



Heart rate variability assessment in athletes and normal individuals during activity: A comparative study

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Abstract

Heart rate variability (HRV) is an essential physiological parameter that provides valuable insights into autonomic nervous system regulation and overall cardiovascular health. This study aims to investigate and compare the heart rate variability patterns in athletes and normal individuals during activity using a heart rate monitor. Additionally, the correlation between heart rate variability in athletes and normal individuals will be examined.

Keywords: Heart rate variability, athletes, normal individuals, physical activity, autonomic nervous system, cardiovascular health

Introduction

Heart rate variability is where the amount of time between your heartbeat fluctuates slightly. Normal range (adults) – below 20 to over 200 milliseconds Bradycardia is slower than expected heart rate generally beating fewer than 60 beats per minutes. Tachycardia is rapid heartbeat that may be regular or irregular.

The part to the resting bradycardia observed in endurance athletes and the sympathovagal balance of the sinus mode are changes in aerobic physical training attenuation of sympathetic tone The resting bradycardia are caused by / or by enhanced vagal activity it has remains controversial whether the alteration in the autonomic functions.

There has be changes reported in which intrinsic mechanisms of the sinus node rather than autonomic alteration that is responsible for endurance trained bradycardia. The autonomic cardiovascular responses may be activated during exercise itself and in postural and respiratory tests when trained and untrained subjects are compared, there is a possible role of vagal and sympathetic adaptations in resting bradycardia induced by aerobic training. It has been associated with alteration in autonomic cardiovascular control in some studies have reported that during orthostatic stress, trained and untrained subjects present different with cardiovascular responses. The measurement of the heart rate variability (HRV) that is obtained by calculating the variation between respiratory rate

(RR) intervals of the Electrocardiography (ECG) signal, in order to evaluate the cardiac autonomic activity non-invasively in many studies it has been used.

In last conduct they are expressed as sinus wave power values, in this variation are calculated in the time& frequency domains. High HRV is usually caused by an increase in vagal tone associated with a decrease in sympathetic tone Spectral components related to parasympathetic and sympathetic modulation is included by aerobic training, there is substantial controversy concerning the absolute and relative changes of power.

In the past century in which the intact of organism and the cardiovascular system in which the responds to the stress of exercise has intrigued in sports.

In anatomical and cardiovascular function the heart has been altered after the chronic physical activity. It has been remains that difficult problem has developed understanding interactive between cardio-vascular function activity in ANS exercise training.

In sports there has been captured stress of exercise that responds to cardiovascular system. The heart rate (HR) regulates the sympathetic and parasympathetic nervous system. Rapid changes in heart rate including cardiac and peripheral vascular control and autonomic nervous system is seen. Different cardiovascular responds is seen in trained and untrained subjects during ortsthatc which is associated with alteration in autonomic cardiovascular control.

Its been seen from many years significant relationship between cardiovascular and autonomic nervous system mortality including sudden cardiac death. The phenomenon that is the focus in the oscillation in the interval between consecutive heartbeats as well as the oscillation between consecutive instantaneous heart rates.

Heart rate variability has become the conventionally accepted term to describe variations of both instantaneous heart rate and RR intervals. Sympathetic nerves and parasympathetic nerves are comprise by autonomic nerves. Studies has been seen effects on exercise and other stresses on cardiac structure and functions also it allies environmental physiology and physical education. Autonomic cardiovascular control shown influence on physical training.

Material and methodology

Methodology

- **Study design:** Observational Study
- **Sampling method:** Simple Random Sampling
- **Sample size:** 60 Runners
- **Study population:** State Level Runners
- **Study setup:** Sport Clubs in And Around Pune

Materials

- Heart rate monitor (Chest Belt)
- Consent Form
- Data Collection Sheet
- Pen
- Pencil

individuals on physical activity. a total data of 60 participate was included in the study.

Majority of participate were female (23) and other were male (37).

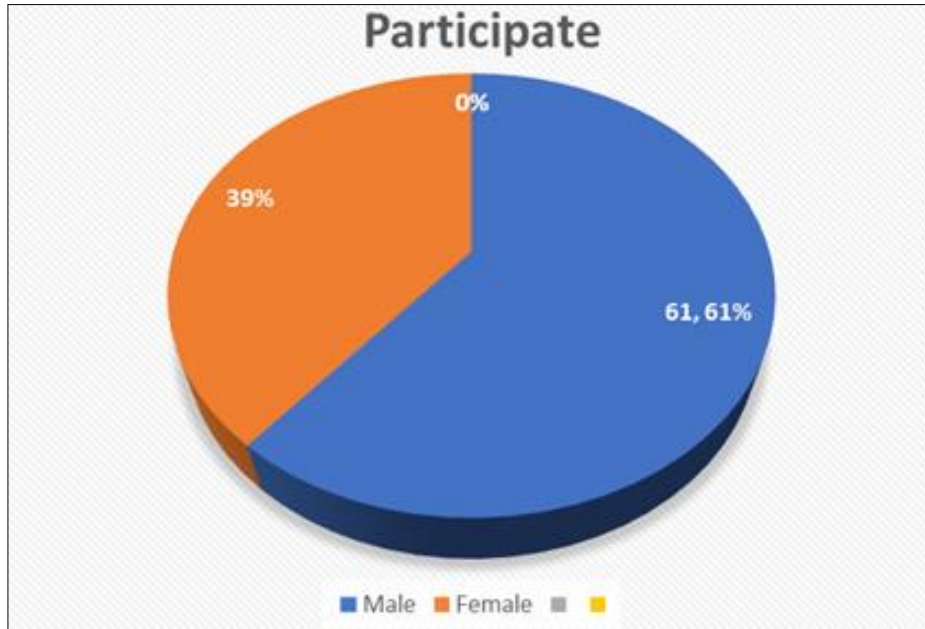
The data was analysed in the form of mean standard deviation and percentage.

Result and data analysis

The presented study was conducted to study the heart rate variability comparison in between athletes and normal

Table 1: Demographic data

Gender (n = 60)	Male (n = 37)	Female (n = 23)
Mean ± SD	19.70±2.077	19.08±2.083

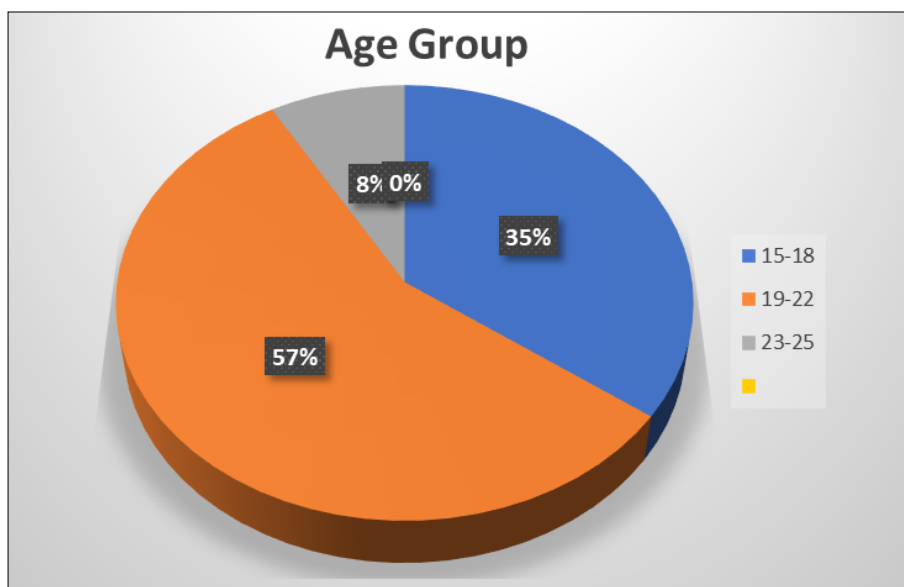


Graph 1: Distribution of participate according to average gender

Interpretation: Graph no.1 indicates that out of 60 participants 61% are male and 39% are female.

Table 2: Age wise distribution

Age group	No. of subjects
15-18	21
19-22	34
23-25	5

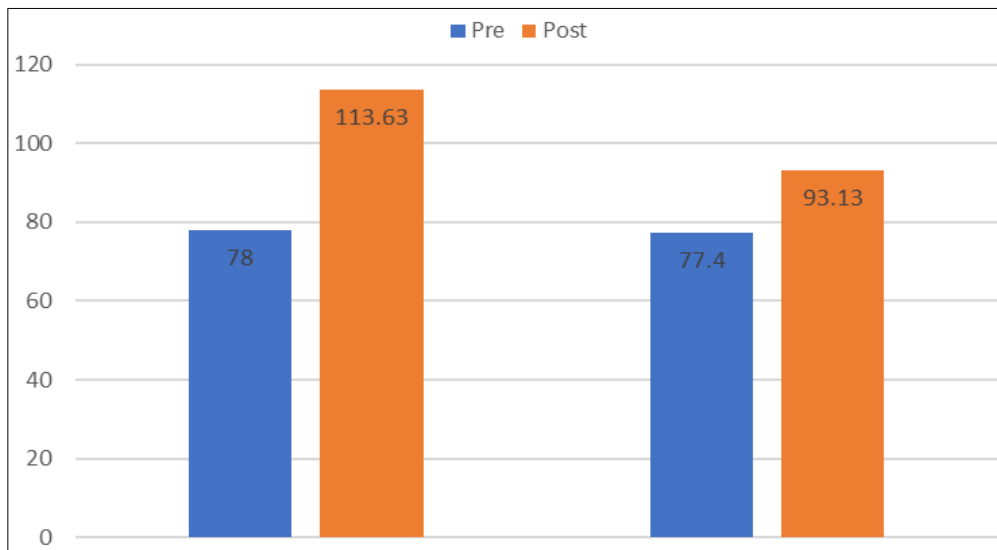


Graph 2: Distribution of participate according to Age Group

Interpretation: Graph no 2: shows about the age group in which 35% belongs to 15-18, 57% belongs to 19-22, 8% belongs to age group 23-25.

Table 3: Heart rate reading

	Normal individuals		Athletes	
	Pre-reading	Post-reading	Pre-reading	Post-reading
Mean±SD	78±7.8	113.6±7.6	77.4±6.97	93.1±6.11

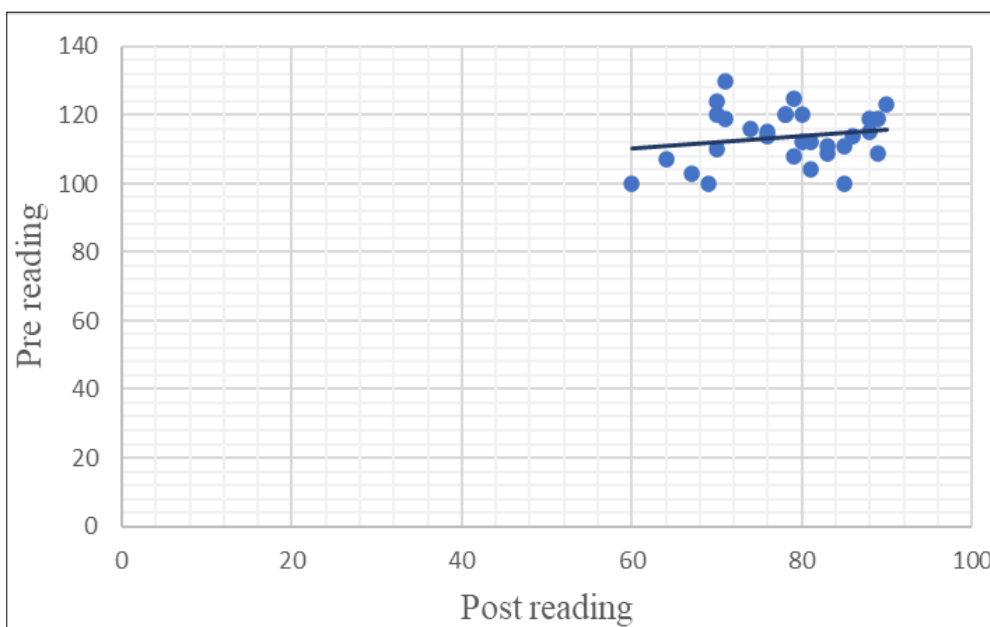


Graph no 3

Interpretation: Graph no.3 shows in normal individuals pre-reading (78±7.8) and post-reading (113.6±7.6) and in athletes pre reading (77.4±6.9) post-reading (93.1±6.11).

Table 4: Prereading and post reading in athletes

	Pre-reading	Post-reading	r value	p value
Mean±SD	77.4±6.97	93.1±6.11	0.6263	0.0002

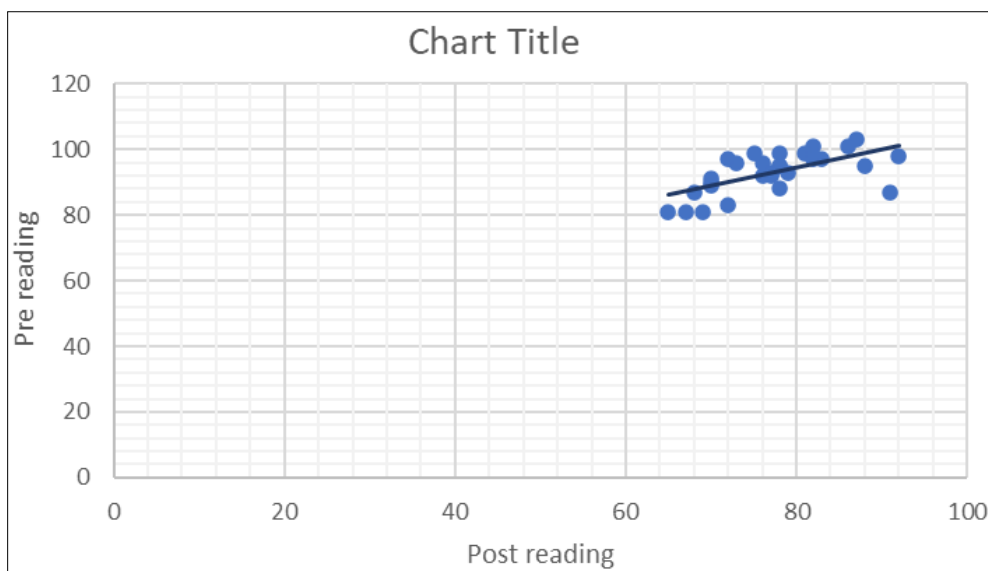


Graph no 4

Interpretation: Graph no.4 shows in athletes correlation of coefficient of pre-reading and post-reading is 0.6263, hence there is a positive correlation between them. The p value is <0.0002 and hence the correlation is significant.

Table 5: Prereading and post reading in normal individual

	Pre-reading	Post-reading	r value	p value
Mean±SD	78±7.8	113.6±7.6	0.1820	0.335



Graph no. 5

Interpretation: Graph no.5 shows in normal individuals correlation of coefficient of pre-reading and post-reading is 0.1820, hence there is positive correlation between them. The p value is <0.335 and hence the correlation is significant.

Discussion

The present study on heart rate variability comparison in athletes and normal individuals on physical activity, 60 participants were taken upon the inclusion criteria, in which 37 male and 23 female were included and age group of 15-25.

In graph no: 1 shows the age wise distribution in which 35% belongs 15-18 age group, 57% belongs 19-22 age group, 8% belongs to 23-25 age group.

In graph no. 2 Distribution of participate according to average gender indicates 61% are male and 39% are female. One of the study by WILLIS MS *et al* (2013) [3]s The eart rate variability used to identify autonomic nervous system that changes seen in the athletes performance it has been increasingly researched and analysed in the recent years. Heart rate variability has been used with trained athletes. The studies has present evidence that HRV measurements change with different exercise intensities.

Our study collected data taken in two form before activity and after the activity as pre reading and post reading by using heart rate monitor (chest belt) to measure the heart rate.

In graph no. 3 The average Heart rate in normal individuals Pre Activity was 78 and Post activity 113.63 where as in athletes the average Heart rate Pre Activity 77.4 and Post activity 93.13. Hence we observed there was significant increase in the Heart rate in athletes post activity, where as in the heart rate in normal individuals post activity there was not much significant increase.

In graph no.4 shows in athletes correlation of coefficient of pre-reading and post-reading is 0.6263, hence there is a positive correlation between them. The p value is

In graph no.5 shows in normal individuals correlation of coefficient of pre-reading and post-reading is 0.1820, hence there is positive correlation between them. The p value is <0.335 and hence the correlation is significant

The studies here has been demonstrate that HRV measurements change with exercise intensity (HOTTENROTT *et al* 21).

In one of the study by F S MARTINELLI *et al* the result of athletes during endurance trained the indications if increased HRV in the time domain.

Conclusion

The present study found that after activity there has been significant heart rate increased in normal individuals as compared to athletes.

We recommend that closer attention has to paid on heart rate variability in healthy subjects it may reflect their physiological factors of ANS function and also leads to heart conditions.

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