Research Paper Medical Sciences

Effect of Physical Training on Cardio respitory Parameters in Adults.

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ABSTRACT

Regular exercise enhances physical capabilities of human body and heart, blood vessels and lungs are no exception. We evaluated and compared various cardio-respiratory parameters like heart rate, blood pressure, tidal volume, vital capacity and peak expiratory flow rate in physically trained and sedentary subjects. We found decreased resting heart rate (HR) and blood pressure (BP) but increased tidal volume (TV), vital capacity (VC) and peak expiratory flow rate (PEFR) statistically significantly in physically trained subjects when compared to sedentary ones.

Keywords :Physical training, Heart, Blood vessels, Lungs, Cardio-respiratory parametersw

INTRODUCTION

The word physical training is used to mean the improvement of physical capacity i.e. strength and endurance. Role of physical activity in cardio-vascular health has received increasing attention in the recent years. Regular physical activity tends to have lower prevalence of coronary artery disease. Regular moderate exercise improves certain diseases like Diabetes mellitus, benign essential hypertension and osteoarthritis.1 Exercise training increases cardio-respiratory efficiency and tolerance to lactic acid. It also causes muscle hypertrophy. In the present study attempt is made to study effect of physical training on cardio-respiratory parameters like heart rate, blood pressure, tidal volume, vital capacity and peak expiratory flow rate.

MATERIAL AND METHODS

We studied 186 healthy, nonsmoker students of same age group (20-25 years). They were assigned randomly into two groups as study group and control group. 96 subjects (80 male and 16 female) assigned to study group were given physical training of one year, 3-4 hours daily, for 5 days a week. Training included running, jogging, and weight lifting as well as team games volleyball, football and hockey. 90 students with sedentary lifestyle (64 male and 24 female) were assigned to control group.

Informed consent was taken from all the subjects. They were included in study after thorough physical examination and subjects with any obvious physical abnormality and cardiovascular and respiratory diseases were excluded from the study. Subjects with any history of smoking, chronic cough, recurrent respiratory tract infection, history of chest or spinal deformity, obesity, personal history of asthma, chronic obstructive lung diseases were excluded from the study. Subjects of both the groups were examined for different cardio-respiratory parameters twice i.e. for study group before and after one year physical training and at the same time for control group. Heart rate and blood pressure were measured by routine radial pulse and sphygmomanometer. Pulmonary function tests i.e. tidal volume and vital capacity were measured with simple spirometer while peak expiratory flow rate was measured with wright's peak flowmeter. For every parameter average of three readings was taken as final reading and results were expressed as mean & standard deviation (± SD). Statistical analysis of data was done using Student't' test.

RESULTS AND DISCUSSION

As shown in observation table No.1, relative values of probability for both groups and sexes at the time of I reading are nonsignificant thus showing same (statistically nonsignificant difference) heart rate values in both the groups and sexes at the time of first reading. Heart rate at the time of II reading (after one year) in control group changes slightly but decreases markedly in study group subjects. When both groups are compared, heart rate shows statistically significant difference in both the sexes. Training causes enlargement of heart and hypertrophied heart is strong, powerful and efficient to pump greater stroke volume output. The excessive quantity of blood pumped into arterial tree with each beat initiate circulatory reflexes to increase vagal tone and sympathetic inhibition thus causing physiological bradycardia 2, 3, 4, 5.

The results of our study are in close agreement to decreased values of heart rate per minute, after training by many workers like M.H. Frick and R.O. Elovainio found significant decrease in the heart rate. 5 B. S. Tabkin and J. S. Hanson also found about 8-9 beats/min decrease of heart rate after training. 6

Table No. 2 and 3 reveal variations of systolic blood pressure (SBP) and diastolic blood pressure (DBP) before and after one year of physical training in both groups. After one year of physical training both SBP as well as DBP of study group subjects in both sexes shows statistically significant decrease when compared to that of control group ones. Reduction in resting and exercise heart rates is typical response to exercise training and could aid in lowering resting blood pressure. In addition to heart rate changes in peripheral resistance probably comprise an important part of hypotensive mechanism. 7, 8, 9 Our results of decreased blood pressure are quite compatible with results of many workers. Gaston choquette and Ronald J. Ferguson found significant decrease of BP in normotensive as well as hypertensive groups following physical training. 10 They found near about 10 – 14 mm of Hg and 6 – 10 mm of Hg decrease of SBP and DBP respectively. J. L. Boyer and F. W. Kusch also found decrease of SBP

and DBP by 13 mm of Hg and 11.8 mm of Hg respectively. 11 Table 4, 5 and 6 reveal statistically significant increase of peak expiratory flow rate (PEFR), tidal volume (TV) and vital capacity (VC) in study group subjects after one year physical training. Training affects cardiopulmonary system and skeletal muscular system in variety of ways which improves work performance. Training increases strength of respiratory muscles. All oxygen delivery and utilization system involved in exercise are enlarged e.g. stroke volume, blood volume, total Hb, muscle capillary bed and mitochondrial content of muscle are increased. Better mechanical factors and lower airway resistance influenced during the training period might have benefited in improving lung volumes and flow rates. Physical training and strength training exercises, involve the movement and strengthening of the whole body including the strengthening of respiratory and chest muscles. Skeletal muscle control many crucial elements of aerobic conditioning including lung ventilation. There might be increase in the maximal shortening of the inspiratory muscles as an effect of training, which has been shown to improve the lung function parameters. The physical training which trainees undergo must have helped in developing reduced resistance to respiration and greater endurance in respiratory muscles, accounting for increased PEFR and VC. 12, 13, 14

CONCLUSION

After comparing results of control and study group subjects we conclude that heart rate and both systolic & diastolic blood pressure decreases following physical training. Pulmonary function tests like TV, VC and PEFR increase following training. From conclusions of study we suggest that physical training is extremely beneficial to the health of human being as it increases cardiorespiratory efficiency and physical working capacity of an individual.

Table NO. 1
Effect of training on Heart Rate (Beats/min)

	Control Group			Study Group			P Value	Comment
	Sex	No.	Mean & SD	Sex	No.	Mean & SD		
I Reading	M	64	78.75 ± 8.94	M	80	78.02 ± 10.39	P < 0.05	NS
	F	26	79.69 ± 8.33	F	16	80 ± 10.09	P < 0.05	NS
II Reading (After one year training)	M	64	77 ± 9	M	80	67.27 ± 10.42	P < 0.001	HS
	F	26	78.92 ± 8.72	F	16	69.5 ± 11.23	P < 0.01	S

NS: Non significant, HS: Highly significant, S: Significant

Table NO. 2
Effect of training on Systolic Blood Pressure (mm of Hg)

	Control Group			Study Group			P Value	Comment
	Sex	No.	Mean & SD	Sex	No.	Mean & SD		
I Reading	M	64	130. 54 ± 12.28	M	80	129.09 ± 12.29	P < 0.05	NS
	F	26	116 ± 10.33	F	16	121 ± 8.45	P < 0.05	NS
II Reading (After one year training)	M	64	129.59 ± 11.54	M	80	121.5 ± 9.48	P < 0.001	HS
	F	26	117.38 ± 7.35	F	16	109 ± 7.20	P < 0.001	HS

NS: Non significant, HS: Highly significant, S: Significant

Table NO. 3
Effect of training on Diastolic Blood Pressure (mm of Hg)

	Control Group			Study Group			P Value	Comment
	Sex	No.	Mean & SD	Sex	No.	Mean & SD		
I Reading	M	64	83.21 ± 10.53	M	80	83.15 ± 9.63	P < 0.05	NS
	F	26	74.07 ± 9.69	F	16	74.68 ± 9.75	P < 0.05	NS
II Reading (After one year training)	M	64	81 ± 10.38	M	80	75.23 ± 12.67	P < 0.01	S
	F	26	72.07 ± 10.19	F	16	65.62 ± 11.75	P < 0.001	HS

NS: Non significant, HS: Highly significant, S: SignificantTable NO.4Effect of training on Peak Expiratory Flow Rate (Lit/min)

	Control Group			Study Group			P Value	Comment
	Sex	No.	Mean & SD	Sex	No.	Mean & SD		
I Reading	M	64	504.68 ± 105. 67	M	80	504.87 ± 97.26	P < 0.05	NS
	F	26	429.23 ± 91.48	F	16	437.5 ± 89.82	P < 0.05	NS
II Reading (After one year training)	M	64	509.37 ± 104.93	M	80	642.87± 133.08	P < 0.001	HS
	F	26	431.53 ± 90.20	F	16	538 ± 105.76	P < 0.001	HS

NS: Non significant, HS: Highly significant, S: Significant

Table NO. 5
Effect of training on Tidal Volume (ml)

	Control Group			Study Group			P Value	Comment
	Sex	No.	Mean & SD	Sex	No.	Mean & SD		
I Reading	M	64	484 ± 79.38	M	80	482.01 ± 89.72	P < 0.05	NS
	F	26	442.30 ± 68.90	F	16	437 ± 59.94	P < 0.05	NS
II Reading (After one year training)	M	64	491.25 ± 78.79	M	80	575 ± 113.85	P < 0.001	HS
	F	26	450 ± 69.33	F	16	521.87 ± 80.40	P < 0.01	S

NS: Non significant, HS: Highly significant, S: Significant

Table NO. 6
Effect of training on Vital Capacity (ml)

	Control Group			Study Group			P Value	Comment
	Sex	No.	Mean & SD	Sex	No.	Mean & SD		
I Reading	M	64	3156.25 ± 433.10	M	80	3136.25 ± 421	P < 0.05	NS
	F	26	2761.5 ± 406	F	16	2837.5 ± 382	P < 0.05	NS

II Reading (After one year training)	M	64	3174.37 ± 591.89	M	80	4041.25 ± 488.78	P < 0.001	HS
	F	26	2819.2 ± 401	F	16	3212.5 ± 350	P < 0.01	S

NS: Non significant, HS: Highly significant, S: Significant

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