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Effect of High Altitude Training on the Physiological profiles of middle and Long Distance Runners

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Abstract

The purpose of the study was to investigate the effect of twelve weeks high altitude training programme, on the physiological profiles of middle and long distance runners. It was hypothesized that there would have been a significant effect of twelve weeks high altitude training programme on physiological profiles among the middle and long distance runners. For the present study the subjects were 30 male long distance runners from varies Sports Authority of India, Training center hostels, of south India, were selected as subjects at random and their age ranged from 18 to 25 years. For the present study pre test – post test randomized group design which consists of control group and experimental group was used. The subjects were randomly assigned to two equal groups of fifteen each and named as Group 'A' and Group 'B'. Group 'A' underwent high altitude training and Group 'B' underwent no High altitude training. The data was collected before and after twelve weeks of training. The data was analyzed by applying Analysis of Co-Variance (ANCOVA) technique to find out the effect of high altitude training programme on selected physiological profiles among middle and long distance runners. The level of significance was set at 0.05.

Key words: *High Altitude, Long Distance Runner, Pulse Rate, Vital Capacity.*

Introduction

Altitude training is the practice by some endurance athletes of training for several weeks at high altitude, preferably over 2,400 metres (8,000 ft) above sea level, though more commonly at intermediate altitudes due to the shortage of suitable high-altitude locations. At intermediate altitudes, the air still contains approximately 20.9% oxygen, but the barometric pressure and thus the partial pressure of oxygen is reduced. The underlying problem with high altitude (>2000 m) is that there is less oxygen and while this may not be that threatening to individuals at rest it does pose a challenge to athletes. Of course for the pure anaerobic events no adaptation is required so this discussion is necessarily focused on endurance training and competition. In general the higher the altitude the longer it takes to adapt. Understanding the adaptation process and the things that you can do to aid it will make for a less taxing transition. A number of physiologic changes occur to allow for acclimatization at high altitude. These can be divided into immediate, which take place over several days, and long term which requires weeks to a few months.

The first thing that happens is your respiratory rate and heart rates speed up. This occurs both at rest and during sub-maximal exercise. This helps offset the lower partial pressure of oxygen. You will not be able to reach your max VO2 so don't get frustrated. The faster breathing rate changes your acid-base balance and this takes a little longer to correct. The body's adaptation to high altitude helps significantly but doesn't fully compensate for the lack of oxygen. There is a drop in VO2 max of 2% for every 300 m elevation above 1500 m even after allowing for full acclimatization **(West, 1996)**.

Purpose of the Study

The purpose of the study was to investigate the effect of twelve weeks high altitude training programme on selected physiological profiles of middle and long distance runners. It was hypothesized that there would have been a significant effect of twelve weeks high altitude training programme on selected physiological variables among middle and long distance runners.

Procedure and Methodology

For the present study the subjects were 30 male middle and long distance runners from varies Sports Authority of India, Training center hostels of south India, were selected as subjects at random and their age ranged from 18 to 25 years. For the present study pre test – post test randomized group design which consists of control group and experimental group was used. The subjects were randomly

assigned to two equal groups of fifteen each and named as Group 'A' and Group 'B'. Group 'A' underwent high altitude training (The high altitude training was organized at MRC Wellington, Ooty, Tamil Nadu) and Group 'B' underwent regular training. The data was collected before and after twelve weeks of training. The data was analyzed by applying Analysis of Co-Variance (ANCOVA) technique to find out the effect of high altitude training programme on selected physiological profiles among the Middle and long distance runners. The level of significance was set at 0.05.

Results and Discussions on Findings

The findings pertaining to analysis of co-variance between experimental group and control group on selected physiological variables among middle and long distance runners for pre-post test respectively have been presented in table No.1 to 3.

Table – 1: ANCOVA between Experimental Group and Control Group on Resting Pulse Rate of middle and Long distance runners for Pre, Post and Adjusted Test

	Experimental Group	Control Group	Source of Variance	Sum of Squares	df	Mean Square	F
Pre Test Mean	54.54	54.21	BG	0.62	1	0.62	0.40
			WG	59.15	38	1.55	
Post Test Mean	51.35	54.16	BG	1000.00	1	1000.00	730.76*
			WG	52.00	38	1.36	
Adjusted Post Mean	51.36	54.16	BG	985.78	1	985.78	706.07*
			WG	51.65	37	1.39	

**** Significant at 0.05 level.** **df: 1/37= 4.10**

Table No. 1 revealed that the obtained 'F' value of 706.07 was found to be significant at 0.05 level with df 1, 37 as the tabulated value of 4.10 required to be significant at 0.05 level. The same table indicated that there was a significant difference in adjusted means of Resting pulse rate of the middle and long distance runners between experimental group and control group.

The graphical representation of data has been presented in figure No.1

Figure: 1 Comparisons of Pre – Test Means Post – Test Means and Adjusted Post – Test Means for Control group and Experimental Group in relation to Pulse rate

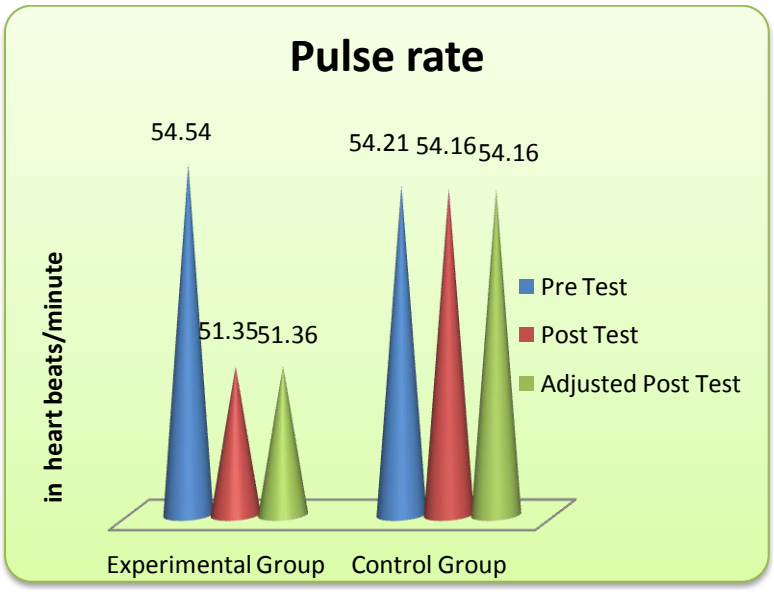


Table – 2: ANCOVA between Experimental Group and Control Group on Respiratory Rate of the middle and Long distance runners for Pre, Post and Adjusted Test

	Experimental Group	Control Group	Source of Variance	Sum of Squares	df	Mean Square	F
Pre Test Mean	21.45	20.98	BG	0.02	1	0.02	0.01
			WG	96.95	38	2.55	
Post Test Mean	17.13	20.76	BG	532.90	1	532.90	197.17*
			WG	102.70	38	2.70	
Adjusted Post Mean	17.13	20.76	BG	534.68	1	534.68	206.14*
			WG	95.96	37	2.59	

**** Significant at 0.05 level.** **df: 1/37= 4.10**

Table No. 2 revealed that the obtained 'F' value of 206.14 was found to be significant at 0.05 level with df 1, 37 as the tabulated value of 4.10 required to be significant at 0.05 level. The same table indicated that there was a significant difference in adjusted means of respiratory rate of the middle and long distance runners between experimental group and control group.

The graphical representation of data has been presented in figure No.2

Figure: 2 Comparisons of Pre – Test Means Post – Test Means and Adjusted Post – Test Means for Control group and Experimental Group in relation to Respiratory Rate

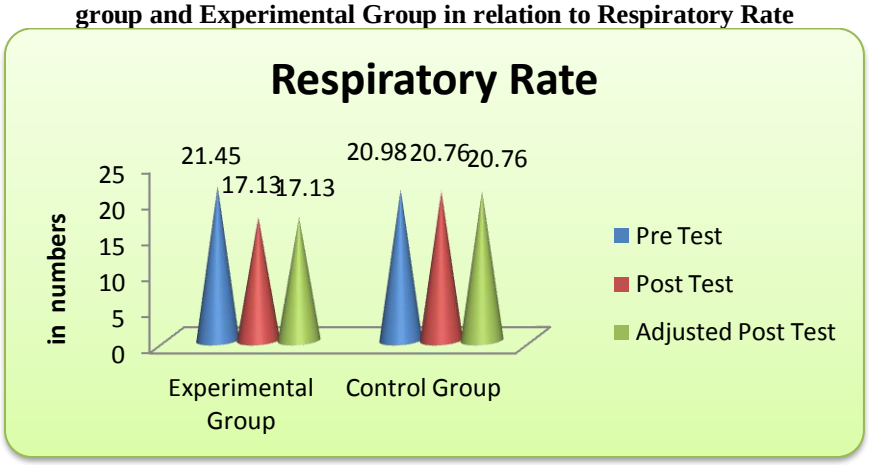


Table – 3: ANCOVA between Experimental Group and Control Group on Vital Capacity of the middle and Long distance runners for Pre, Post and Adjusted Test

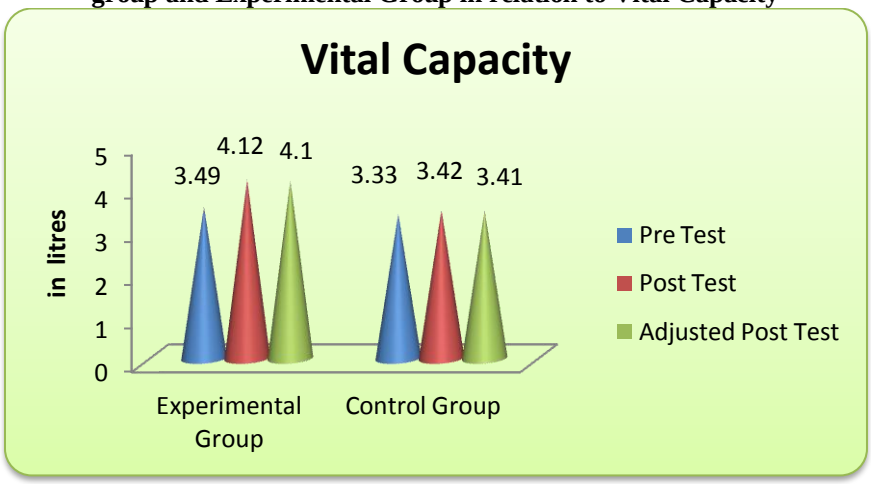
	Experimental Group	Control Group	Source of Variance	Sum of Squares	df	Mean Square	F
Pre Test Mean	3.49	3.33	BG	0.004	1	0.004	0.30
			WG	0.49	38	0.01	
Post Test Mean	4.12	3.42	BG	1.36	1	1.36	73.32*
			WG	0.70	38	0.01	
Adjusted Post Mean	4.10	3.41	BG	1.33	1	1.33	70.55*
			WG	0.70	37	0.01	

**** Significant at 0.05 level.** **df: 1/37= 4.10**

Table No. 3 revealed that the obtained 'F' value of 24.18 was found to be significant at 0.05 level with df 1, 37 as the tabulated value of 4.10 required to be significant at 0.05 level. The same table indicated that there was a significant difference in adjusted means of vital capacity of long distance runners between experimental group and control group.

The graphical representation of data has been presented in figure No.3

Figure: 3 Comparisons of Pre – Test Means Post – Test Means and Adjusted Post – Test Means for Control group and Experimental Group in relation to Vital Capacity



In case of physiological variables i.e. pulse rate, respiratory rate and vital capacity the results between pre and post (12 weeks) test has been found significantly higher in experimental group in comparison to control group. The findings of the present study have strongly indicates that high altitude training of twelve weeks have significant effect on selected physiological profiles i.e., pulse rate, respiratory rate and vital capacity of the middle and long distance runners. Hence the hypothesis earlier set that high altitude training programme would have been significant effect on selected physiological variables in light of the same the hypothesis was accepted.

Conclusions

On the basis of findings and within the limitations of the study the following conclusions were drawn: Significant effect of high altitude training was found on pulse rate, respiratory rate and vital capacity.

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