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Research Article

COMPARISON OF HEART RATE AT SUBMAXIMAL 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 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. The subjects for this study were selected from Pannalal Institution, Kalyani, Nadia, West Bengal, India. The fifteen regular and fifteen occasional participants (boys) between the ages 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 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 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 minutes, 2 – 2.5 minutes, 3 – 3.5 minutes, 5 – 5.5 minutes and 10 – 10.5 minutes 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.

Keywords: Heart Rate, Sub-maximal work, Regular sports participants, Occasional sports participants.

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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 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.

MATERIALS AND 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.

The Subject

The subjects for this study were selected from Pannalal Institution, Kalyani, Nadia, West Bengal, India. The fifteen regular and fifteen occasional participants (boys) between the ages of 14–15 years, were selected randomly for this study.

Criteria Measure

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.

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.

Recovery Heart Rate

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

RESULTS AND DISCUSSION

The mean and standard deviation of age, height and weight of regular and occasional participants have been presented in Table 1. It is seen from Table 2 that the mean and standard deviation of regular participant group of R. H. R., P. H. R., R₁, R₂, R₃, R₄, R₅ 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., R₁, R₂, R₃, R₄, R₅ 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 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 minutes, 2 – 2½ minutes, 3 – 3½ minutes, 5 – 5½ minutes and 10 – 10½ minutes after exercise. 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 – 1½ minutes, 2 – 2½ minutes, 3 – 3½ minutes, 5 – 5½ minutes and 10 – 10½ minutes after exercise. Table 6 shows a comparative account of different states of Heart Rate. The table shows significant difference of Recovery₁ with Recovery Heart Rate during 2 – 2½ minutes, 3 – 3½ minutes, 5 – 5½ minutes and 10 – 10½ minutes after exercise. Table 7 shows a comparative account of different states of Heart Rate. The table shows significant difference of Recovery₂ with Recovery Heart Rate during 3 – 3½ minutes, 5 – 5½ minutes and 10 – 10½ minutes after exercise. Table 8 shows a comparative account of different states of Heart Rate. The table shows significant difference of Recovery₃ with R₄, R₅ and Recovery₄ with R₅. Thus, from Figure 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 O₂ 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.

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

| 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 |

Table 3: ANOVA between R. H. R. and P. H. R., R₁, R₂, R₃, R₄, R₅ 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 | | | | | |
| 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., R₁, R₂, R₃, R₄, R₅ of Regular and Occasional Participation Group

| Group (I) | Group (J) | Mean Difference (I – J) | Sig. | Mean Difference (I – J) | Sig. |
|-----------|----------------|-------------------------|-------|-------------------------|-------|
| | | R. P. | | O. P. | |
| 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 5: Comparison of Means between P. H. R. and R₁, R₂, R₃, R₄, R₅ of Regular and Occasional Participation Group

| Group (I) | Group (J) | Mean Difference (I – J) | Sig. | Mean Difference (I – J) | Sig. |
|-----------|----------------|-------------------------|-------|-------------------------|-------|
| | | R. P. | | O. P. | |
| 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 |

**Sig. at 0.01 level

Table 6: Comparison of Means between Recovery₁ and R₂, R₃, R₄, R₅ of Regular and Occasional Participation Group

| Group (I) | Group (J) | Mean Difference (I – J) | Sig. | Mean Difference (I – J) | Sig. |
|-----------|----------------|-------------------------|-------|-------------------------|-------|
| | | R. P. | | O. P. | |
| 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 7: Comparison of Means between Recovery₂ and R₃, R₄, R₅ of Regular and Occasional Participation Group

| Group (I) | Group (J) | Mean Difference (I – J) | Sig. | Mean Difference (I – J) | Sig. |
|-----------|----------------|-------------------------|-------|-------------------------|-------|
| | | R. P. | | O. P. | |
| 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

Table 8: Comparison of Means between Recovery₃ and R₄, R₅ and Recovery₄ with R₅ of Regular Occasional Participation Group

| Group (I) | Group (J) | Mean Difference (I – J) | Sig. | Mean Difference (I – J) | Sig. |
|-----------|----------------|-------------------------|-------|-------------------------|-------|
| | | R. P. | | O. P. | |
| 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

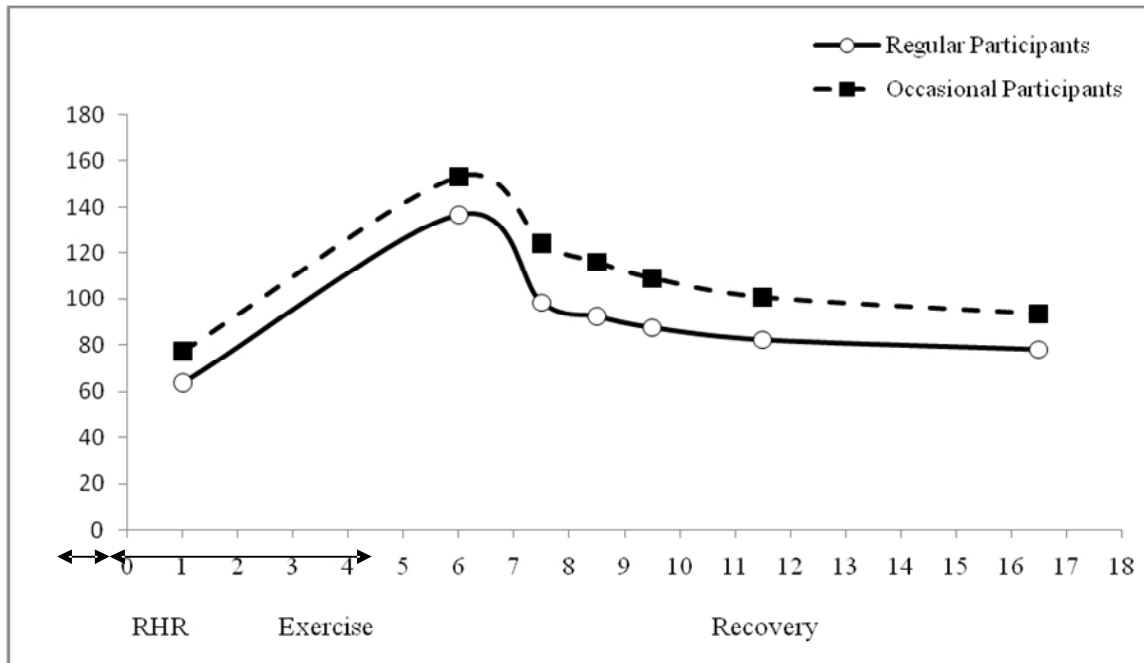


Figure 1: Pattern of Heart Rate at pre and post exercise and recovery period following sub-maximal work

CONCLUSION

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.

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