A Comparative Study of Heart Rate Variability (Time Domain) of Selected Variables of Male Science Students from Sports and Non-Sports Background

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Abstract

Heart rate variability (HRV) is the physiological phenomenon of variation in the time interval between heartbeats. It is seen that there are many problems related to health which are occurring at very young age due to less participation in sports activities and stressful life due to performance in academics and other socio-economic and environmental factors. The **aim** of the study was to compare the heart rate variability (time domain) of selected variables of male science students from sports and non-sports background.The study was **conducted** on 40 male science students (20 sports and 20 non-sports background). Ages of the sample ranged from 17 to 21 years of same socio-economic status from different games/sports. Data was **collected** using ECGpolygraphs. Data were processed and extracted using time domain analysis. Collected data was **computed** with Mean, Standard Deviation and Anova. The**finding** regarding the heart rate variability (time domain) of selected variables of male science students from sports and non-sports backgroundnamely SDNN having 'F' ratio 0.114, likely mean heart rate having 'F' ratio 0.292, RMSSD insignificant 'F' ratio 0 .382, NN50 count having 'F' ratio 0.219, pNN50 having 'F' ratio 0.879, and RR triangular index having 'F' ratio 0.038 were insignificant at 0.05 level of significance.

KEY WORDS: HRV SDNN NN50 RMSSD

INTRODUCTION

Heart rate variability (**HRV**) is the physiological phenomenon of variation in the time interval between heartbeats. It is measured by the variation in the beat-to-beat interval[1]. Reduced HRV has been shown to be a predictor of mortality after myocardial infraction[2,3] although others have shown that the information in HRV relevant to acute myocardial infarction survival is fully contained in the mean heart rate[4]. Variations in heart rate may be evaluated by a number of methods. Perhaps the simplest to perform are the time domain measures. With these methods either the heart rate at any point in time or the intervals between successive normal complexes are determined. In a continuous electrocardiographic (ECG) record, each QRS complex is detected, and the so-called normal-to-normal (NN) intervals (that is all intervals between adjacent QRS complexes resulting from sinus node depolarizations), or the instantaneous heart rate is determined. Simple time–domain variables that can be calculated include the mean NN interval, the

mean heart rate, the difference between the longest and shortest NN interval, the difference between night and day heart rate, etc. Other time–domain measurements that can be used are variations in instantaneous heart rate secondary to respiration, tilt, Valsalva manoeuvre, or secondary to phenylephrine infusion. These differences can be described as either differences in heart rate or cycle length.

Since many of the measures correlate closely with others, the following are recommended for time–domain HRV assessment The SDNN (estimate of overall HRV); HRV triangular index (estimate of overall HRV); and RMSSD (estimate of short-term components of HRV). Two estimates of the overall HRV are recommended because the HRV triangular index permits only casual pre-processing of the ECG signal. The RMSSD method is preferred to pNN50 and NN50 because it has better statistical properties.

It is seen that there are many problems related to health are occurring at very young age due to less participation in sports activities and more stress due to academics and other socio-economicand environmental factors. The researchers inspired by the above mentioned factors and wanted to see the heart rate variability in male science students from sports and non-sports background.

OBJECTIVES

Objective of the study is selected variables of heart rate variability (time domain) of male science students from sports and non-sports background.

HYPOTHESIS OF THE STUDY

It was hypothesized that there will be significant difference between theselected variables of heart rate variability (time domain) of male science students from sports and non-sports background.

SAMPLE FOR THE STUDY

The study was conducted on 40 male science students (20 sports and 20 non-sports background). Ages of the sample ranged from 17 to 21 years of same socio-economic status from different games/sports.

METHODOLOGY

Students were asked to come with two hours fasting before the test. No medication was taken before 48 hours of the testing. Subjects rested for 30 minutes before the commencement of the test and then heart rate variability (HRV) was performed, which quantifies autonomic drive to the myocardium. The ECG analog were filtered and quantified using the software namely 1) AUTONOMIC FUNCTION TEST HRV_Soft version 1.1, 2) HRV Software, Biomedical Signal Analysis Group, Department of Applied Physics, University of Kupio, Finland. Both sympathetic and parasympathetic drives to myocardium were assessed by SDNN, LF (Normalized Power), LF/HF ratio, LF (Absolute power), TP (Absolute Power), NN50 count, pNN50 count, SDSD, RMSSD, HF (Normalized Power), HF (Absolute Power) , and SDSD with regard

to HRV variables (sympathetic and parasympathetic activity and reactivity). This was achieved by simultaneous measurement of ECG.

STATISTICS

Collected data was computed with Mean, Standard Deviation and Anova. The findings have been presented with table numbers 1 and 2.

FINDINGS

Table- 1

Descriptive Statistics of Selected Variables Recorded of Heart Rate Variability (Time Domain) of Male Science Students from Sports and Non-Sports Background

Variables		Unit	Mean	Standard Deviation
SDNN	Sports	ms	45.03	20.87
	Non Sports		42.84	20.11
MEAN Heart Rate	Sports	Beats/minute	79.76	12.76
	Non Sports		81.78	10.83
RMSSD	Sports	ms	28.78	16.94
	Non Sports		32.22	18.21
NN50	Sports	f	20.50	11.21
	Non Sports		22.40	14.30
pNN50	Sports	%	8.71	4.73
	Non Sports		10.99	9.79
RR	Sports		6.36	2.72

triangular index	Non Sports		6.22	2.05

N= 40; ms- milliseconds; f- frequency
SDNN- Standard Deviation of NN intervals; RMSSD- The square root of the mean sum of the squares of differences between adjacent NN intervals

Table- 2

ANOVA on Selected Variables Recorded of Heart Rate Variability (Time Domain) of Male Science Students from Sports and Non-Sports Background

Variables	Mean Square	F	Significance
SDNN	47.961	.114	.737
MEAN Heart Rate	40.905	.292	.592
RMSSD	118.198	.382	.540
NN50 count	36.100	.219	.643
pNN50	51.984	.879	.354
RR TRIANGULAR INDEX	.221	.038	.846

N= 40; significance at .05 level of significance
SDNN- Standard Deviation of NN intervals; RMSSD- The square root of the mean sum of the squares of differences between adjacent NN intervals

The analysis of data in table- 2, regarding the comparison between the selected variables of heart rate variability (time domain) of male science students from sports and non-sports background SDNN having mean square= 47.961, which having insignificant 'F' ratio .114 likely mean heart rate having mean square= 40.905, which having insignificant 'F' ratio .292, RMSSD having mean square= 118.198, which having insignificant 'F' ratio .382, NN50 count having mean square= 36.1, which having insignificant 'F' ratio .219, pNN50 having mean square= 51.984, which having

insignificant 'F' ratio .879, and RR triangular index having mean square= .221, which having insignificant 'F' ratio .038 wasinsignificant at .05 level of significance.

INTERPRETATION

- Mean projections are optimistic when compared for sports non-sports students. The projections are positive and as per the desired/expected data viz. time domain is decreasing in sports, which is positive.
- Heart rate is also variable is on higher side. This is attributed to the fact that the sample comprises of science students and such students are always under stress of academics etc.
- The data of sports person of our college seems to be suggestive that science students although involved in sports are not purely from sports background since; they are not regular in sports.

DISCUSSION

Inference analysis show that all the variables are insignificant as variation is much more. This is because sample size is small and/ or sports students are not actively participating in the physical activity.When looking at the possible causal relations between physical activity and non-physical activity, previous research have shown that chronic aerobic exercise results in enhanced brain structure and functioning throughout the life span[5]. The "cardiovascular fitness hypothesis"[6] suggests that cardiovascular fitness is the physiological mediator that explains the cognitive benefits of physical activity.

Long-term endurance training significantly influences how the autonomic nervous system controls heart function. Endurance training increases parasympathetic activity and decreases sympathetic activity in the human heart at rest. These two training-induced autonomic effects, coupled with a possible reduction in intrinsic heart rate, decrease resting heart rate. Long-term endurance training also decreases submaximal exercise heart rate by reducing sympathetic activity to the heart[7].

Overall, our result does not seem to support a positive relationship between a sport participation and performance in science students. However, on the basis of the extant literature and the strong correlation between sport participation and fitness (i.e., our athletes were more fit than our non-athletes).

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