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High Altitude Exposure and Heart Rate

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Abstract: The present study examine the effect of high altitude exposure on heart rate. In this study, highaltitude exposure includes, height gain at the particular altitude and duration in days that has been spentat the high altitude. For this study, 43 healthy male individual participated in mountaineering trainingprogram were selected as the subject for this study and age ranged from 17-45 yrs. Single group repeatedmeasure design was used. Analysis of Variance (RM ANOVA) was used analyzed collected data. From theresult of the study, it can be concluded that exposure to high altitude significantly affects Heart Rate

Keywords: high altitude exposure, heart rate, altitude, height gain, duration, male individuals, mountaineering training program, age, repeated measure design, analysis of variance

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INTRODUCTION

An individual having lower heart rate which increases little during work or physical activities and which returns to the normal or resting level again is considered to be physically fit at sea level. This also indicates that that individual is adjusting well to that of high altitude condition. However, it has been observed that resting pulse increases with increasing altitude and is higher at altitude than at sea level. However, this decreases soon to normal level and remains normal at rest, or for a given level of exercise, as long as one stay at high altitude. It has been observed that during ascending to the high altitude the pulse rate rises with the working but decreases during rest. The increase in heart rate and pace at which it returns to the normal depends on altitude and can be also considered to be an indicator of acclimatization (James and Others 2014, Page No. 241).

METHODOLOGY

Total 43 healthy male individual participated in mountaineering training program were selected as the subject for this study. The age of the selected subjects were from 17-45 yrs. For the purpose of this study, single group repeated measure design was used. Data was collected at various altitude and various duration spent at altitude i.e. Camp – I on Day 1 at the altitude of 6,100 feet, Camp – II on day 12 at the altitude of 8,500 feet, Camp – III on day 14 at the altitude of 11,500 feet, Camp – III on day 22 at the altitude of 11,500 feet after the height gain of around 15,700 feet and Camp – I on day 25 at the altitude of 6,100 feet. Repeated Measure Analysis of Variance (RM ANOVA) was used analyzed collected data.

RESULT OF THE STUDY AND DISCUSSION OF FINDING

Result of the present study has been presented in Table – I & II, and Figure – I.

Table - I

Summary of Repeated Measure ANOVA for Heart Rate of Mountaineering Trainees for Five Camps at Different Altitude

Source of Variance	Type III SS	df	MS	F	η_p^2
Camp	2290.484	3.005	762.317	11.340*	.213
Error (Camp)	8483.116	126.195	67.222		

*Significant at 0.05.

The Mauchly's test was used to check the assumption of sphericity and it indicates that the assumption of sphericity had been violated, = 37.13, p = .000, therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (ε = .751).

From the Table - I it can be seen that the F value is significant at 0.05 level (F(3.005, 126.195) = 11.34, p = .000, η_p^2=.213).

It reflects that there is significant effect of Mountaineering Training on Heart Rate of male mountaineering trainees. Partial Eta-Squared (η_p^2) indicates that approximately 21% of the total variance in the dependent variable is accounted for by the variance in the independent variable.

Since, the F value was significant, the data were further analysed with the help of LSD Post Hoc Test for pairwise comparison and results are given in Table - II.

Table - II

Pairwise Comparisons by LSD Post-hoc test for Heart Rate of Mountaineering Trainees for Five Camp at Different Altitude

Mean of Heart Rate					MD	Sig.
Camp – I	Camp – II	Camp – III	Camp – IV	Camp – V		
82.65	86.91				4.26*	.000
82.65		89.47			6.82*	.000
82.65			85.74		3.09*	.039
82.65				80.14	2.51	.144
	86.91	89.47			2.56*	.043
	86.91		85.74		1.17	.355
	86.91			80.14	6.77*	.001
		89.47	85.74		3.73*	.009
		89.47		80.14	9.33*	.000
			85.74	80.14	5.60*	.004

*Significant at 0.05.

From Table - II it is evident that there is a significant difference between the mean score of Heart Rate of Camp – I and Camp – II; Camp – I and Camp – III; Camp – I and Camp – IV; Camp – II and Camp – III; Camp – II and Camp – V; Camp – III and Camp – IV; Camp – III and Camp – V; Camp – IV and Camp –

V. On the other hand, no significant difference found between the mean score of Heart Rate of Camp – I and Camp – V and Camp – II and Camp – IV.

Therefore, it can be said that mountaineering training significantly affects Heart Rate similarly at Camp – V (M = 80.14) and Camp – I (M = 82.65) than the Camp – IV (M = 85.74), Camp – II (M = 86.91) and Camp – III (M = 89.47) (Fig.1).

It is evident from Table - II that the mean value of Heart Rate at Camp - I on Day 1 is 82.65 and at Camp - II on Day 12 is 86.91. The mean difference of Heart Rate between Camp - I on Day 1 and Camp - II on Day 12 is 4.26. Which shows that Heart Rate increased significantly from Camp - I on Day 1 to Camp - II on Day 12.

It is evident from Table - II that the mean value of Heart Rate at Camp - I on Day 1 is 82.65 and at Camp - III on Day 14 is 89.47. The mean difference of Heart Rate between Camp - I on Day 1 and Camp - III on Day 14 is 6.82. Which shows that Heart Rate increased significantly from Camp - I on Day 1 to Camp - III on Day 14.

It is evident from Table - II that the mean value of Heart Rate at Camp - I on Day 1 is 82.65 and at Camp - IV on Day 22 is 85.74. The mean difference of Heart Rate between Camp - I on Day 1 and Camp - IV on Day 22 is 3.09. Which shows that Heart Rate increased significantly from Camp - I on Day 1 to Camp - IV on Day 22.

It is evident from Table - II that the mean value of Heart Rate at Camp - I on Day 1 is 82.65 and at Camp - V on Day 25 is 80.14. The mean difference of Heart Rate between Camp - I on Day 1 and Camp - V on Day 25 is -2.51. Which shows that Heart Rate decreased insignificantly from Camp - I on Day 1 to Camp - V on Day 25.

It is evident from Table - II that the mean value of Heart Rate at Camp - II on Day 12 is 86.91 and at Camp - III on Day 14 is 89.47. The mean difference of Heart Rate between Camp - II on Day 12 and Camp - III on Day 14 is 2.56. Which shows that Heart Rate increased significantly from Camp - II on Day 12 to Camp - III on Day 14.

It is evident from Table - II that the mean value of Heart Rate at Camp - II on Day 12 is 86.91 and at Camp - IV on Day 22 is 85.74. The mean difference of Heart Rate between Camp - II on Day 12 and Camp - IV on Day 22 is -1.17. Which shows that Heart Rate decreased insignificantly from Camp - II on Day 12 to Camp - IV on Day 22.

It is evident from Table - II that the mean value of Heart Rate at Camp - II on Day 12 is 86.91 and at Camp - V on Day 25 is 80.14. The mean difference of Heart Rate between Camp - II on Day 12 and Camp - V on Day 25 is -6.77. Which shows that Heart Rate decreased significantly from Camp - II on Day 12 to Camp - V on Day 25.

It is evident from Table - II that the mean value of Heart Rate at Camp - III on Day 14 is 89.47 and at Camp - IV on Day 22 is 85.74. The mean difference of Heart Rate between Camp - III on Day 14 and Camp - IV on Day 22 is -3.73. Which shows that Heart Rate decreased significantly from Camp - III on

Day 14 to Camp - IV on Day 22.

It is evident from Table - II that the mean value of Heart Rate at Camp - III on Day 14 is 89.47 and at Camp - V on Day 25 is 80.14. The mean difference of Heart Rate between Camp - III on Day 14 and Camp - V on Day 25 is -9.33. Which shows that Heart Rate decreased significantly from Camp - III on Day 14 to Camp - V on Day 25.

It is evident from Table - II that the mean value of Heart Rate at Camp - IV on Day 22 is 85.74 and at Camp - V on Day 25 is 80.14. The mean difference of Heart Rate between Camp - IV on Day 22 and Camp - V on Day 25 is -5.60. Which shows that Heart Rate decreased significantly from Camp - IV on Day 22 to Camp - V on Day 25.

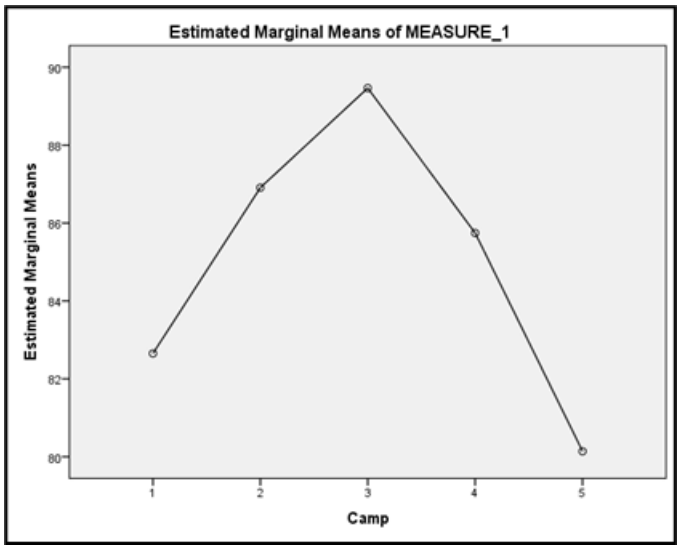

Figure – 1

Mean Plot for Heart Rate at Five Camps of Different Altitude

Acclimatization can be described as a series various interdepended physiological changes which out body makes to survive in the extreme condition of high altitude i.e. basically the partial pressure of oxygen in the blood reaching the tissue is brought to closer to that in the ambient air. Acclimatization is a gradual process that take places within a few days to week after the arrival at high altitude. An individual acclimatized well will be able to cope up with that of extreme conditions with compare to that sea level (James and Others, 2014, Page No. 242). Similarly, the statistical analysis of present study clearly indicates that exposure to high altitude significantly affects Heart Rate at 6,100 ft. on day 25 (M = 80.14) and 6,100 ft. on day 1 (M = 82.65) than the 11,500 ft. on day 22 (M = 85.74), 8,500 ft. on day 12 (M = 86.91) and 11,500 on day 14 (M = 89.47).

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