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Effect of Varied Intensities of Strength Training on Aerobic Capacity and Anaerobic Power of State Level Men Fencers

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Abstract

The sport fencing requires optimum level of aerobic capacity and anaerobic power. The purpose of this study was to find out the effect of varied intensities of strength training on aerobic capacity and anaerobic power of state level men fencers. Randomly selected 60 state level men fencers were assigned to four equal groups of fifteen state level men fencers in each group, namely, experimental groups I, II, III and control group respectively. Their age was ranging from 18 to 25 years. Experimental group I underwent low intensity strength training (LIST), experimental group II underwent medium intensity strength training (MIST) and experimental group III underwent high intensity strength training (HIST) and the fourth group, namely, control group did not undergo any special training or coaching programmed apart from their regular routine. Pre and post test scores of the fencers proved improvement on aerobic capacity and anaerobic power. LIST was significantly improved in aerobic capacity better than MIST, HIST and control group, and HIST was significantly in anaerobic power better than LIST and MIST groups. It was concluded that high intensity and low intensity had significant improvement in aerobic and anaerobic power among the state level men fencers.

Keywords: Strength Training, Aerobic Capacity, Anaerobic Power, Fencing.

Introduction

Strength training is a type of physical exercise specializing in the use of resistance to induce muscular contraction which builds the strength, anaerobic endurance, and size of skeletal muscles. When properly performed, strength training can provide significant functional benefits and improvement in overall health and well-being, including increased bone, muscle, tendon and ligament strength and toughness, improved joint function, reduced potential for injury, increased bone density, increased metabolism, improved cardiac function, and elevated HDL cholesterol. Strength training commonly uses the technique of progressively increasing the force output of the muscle through incremental weight increases and uses a variety of exercises and types of equipment to target specific muscle groups. Strength training is primarily an anaerobic activity, although some proponents have adapted it to provide the benefits of aerobic exercise through circuit training. (De Mello Meirelles, Gomes 2004).

In one common method, strength training uses the principle of progressive overload, in which the muscles are overloaded by attempting to lift at least as much weight as they are capable. They respond by growing larger and stronger. This procedure is repeated with progressively heavier weights as the practitioner gains strength and endurance. (Brooks,; Fahey, & White 1996) Weight training can be a very effective form of strength training because exercises can be chosen, and weights precisely adjusted, to safely exhaust each individual muscle group after the specific numbers of sets and repetitions that have been found to be the most effective for the individual.

Sports where strength training is central are bodybuilding, weightlifting, power lifting, strongman, Highland games, shot put, discus throw, and javelin throw. Many other sports use strength training as part of their training regimen, notably football, wrestling, track and field, rowing, lacrosse, basketball, pole dancing (or pole fitness),and hockey . Strength training for other sports and physical activities is becoming increasingly popular. In this study, the researcher was interested to find out the effect of varied intensities of strength training on aerobic capacity and anaerobic power of the state level men fencers, as there was dearth of studies in this area. According to Roi and Bianchedi (2008) the demands of fencing competitions are high, involving the aerobic and anaerobic alactic and lactic metabolisms, and are also affected by age, sex, level of training and technical and tactical models utilized in relation to the adversary. Further stated that it is difficult to identify a significant relationship between any one physiological

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characteristic and performance, and performance is more likely to be influenced by perceptual and neuro-physiological characteristics of fencers. And further reported that although the aerobic capacity of fencers (52.9 mL/kg per minute) is greater than that of the sedentary population (approximately 42 mL/kg per minute), it is clearly lower than that of aerobic endurance–based athletes and may be suggestive of the relatively small role a high [Combining Dot Above] VO_2max has to fencing. The energy system requirements of each sword of fencers will inevitably differ, it is in their opinion none will significantly tax the aerobic system to the extent that training need directly target its development through the traditional methods of long slow distance (LSD) running (Ratmess 2008)

The predominant anaerobic system, originates from reports quantifying the blood lactate concentrations of fencing bouts. In men's foil, for example, blood lactate concentrations (measured 5 minutes after bout) averaged 2.5 mmol/L during the preliminary pools and then were consistently above 4 mmol/L (and as high as 15.3 mmol/L in the winner) during the elimination bouts (Cerizza, Roi 1994).

The foil fencing is undoubtedly an anaerobic-type sport. The theoretical foundations proved that the sport, fencing requires aerobic capacity and anaerobic power and there was lack of research to find out the effect of varied intensities of strength training on these variables among state fencers. Hence, the investigator made an attempt to this effect (Turner, Anthony 2013)

Methodology

Sixty state level men fencers were selected randomly as subjects for this study. The age group of the subjects was between 18 to 25 years. The subjects were selected during state level selection trails and competition held at Chennai under the sponsorship of Sports Development Authority of Tamil nadu with prior permission from the authorities. The study was formulated as a true random group design, consisting of a pre test and post test. The subjects (n=60) were randomly assigned to four equal groups of fifteen state level men fencers in each group. The groups were assigned as experimental groups I, II, III and control group respectively. Experimental group I was assigned as low intensity strength training (LIST), experimental group II was assigned as medium intensity strength training (MIST) and experimental group III was assigned as high intensity strength training (HIST) and control group. The control group was not given any special treatment except of their routine. Pre tests were conducted for all the subjects on selected criterion variables. The experimental groups participated in their respective training protocols for a period of twelve weeks. The post tests were conducted on the above said dependent variables after the experimental period of twelve weeks for all the four groups. Aerobic capacity was measured through Queen College Test and scores recorded in maximal oxygen consumption in ml/kg/min. Anaerobic Power measured through Margaria Kalaman Anaerobic Test and scores recorded in seconds and converted into watts. The differences between the initial and final means on selected variables were considered. The obtained data were subjected to statistical treatment using ANCOVA. In all cases 0.05 levels was fixed to test the hypothesis set for this study.

Results

Table I. Analysis of covariance on aerobic capacity and anaerobic power among low, medium, high intensities of strength training group and control group

AEROBIC CAPACITY									
Test	LIST	MIST	HIST	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	f-ratio
Pre Test Mean	40.32	41.47	42.10	41.84	Between	27.80	3	9.27	0.42
					Within	1233.68	56	22.03	
Post Test Mean	46.41	43.98	45.47	41.61	Between	197.34	3	65.78	3.77*
					Within	977.17	56	17.45	
Adjusted Post Test Mean	47.29	43.95	44.95	41.28	Between	275.59	3	91.86	24.78*
					Within	203.86	55	3.71	
ANAEROBIC POWER									
Test	LIST	MIST	HIST	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	f-ratio
Pre Test	63.57	64.12	63.22	66.76	Between	115.84	3	38.61	

Mean					Within	4333.09	56	77.38	0.50
Post Test Mean	67.61	68.64	72.70	66.81	Between	308.35	3	102.78	1.93
					Within	2976.17	56	53.15	
Adjusted Post Test Mean	68.24	68.86	73.60	65.05	Between	549.39	3	183.13	18.42*
					Within	546.78	55	9.94	

***** Significant at 0.05 level and required $F_{(0.05),\,(df\ 3.45)} = 2.77$

The results of comparing the adjusted post-test mean among low intensity strength training group, medium intensity strength training group, high intensity strength training group and control group, it was observed that the mean difference among these groups on aerobic capacity and anaerobic power was statistically significant Further to determine which of the paired had a significant difference the Scheffe's test was used as post-hoc test and the results are presented in the table II

Table II. Scheffe's post hoc analysis on aerobic capacity and anaerobic power of state level men fencers

MEANS					Required C.I.
Low intensity Group	Medium Intensity Group	High Intensity Group	Control Group	MEAN DIFF	
AEROBIC CAPACITY					
47.29	43.95			3.34*	2.03
47.29		44.95		2.34*	2.03
47.29			41.28	6.01*	2.03
	43.95	44.95		1.00	2.03
	43.95		41.28	.66	2.03
		44.95	41.28	3.67	2.03
ANAEROBIC POWER					
68.24	68.86			0.62	3.32
68.24		73.60		5.36*	3.32
68.24			65.05	3.19	3.32
	68.86	73.60		4.73*	3.32
	68.86		65.05	3.81*	3.32
		73.60	65.05	8.54*	3.32

***** Significant at 0.05 level

The multiple mean comparisons reveal that there existed statistically significant improvement in aerobic capacity among LITG and HITG groups. The medium intensity training group had not shown improvement in aerobic capacity, however there significant differences between the groups existed. High intensity training group had better improvement than the low intensity training group in the aerobic capacity. In the anaerobic power high intensity training group had better improvement than the other two group namely low and medium intensity. Medium intensity training group had better improvement than the low intensity training group in anaerobic power. The obtained mean values on the experimental and control groups were presented in figure I and II.

Figure I. Bar diagram showing pre, post and adjusted means on aerobic capacity

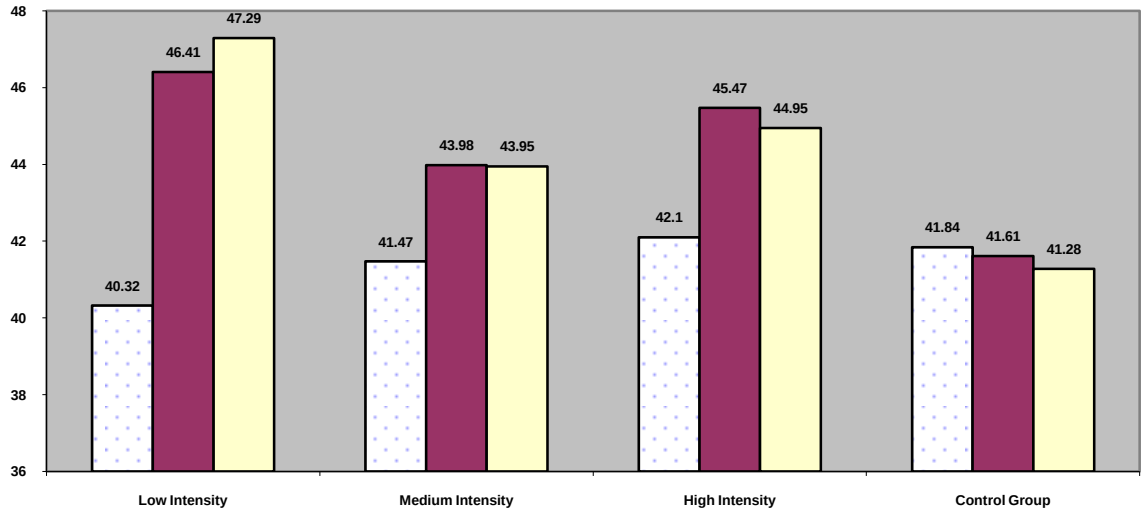
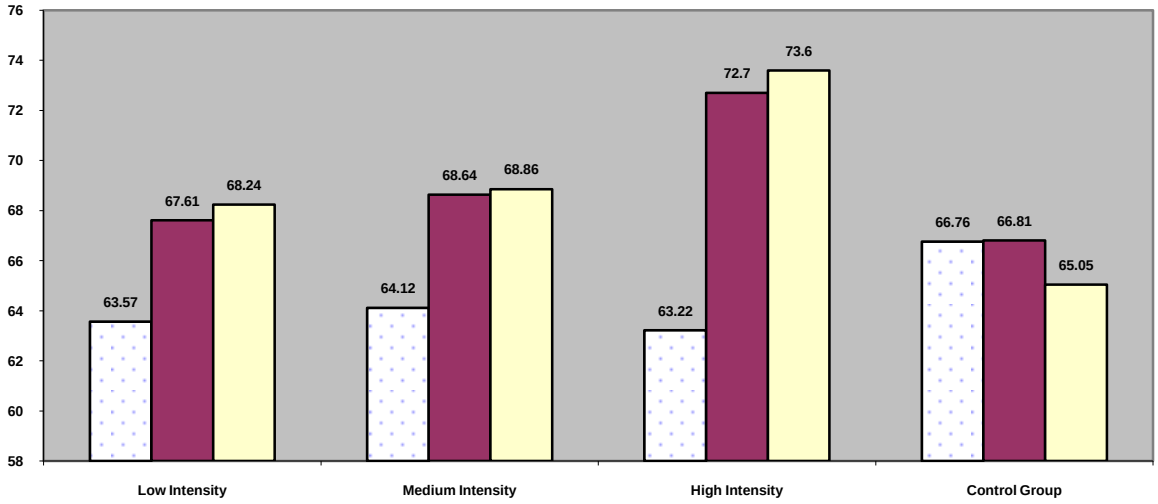


Figure II. Bar diagram showing pre, post and adjusted means on anaerobic power



This bar diagram is presented for easy understanding of the facts.

Discussions

The low resistance circuit weight training and endurance training on maximal aerobic power improved in sedentary adults (Kaikkonen. et al. 2000). Fencing is an explosive sports requiring energy production predominately from anaerobic sources Turner et al. (2014). Similarly on anaerobic power of the state level men fencers LIST group had improved. It was proved that the experimental treatments significantly improved aerobic capacity and anaerobic power of the state level men fencers. The results proved that LIST group was significantly better than MIST, HIST and control groups in improving aerobic capacity of the state level men fencers. HIST group was significantly better than LIST, MIST and control group in improving anaerobic power of the state level men fencers. Comparison between treatments groups proved that HIST was significantly better than MIST in improving anaerobic power. The results of this study are in agreement with the findings of Nash, et.al. (2007) who found the effects of circuit resistance exercise (CRT) training on muscle strength, endurance, anaerobic power and Kaikkonen, et.al. (2000) who found circuit weight training and endurance training improved maximal aerobic power.

Roi and Bianchedi (2008) reported that demands of fencing competitions are high, involving the aerobic and anaerobic alactic and lactic metabolisms, and are also affected by age, sex, level of training and technical and tactical models utilized in relation to the adversary. Further stated that it is difficult to identify a significant relationship between any one physiological characteristic and performance, and performance is more likely to be influenced by perceptual and neuro-physiological characteristics of fencers. they further

reported that although the aerobic capacity of fencers (52.9 mL/kg per minute) is greater than that of the sedentary population (approximately 42 mL/kg per minute), it is clearly lower than that of aerobic endurance–based athletes and may be suggestive of the relatively small role a high [Combining Dot Above] VO_2max has to fencing. Ratmess (2008) found although the energy system requirements of each sword of fencers will inevitably differ, it is in their opinion none will significantly tax the aerobic system to the extent that training need directly target its development through the traditional methods of long slow distance (LSD) running. Cerizza, Roi (1994) supported that defining the predominant anaerobic system, originates from reports quantifying the blood lactate concentrations of fencing bouts. In men's foil, for example, blood lactate concentrations (measured 5 minutes after bout) averaged 2.5 mmol/L during the preliminary pools and then were consistently above 4 mmol/L (and as high as 15.3 mmol/L in the winner) during the elimination bouts. Turner, Anthony (2013) found that although foil fencing is undoubtedly an anaerobic-type sport. The theoretical foundations proved that the sport, fencing requires aerobic capacity and anaerobic power and there was lack of research to find out the effect of varied intensities of strength training on these variables among state fencers. Hence, the investigator made an attempt to this effect.

Conclusions

It was concluded that the LIST and HIST training improved the aerobic capacity and anaerobic power of the state level fencers.

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