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Research Article

EFFECT ON HEART RATE VARIABILITY PARAMETERS IN MALE AND FEMALE BEFORE AND AFTER PHYSICAL TRAINING

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ABSTRACT
It is proved fact that physical training brings about favourable cardiovascular changes. Physiologically both divisions of autonomic nervous system undergo changes with regular physical training and well trained person performs the same work with better skill than untrained individuals. The paper reports that the autonomic activity is assessed by heart rate variability in resting conditions and all parameters may be used as criteria for physical fitness as well as autonomic well being of individual, both males and females and all the parameters are compared before and after physical training.

Key Words: *Autonomic Nervous System, Heart Rate Variability Parameters*

INTRODUCTION
It is proved that physical training brings about favourable cardiovascular changes. Autonomic nervous system is the prime mediator of these changes. Rosenwinkel *et al.,* (2001) explained that autonomic nervous system establishes and maintains a dynamic adaptive state, allowing an organism to respond to internal and external demands. It mediates changes in heart rate and blood pressure and peripheral vascular tone in response to daily changes. Freeman *et al.,* (2006) focused the attention on the Heart Rate (HR) response to endurance exercise and on the pattern of HR recovery after exercise. Their study suggests that the measurement of autonomic HR control during and after endurance may provide additional information on the functioning of the autonomic nervous system. Akselrod *et al.,* (1981) suggests that Heart rate variability (HRV) provides a non-invasive tool for assessing autonomic HR control. HRV is primarily due to the changing modulation of vagal and sympathetic control of the heart and may therefore be considered as an estimate of autonomic HR control. Mainardi *et al.,* (2002) develop noval methods of HRV analysis that allow the assessment of HRV also in conditions when HR changes rapidly. Fouad *et al.,* (1984) observed a string inter individual correlation between Respiratory Sinus Arrhythmia (RSA) and pharmacologically defined vagal tone has been observed. RSA has been proposed to result from the interplay of several factors. Eckberg (2003) suggests that the relationship between respiratory frequency and RSA may reflect the kinetics of sinoatrial mode responses to fluctuating levels of acetylcholine. Respiratory activity is able to result in small RSA also, in the absence of autonomic HR control. The present study is attempting to evaluate the effect of short duration of physical training on cardiovascular performance and to evaluate vagal and sympathetic contributions to HRV.

MATERIALS AND METHODS
50 female and 50 male healthy, non-athletic, young individuals from various socioeconomic groups residing nearby residential layouts of Navodaya Medical College, Raichur belonging to age group of 18-25yrs. The study was approved by the Ethical clearance committee of NMCH and RC, Raichur.
Informed consent for the test protocol was obtained from the volunteers subjects of study before the start of the study.
For recording of HRV parameters ECG V; 52 (Heart Rate Variability analysis software) is used.

Manufactured by NIVIQURE Meditech pvt. Ltd. Bengaluru and marketed by Inco Medicals; Ambala. Manufactured year-2006; computerized software for ambulatory ECG recording.
Recording were standardized and instructions followed as per the guidelines of Task Force of the European Society of Cardiology as HRV, Standards of measurement, Physiological interpretation and Clinical Use. The soft ware has an inbuilt analysis and interpretation of five minute uninterrupted recording of standard Lead II recording of ECG in supine resting eyes closed relaxed state.

RESULTS AND DISCUSSION

All the parameters were measured and analyzed before and after the physical training Program expressed in terms of mean ± SD. The standard statistical tests used in this study were, Student's t-test was applied to analyze the changes in the cardiovascular parameters during exercise and recovery. Non-parametric Wilcoxon signed rank test was applied to analyze the changes in the heart rate variability parameters because of non-normal distribution of the data. P value less than or equal to 0.05 (5%) were considered statistically significant. Data analyses were conducted using SPSS (version 11.0).
Although there was no significant change in post training values of time and frequency domain measures of HRV the trend in both these domains reflected an increase in parasympathetic tone. As for frequency domain parameters Total Power [TP] and high frequency power normalized [HFnu] showed an increasing trend. Similarly time domain measures of HRV showed an increasing trend in mean RR interval, SDNN, RMSSD, NN50 and pNN50 after physical training in both genders male and females as presented in Table No. 4, 5, 8 and 9 respectively.

Table 4: Time domain measures of Heart Rate Variability (HRV) in Males

Parameter	Pre-training Mean ± SD	Post-training Mean ± SD	p-value	Remarks
Mean R-R	877.34 ± 107.24	892.06 ± 96.04	P>0.05	NS
SDNN	43.95 ± 5.37	43.36 ± 4.67	P>0.05	NS
RMSSD	30.20 ± 3.69	30.72 ± 3.67	P>0.05	NS
NN50	7.22 ± 0.91	7.40 ± 0.85	P>0.05	NS
PNN50	3.32 ± 0.41	3.42 ± 0.58	P>0.05	NS

Table 5: Frequency domain measures of Heart Rate Variability (HRV) in Males

Parameter	Pre-training Mean ± SD	Post-training Mean ± SD	p-value	Remarks
TP	1016.09 ± 124.29	990.86 ± 95.80	P>0.05	NS
LF	429.36 ± 52.48	417.79 ± 42.95	P>0.05	NS
HF	138.72 ± 16.96	135.49 ± 12.64	P>0.05	NS
LFnu	91.08 ± 11.13	89.00 ± 8.42	P>0.05	NS
HFnu	16.61 ± 2.03	16.26 ± 1.60	P>0.05	NS

Table 8: Time domain measures of Heart Rate Variability (HRV) in Females

Parameter	Pre-training Mean ± SD	Post-training Mean ± SD	p-value	Remarks
Mean R-R	927.14 ± 92.57	931.07 ± 88.91	P>0.05	NS
SDNN	49.67 ± 4.96	49.88 ± 4.96	P>0.05	NS
RMSSD	33.71 ± 3.36	33.84 ± 3.46	P>0.05	NS
NN50	9.73 ± 0.97	9.82 ± 0.89	P>0.05	NS
PNN50	4.26 ± 0.42	4.28 ± 0.42	P>0.05	NS

NS- Not Significant, S- Significant

Table 9: Frequency domain measures of Heart Rate Variability (HRV) in Females

Parameter	Pre-training Mean ± SD	Post-training Mean ± SD	p-value	Remarks
TP	1063.41 ± 106.19	1063.7 ± 105.70	P>0.05	NS
LF	456.14 ± 45.54	456.16 ± 45.81	P>0.05	NS
HF	151.10 ± 15.08	151.40 ± 15.21	P>0.05	NS
LFnu	102.38 ± 10.22	101.27 ± 10.45	P>0.05	NS
HFnu	20.19 ± 2.02	20.02 ± 2.51	P>0.05	NS

NS- Not Significant, S- Significant

Documentation of both short term effects of exercise and its physiological mechanism is important from clinical point of view:

i) The duration of stay (post operative period), which is important for socio economic reasons.
ii) In certain diseases the duration of acquisition of physical fitness may be altered.

The primary purpose of this investigation, however, was to examine the response of cardiovascular parameters to exercise training sessions performed over 4 weeks. Previous studies have demonstrated that endurance exercise training in young, healthy participants results in significant alterations in HRV that reflect an increased vagal modulation of the heart.

The current study demonstrated that for young, regular aerobic exercise training reduced HR during supine rest and upright exercise with minimal changes in the LF and HF components of HRV. Factors other than an increased cardiac vagal modulation (i.e., nonautonomic) may contribute to the mechanism of training-induced bradycardia and cardioprotection.

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