accelerate faster.

Among sport conditioning coaches, there is considerable discussion regarding the efficiency of training methods that improve anaerobic power performance. But the best method for achieving improvement in anaerobic power performance is disputed. SAQ training and sprint interval training are well-established training method and vital necessary for athletes and players; however, there is a lack of information regarding SAQ training and sprint interval training impact on anaerobic power.

Methodology

Subject and Variable

To achieve the purpose of the study, forty five male inter-collegiate level sprinters from various colleges affiliated to Bharathidhasan University, Trichirapalli, Tamil Nadu, India were selected as subjects. The sprinters who represented inter collegiate level competitions are only selected as subjects and their age ranged from 18 to 23 years. The selected subjects were randomly assigned into three equal groups of 15 subjects each. Group-I underwent SAQ training, group-II underwent sprint interval training and group-III acted as control. The selected dependent variable anaerobic power was assessed by conducting Running-based Anaerobic Sprint Test.

Training Programme

After the initial measurements, the specially designed training programme was given to the subjects of the experimental groups named as SAQ (*Speed, Speed & Quickness*) and sprint interval training. The training sessions were conducted three days a week (*Monday, Wednesday & Friday*) over a period of twelve weeks. Each experimental session was of 30-45 minutes duration excluding warm-up and warm-down. The SAQ training was administrated to the experimental group, which include speed, agility and quickness drills. The experimental group undertook three SAQ training sessions a week. Sessions were progressively structured to gradually increase intensity over each of the 12 weeks. To fix the training load for the sprint interval training group the subjects were examined for their exercise heart rate in response to different work bouts, for proposed repetitions and sets, alternating with active recovery based on work-rest ratio. The subject's training zone was computed using Karvonen formula and it was fixed at 70%HRmax to 95%HRmax for both sprint interval training and SAQ training groups.

Collection of the Data

The pretest data was collected prior to the training programme and posttest data was collected immediately after the twelve weeks of SAQ training and sprint interval training, from the experimental groups and a control group.

Statistical Technique

The data collected from the three groups prior to and post experimentation on anaerobic power was statistically analyzed to find out the significant difference if any, by applying the Analysis of Covariance (ANCOVA). Since three groups were involved, whenever the obtained 'F' ratio value was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. In all the cases the level of confidence was fixed at 0.05 for significance.

Result

The pre and post test data collected from the experimental and control groups on anaerobic power was statistically analyzed by analysis of covariance and the results are presented in table–1.

Table 1: Analysis of Covariance on Anaerobic power of Experimental and Control Groups (Unit of Measurement - Watts)

	SAQ Training Group	Sprint Interval Training Group	Control Group	SoV	Sum of Squares	df	Mean Squares	'F' ratio
Pre-test Mean SD	223.67	226.67	224.47	B	72.40	2	36.20	2.65
	2.55	5.31	2.50	W	574.40	42	13.68	
Post-test Mean SD	232.13	240.33	226.20	B	1510.98	2	755.49	35.59*
	3.09	6.54	3.36	W	891.47	42	21.23	
Adjusted Post-test Mean	233.30	238.70	226.60	B	1035.85	2	517.93	58.49*
				W	363.04	41	8.86	

(The required table value for significance at 0.05 level of confidence with degrees of freedom 2 and 42 is 3.23 and degree of freedom 2 and 41 is 3.22) *Significant at.05 level of confidence

Table-1 shows that the pre-test means and standard deviation on anaerobic power of SAQ training, sprint interval training and control groups are 223.67 ± 2.55, 226.67 ± 5.31 and 224.47 ± 2.50 respectively. The obtained 'F' ratio value 2.65 of anaerobic power is less than the required table value of 3.23 for the degrees of freedom 2 and 42 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores in anaerobic power before the training were equal and there was no significant differences.

The post-test means and standard deviation on anaerobic power of SAQ training, sprint interval training and control groups are 232.13 ± 3.09, 240.33 ± 6.54 and 226.20± 3.36 respectively. The obtained 'F' ratio value 35.59 of anaerobic power is greater than the required table value of 3.23 for the degrees of freedom 2 and 42 at 0.05 level of confidence. It implies that significant differences existed between the three groups during the post test period on anaerobic power.

The adjusted post-test means on anaerobic power of SAQ training, sprint interval training and control groups are

233.30, 238.70 and 226.60 respectively. The obtained 'F' ratio value 58.49 of anaerobic power is greater than the required table value of 3.22 for the degrees of freedom 2 and 41at 0.05 level of confidence. Hence, it is concluded that significant differences exist between the adjusted post test means of SAQ training, sprint interval training and control groups on anaerobic power.

Since, the obtained 'F' ratio value in the adjusted post-test means was found to be significant, the Scheffe'S test was applied as post hoc test to find out the paired mean difference, and it is presented in table-2.

Table 2: Scheffe's Post Hoc Test for the Differences among Paired Means of Experimental and Control Groups on Anaerobic power

SAQ Training Group	Sprint Interval Training Group	Control Group	Mean Difference	Confidence Interval
233.30	238.70		5.40*	2.76
233.30		226.60	6.70 *	2.76
	238.70	226.60	12.10*	2.76

*Significant at.05 level

From table-2 the Scheffe's post hoc analysis proved that significant mean differences exist between SAQ training and sprint interval training groups, SAQ training and control groups, sprint interval training and control groups on anaerobic power. Since, the mean differences 5.40, 6.70 and 12.10 are higher than the confident interval value of 2.76 at.05 level of significance. Hence, it is concluded that due to the effect of SAQ training and sprint interval training the anaerobic power of the subjects is significantly improved. It is also concluded that sprint interval training is significantly better than SAQ training in improving anaerobic power.

The pre, post and adjusted post test mean values of experimental and control groups on anaerobic power is graphically represented in figure-1.

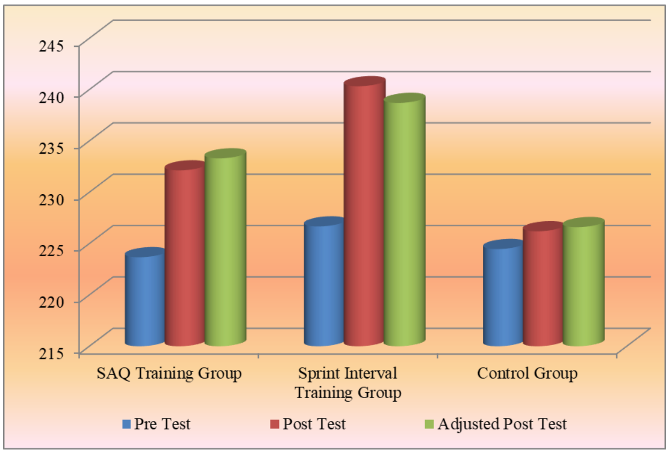

Fig 1: Diagram Showing the Mean Values on Anaerobic Power of Experimental and Control Groups

Discussion

Twelve weeks of SAQ and sprint interval training had positive effects on anaerobic power performance of the male sprinters. Previous studies have reported the beneficial effects of SAQ and sprint interval training on anaerobic power. It is suggested that SAQ training program appears to be an effective way of improving some segments of power performance. A recent study by Cronin and Hansen, (2005) [3] showed that faster athletes have higher test values in squat jump (SJ) and countermovement jump (CMJ) tests. Furthermore, recent studies showed that jump test performance is also related to team success (Arnason *et al.*, 2004) [1], whereas vertical jump height is related to short sprint performance (Cronin & Hansen, 2005; Wisloff *et al.*, 2004) [3, 15]. Thus, SAQ training method can be applied as a power performance enhancing method. With intensive SAQ, we can achieve improvement in the player's power performance during the competitive season without having any overtraining effects.

Most of the former studies also show a substantial increase in anaerobic power following short bouts of intense exercises. These results are support the observation by Laursen *et al.*, (2005) [4] that, peripheral adaptation rather than central adaptation are likely responsible for the improved anaerobic capacity following various forms of high intensity interval training. Roads *et al.*, (2000) [12] suggested that, training of short duration, high loads and long recovery periods seems to be an effective programme for improving the enzymatic actives of the energetic pathways in a short period of time, however, Para *et al.*, (2000) [9] reported that, these changes are affected by the distribution of rest periods.

MacDougall *et al.*, (1996) [5] found that, relatively brief period of sprint training increased aerobic and anaerobic capacities in initially untrained individuals. These results are in agreement with the previous observation by Wenzel (1992) [14] and Nowberry & flowers (1999) [8] in which they found significant improvement in anaerobic power following speed training. Medbo and Burgers (1990) reported that, six weeks of intense exercise of short duration improved anaerobic capacity. They identified that sprinters have better anaerobic capacity than endurance athletes, due to increase in anaerobic energy release. It has been observed by Pizza *et al.*, (1994) that, anaerobic capacity was not affected by endurance training. Mahon (2000) [6] postulated that, factors such as motor neurone firing rate and improved coordination were responsible for enhanced anaerobic power performance.

In addition, Casey *et al.*, (1996) [2] reported that during sprints, type-II muscle fibers are recruited to a large extent to produce high power output as fast as possible. The intense exercise of short duration heavily depends on energy from anaerobic sources, and athletic successful anaerobic types of sports may therefore have a larger anaerobic capacity and be able to release energy at a higher rate. The mechanisms responsible for anaerobic performance enhancements may relate to greater force generation increase in energy release and neural adaptation. Since, similar improvements are also confirmed in previous studies, and they offer an insight to everyone that can take such information to the level of practical application.

Conclusion

The result of the study reveals that due to the effect of SAQ training and sprint interval training the anaerobic power performance of the male sprinters was significantly improved. It was also concluded that sprint interval training was significantly better than SAQ training in improving anaerobic power performance of the male sprinters. To conclude, the SAQ and sprint interval training appears to be an effective way of improving anaerobic power performance of the male sprinters and would therefore be a good method for coaches to incorporate into their conditioning programs.

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