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Effect of Varied Intensities of Strength Training on Selected Physical Fitness Variables among State Level Men Fencers

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Abstract

Fencing is a sport requiring hand-eye coordination, explosiveness, and pinpoint accuracy. The aim of this study was to find out the effect of varied intensities of strength training, on selected physical fitness variables, explosive strength and speed. Randomly selected 60 men state level fencers were divided into 4 groups consisting of 15 subjects in each. Low intensity strength training (LIST) group I underwent 40 to 50% of 1 RM of selected 8 strength training exercises. Group II underwent medium intensity of strength training (MIST) 50 to 60% of 1 RM and group III underwent high intensity of strength training (HIST) 60 to 70% of 1 RM. The control group did not undergo any special training or coaching programmed apart from their regular routine. Pre and post tests scores were analysed using ANCOVA. The results proved that MIST and HIST groups significantly improved speed and lower explosive strength ($P<0.05$), and LIST, MIST and HIST groups significantly improved upper explosive strength. It was concluded that High intensity training group significantly improved explosive strength and speed better than medium intensity group.

Keywords: Strength training, Explosive strength, Speed, Fencing.

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Introduction

Fencing is a sport requiring hand-eye coordination, explosiveness, and pinpoint accuracy. Whatever type of blade a fencer uses, the individual must be faster and more accurate than the opponent.(Harmer (2008)). Fencing sports requires strength, speed and timing, as well as specific skill. To improve on many of these aspects, a routine based around explosive training can help to lunge faster and give the extra inch needed to score the winning point. Much of the explosiveness of the technique comes from the lower body, and strong legs are critical to drive down the strip. The barbell squat and the lunge should be considered foundational exercises, and be the focus of many workouts. Much of the upper body control of the weapon comes from the shoulders, and the military press is the best exercise to strengthen them. Work out for the latissimus dorsi, the widest muscles of the back, is crucial as much of the power will come from the back. Chin-ups and rowing movements are essential rotator cuff exercises, such as external rotations, will help improve shoulder stability and lower the risk for injury. External rotations can be performed by standing next to a cable stack with arm across the body and pulling the arm away against the resistance of the weight. (Bompa & Haff, 2009)

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Strength training is the use of resistance to muscular contraction to build the strength, anaerobic endurance and size of skeletal muscles. There are many different methods of strength training, the most common being the use of gravity or elastic/hydraulic forces to oppose muscle contraction. 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, a temporary increase in metabolism, improved cardiac function, and elevated HDL cholesterol. (Newton and Dugan. 2002)

Different strength training activities can be carried out with different intensities which may have different effect in organism. Exercise intensity should be checked frequently during and beginning of exercise programme. The intensity and length of the work interval should be based upon the primary energy system being used in the activity. Sprinters should have short high intensity intervals whereas marathons may run intervals of 3 miles at race pace or slower. It should be pointed out that the rest interval is really not a time to stop all activity but only a jog or walk period which allows the body to recover somewhat before the next interval begin. (Turner 2009)

Fencing produces typical functional asymmetries that emphasize the very high level of specific function, strength and control required in this sport. Fencers need to anticipate the opponent and to mask their true intentions with a game of feints and counter-feints As in every other sport, the prevention of accidents must be accomplished at various levels and above all must involve the institutions that are responsible for safety in sports (Roi and Bianchedi. 2008). The maximal isometric force (MIF) of a muscle is directly related to its cross-sectional area (CSA). Strength training produces an increase in muscular force while muscular hypertrophy becomes appreciable at a later time; in asymmetric sports, training causes significant increases in force and muscular mass of the dominant limb of the athlete (Margonato et al. (1994). Drop jump and thigh cross-sectional area were best predictors of lunge time and distance of squat jump on the shuttle test (Tsolakis et al. (2010). Fencing is an explosive sport requiring energy production predominately from anaerobic sources. Lunging and change of direction speed seem vital to performance, and strength and power qualities underpin this. In the elimination rounds, fencers are likely to accumulate high levels of blood lactate, and so high-intensity interval training is recommended to reduce the intolerance to and the accumulation of hydrogen ions (Turner et al. (2014) . Redondo et al. (2014) showed that the treatment group participated in a 12-week strength training program divided into 2 parts: maximal strength training, including weightlifting exercises and demonstrated significant increases ($p \leq 0.05$) in maximal strength and jumping ability after 6 weeks of training and after 12 weeks. These improvements remained unaltered during the 4-week detraining period. It may be concluded that a 12-weekstrength training program can improve maximal and explosive strength, and these increases can be transferred to movement time performance. Thus, the theoretical foundations laid proved that only very few attempts were made to find out the effect of strength training on selected physical fitness variables of fencers and further scope for research to find out the varied strength training on selected physical fitness variables, lower strength, upper strength and speed.

Methodology

Randomly selected 60 state level men fencers from the state level selection trials and competitions were selected for this study. The selected subjects were divided into four groups, three experimental groups and one control group consisting of 15 in each. Selected subjects were tested of their lower explosive strength and speed prior to experimental treatment. Group I underwent low intensity strength training of 40 to 50% of 1 RM of selected 8 strength training exercises. Group II underwent medium intensity of strength training 50 to 60% of 1 RM and group III underwent high intensity of strength training 60 to 70% of 1 RM. The control group did not undergo any special training or coaching programmed apart from their regular routine. The experimental period was for 12 weeks. After the experimental period all the subjects' explosive strength and speed was assessed. The difference between the pre and post test scores were considered as the effect of varied intensities of strength training on selected physical fitness variables among the subjects. The obtained data were statistically analysed to test the significance of difference. In all cases 0.05 levels was fixed to test the significance of the study.

Results

Table I. Analysis of covariance on speed, lower explosive strength and upper explosive strength among low, medium, high intensities of strength training group and control group

Test	LIST GROUP	MIST GROUP	HIST GROUP	Control	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
SPEED									
Pre Test Mean	7.18	7.18	7.09	7.09	Between	0.11	3	0.04	1.31
Std Dev	0.19	0.17	0.17	0.13	Within	1.60	56	0.03	
Post Test Mean	7.03	6.97	6.85	7.13	Between	0.63	3	0.21	7.66*
Std Dev	0.16	0.19	0.17	0.14	Within	1.54	56	0.03	
Adjusted Post Test Mean	7.01	6.96	6.86	7.15	Between	0.64	3	0.21	8.54*
					Within	1.37	55	0.02	
Mean Diff	-0.15	-0.20	-0.25	0.04					
LOWER EXPLOSIVE STRENGTH									
Pre Test Mean	55.07	55.93	53.73	55.1	Between	37.12	3	12.37	0.21
Std Dev	7.95	7.56	7.22	7.95	Within	3299.73	56	58.92	
Post Test Mean	62.07	63.47	65.80	56.6	Between	686.32	3	228.77	4.54*
Std Dev	5.60	8.19	7.02	7.35	Within	2824.67	56	50.44	
Adjusted Post Test Mean	62.01	62.95	66.43	56.5	Between	754.17	3	251.39	7.17*
					Within	1927.07	55	35.04	
Mean Diff	7.00	7.53	12.07	1.53					

UPPER EXPLOSIVE STRENGTH									
Pre Test Mean	11.60	11.80	12.47	12.0	Between	6.20	3	2.07	0.41
Std Dev	3.16	2.04	1.41	1.96	Within	279.73	56	5.00	
Post Test Mean	13.27	13.67	14.60	11.9	Between	55.13	3	18.38	5.45*
Std Dev	2.58	1.63	0.99	1.79	Within	188.80	56	3.37	
Adjusted Post Test Mean	13.55	13.79	14.22	11.9	Between	46.01	3	15.34	30.64*
					Within	27.53	55	0.50	
Mean Diff	1.67	1.87	2.13	-0.07					

LIST : Low Intensity Strength Training; MIST : Medium Intensity Strength Training; HIST : High Intensity Strength Training
***** Significant at 0.05 level

Since significant f values were obtained the data were subjected to Scheffe's post hoc test to find out the paired mean difference and the results presented in table II.

Table II. Scheffe's post hoc analysis on speed and explosive strength

SPEED					
MEANS					Required C.I.
Low intensity Group	Medium Intensity Group	High Intensity Group	Control Group	MEAN DIFF	
7.01	6.96			0.05	0.17
7.01		6.86		0.15	0.17
7.01			7.15	0.13	0.17
	6.96	6.86		0.10	0.17
	6.96		7.15	0.19*	0.17
		6.86	7.15	0.29*	0.17
LOWER EXPLOSIVE STRENGTH					
62.01	62.95			0.95	6.23
62.01		66.43		4.43	6.23
62.01			56.54	5.47	6.23
	62.95	66.43		3.48	6.23
	62.95		56.54	6.41*	6.23
		66.43	56.54	9.90*	6.23
UPPER EXPLOSIVE STRENGTH					
13.55	13.79			0.25	0.74
13.55		14.22		0.68	0.74
13.55			11.91	1.64*	0.74
	13.79	14.22		0.43	0.74
	13.79		11.91	1.89*	0.74
		14.22	11.91	2.31*	0.74

***** Significant at 0.05 level.

The obtained mean values on the experimental and control groups were presented in the following figures.

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

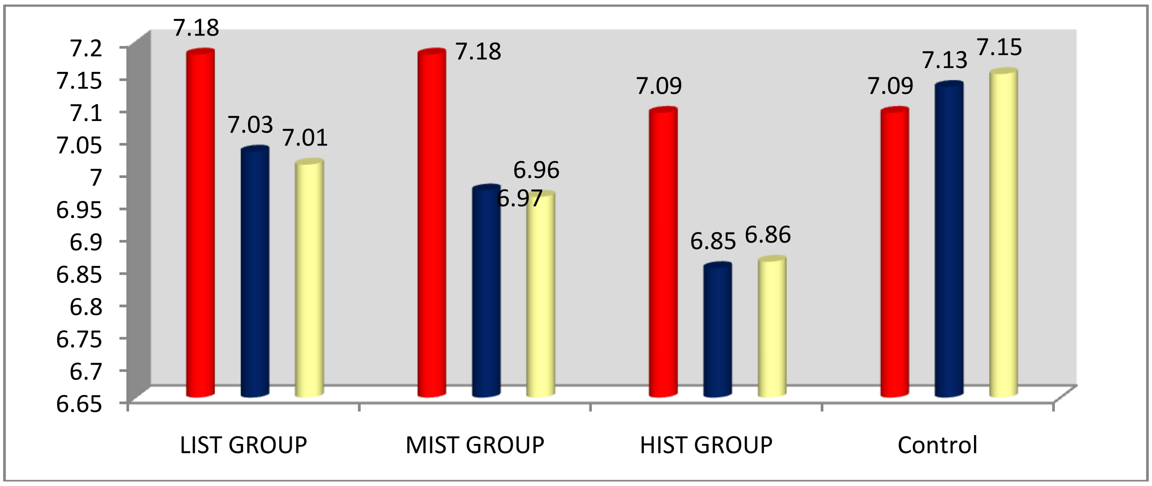


Figure II. Bar diagram showing pre, post and adjusted means on lower explosive strength

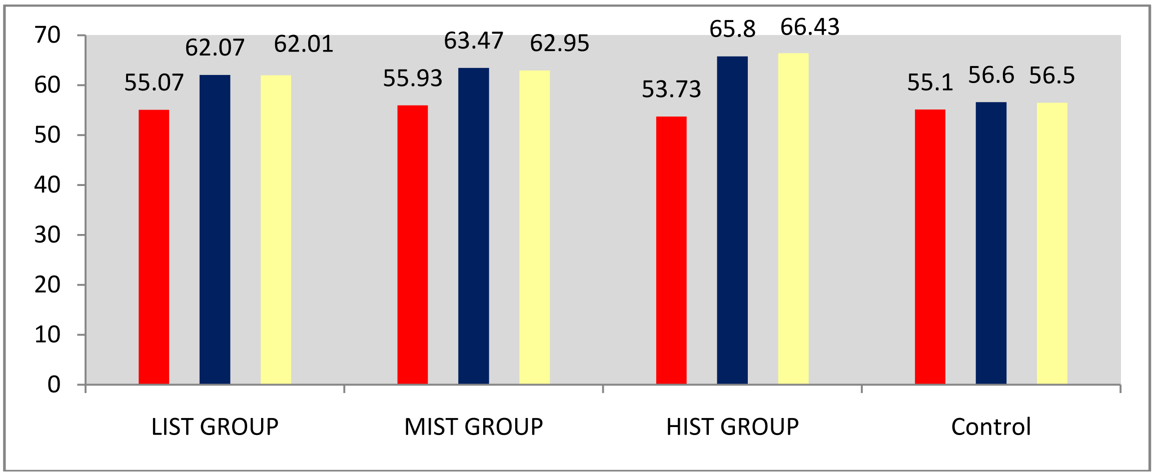
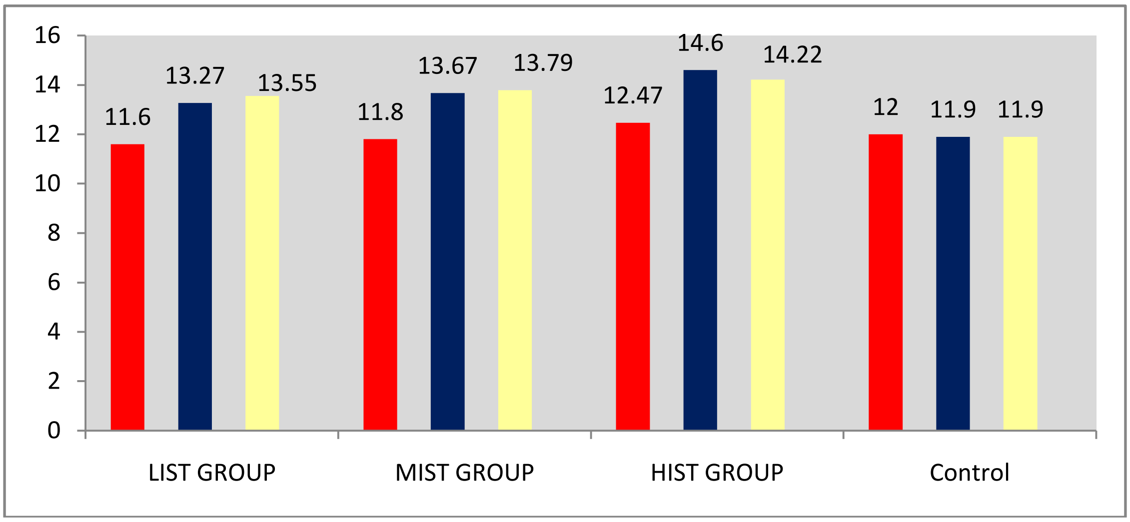


Figure III. Bar diagram showing pre, post and adjusted means on upper explosive strength



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

Discussions

Physical demands of fencing competitions are high, involving the aerobic and anaerobic alactic and lactic metabolisms. Fencing is an explosive sport requiring energy production predominately from anaerobic sources. Lunging and change of direction speed seem vital to performance, and strength and power qualities underpin this. In the elimination rounds, fencers are likely to accumulate high levels of blood lactate, and so high-intensity interval training is recommended to reduce the intolerance to and the accumulation of hydrogen ions (Turner et al. (2014). This study aims at finding out the effect of varied intensities of strength training, namely, low, medium and high intensity strength training on selected physical fitness variables, lower explosive strength, upper explosive strength and speed, among state level men fencers. The results presented in Table I proved that varied intensities of strength training significantly improved lower explosive strength, upper explosive strength and speed among men fencers. Table II the post hoc analysis proved that comparing to control group, varied intensities, low, medium and high intensity strength training significantly improved upper explosive strength. The results also proved that there were no significant differences among treatment groups. The maximal strength training, including weightlifting exercises and demonstrated significant increases ($p \leq 0.05$) in maximal strength and jumping ability and concluded that a 12-week strength training program can improve maximal and explosive strength, and these increases can be transferred to movement time performance (Redondo et al. 2014). The results of this study that varied intensities of strength training increased physical fitness variables, lower explosive strength, upper explosive strength and speed of state level men fencers is in agreement with the findings of Turner et al. (2014) and Redondo et al. (2014).

Conclusions

1. It was concluded that the high intensity had significant improvement in the chosen variable such as lower explosive strength, upper explosive strength and speed among the state level fencers.
2. It was also concluded that the medium intensity training group improved in the selected variables better than the low intensity training group.
3. It was concluded that the low intensity training group did not improve the selected variables of the state level fencers.

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