Comparison of Heart Rate at Moderate Work Between Regular and Occasional Participants in Sports

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Abstract

The heart is a muscular organ that is the connection between the pulmonary and systemic circulatory systems. The heart produces contractile force that moves blood around the body. The primary mechanisms for an increase in heart rate with exercise are related to neural and hormonal control. At the onset of exercise the parasympathetic neural activity is reduced and this alone will result in an increase in heart rate. Subsequently, sympathetic neural drive is increased and this will also increase heart rate.

The Purpose of this Study is to compare the resting heart rate between regular and occasional male participants by comparing the peak heart rate between regular and occasional

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male participants and by comparing the recovery heart rate between regular and occasional male participants. Here the regular participants means the person who participate some specific physical exercise regularly for developing physical fitness and the person who does not participate in a specific physical exercise regularly is called an occasional participant. The subjects for this study were selected from Manindra Chandra Vidyapith, Berhampore, Murshidabad, West Bengal. The fifteen regular and fifteen occasional participants (boys) between the age of 14–15 years, were selected randomly for this study.

Here, resting heart rates were recorded by Palpation Method from carotid artery following a complete resting condition for at least half-an-hour for each subject, peak heart rate was measured **a**fter 5 minutes of stepping up on the selected bench peak heart rate was recorded for carotid artery. The cadence was set at 24 / minutes as well as recovery heart rate was measured after 5 minutes of stepping-up recovery heart rates recorded at an interval of 1 – 1.5 min., 2 – 2.5 min., 3 – 3.5 min., 5 – 5.5 min. and 10 – 10.5 min. respectively. After collecting the data, they were analysed through statistical manipulation. Table–3 shows ANOVA of different states of Heart Rate. The 'F' values obtained are 68.28 for regular participants and 161.43 for occasional participants which are significant at 0.05 level.

The mean resting heart rate of occasional participation group is significantly higher than the regular participation group. The mean peak heart rate following exercise of regular participation group is significantly lower than the occasional participation groups. The mean recovery heart rate after exercise of regular participation group is significantly lower than the occasional participation groups.

Key words: Heart Rate, Moderate work, Regular sports participants, Occasional sports participants.

1. Introduction

The heart is a muscular organ that is the connection between the pulmonary and systemic circulatory systems. The heart produces contractile force that moves blood around the body.

Heart rate is the number of times the heart beats in a minute. The American Heart

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Association suggests that the normal range should be 50 to 100 beats per minute.

Heart rate increases in a linear fashion with oxygen consumption to the point where oxygen uptake reaches a peak or maximal value. We can predict this through a simple and common equation where, Maximal Heart Rate = 220 – Age.

The primary mechanisms for an increase in heart rate with exercise are related to neural and hormonal control. At the onset of exercise the parasympathetic neural activity is reduced and this alone will result in an increase in heart rate. Subsequently, sympathetic neural drive is increased and this will also increase heart rate. Adrenaline will also cause the heart rate to rise. The fact that the heart rate is increased during exercise is a matter of common observation. The maximal heart rate reached during exercise and the rapidity with which the maximal value is attained vary with a number of factors, including the type of exercise, the emotional content of the exercise, environmental condition and physical condition of the subject. The Purpose of the Study is to compare the resting heart rate between regular and occasional male participants by comparing the peak heart rate between regular and occasional male participants and by comparing the recovery heart rate between regular and occasional male participants. Here the regular participants means the person who participate some specific physical exercise regularly for developing physical fitness and the person who does not participate in a specific physical exercise regularly is called an occasional participant.

2. Methods

Methodology is a process by which the programs are initiated and carried out. In this chapter the subjects criterion measures, the design and the procedure for administering tests for the study are described.

2.1 The Subjects

The subjects for this study were selected from Manindra Chandra Vidyapith, Berhampore, Murshidabad, West Bengal. The fifteen regular and fifteen occasional participants (boys) between the age of 14–15 years, were selected randomly for this study.

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2.2 Criteria Measure

a. Resting Heart Rate : Resting heart rates were recorded by Palpation Method from carotid artery following a complete resting condition for at least half-an-hour for each subject.

b. Peak Heart Rate : After 5 minutes of stepping up on the selected bench peak heart rate was recorded for carotid artery. The cadence was set at 24 / minutes.

c. Recovery Heart Rate : After 5 minutes of stepping-up recovery heart rates recorded at an interval of 1 – 1.5 min., 2 – 2.5 min., 3 – 3.5 min., 5 – 5.5 min. and 10 – 10.5 min. respectively.

3. Results and Discussion

The mean and standard deviation of age, height and weight of regular and occasional participants have been presented in Table – 1.

Table – 1. Personal Data : Mean and Standard Deviation of Age, Height, Weight of Regular and Occasional Participants (Boys)

Variables	Regular Participants		Occasional Participants	
	Mean	SD	Mean	SD
Age	14.50	± 0.39	14.59	± 0.34
Height	159.33	± 7.03	161	± 4.06
Weight	45.34	± 5.3	46.33	± 7.5

Table – 2. Mean and Standard Deviation of Selected Variables of Regular Participants and Occasional Participants Group

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Variables	Regular Participants		Occasional Participants	
	Mean	SD	Mean	SD
Resting Heart Rate	63.80	± 3.47	77.33	± 5.38
Peak Heart Rate	136.53	± 12.55	153.53	± 10.45
Recovery 1	98.40	± 12.88	124.40	± 7.57
Recovery 2	92.27	± 12.40	116.27	± 7.44
Recovery 3	87.53	± 11.24	109.33	± 7.62
Recovery 4	82.33	± 10.39	100.93	± 6.76
Recovery 5	78.13	± 8.77	93.60	± 5.57

It is seen from Table–2 that the mean and standard deviation of regular participant group of R. H. R., P. H. R., R_1, R_2, R_3, R_4, R_5 were 63.80 ± 3.47, 136.53 ± 12.55, 98.40 ± 12.88, 92.27 ± 12.40, 87.53 ± 11.24, 82.33 ± 10.39, 78.13 ± 8.77.

Also the mean and standard deviation of occasional participant group of R. H. R., P. H. R., R_1, R_2, R_3, R_4, R_5 were 77.33 ± 5.38, 153.53 ± 10.45, 124.40 ± 7.57, 116.27± 7.44, 109.33 ± 7.62, 100.93 ± 6.76, 93.60 ± 5.57 and respectively.

After collecting the data, they were analysed through statistical manipulation. Table–3 shows ANOVA of different states of Heart Rate. The 'F' values obtained are 68.28 for regular participants and 161.43 for occasional participants which are significant at 0.05 level.

Table – 3. ANOVA between R. H. R. and P. H. R., R_1, R_2, R_3, R_4, R_5 of Regular and Occasional Participation Group

ANOVA OF HEART RATES					
	Sum of Squares	df	Mean Square	F	Sig.
Regular Participants					
Between Groups	46823.962	6	7803.994	68.28	.000
Within Groups	11201.467	98	114.301		
Total	58025.429	104			
Occasional Participants					

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Between Groups	53345.048	6	8890.841	161.43	.000
Within Groups	5397.467	98	55.076		
Total	58742.514	104			

Table – 4. Comparison of Means between R. H. R. and P. H. R., R_1, R_2, R_3, R_4, R_5 of Regular and Occasional Participation Group

Group (I)	Group (J)	Mean Difference (I – J) R. P.	Sig.	Mean Difference (I – J) O. P.	Sig.
RHR	PHR	−72.73**	0.000	− 76.20**	0.000
	R_1	− 34.69**	0.000	− 47.07**	0.000
	R_2	− 28.47**	0.000	− 38.93**	0.000
	R_3	− 23.73**	0.000	− 32.00**	0.000
	R_4	− 18.53**	0.000	− 23.60**	0.000
	R_5	− 14.33**	0.000	−16.27**	0.000

** Sig. at 0.01 level

Table –4 shows a comparative account of different states of Heart Rate. The table shows significant difference of Resting Heart Rate, Peak Heart Rate, Recovery Heart Rate during 1 – 1½ min., 2 – 2½ min., 3 – 3½ min, 5 – 5½ min and 10 – 10½ min. after exercise.

Table – 5. Comparison of Means between P. H. R. and R_1, R_2, R_3, R_4, R_5 of Regular and Occasional Participation Group

Group (I)	Group (J)	Mean Difference (I – J) R. P.	Sig.	Mean Difference (I – J) O. P.	Sig.
RHR	R_1	38.13 **	0.000	29.13**	0.000
	R_2	44.27**	0.000	37.27**	0.000
	R_3	49.00**	0.000	44.20**	0.000
	R_4	54.20**	0.000	52.60**	0.000
	R_5	58.40**	0.000	59.93**	0.000

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** Sig. at 0.01 level

Table – 5 shows a comparative account of different states of Heart Rate. The table shows significant difference of Peak Heart Rate, Recovery Heart Rate during $1 - 1\frac{1}{2}$ min., $2 - 2\frac{1}{2}$ min., $3 - 3\frac{1}{2}$ min, $5 - 5\frac{1}{2}$ min and $10 - 10\frac{1}{2}$ min. after exercise.

Table – 6. Comparison of Means between Recovery$_1$ and R$_2$, R$_3$, R$_4$, R$_5$ of Regular and Occasional Participation Group

Group (I)	Group (J)	Mean Difference (I – J) R. P.	Sig.	Mean Difference (I – J) O. P.	Sig.
RHR	R$_2$	6.13	0.119	8.13**	0.003
	R$_3$	10.87**	0.006	15.07**	0.000
	R$_4$	16.07**	0.000	23.47**	0.000
	R$_5$	20.27**	0.000	30.80**	0.000

** Sig. at 0.01 level

Table – 6 shows a comparative account of different states of Heart Rate. The table shows significant difference of Recovery$_1$ with Recovery Heart Rate during $2 - 2\frac{1}{2}$ min., $3 - 3\frac{1}{2}$ min, $5 - 5\frac{1}{2}$ min and $10 - 10\frac{1}{2}$ min. after exercise.

Table – 7. Comparison of Means between Recovery$_2$ and R$_3$, R$_4$, R$_5$ of Regular and Occasional Participation Group

Group (I)	Group (J)	Mean Difference (I – J) R. P.	Sig.	Mean Difference (I – J) O. P.	Sig.
RHR	R$_3$	4.73	0.228	6.93**	0.012
	R$_4$	9.93*	0.013	15.33**	0.000
	R$_5$	14.13**	0.000	22.67**	0.000

** Sig. at 0.01 level, *Sig. at 0.05 level

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Table – 7 shows a comparative account of different states of Heart Rate. The table shows significant difference of Recovery$_2$ with Recovery Heart Rate during 3 – 3½ min, 5 – 5½ min and 10 – 10½ min. after exercise.

Table – 8. Comparison of Means between Recovery$_3$ and R$_4$, R$_5$ and Recovery$_4$ with R$_5$ of Regular Occasional Participation Group

Group (I)	Group (J)	Mean Difference (I – J) R. P.	Sig.	Mean Difference (I – J) O. P.	Sig.
RHR	R$_3$	5.20*	0.186	8.40**	0.003
	R$_4$	9.40*	0.018	15.73**	0.000
	R$_5$	4.20	0.285	7.33**	0.008

** Sig. at 0.01 level, *Sig. at 0.05 level

Table – 8 shows a comparative account of different states of Heart Rate. The table shows significant difference of Recovery$_3$ with R$_4$, R$_5$ and Recovery$_4$ with R$_5$.

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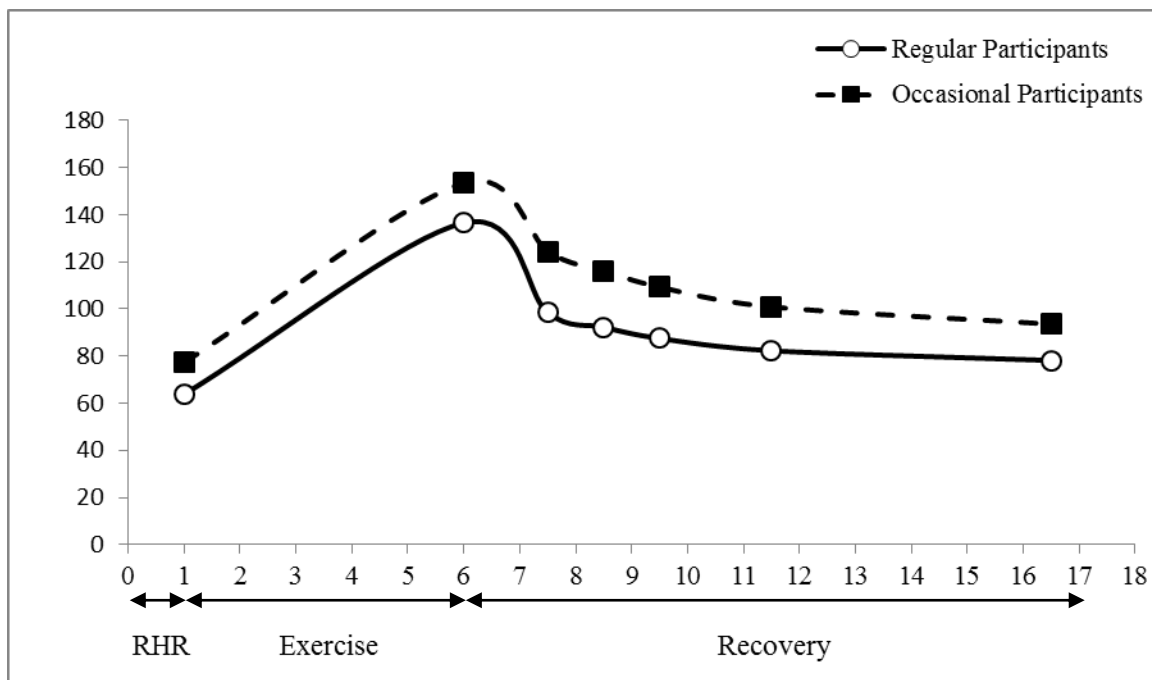
Fig. 1. Pattern of Heart Rate at pre and post exercise and recovery period following sub-maximal work

Thus, from Fig. 1 it is evident that the heart rate before exercise is increased after sub-maximal work through step test. At the same time because of O_2 debt during recovery from exercise. The frequency of heart beat is gradually slowed down and after 10 minutes the heart rate reaches to its basal level.

4. Conclusion

The mean resting heart rate of occasional participation group are significantly higher than the regular participation group. The mean peak heart rate following exercise of regular participation group is significantly lower than the occasional participation groups. The mean recovery heart rate after exercise of regular participation group is significantly lower than the occasional participation groups.

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