Original Research Article

A study of heart rate variability in sport person and non-sport person

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Abstract

Background: The heart is a specialized pump that functions by regular and continuous contractions for delivery of blood throughout the body. **Aims and Objectives:** To study Heart rate variability in Sport person and Non-sport person Methodology: This was a cross-sectional study carried out in the Department of Physiology of a tertiary health care center. The heart rate variability in the two Groups i.e. Sport and Non Sport person was studied during the study period i.e. March 2015 to April 2015 in the two groups i.e. Sports i.e. those who aged 20-50. The statistical analysis done by paired t-test calculated by SPSS version 19 software. **Result:** The HR in the Non-Sport person persons were significantly higher at rest and peak of the anaerobic exercise i.e. 73.5 ± 9.12 and 62.7± 7.82 and 192.21±10.1 and 185.43 ± 5.9 respectively ($p< 0.001$, $t = 3.4817$, $df = 28$, $P<0.03$, $t = 2.2449$, $df = 28$), but at Anaerobic Threshold was higher in Sport person as compared to Non-Sport person i.e. 192.21±10.1 and 185.43 ± 5.9 respectively ($P<0.03$, $t = 2.2449$, $df = 28$). In the Aerobic exercise the HR was significantly higher in Non-sport person at rest, threshold and at Peak as compared to sport person i.e. 70.51 ± 10.12 and 60.4± 6.67 105.21± 8.79 and 87 ± 6.72 ; 142±11.2 and 112 ± 5.9 ($p<0.003$, $t = 3.2306$, $df = 28$, $p<0.0001$, $t = 6.3742$, $df = 28$, $P<0.0001$, $t = 9.1784$, $df = 28$) respectively. **Conclusion:** It can be concluded from our study that except to anaerobic exercise at threshold the Heart rate was significantly higher in Non -sport person as compared to Sport person in both Aerobic and anaerobic exercise.

Key Words: Sport person, Non-sport person, Heart variability, anaerobic exercise, Aerobic exercise.

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INTRODUCTION

The heart is a specialised pump that functions by regular and continuous contractions for delivery of blood throughout the body[1]. The pumping action is caused by a flow of electricity through the heart that repeats itself in a cycle, known as heart rate (HR) or heart pulse. HR is the speed of the heartbeat measured by the number of contractions per unit of time[2], a measure determined by calculating the heart rate variability (HRV) from electrocardiogram (ECG) recordings. The understanding of the significance of HRV is ongoing. However, it has been suggested that HRV is an important method for assessing cardiovascular autonomic parameters that are partially under the regulatory control of innervations from the sympathetic and parasympathetic systems[3,4]. Notably, these two components of the autonomic nervous system (ANS) balance between them affects the consistency in the time between heart beats. Consequently, HRV reflects oscillations in the heart cycle duration over time and is generally considered the measure of regulatory influences, mainly of the activity of ANS to regulate the function of the cardiovascular system. Previous findings have identified the potential use of HRV for recognizing healthy and diseased states since the vagal-mediated HRV indices were inversely associated with several risk factors for diabetes, glucose intolerance, insulin resistance, central obesity, dyslipidemia and hypertension[3]. However, while HRV was largely applied to predict

sudden cardiac death and diabetic neuropathies in assessing disease progression[5,6], recent studies demonstrated the application of HRV in exercise training. Their findings supported the use of HRV as a marker to reflect the cardiac modulation of the sympathetic and vagal component of the ANS[7], and suggested that monitoring indices of HRV may be useful for tracking the time course of training adaptation/maladaptation in order to set optimal training loads that lead to improved performances[3,7-9].

MATERIAL AND METHODS

This was a cross-sectional study carried out in the Department of Physiology of a tertiary health care centre. The heart rate variability in the two Groups i.e. Sport and Non Sport person was studied during the study period i.e. March 2015 to April 2015 in the two groups i.e. Sports i.e. those who aged 20-50, regularly engaged in sport activity at least 1 hour per day and not less than 5 days in a week since one year of the study period and those who are not fulfilling criteria were enrolled in the non-sport group. The Heart rate variability was accessed during various activities like Aerobic exercises and Anaerobic exercises. The statistical analysis done by paired t-test calculated by SPSS version 19 software.

RESULT

Table 1: Distribution of the patients as per the Age

Age group	Non-sport person No. (%)	Sport person No. (%)
20-30	6 (40.00)	4 (26.67)
30-40	4 (26.67)	3 (20.00)
40-50	5 (33.33)	8 (53.33)
Total	**15 (100)**	**15 (100)**

The age distribution in the two groups was comparable

Table 2: Distribution of the patients as per the sex

Age group	Non-sport person No. (%)	Sport person No. (%)
Male	9 (60)	8 (53.33)
Female	6 (40)	7 (46.67)
Total	**15 (100)**	**15 (100)**

The male and female distribution in both the group is comparable

Table 3: Distribution of the Study groups as per the Anaerobic exercise

Heart Rate	Non-Sport person	Sport person	P-value
HR rest	73.5 ± 9.12	62.7± 7.82	p< 0.001, t = 3.4817 df = 28
HR_{AT} (bpm)	129.52 ± 9.21	138 ± 5.6	p< 0.005, t = 3.0470 df = 28
HR_{peak} (bpm)	192.21±10.1	185.43 ± 5.9	P<0.03, t = 2.2449 df = 28

The HR in the Non-Sport person persons were significantly higher at rest and peak of the anaerobic exercise i.e. 73.5 ± 9.12 and62.7± 7.82 and 192.21±10.1 and185.43 ± 5.9 respectively (p< 0.001, t = 3.4817, df = 28, P<0.03, t = 2.2449, df = 28), but at Anaerobic Threshold was higher in Sport person as compared to Non-Sport person i.e. 192.21±10.1 and 185.43 ± 5.9 respectively (P<0.03, t = 2.2449, df = 28).

Table 4: Distribution of the Study groups as per the Aerobic exercise

Heart Rate	Non-Sport person	Sport person	P-value
HR rest	70.51 ± 10.12	60.4± 6.67	p<0.003, t = 3.2306 df = 28
HR_{AT} (bpm)	105.21± 8.79	87 ± 6.72	p<0.0001, t = 6.3742 df = 28
HR_{peak} (bpm)	142±11.2	112 ± 5.9	P<0.0001, t = 9.1784 df = 28

In the Aerobic exercise the HR was significantly higher in Non-sport person at rest, threshold and at Peak as compared to sport person i.e. 70.51 ± 10.12 and 60.4± 6.67 105.21± 8.79 and 87 ± 6.72; 142±11.2 and 112 ± 5.9 (p<0.003, t = 3.2306, df = 28, p<0.0001, t = 6.3742, df = 28, P<0.0001, t = 9.1784, df = 28) respectively.

DISCUSSION

Sports activity, regular exercise and physical fitness have always been the most sought after topics. Sports persons along with their respective fields also undergo regular aerobic and anaerobic exercises. The effect of organs when they are put to endurance test have been a subject of discussion in past. Irrefutable evidence now exists to slow the rate of decline with age of most of the physiological parameters that we associate with health and fitness viz. Muscle strength, aerobic capacities, reaction time and joint flexibilities[10]. 'Body fitness prolongs life; as regular exercise/physical activity a) maintains moderately low blood pressure, b) reduced blood cholesterol and LDL along with increased HDL, which all work together to reduce the number of attacks and brain strokes. Second and perhaps equally important, the athletically fit person has more bodily reserves to call on when he or she does become sick. As in the case of cardiac reserve, the normal untrained person can increase cardiac output a little over fourfold, and the usual well trained athelete can increase cardiac output sixfold. Although both of them have normal resting cardiac output; this normal cardiac output is achieved by a large stroke volume at a reduced heart rate. The heart- pumping effectiveness of each heart beat is greater in the highly trained athlete than in the untrained person, but there is a corresponding decrease in heart rate at rest.'[11] In our study we have seen that The HR in the Non-Sport person persons were significantly

higher at rest and peak of the anaerobic exercise i.e. 73.5 ± 9.12 and 62.7± 7.82 and 192.21±10.1 and 185.43 ± 5.9 respectively ($p< 0.001$, $t = 3.4817$, $df = 28$, $P<0.03$, $t = 2.2449$, $df = 28$), but at Anaerobic Threshold was higher in Sport person as compared to Non-Sport person i.e. 192.21±10.1 and 185.43 ± 5.9 respectively ($P<0.03$, $t = 2.2449$, $df = 28$). In the Aerobic exercise the HR was significantly higher in Non-sport person at rest, threshold and at Peak as compared to sport person i.e. 70.51 ± 10.12 and 60.4± 6.67 105.21± 8.79 and 87 ± 6.72; 142±11.2 and 112 ± 5.9 ($p<0.003$, $t = 3.2306$, $df = 28$, $p<0.0001$, $t = 6.3742$, $df = 28$, $P<0.0001$, $t = 9.1784$, $df = 28$) respectively. These findings are similar to Rachit Joshi *et al*[1] they found sportsperson have a significantly lower resting heart rate; lower maximum heart rate achieved and a reduced recovery time than sedentary individuals. Although there are notable physical and physiological differences between athletes training for different sporting activities [13], HRV is becoming one of the most used training and recovery monitoring tools in sport sciences[14,15,16]. The possibility of applying HRV on such variety is based on the fact that cardiovascular autonomic regulation is an important determinant of training adaptations, before also being responsive to training effects 15. In concordance with these observations, an ANS comparison between sedentary subjects and recreationally active subjects or athletes of different sports modalities have demonstrated that athletes exhibit a different HRV profile to sedentary control subjects, with an overall increase in HRV and parasympathetic cardiac modulation[17].

CONCLUSION

It can be concluded from our study that except to anaerobic exercise at threshold the Heart rate was significantly higher in Non -sport person as compared to Sport person in both Aerobic and anaerobic exercise.

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