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Hill interval training and its effect on VO_2 max amongst the football players

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Abstract
The purpose of the study was to evaluate and find out the effect of Hill interval training on VO2 MAX among football players. Thirty male football players were selected from C.C.S University men intercollegiate tournament who were participated in tournament. The selected subjects were aged between 18 to 23 years. The VO2 MAX was calculated and they were divided into two group. One group (N=15) considered as control group that did not participated in any special training apart from regular scheduled/curriculum and another group (N=15) considered as experimental group which underwent four-week Hill Training program. The selected criterion variable such VO2 Max was measured by the Cooper 12min/run/walk test and scores was recorded in ml/kg/min. The subjects were tested on selected criterion variable such as VO2 Max prior and immediately after the training program. The pretest and posttest data were evaluate by the Analysis of Covariance (ANCOVA) to find out the significance difference if any between the experimental and control group on selected criterion variable. The level of significance was set at 0.05 level of confidence. After applied ANCOVA it was revealed that there was a significant different among the experimental and control group on VO2 Max. Finally, it was concluded that 4 week of Hill interval training effect the VO2 Max performance of football players.

Keywords: VO2Max, hill interval training

Introduction
Almost all physical activities incorporate elements of force, quickness, duration and range of motion. Exercises to overcome resistance are strength exercises; speed exercises maximize quickness and high frequency. Exercises of long distance on duration, or many repetitions are endurance exercises. Maximum range of motion results in a flexibility movement. Exercises with complex movements are known as coordination exercises. Training and conditioning are the best way to prepare the players for effective performance and healthy living. Football players can benefit from an increased aerobic capacity, whether they achieve this higher aerobic capacity through endurance training or interval training. By determining the level of aerobic fitness at which the athletes currently perform, trainers and coaches can determine a goal for improvement, and whether they should actually train aerobically or train at high intensity anaerobic intervals to stimulate aerobic improvement. In today's techno- scientific age, the world has completely changed in all aspect due to discovery and research. In the field of games and sports also, there has been a great change with the help of scientific coaching and training. The athletes are being trained on scientific guidelines with highly sophisticated means for better achievement in their concerned sports to enable the coaches to get optimum performance with minimum expenditure of energy and time. They are being exposed to the exercise and training method, which have got beneficial effect for achieving higher standard. Hill running has a strengthening effect as well as boosting your athlete's power and is ideal for those athletes who depend on high running speeds - football, rugby, basketball, cricket players and even runners. To reduce the possibility of injury hill training should be conducted once the athlete has a good solid base of strength and endurance. A short hill is one which takes no more than 30 seconds to run up and has an inclination between 5 and 15 degrees gradient. The athlete's energy source on short hills is entirely anaerobic. the athlete should focus on a running technique which has vigorous arm drive and high knee lift, with the hips kept high, so that they are 'running tall', not leaning forwards. VO2 max is a measure of the maximum volume of oxygen that an athlete can use. It is measured in milliliters per kilograms of body weight per minute (ml/kg/min).some expert believe that VO2 max is a key physiological determinant of an athlete's running performance, and that it is an important objective of a training program me to improve it. Other sports scientist argue that the limits to an athlete's running performance are determined by a range of factors- such as adaptation of muscles, running efficiency, metabolism – and that VO2 max is simply a measure of the oxygen that the athlete consume at the maximum level of energy output.

Methodology
The purpose of the study was to find out the effect of short hill interval training on VO2 max variables among football players. For the study 30 male football players of different colleges ware selected. The age level of the subject ranged from 18 to 23 year. They were divided into two groups of 15 each, Group I underwent short hill training program and Group II acted as control that did not participated in any special training apart from their

regular curricular activity. The experimental group underwent the training program for three day per week six week. The hill interval training starts with warm up with at least 10 min of easy jogging. Then run uphill hard for 2 min jog back down to your starting point and repeat. Experimental group started with 1st week a set of 4 x 2:00, 2nd week with 6 x 3:00, 3rd with 8 x 4:00 and 4thwith 10 x 5:00 progressively. After completion of six week training VO2 max was measured by using 400 meter track and marked with 8 divisions of 50 meters each. Pre test data were collected before the training program and post data were collected after the training program.

- **The VO2 max calculated in ml/kg/min**.
- VO2 max = (Distance in meters – 504.9) ÷ 44.73

The data were collected at prior and immediately after the training program for the criterion variable. Analysis of covariance (ANCOVA) was applied for the analyze the data which was calculated by SPSS version 26.0. In all the cases, 0.05 level of confidence was used as the significance of the study.

Result

In order to analysis the effect of hill training on vo2 max collected data were analyzed by the descriptive analysis and Analysis of covariance. The result of the statistical technique used on data was presented in given tables.

Table 1: Descriptive statistic of VO2 Max of football player

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Pre-test Exp	15	40.1187	3.56245	.91982	38.1458	42.0915	34.10	46.66
Control	15	40.5333	3.16932	.81831	38.7782	42.2884	32.14	47.82
Total	30	40.3260	3.31968	.60609	39.0864	41.5656	32.14	48.82
Posttest Exp	15	45.0240	1.66925	.43100	44.0996	45.9484	42.10	45.31
Control	15	42.4313	2.17019	.56034	41.2295	43.6331	37.80	46.18
Total	30	43.7277	2.31457	.42258	42.8634	44.5919	37.80	48.31

Table 2: Analysis of Covariance of Vo2 Max of football Player in Different Observation

Test	Mean & SD		ANCOVA table					
	Experimental	Control	Source of variance	SS	df	MS	F	Sig.
Pre	40.1187±3.56245	40.5333±3.16932	Between	1.290	1	1.290	.113	.739
			With in	318.299	28	11.368		
Post	45.0240±1.66925	42.4313±2.17019	Between	50.414	1	50.414	12.45*	.001
			With in	104.946	28	3.748		
Adjusted post test	45.061	42.394	Between	53.120	1	53.120	11.11*	.001
			With in	94.795	27	3.511		

*Significant at 0.05 level, Tab.F.05 (1, 27) =4.21

Above two Tables shows the analyzed data of VO2 Max. The vo2 max pre mean were 40.11±3.56 for experimental group and 40.53±3.16 for control group. It was revealed that the 'F' ratio of .113 was not significant at .05 levels indicating that the two groups were no significant variation. The post test means were 45.02±1.66 for experimental group and 42.43±2.17 for control group. The resultant 'F' ratio of 13.45* at .05 level indicating that was significant difference. The difference between the adjusted post test mean of 42.39 for the control group and 45.06 for experimental group yield on 'F' ratio 15.13* which was significant at .05 level. The result of the study revealed that there was a significant difference among the experimental group and control group on the vo2 max.

Discussion and Conclusions

The findings of the study showed that there was no significant difference between the pretest of VO2 max. The finding of the study showed that there was a significant difference between the posttest and adjusted posttest of VO2 max as mentioned above. The result of the study have shown there was a significant difference among hill interval training and control group on VO2 max reference to past studies on different variable such as vo2 max in accordance with Miller TA and other (2007) [2], and Vehrs PR, and others (2007) [3].

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