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Heart Rate Variability in Trained Athletes and Sedentary Individuals- A Comparative Study in Rajasthan

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Abstract

Background: The autonomic nervous system (ANS) exerts control over the cardiovascular system.

Methods- A cross sectional study was conducted. A total of 50 subjects taken as sample size . They were selected in the age group of 21 to 50 years.

Result: It was observed that there exists a significant statistical difference in the resting pulse and DBP between trained athletes (group I) and sedentary individuals (group II).

Conclusion: These indicate parasympathetic (Vagal) dominance in trained athletes which is beneficial to cardiovascular system. Therefore this information can be used to make recommendation to the masses to follow exercise regime regularly to help prevent lifestyle diseases.

Keywords: Heart Rate, Sympathetic, Parasympathetic, Exercise

Introduction

The autonomic nervous system (ANS) exerts control over the cardiovascular system. The heart's activity at rest is primarily regulated by the parasympathetic vagal branch of ANS. Heart rate (HR) and stroke volume increase during exercise to meet the metabolic demands of active skeletal muscles of the body. Rapid tachycardia during exercise is due to withdrawal of parasympathetic response followed by sympathetic dominance phase[1].

In this era of mechanization with mobiles, computers, television and various electrical and electronic gadgets, there has been a drastic decrease in physical activity at home as well as work place. Many of the office goers have to sit for prolonged periods while commuting or at work place. Even children spend most of their time indoors with less physical activity in the school or at home. [1] Sedentary lifestyle has given rise to a huge problem of lifestyle diseases which are affecting our day to day living and work. Medical research to pinpoint exact reasons for these diseases are being conducted so as to prevent and cure them.

Pursuing physical activities like sports, exercises such as walking, jogging, swimming or yoga can help in achieving efficient cardio respiratory functions and is thus helpful in prevention of lifestyle diseases. Specifically, it has been found that exercises alter cardiac autonomic functions of the body. [2]

Materials and Methods

A cross sectional study was conducted. A total of 50 subjects taken as sample size. They were selected in the age group of 21 to 50 years.

Group I - Consisted of 25 apparently healthy trained athletes who have regularly run for at least the past 6 months. Regular practice was defined as running 5Kms in 30- minutes at a speed of 10 kmph for a minimum of three sessions per week. 1,5 Running could take place in any setting (indoor or outdoor) under supervision of a trainer.

Group II - Consisted of 25 apparently healthy individuals of sedentary lifestyle who carried out only their daily chores and did not do any form of extra physical exercise to improve their physical fitness. This non exercise regimen was continued for six months. 6 Individuals with any history of substance abuse like smoking, consumption of alcohol or a history of any known chronic systemic disease were excluded. All subjects were explained in detail about the purpose and methodology of the study.

Observations

Table 1: Mean distribution of age, sex, BMI in the two study groups

Parameters	Group-I		Group-II		p-value
	Mean	SD	Mean	SD	
Age	31.24	6.22	31.57	6.02	>0.05
Sex(M:F)	31:9		32:8		>0.05
BMI	22.4	1.63	22.8	0.81	<0.05

BMI in athletes were 22.6±1.65 and in sedentary individuals were 23.8±0.82. The difference was statistically significant.

Table 2: Comparison of resting pulse, SBP, DBP in the two study groups

Parameters	Group-I		Group-II		p-value
	Mean	SD	Mean	SD	
Pulse	71.84	3.84	76.24	6.08	<0.05
DBP	72.8	3.58	75.2	6.20	<0.05
SBP	122.80	8.14	121.24	5.80	>0.05

It was observed that there exists a significant statistical difference in the resting pulse and DBP between trained athletes (group I) and sedentary individuals (group II).

Discussion

Globally, the number of cases of lifestyle diseases has increased drastically. The main factor responsible for this significant increase in lifestyle diseases is decrease in physical activity. It has been observed by Lown et al that there exists a significant relationship between the autonomic nervous system and cardiovascular morbidity and mortality. 9 Autonomic dysfunction to certain extent was noticed in sedentary individuals that in future could pave way to lifestyle diseases. Similar findings were noticed by Noll G et al[3].

In the present study, as expected significant lower resting pulse rate was seen in trained athletes in comparison to sedentary individuals. This is because, at rest the heart rate is determined by balance between high parasympathetic (Vagal) influence and low sympathetic activity.[4] Physiological bradycardia in trained athletes is said to be mainly due to long endurance training which increases the “vagal tone”. 2 In our study mean value of Diastolic BP is significantly lower in trained athletes in comparison to sedentary individuals. The findings of our study are in line with the observations made by Sawane

MV et al in 2015 which says that physical exercises are known to modulate or 'condition' the autonomic nervous system[5] . The results of our study indicate that regular exercise training reduces resting diastolic BP perhaps due to changes in sympathetic/parasympathetic activation, with alterations in cardiovascular autonomic reflexes.

Conclusion

These indicate parasympathetic (vagal) dominance in trained athletes which is beneficial to cardiovascular system. Therefore this information can be used to make recommendation to the masses to follow exercise regime regularly to help prevent lifestyle diseases.

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