CHAPTER IV

RESULTS AND DISCUSSIONS

4.1 OVERVIEW

This chapter deals with the analysis of data collected from the samples under study. The purpose of the study was to find out the effects of varied intensities and frequencies of weight training on selected motor ability components and physiological variables among athletes. To achieve the purpose of this study, sixty athletes who represented their schools at Thiruvannamalai District Sports Meet were randomly selected as subjects. The selected subjects age group was ranging from sixteen to eighteen years. The subjects were randomly divided into three groups and each group consists of twenty subjects. Group one acted as experimental group I and Group two acted as experimental group II and group three acted as control group. Control group was not given any exposure to any training. Experimental Group I underwent low intensity and frequency of weight training and Experimental group II under went high intensity and frequency of weight training for twelve weeks. Motor fitness variables selected were speed, explosive power, endurance and arm strength. The physiological variables selected were resting pulse rate, VO_2 max, anaerobic power and breath holding time.

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 three equal groups

of twelve athletes each. The groups were assigned as Experimental Groups I, II and control group respectively. Pre tests were conducted for all the subjects on selected motor fitness and physiological variables such as speed, explosive power, endurance, arm strength, resting pulse rate, VO_2 max, Anaerobic power and breath holding time. Eight selected weight training exercises were selected for the study and 1 RM (Repetition Maximum) of the weight training exercises were determined for experimental group subject. The experimental groups participated in their respective high intensity (80% of 1 RM) low frequency (2 days per week) weight training and low intensity (60% of 1 RM) and high frequency (3 days per week) weight training 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 three groups. The difference between the initial and final scores of the subjects on each variable was the effect of respective treatments. Statistical significance was tested through applying ANCOVA.

4.2 TEST OF SIGNIFICANCE

This is the vital portion of the thesis achieving the conclusion by examining the hypotheses. The procedure of testing the hypotheses was either by accepting the hypotheses or rejecting the same in accordance with the results obtained in relation to the level of confidence.

The test was usually called the test of significance since we test whether the differences between three groups or within many groups scores were significant or

not. In this study, if the obtained F-value were greater than the table value, the null hypotheses was rejected to the effect that there existed significant difference among the means of the groups compared and if the obtained values were lesser than the required values, then the null hypotheses was accepted to the effect that there existed no significant differences among the means of the groups under study.

4.2.1 LEVEL OF SIGNIFICANCE

The subjects were compared on the effect of varied intensities and frequencies of weight training on selected motor fitness and physiological variables among athletes. The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between the groups on selected criterion variables. In all the cases, 0.05 level of confidence was fixed to test the significance, which was considered as appropriate.

In this study, if the obtained F value were greater than the table value, the null hypotheses was rejected to the effect that there existed significant difference among the means of the groups compared and if the obtained values were lesser than the required values at 0.05 level, then the null hypotheses were accepted to the effect that there existed no significant differences among the means of the groups under study.

4.3 COMPUTATION OF ANALYSIS OF COVARIANCE AND POST HOC TEST

4.3.1 RESULTS ON SPEED

The statistical analysis comparing the initial and final means of Speed due to High Intensity and Low Frequency (HILF) weight training and Low Intensity and High Frequency (LIHF) weight training on selected motor fitness variable Speed among athletes in Table IV

Table IV

COMPUTATION OF ANALYSIS OF COVARIANCE OF SPEED (In Seconds)

	HILF TRG GROUP I	LIHF TRG GROUP	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	7.12	7.15	7.11	Between	0.02	2	0.01	0.27
				Within	1.83	57	0.03	
Post Test Mean	6.93	6.96	7.07	Between	0.24	2	0.12	3.53*
				Within	1.91	57	0.03	
Adjusted Post Test Mean	6.94	6.94	7.08	Between	0.29	2	0.14	21.78*
				Within	0.37	56	0.01	
Mean Diff	-0.19	-0.19	-0.04					

HILF: High Intensity Low Frequency; LIHF : Low Intensity High Frequency Trg: Training
Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.15, 2 and 56 (df) =3.15.
*Significant

As shown in Table IV, the obtained pre test means on Speed on High Intensity Low Frequency (HILF) group was 7.12, Low Intensity High Frequency (LIHF) group was 7.15 and control group was 7.11. The obtained pre test F value

was 0.27 and the required table F value was 3.15, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on Speed on High Intensity Low Frequency (HILF) group was 6.93, Low Intensity High Frequency (LIHF) group was 6.96 and control group was 7.07. The obtained post test F value was 3.53 and the required table F value was 3.15, which proved that there was significant difference.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 21.78 was greater than the required value of 3.15 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results are presented in Table V.

Table V

Scheffe's Confidence Interval Test Scores on Speed

MEANS				Required C I
High Intensity Low Frequency (HILF) Group	Low Intensity High Frequency (LIHF) Group	Control Group	Mean Difference	
6.94	6.94		0.00	0.06
6.94		7.08	0.15*	0.06
	6.94	7.08	0.15*	0.06

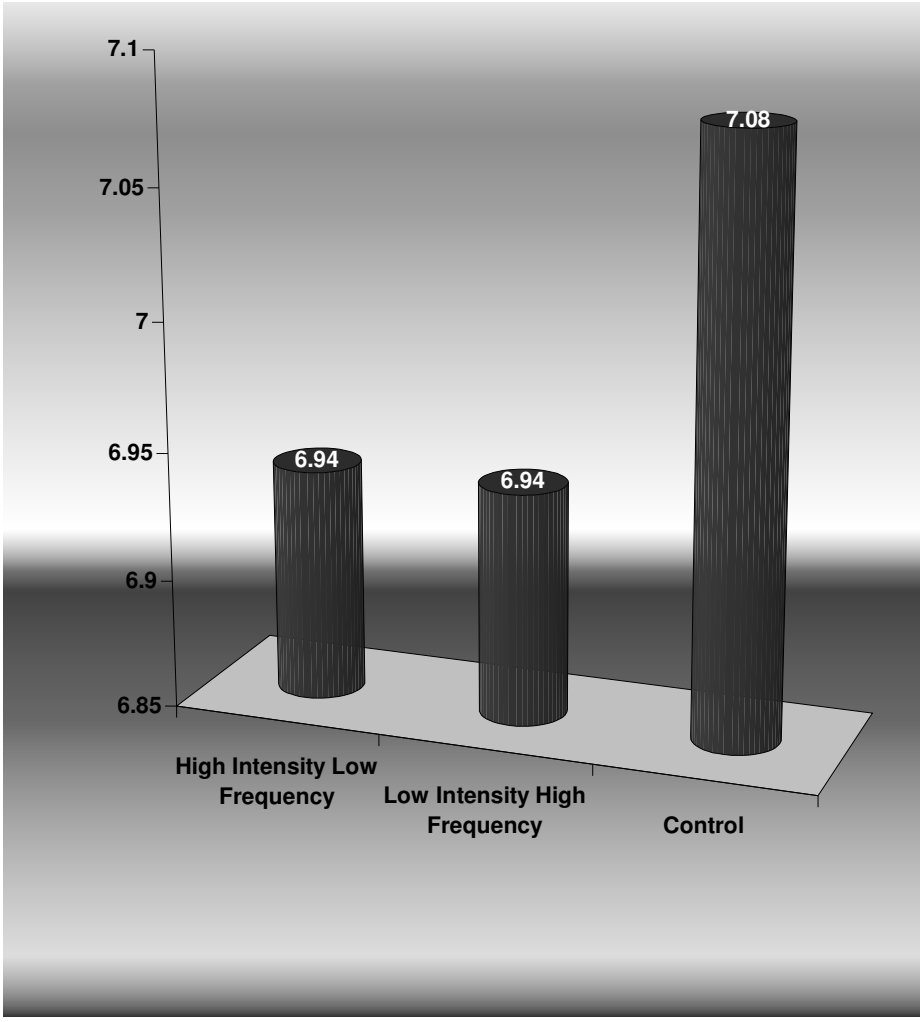
* Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between High Intensity Low Frequency (HILF) group and control group (MD: 0.15). There was significant difference between Low Intensity High Frequency (LIHF) group and control group (MD: 0.15). There was ingnificant difference between treatment groups, namely, High Intensity Low Frequency (HILF) group and Low Intensity High Frequency (LIHF) group. (MD: 0.00).

The ordered adjusted means are presented through bar diagram for better understanding of the results of this study in Figure I.

Figure I

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON SPEED
(In Seconds)



4.3.1.2 DISCUSSIONS ON FINDINGS

One of the major goals of an exercise programme is to make it not only intense enough to see some positive results but also to make it enjoyable enough where it becomes a part of an individual's regular routine, any person should look forward to workout session and not dread it. It is better to start gradually and take more time reaching the objectives than to start at a high level and drop out because of injury caused by either the intensity or frequency of the programme. In this part similar attempt is made to find out the effect of varied frequencies and frequencies of weight training on selected motor fitness variable, speed.

The effect of High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) on Speed is presented in Table IV. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 21.78 was greater than the required table F value of 3.15 to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table V proved that there was significant difference between High Intensity Low Frequency (HILF) group and control group (MD: 0.15) and Low Intensity High Frequency (LIHF) group and control group (MD: 0.15). Comparing between the treatment groups, it was found that there was insignificant difference between High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) group among male athletes.

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 marathon runners may run intervals of 3 miles at race pace or slower. There are several factors that affect the resulting heart rate besides exercise and training. Although the extent of variation differs with each individual body position has a definite effect upon the heart rate. The training effect of exercise depends upon the amount of stress imposed upon the relevant part of the body. There are variation in the resting heart rate response that is used in the exercise gives a better indication of intensity.

The findings of this study that varied intensity and frequency of weight training would significantly improve speed of the athletes is in agreement with the findings of Power man (2003) who found connective tissues are strengthened and increase speed and strength due to due to maximal and dynamic effect methods, heavy load training, light load training.

4.3.2 RESULTS ON EXPLOSIVE POWER

The statistical analysis comparing the initial and final means of Explosive Power due to High Intensity and Low Frequency (HILF) weight training and Low Intensity and High Frequency (LIHF) weight training on selected motor fitness variable Explosive Power among athletes is presented in Table VI

Table VI

COMPUTATION OF ANALYSIS OF COVARIANCE OF EXPLOSIVE POWER
(In Meters)

	HILF TRG GROUP I	LIHF TRG GROUP	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	2.24	2.29	2.19	Between	0.09	2	0.05	2.46
				Within	1.07	57	0.02	
Post Test Mean	2.27	2.34	2.18	Between	0.26	2	0.13	6.79*
				Within	1.07	57	0.02	
Adjusted Post Test Mean	2.27	2.29	2.22	Between	0.04	2	0.02	11.48*
				Within	0.11	56	0.002	
Mean Diff	0.03	0.05	-0.01					

HILF: High Intensity Low Frequency; LIHF: Low Intensity High Frequency Trg: Training
Table F-ratio at 0.05 level of confidence for 2 and 57 (DF) =3.15, 2 and 56 (DF) =3.15.
*Significant

As shown in Table IV, the obtained pre test means on Explosive Power on High Intensity Low Frequency (HILF) group was 2.24, Low Intensity High Frequency (LIHF) group was 2.29 and control group was 2.19. The obtained pre test

F value was 2.46 and the required table F value was 3.10, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on Explosive Power on High Intensity Low Frequency (HILF) group was 2.27, Low Intensity High Frequency (LIHF) group was 2.34 and control group was 2.18. The obtained post test F value was 6.79 and the required table F value was 3.15, which proved that there was significant difference among initial scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value of 11.48 was greater than the required value of 3.15 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results are presented in Table VII.

Table VII

Scheffe's Confidence Interval Test Scores on Explosive Power (In Meters)

MEANS				Required CI
High Intensity Low Frequency (HILF) Group	Low Intensity High Frequency (LIHF) Group	Control Group	Mean Difference	
2.27	2.29		0.02	0.03
2.27		2.22	0.04*	0.03
	2.29	2.22	0.07*	0.03

* Significant

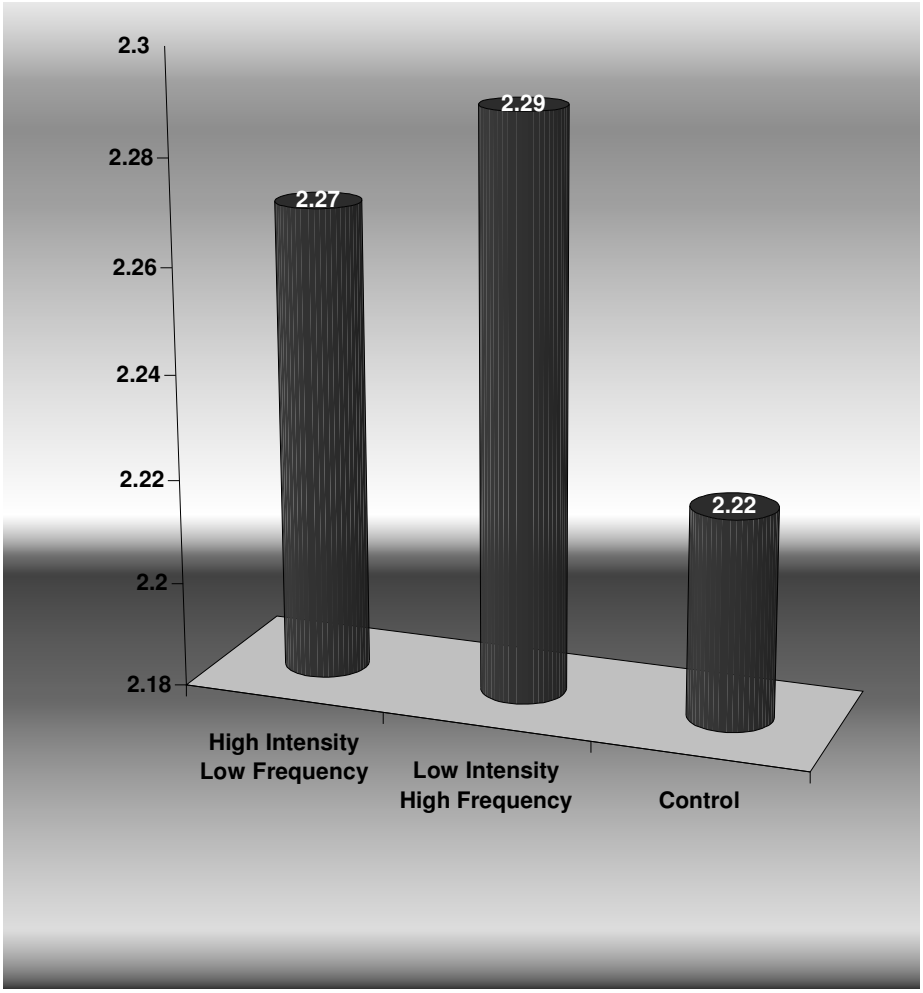
The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between High Intensity Low Frequency (HILF) group and control group (MD: 0.04). There was significant difference between Low Intensity High Frequency (LIHF) group and control group (MD: 0.07). There was insignificant difference between treatment groups, namely, High Intensity Low Frequency (HILF) group and Low Intensity High Frequency (LIHF) group. (MD: 0.02).

The ordered adjusted means are presented through bar diagram for better understanding of the results of this study in Figure II.

Figure II

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON EXPLOSIVE POWER

(In Meters)



4.3.2.2 DISCUSSIONS ON FINDINGS

One of the major goals of an exercise programme is to make it not only intense enough to see some positive results but also to make it enjoyable enough where it becomes a part of an individual's regular routine, any person should look forward to workout session and not dread it. It is better to start gradually and take more time reaching the objectives than to start at a high level and drop out because of injury caused by either the intensity or frequency of the programme. In this part similar attempt was made to find out the effect of varied intensities and frequencies of weight training on selected motor fitness variable, power.

The effect of High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) on Explosive Power is presented in Table VI. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value of 11.48 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table VII proved that there was significant difference between High Intensity Low Frequency (HILF) group and control group (MD: 0.04) and Low Intensity High Frequency (LIHF) group and control group (MD: 0.07). Comparing between the treatment groups, it was found that there was insignificant difference between High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) group among male athletes.

The findings of this study the varied intensities and frequencies of weight training significantly improved motor fitness variable on explosive power is in agreement with the findings of Rhea MR, et.al. (2009) who assessed the effect of heavy/slow movements and variable resistance training on peak power and strength development and found Variable resistance training with elastic bands appears to provide greater performance benefits with regard to peak force and peak power and speed which resulted in improved explosive power.

4.3.3 RESULTS ON CARDIOVASCULAR ENDURANCE

The statistical analysis comparing the initial and final means of Cardiovascular endurance due to High Intensity and Low Frequency (HILF) weight training and Low Intensity and High Frequency (LIHF) weight training on selected motor fitness variable Cardiovascular endurance among athletes is presented in Table VIII

Table VIII

COMPUTATION OF ANALYSIS OF COVARIANCE OF CARDIOVASCULAR ENDURANCE
(In Meters)

	HILF TRG GROUP I	LIHF TRG GROUP	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	1817.50	1839.75	1862.50	Between	20250.83	2	10125.42	0.63
				Within	916173.75	57	16073.22	
Post Test Mean	2045.50	1972.75	1883.75	Between	262510.83	2	131255.42	9.86*
				Within	758462.50	57	13306.36	
Adjusted Post Test Mean	2049.74	1972.78	1879.48	Between	284484.42	2	142242.21	10.98*
				Within	725737.97	56	12959.61	
Mean Diff	228.00	133.00	21.25					

HILF: High Intensity Low Frequency; LIHF: Low Intensity High Frequency Trg: Training
Table F-ratio at 0.05 level of confidence for 2 and 57 (DF) =3.15, 2 and 56 (DF) =3.15.
*Significant

As shown in Table VIII, the obtained pre test means on Cardiovascular endurance on High Intensity Low Frequency (HILF) group was 1817.5, Low Intensity High Frequency (LIHF) group was 1839.75 was and control group was 1862.50. The obtained pre test F value was 0.63 and the required table F value was 3.10, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on Cardiovascular endurance on High Intensity Low Frequency (HILF) group was 2045.50, Low Intensity High Frequency (LIHF) group was 1972.75 and control group was 1883.75. The obtained post test F value

was 9.86 and the required table F value was 3.15, which proved that there was significant difference among initial scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 10.98 was greater than the required value of 3.15 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table IX.

Table IX

Scheffe's Confidence Interval Test Scores on Cardiovascular endurance (In Meters)

MEANS				Required C I
High Intensity Low Frequency (HILF) Group	Low Intensity High Frequency (LIHF) Group	Control Group	Mean Difference	
2049.74	1972.78		76.96	90.50
2049.74		1879.48	170.25*	90.50
	1972.78	1879.48	93.30*	90.50

* Significant

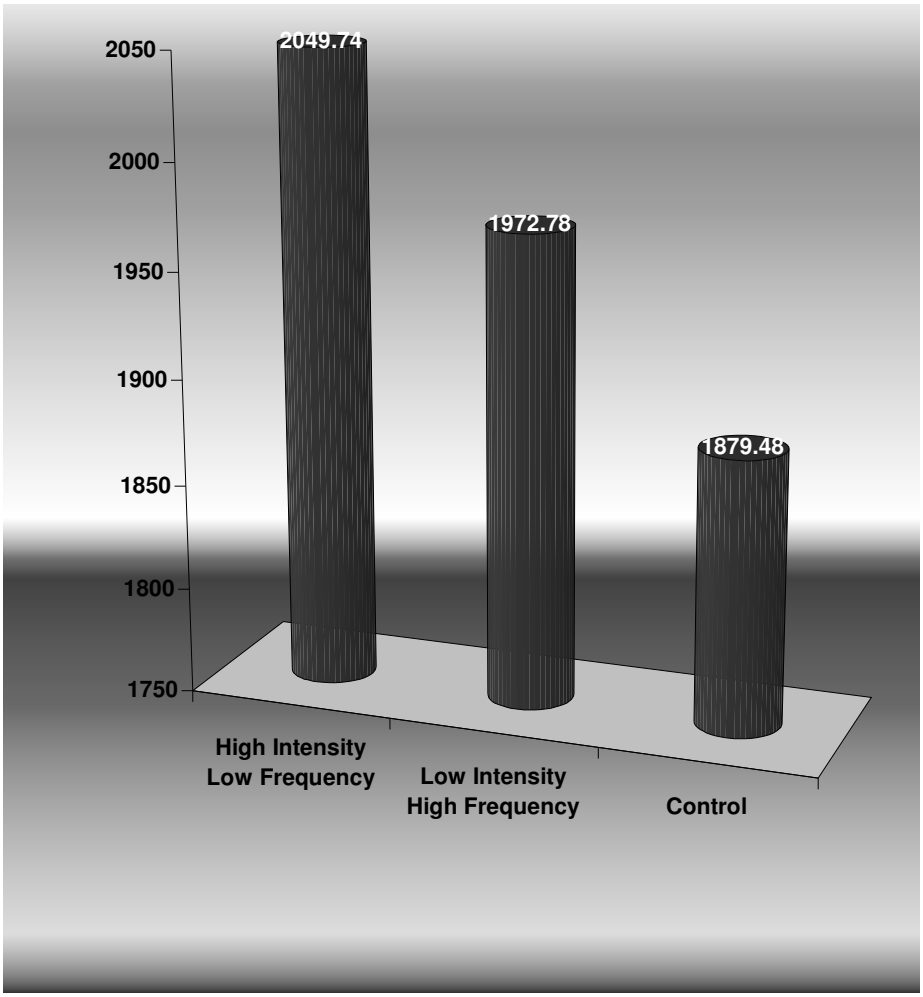
The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between High Intensity Low Frequency (HILF) group and control group (MD: 170.25). There was significant difference between Low Intensity High Frequency (LIHF) group and control group (MD: 93.30). There was insignificant difference between treatment groups, namely, High Intensity Low Frequency (HILF) group and Low Intensity High Frequency (LIHF) group. (MD: 76.96).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure III.

Figure III

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON CARDIOVASCULAR ENDURANCE

(In Meters)



4.3.3.2 DISCUSSIONS ON FINDINGS

There are several factors that affect the resulting heart rate besides exercise and training. Although the extent of variation differs with each individual body position has a definite effect upon the heart rate. The training effect of exercise depends upon the amount of stress imposed upon the relevant part of the body. There are variation in the resting heart rate response that is used in the exercise gives a better indication of intensity. The effect of varied intensity and frequency of weight training on motor fitness variable cardiovascular endurance is presented.

The effect of High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) on Cardiovascular endurance is presented in Table VIII. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 124.64 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table X proved that there was significant difference between High Intensity Low Frequency (HILF) group and control group (MD: 170.25) and significant differences between Low Intensity High Frequency (LIHF) group and control group (MD: 93.30). Comparing between the treatment groups, it was found that there was no significant difference between High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) group among male athletes.

The findings of this study proved that varied intensity and frequency weight training suggested in this study is enjoyable to the subjects under study and due to the experimental treatment high intensity with low frequency and low intensity and high frequency has significantly improved motor fitness variable cardiovascular endurance The findings of this study is in agreement with the finding of Carpinett (2003) who studied the effect of varied weight training programmes on strength and found multiple sets of exercise elicit superior gains in cardiovascular endurance and findings of Clutch et al.(2001), examined the effect of depth jumps and weight training on cardiovascular endurance and vertical jump and found increase in cardiovascular endurance due to varied weight training exercises.

4.3.4 RESULTS ON ARM STRENGTH

The statistical analysis comparing the initial and final means of Arm Strength due to High Intensity and Low Frequency (HILF) weight training and Low Intensity and High Frequency (LIHF) weight training on selected motor fitness variable Arm Strength among athletes is presented in Table X

Table X

COMPUTATION OF ANALYSIS OF COVARIANCE OF ARM STRENGTH

(In Numbers)

	HILF TRG GROUP I	LIHF TRG GROUP	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	6.90	7.15	7.15	Between	0.83	2	0.42	0.33
				Within	70.90	57	1.24	
Post Test Mean	7.65	7.55	7.05	Between	4.13	2	2.07	2.91
				Within	40.45	57	0.71	
Adjusted Post Test Mean	7.76	7.49	6.99	Between	6.08	2	3.04	23.40*
				Within	7.27	56	0.13	
Mean Diff	0.75	0.40	-0.10					

HILF: High Intensity Low Frequency; LIHF : Low Intensity High Frequency Trg: Training
Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.15, 2 and 56 (df) =3.15.
*Significant

As shown in Table X, the obtained pre test means on Arm Strength on High Intensity Low Frequency (HILF) group was 6.90, Low Intensity High Frequency (LIHF) group was 7.15 was and control group was 7.15. The obtained pre test F value was 0.33 and the required table F value was 3.10, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on Arm Strength on High Intensity Low Frequency (HILF) group was 7.65, Low Intensity High Frequency (LIHF) group was 7.55 was and control group was 7.05. The obtained post test F value was 2.91 and the required table F value was 3.15, which proved that there was no significant difference among initial scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 23.40 was greater than the required value of 3.15 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table XI.

Table XI

Scheffe's Confidence Interval Test Scores on Arm Strength

(In Numbers)

MEANS				Required C I
High Intensity Low Frequency (HILF) Group	Low Intensity High Frequency (LIHF) Group	Control Group	Mean Difference	
7.76	7.49		0.27	0.29
7.76		6.99	0.77*	0.29
	7.49	6.99	0.50*	0.29

* Significant

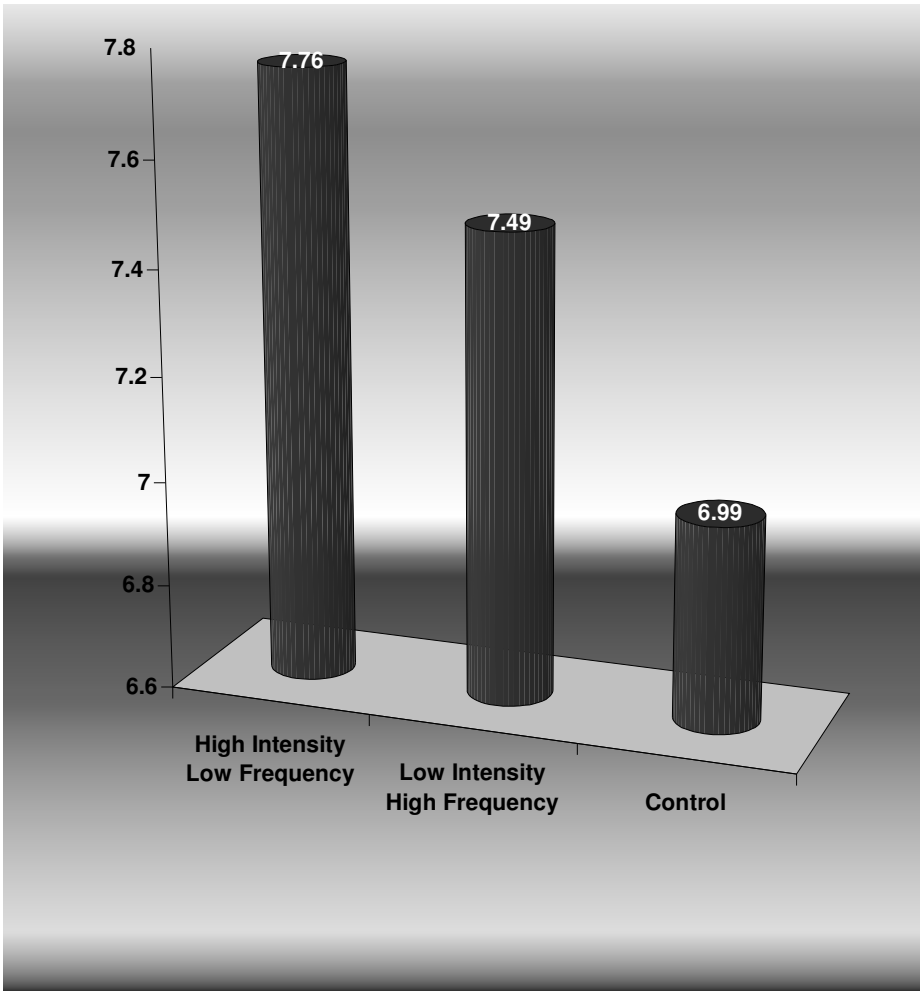
The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between High Intensity Low Frequency (HILF) group and control group (MD: 0.77). There was significant difference between Low Intensity High Frequency (LIHF) group and control group (MD: 0.50). There was insignificant difference between treatment groups, namely, High Intensity Low Frequency (HILF) group and Low Intensity High Frequency (LIHF) group. (MD: 0.27).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure IV.

Figure IV

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON ARM STRENGTH

(In Numbers)



4.3.4.2 DISCUSSIONS ON FINDINGS

The effect of High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) on Arm Strength is presented in Table X. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 23.40 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table XI proved that there was significant difference between High Intensity Low Frequency (HILF) group and control group (MD: 0.77) and Low Intensity High Frequency (LIHF) group and control group (MD: 0.50). Comparing between the treatment groups, it was found that there was insignificant difference between High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) group among male athletes.

One of the major goals of an exercise programme is to make it not only intense enough to see some positive results but also to make it enjoyable enough where it becomes a part of an individual's regular routine, any person should look forward to workout session and not dread it. It is better to start gradually and take more time reaching the objectives than to start at a high level and drop out because of injury caused by either the intensity or frequency of the programme. In this part similar attempt is made to find out the effect of varied frequencies and frequencies of weight training on selected motor fitness variable, arm strength. The results proved

that both high intensity with low frequency and low intensity with high frequency significantly improved arm strength of the subjects.

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. There are several factors that affect the resulting heart rate besides exercise and training. Although the extent of variation differs with each individual body position has a definite effect upon the heart rate. The training effect of exercise depends upon the amount of stress imposed upon the relevant part of the body.

The protocol suggested in this study is conducive and the experimental treatment, varied intensity and frequency significantly altered upper body strength, which was measured through arm strength of the subjects.

The findings of this study is in agreement with the findings of Clader et al., (1996) who examined the upper body exercise and lower body exercise with varied intensities and these treatments improved both upper body and lower body strength. The findings of this study is also in agreement with the findings of Clutch et al.(2001), who found that strength and power improved due to weight training with depth jumps.

4.3.5 RESULTS ON RESTING PULSE RATE

The statistical analysis comparing the initial and final means of Resting Pulse Rate due to High Intensity and Low Frequency (HILF) weight training and Low Intensity and High Frequency (LIHF) weight training on selected motor fitness variable Resting Pulse Rate among athletes is presented in Table XII

Table XII

COMPUTATION OF ANALYSIS OF COVARIANCE OF RESTING PULSE RATE

(Beats / Minute)

	HILF TRG GROUP I	LIHF TRG GROUP	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	66.85	67.55	67.40	Between	5.43	2	2.72	0.51
				Within	304.30	57	5.34	
Post Test Mean	65.50	66.90	68.45	Between	87.10	2	43.55	7.57*
				Within	327.75	57	5.75	
Adjusted Post Test Mean	65.73	66.74	68.38	Between	70.53	2	35.27	8.53*
				Within	231.66	56	4.14	
Mean Diff	-1.35	-0.65	1.05					

HILF: High Intensity Low Frequency; LIHF: Low Intensity High Frequency Trg: Training
Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.15, 2 and 56 (df) =3.15.
*Significant

As shown in Table XII, the obtained pre test means on Resting Pulse Rate on High Intensity Low Frequency (HILF) group was 66.85, Low Intensity High Frequency (LIHF) group was 67.55 was and control group was 67.40. The obtained

pre test F value was 0.51 and the required table F value was 3.10, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on Resting Pulse Rate on High Intensity Low Frequency (HILF) group was 65.5, Low Intensity High Frequency (LIHF) group was 66.9 was and control group was 68.45. The obtained post test F value was 7.57 and the required table F value was 3.15, which proved that there was significant difference among initial scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 8.53 was greater than the required value of 3.15 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Schaffer's Confidence Interval test. The results were presented in Table XIII.

Table XIII

Scheffe's Confidence Interval Test Scores on Resting Pulse Rate

(Beats / Minute)

MEANS				Required CI
High Intensity Low Frequency (HILF) Group	Low Intensity High Frequency (LIHF) Group	Control Group	Mean Difference	
65.73	66.74		1.01	1.61
65.73		68.38	2.64*	1.61
	66.74	68.38	1.63*	1.61

* Significant

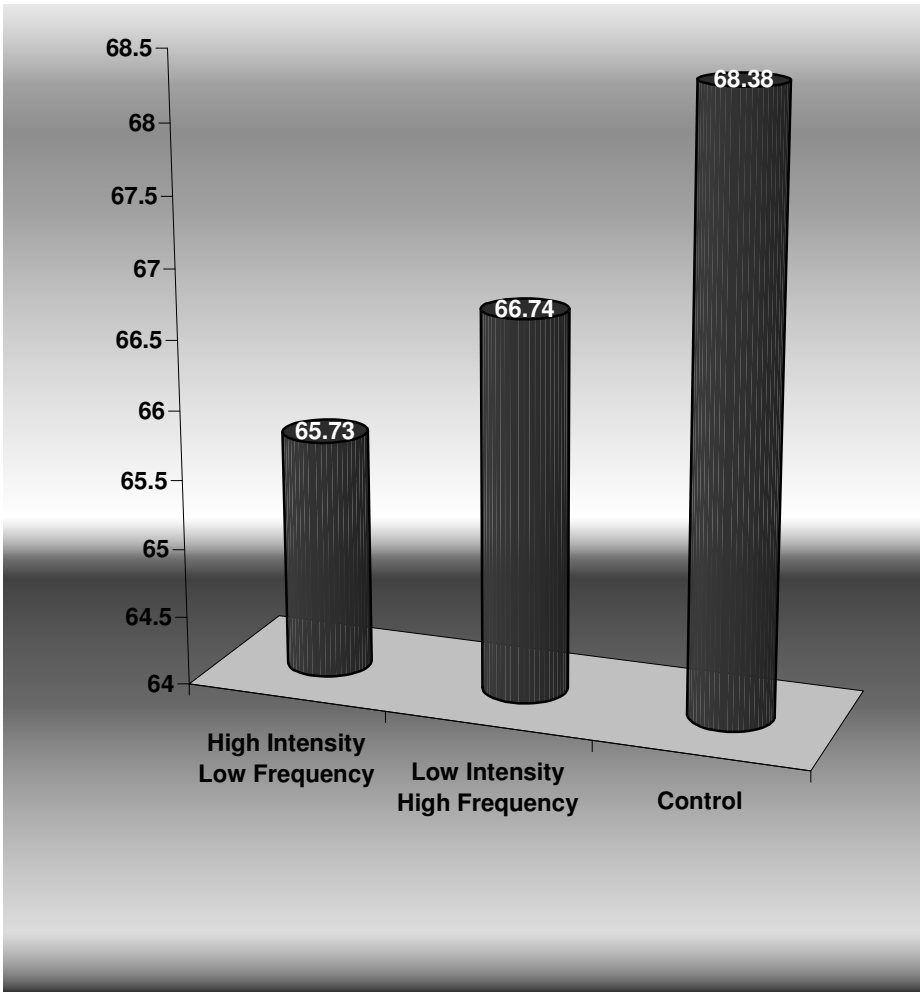
The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between High Intensity Low Frequency (HILF) group and control group (MD: 2.64). There was significant difference between Low Intensity High Frequency (LIHF) group and control group (MD: 1.63). There was insignificant difference between treatment groups, namely, High Intensity Low Frequency (HILF) group and Low Intensity High Frequency (LIHF) group. (MD: 1.01).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure V.

Figure V

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON RESTING PULSE RATE

(Beats / Minute)



4.3.5.2 DISCUSSIONS ON FINDINGS

The training effect of exercise depends upon the amount of stress imposed upon the relevant part of the body. There are variation in the resting heart rate response that is used in the exercise gives a better indication of intensity. Physiological changes ranging from training are generally related to the intensity of the exercise. Intensity is expressed in terms of efforts relative to the subject control capacity. The enhancement of capacity is greater when load of 90 to 100% of the individual capacity are imposed.

One of the major goals of an exercise programme is to make it not only intense enough to see some positive results but also to make it enjoyable enough where it becomes a part of an individual's regular routine, any person should look forward to workout session and not dread it. It is better to start gradually and take more time reaching the objectives than to start at a high level and drop out because of injury caused by either the intensity or frequency of the programme. In this part similar attempt is made to find out the effect of varied frequencies and frequencies of weight training on selected physiological variable, resting pulse rate.

The effect of High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) on Resting Pulse Rate is presented in Table XII. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 8.53 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table XIII proved that there was significant difference between High Intensity Low Frequency (HILF) group and control group (MD: 2.64) and there was significant difference between Low Intensity High Frequency (LIHF) group and control group (MD: 1.63). Comparing between the treatment groups, it was found that there was insignificant difference between High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) group among male athletes. It was found that HILF group was found to be superior than LIHF Group.

The findings of this study is in agreement with the findings of Meyer et al, (2007) who studied the efficacy of varied intensity endurance training and found heart rate during incremental exercise decreased significantly, which was also found in this study that pulse rate of the subjects significantly decreased due to high intensity and low frequency exercises.

4.3.6 RESULTS ON VO_2 MAX

The statistical analysis comparing the initial and final means of VO_2 Max due to High Intensity and Low Frequency (HILF) weight training and Low Intensity and High Frequency (LIHF) weight training on selected motor fitness variable VO_2 Max among athletes is presented in Table XIV

Table XIV

COMPUTATION OF ANALYSIS OF COVARIANCE OF VO_2 MAX

[in mL/(kg·min)]

	HILF TRG GROUP I	LIHF TRG GROUP	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	40.72	41.24	41.32	Between	4.26	2	2.13	0.12
				Within	1000.12	57	17.55	
Post Test Mean	46.62	44.70	41.29	Between	291.83	2	145.92	9.66*
				Within	861.18	57	15.11	
Adjusted Post Test Mean	46.90	44.59	41.12	Between	338.20	2	169.10	32.62*
				Within	290.28	56	5.18	
Mean Diff	5.90	3.46	-0.03					

Table F- HILF: High Intensity Low Frequency; LIHF : Low Intensity High Frequency Trg: Training ratio at 0.05 level of confidence for 2 and 57 (df) =3.15, 2 and 56 (df) =3.15.
*Significant

As shown in Table XIV, the obtained pre test means on VO_2 Max on High Intensity Low Frequency (HILF) group was 40.72, Low Intensity High Frequency (LIHF) group was 41.24 was and control group was 41.32. The obtained pre test F value was 0.12 and the required table F value was 3.10, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on VO_2 Max on High Intensity Low Frequency (HILF) group was 46.62, Low Intensity High Frequency (LIHF) group was 44.70 was and control group was 41.29. The obtained post test F value was 9.66 and the

required table F value was 3.15, which proved that there was significant difference among initial scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 32.62 was greater than the required value of 3.15 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table XV.

Table XV

Scheffe's Confidence Interval Test Scores on VO_2 Max [in mL/(kg·min)]

MEANS				Required CI
High Intensity Low Frequency (HILF) Group	Low Intensity High Frequency (LIHF) Group	Control Group	Mean Difference	
46.90	44.59		2.32*	1.81
46.90		41.12	5.79*	1.81
	44.59	41.12	3.47*	1.81

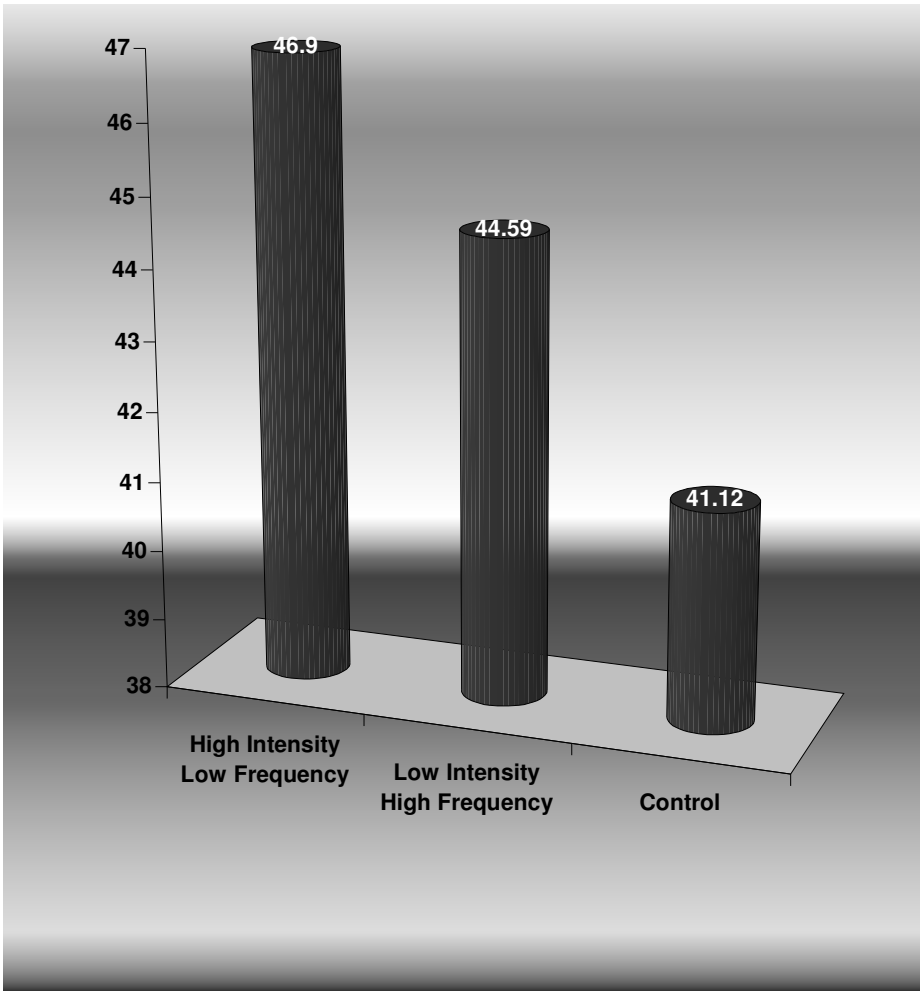
* Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between High Intensity Low Frequency (HILF) group and control group (MD: 5.79). There was significant difference between Low Intensity High Frequency (LIHF) group and control group (MD: 3.47). There was significant difference between treatment groups, namely, High Intensity Low Frequency (HILF) group and Low Intensity High Frequency (LIHF) group. (MD: 2.32).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure VI.

Figure VI

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON VO_2 MAX
[in mL/(kg·min)]



4.3.6.2 DISCUSSIONS ON FINDINGS

One of the major goals of an exercise programme is to make it not only intense enough to see some positive results but also to make it enjoyable enough where it becomes a part of an individual's regular routine, any person should look forward to workout session and not dread it. It is better to start gradually and take more time reaching the objectives than to start at a high level and drop out because of injury caused by either the intensity or frequency of the programme. In this part similar attempt is made to find out the effect of varied frequencies and frequencies of weight training on selected physiological variable, VO_2 max.

The effect of High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) on VO_2 Max is presented in Table XIV. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 32.62 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table XV proved that there was significant difference between High Intensity Low Frequency (HILF) group and control group (MD: 5.79) and Low Intensity High Frequency (LIHF) group and control group (MD: 3.47). Comparing between the treatment groups, it was found that there was significant difference between High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) group among male athletes.

Smith et al. (2003) compare the effects of two high-intensity training programmes and found VO_2 max can be improved among well trained runners through high intensity training programmes. Denadai et al. (2006) analyzed the effect of two different high-intensity interval training on maximal oxygen uptake (VO_2 max) and found improvement in $VO_{2=}$ max was associated with the high intensity training load. The findings of this study revealed that high intensity with low frequency weight training significantly improved VO_2 max than low intensity with high frequency group and control group. Hence, the findings of this study is in agreement with the findings o Smith et.al. (2003) and Denadai et al. (2006).

4.3.7 RESULTS ON ANAEROBIC POWER

The statistical analysis comparing the initial and final means of Anaerobic Power due to High Intensity and Low Frequency (HILF) weight training and Low Intensity and High Frequency (LIHF) weight training on selected motor fitness variable Anaerobic Power among athletes is presented in Table XVI

Table XVI

COMPUTATION OF ANALYSIS OF COVARIANCE OF ANAEROBIC POWER

(Watts)

	HILF TRG GROUP I	LIHF TRG GROUP	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	77.06	75.78	79.79	Between	168.16	2	84.08	0.96
				Within	5013.14	57	87.95	
Post Test Mean	81.44	76.87	79.64	Between	211.50	2	105.75	1.08
				Within	5587.01	57	98.02	
Adjusted Post Test Mean	81.90	78.57	77.47	Between	211.19	2	105.60	6.22*
				Within	950.20	56	16.97	
Mean Diff	4.37	1.10	-0.16					

HILF: High Intensity Low Frequency; LIHF : Low Intensity High Frequency Trg: Training
Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.15, 2 and 56 (df) =3.15.
*Significant

As shown in Table IV, the obtained pre test means on Anaerobic Power on High Intensity Low Frequency (HILF) group was 77.06, Low Intensity High Frequency (LIHF) group was 75.78 was and control group was 79.79. The obtained pre test F value was 0.96 and the required table F value was 3.10, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on Anaerobic Power on High Intensity Low Frequency (HILF) group was 81.44, Low Intensity High Frequency (LIHF) group was 76.87 was and control group was 79.64. The obtained post test F value was 1.08

and the required table F value was 3.15, which proved that there was no significant difference among initial scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 6.22 was greater than the required value of 3.15 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table XVII.

Table XVII

Scheffe's Confidence Interval Test Scores on Anaerobic Power (Watts)

MEANS				Required CI
High Intensity Low Frequency (HILF) Group	Low Intensity High Frequency (LIHF) Group	Control Group	Mean Difference	
81.90	78.57		3.33*	3.27
81.90		77.47	4.43*	3.27
	78.57	77.47	1.10	3.27

* Significant

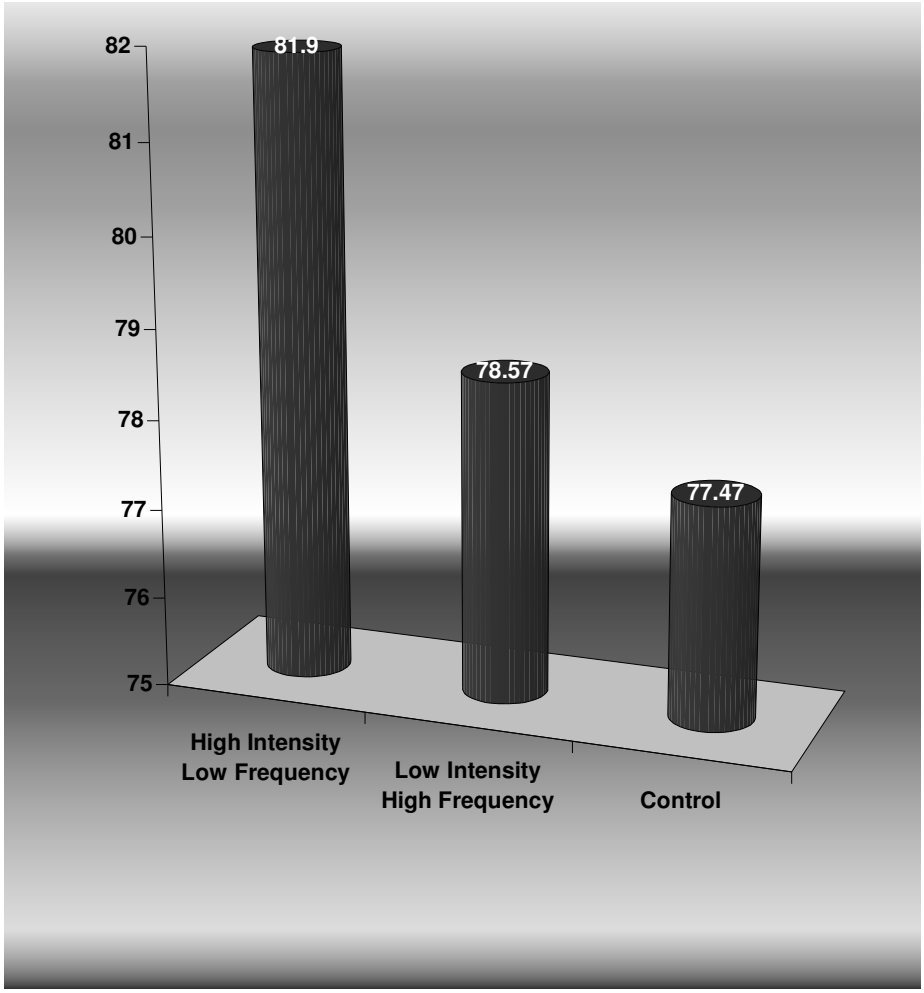
The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between High Intensity Low Frequency (HILF) group and control group (MD: 4.43). There was insignificant difference between Low Intensity High Frequency (LIHF) group and control group (MD: 1.10). There was significant difference between treatment groups, namely, High Intensity Low Frequency (HILF) group and Low Intensity High Frequency (LIHF) group. (MD: 3.33).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure VII.

Figure VII

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON ANAEROBIC POWER

(Watts)



4.3.7.2 DISCUSSIONS ON FINDINGS

The training effect of exercise depends upon the amount of stress imposed upon the relevant part of the body. There are variation in the resting heart rate response that is used in the exercise gives a better indication of intensity. Physiological changes ranging from training are generally related to the intensity of the exercise. Intensity is expressed in terms of efforts relative to the subject control capacity. The enhancement of capacity is greater when load of 90 to 100% of the individual capacity are imposed.

One of the major goals of an exercise programme is to make it not only intense enough to see some positive results but also to make it enjoyable enough where it becomes a part of an individual's regular routine, any person should look forward to workout session and not dread it. It is better to start gradually and take more time reaching the objectives than to start at a high level and drop out because of injury caused by either the intensity or frequency of the programme. In this part similar attempt is made to find out the effect of varied frequencies and frequencies of weight training on selected physiological variable, anaerobic power.

The effect of High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) on Anaerobic Power is presented in Table XVI. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 6.22 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table XVII proved that there was significant difference between High Intensity Low Frequency (HILF) group and control group (MD: 4.43) and there was insignificant differences between Low Intensity High Frequency (LIHF) group and control group (MD: 1.10). Comparing between the treatment groups, it was found that there was significant difference between High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) group among male athletes.

Balabins (2001) conducted a research on the effects of varied strength training among basketball players and found strength training group improved anaerobic power. Bacharach and Davillard (2004) examined a study of intermediate and a long term anaerobic performance of elite Alpine skiers and found anaerobic capacity can be altered by increased intensity of work load. The findings of this study proved that high intensity with low frequency weight raining group was significantly superior than low intensity with high frequency weight training and control group. The findings of this study are in agreement with the findings o Balabins (2002) and Davillard (2004).

4.3.8 RESULTS ON BREATH HOLDING TIME

The statistical analysis comparing the initial and final means of Breath Holding Time due to High Intensity and Low Frequency (HILF) weight training and Low Intensity and High Frequency (LIHF) weight training on selected motor fitness variable Breath Holding Time among athletes is presented in Table XVIII

Table XVIII

COMPUTATION OF ANALYSIS OF COVARIANCE OF BREATH HOLDING TIME

(In Seconds)

	HILF TRG GROUP I	LIHF TRG GROUP	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	39.50	39.65	38.05	Between	31.23	2	15.62	0.23
				Within	3800.50	57	66.68	
Post Test Mean	49.60	47.85	37.29	Between	1772.73	2	886.36	15.29*
				Within	3304.07	57	57.97	
Adjusted Post Test Mean	49.22	47.34	38.19	Between	1381.35	2	690.67	109.40*
				Within	353.54	56	6.31	
Mean Diff	10.10	8.20	-0.76					

HILF: High Intensity Low Frequency; LIHF: Low Intensity High Frequency Trg: Training
Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.15, 2 and 56 (df) =3.15.
*Significant

As shown in Table IV, the obtained pre test means on Breath Holding Time on High Intensity Low Frequency (HILF) group was 39.50, Low Intensity High Frequency (LIHF) group was 39.65 was and control group was 38.05. The obtained

pre test F value was 0.23 and the required table F value was 3.10, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on Breath Holding Time on High Intensity Low Frequency (HILF) group was 49.60, Low Intensity High Frequency (LIHF) group was 47.85 was and control group was 37.29. The obtained post test F value was 15.29 and the required table F value was 3.15, which proved that there was significant difference among initial scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 109.40 was greater than the required value of 3.15 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table XIX.

Table XIX

Scheffe's Confidence Interval Test Scores on Breath Holding Time

(In Seconds)

MEANS				Required CI
High Intensity Low Frequency (HILF) Group	Low Intensity High Frequency (LIHF) Group	Control Group	Mean Difference	
49.22	47.34		1.88	1.99
49.22		38.19	11.03*	1.99
	47.34	38.19	9.15*	1.99

* Significant

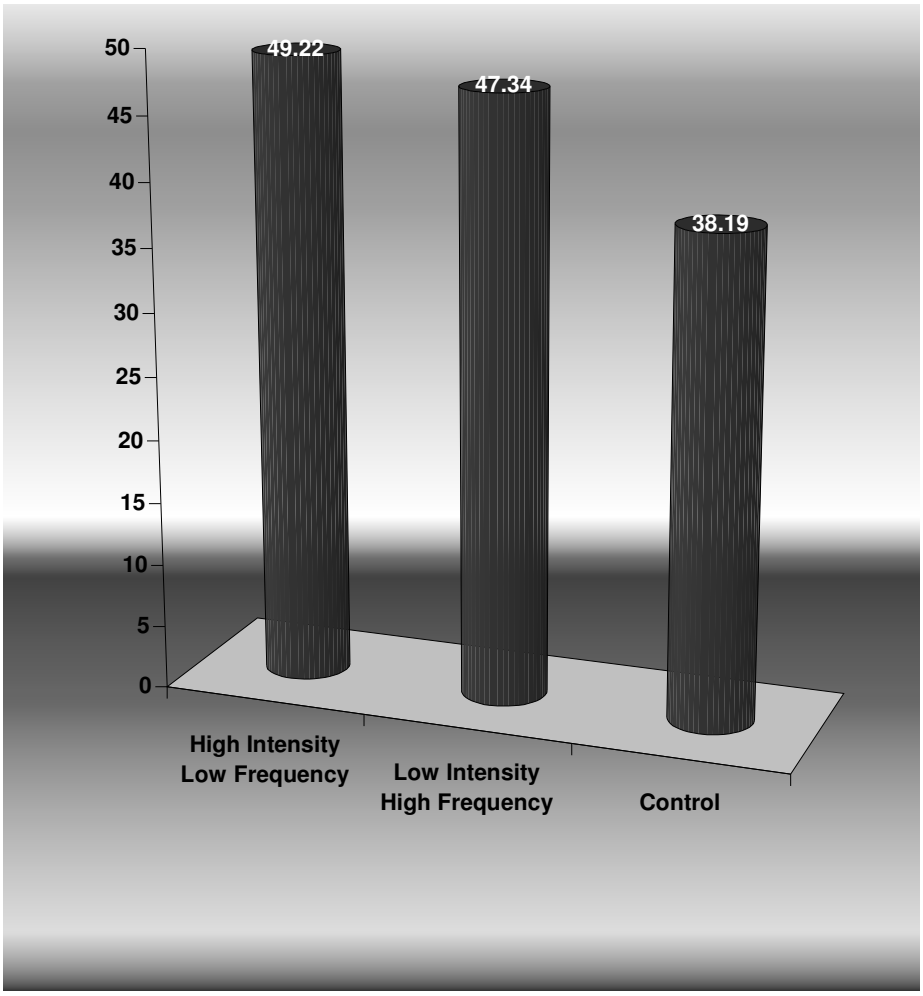
The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between High Intensity Low Frequency (HILF) group and control group (MD: 11.03). There was significant difference between Low Intensity High Frequency (LIHF) group and control group (MD: 9.15). There was insignificant difference between treatment groups, namely, High Intensity Low Frequency (HILF) group and Low Intensity High Frequency (LIHF) group. (MD: 1.88).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure VIII.

Figure VIII

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON BREATH HOLDING TIME

(In Seconds)



4.3.8.2 DISCUSSIONS ON FINDINGS

Anecdotal evidence suggests that people hold their breath during lifting tasks in order to increase intra-abdominal pressure (IAP) and thereby increase lumbar stability. Studies have shown that voluntary control of the breath influences IAP and that increases in IAP are related to increases in breath holding time. However, there is further scope for research to find out whether varied intensities and frequencies of weight training has any effect of breath holding time of athletes. In this research such an attempt is made and the results presented in Tables XVIII and XIX.

The effect of High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) on Breath Holding Time is presented in Table XVIII. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 109.40 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table XIX proved that there was significant difference between High Intensity Low Frequency (HILF) group and control group (MD: 11.03) and Low Intensity High Frequency (LIHF) group and control group (MD: 9.15). Comparing between the treatment groups, it was found that there was significant difference between High Intensity Low Frequency (HILF) and Low Intensity High Frequency (LIHF) group among male athletes.

Chakhunashvili G, et.al. (2011) found that increase of breath and pulse in frequency was observed in sportsmen-basketball players after physical loading. Lamberg EM, and Hagins M. (2010) studied on breath control during manual free style lifting maximally tolerate load and found holding the breath does not appear to be related to lifting of a maximally tolerated load from floor to table. Hagins M, and Lamberg EM. (2006) found there was a significant increase of inspired volume and occurrence of breath holding when lifting the heavy load compared to the medium and light loads The findings of this study proved that high intensity with low frequency and low frequency with high intensity of weight lifting training for twelve weeks significantly improved breath holding time o the athletes and these findings are in agreement with the findings of Chakhunashvili G, et.al. (2011) and Hagins M, and Lamberg EM. (2006)

4.4 DISCUSSIONS ON HYPOTHESES

Wight 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 (good) cholesterol. Training commonly uses the technique of progressively increasing the force output of the muscle through incremental increases of weight, elastic tension or other resistance, and uses a variety of exercises and types of equipment to target specific muscle

groups. Weight training is primarily an anaerobic activity; there is every possibility of reaping the benefits of aerobic exercises through manipulation of intensities and frequencies of weight training. In this study, the researcher was interested to find out whether weight training of different intensities and frequencies can alter selected motor fitness variables, speed, explosive power, endurance and arm strength and physiological variables, resting pulse rate, VO_2 max, anaerobic capacity, and breath holding time. To achieve the purpose of the study, the investigator formulated the following hypotheses to be tested.

1. It was hypothesized that varied intensities and frequencies of weight training would significantly improve in selected motor fitness variables, speed, explosive power, endurance and arm strength among athletes compared to control group.

2. It was hypothesized that varied intensities and frequencies of weight training would significantly improve selected physiological variables, resting pulse rate, VO_2 max, anaerobic power and breath holding time among athletes compared to control group.

3. It was hypothesized that there would be significant differences among treatment groups involved in varied intensities and frequencies of weight training on selected motor fitness and physiological variables.

The formulated hypothesis No. 1 stated that varied intensities and frequencies of weight training would significantly improve in selected motor fitness variables,

speed, explosive power, endurance and arm strength among athletes compared to control group. The results presented in Table IV, VI, VIII and X shows the ANCOVA results proved that there was significant difference among high intensity and low frequency (HILF) group, low intensity and high frequency (LIHF) group and control group on motor fitness variables speed, explosive power, cardiovascular endurance and arm strength. The post hoc analysis proved (Tables V, VII, IX and XI) that both HILF and LIHF groups were significantly improved speed, explosive power, cardiovascular endurance and arm strength and there was no significant difference among the experimental groups. Thus, the formulated hypothesis No. 1 was accepted at 0.05 level on motor fitness variables, speed, explosive power, cardiovascular endurance and arm strength.

The formulated hypothesis No. 2 stated that varied intensities and frequencies of weight training would significantly improve selected physiological variables, resting pulse rate, VO_2 max, anaerobic power and breath holding time among athletes compared to control group. The results presented in Tables XII, XIV, XVI and XVIII on resting pulse rate, VO_2 max, anaerobic power and breath holding time proved to be significant. However, the post hoc analysis proved that experimental groups, HILF and LIHF were significantly better than control group on resting pulse rate, VO_2 max and breath holding time and the formulated hypothesis was accepted a 0.05 level. However, as for the anaerobic power there is no significant difference between LIHF group and control group. To this extent the formulated hypothesis was rejected at 0.05 level.

The formulated hypothesis No. 3 stated that there would be significant differences among treatment groups involved in varied intensities and frequencies of weight training on selected motor fitness and physiological variables. The post hoc analysis on speed, explosive power, endurance, arm strength, resting pulse rate, VO_2 max, anaerobic power and breath holding time are presented in Table V, VII, IX, XI, XIII, XV, XVII and XIX respectively. There is no significant differences between HILF and LIHF groups on speed, explosive power, cardiovascular endurance, arm strength, resting pulse rate and breath holding time and the formulated hypothesis, there would be significant differences was rejected. As for VO_2 max and anaerobic power (Tables XV and XVII), there was significant differences between experimental groups. And it was found that HILF group was found to be superior than LIHF group on VO_2 max and anaerobic power. And the formulated hypothesis was accepted at 0.05 level. As for breath holding time, the post hoc analysis results presented in Table XIX proved that there is no significant difference among experimental group and to this extent the formulated hypothesis was rejected at 0.05 level.

Weight training is primarily an anaerobic activity; there is every possibility of reaping the benefits of aerobic exercises through manipulation of intensities and frequencies of weight training. In this study, the investigator uses the technique of progressively increasing the force output of the muscle through incremental increases of weight, elastic tension or other resistance, and uses a variety of exercises

and types of equipment to target specific muscle groups of low intensity and high frequency and high frequency and low frequency exercises.

And these manipulations of anaerobic activity benefited in reaping the benefits of aerobic exercises, which resulted in improved motor fitness and physiological conditions of the athletes and provided 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 (good) cholesterol.. These changes significantly altered the selected motor fitness and physiological variables selected in this study.