Article

Effect of Deep Relaxation on Heart Rate Variability in Sedentary Females

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Abstract

Background: Lower heart rate variability (HRV) in sedentary people is associated with higher risk of coronary heart diseases. Deep Relaxation Technique (DRT) generate higher HRV which reduces the risk of coronary heart disease. **Objective:** To assess HRV after practicing DRT to find out it's effect on cardiac autonomic nerve function in sedentary subjects. **Methods:** This study with intervention by DRT was carried out in the Department of Physiology, Bangabandhu Sheikh Mujib Medical University from July 2012 to June 2013 on 30 apparently healthy sedentary females aged 25-35 years practicing DRT for 3 months. 30 apparently healthy sedentary females who had no experience of relaxation technique constituted control. All subjects were sedentary housewives. The study subjects were participants in a private yoga center in Dhaka. HRV was assessed by RMS polynte D and frequency domain parameters were analysed. Statistical analysis was done by Independent Sample t-test. **Results:** Total power ($p<0.001$), HF power ($p<0.01$), HF norm ($p<0.05$) were significantly higher and LF power ($p<0.001$), LF norm ($p<0.05$), LF/HF ($p<0.01$) were significantly lower in the relaxation group than those of non relaxation group. **Conclusion:** Cardiac autonomic nerve function was improved by practice of DRT with parasympathetic dominance in sedentary females.

Key words: HRV, Sedentary females, Deep relaxation technique.

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Introduction

Yoga is an ancient science originated in India. It includes diverse practices, such as physical postures, regulated breathing, instructed relaxation and meditation[1]. Among the yoga based relaxation techniques, Deep relaxation technique (DRT), Cyclic meditation (CM), Shavasan are most popular. Practicing relaxation has earned popularity in Bangladesh. Recently, relaxation has come in limelight because of its cardiac and multisystem benefits among the practitioners [2,3,4,5].

Relaxation is practiced by means of simple meditation[2]. In addition, DRT has been described as meditation Process[6]. This type of relaxation technique induces a quiet state of mind[1].

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European Society of Cardiology reported that relaxation technique had been used in cardiac rehabilitation since 1970 [7]. A study reported recovery of seriously ill cardiac patients through relaxation and dietary modification [3].

Several researchers investigated the effect of relaxation response on cardiac autonomic nerve function by assessing heart rate variability (HRV) as it can quantify cardiac parasympathetic and sympathetic activity. It measures the variations of instantaneous heart rate as well as the R-R intervals [8].

Common frequency domain measures of HRV include total power, high frequency (HF) power and HF norm which reflect cardiac parasym-

pathetic modulation and also low frequency (LF) power, LF norm and LF/HF ratio which reflect cardiac sympathetic modulation [8].Research evidences showed relaxation may induce an increase in parasympathetic outflow along with a decrease in sympathetic outflow. It is associated with higher heart rate variability (HRV) with reduced risk of coronary heart diseases [5,7].

In frequency domain measures, relaxation lead to significantly higher HF component, HF power and HF norm and lower LF power, LF norm and LF/HF in healthy subjects irrespective of sex[9,10,11,12].

Besides, two controlled trials of relaxation improved cardiac parasympathetic tone in coronary heart disease patients [5,7]. Again few investigators found significantly increased LF power and LF component after relaxation in healthy males. In addition, they failed to find any change of LF/HF ratio and total power compared to preceding baseline in healthy males [13].

Sedentary lifestyle has been found associated with decrement of cardiac parasympathetic activity [11,13,14,15].

In Bangladesh, there are reports of lower HRV in sedentary adolescents adults [11,13,15,16]. But the effect of relaxation technique on HRV in sedentary subjects was not investigated. Assessment of the effect of relaxation technique on these cardiac autonomic nerve function parameters in sedentary subjects may be helpful as a preventive measure against the risk of unfavorable cardiac health.

Therefore, this study was undertaken to assess the effects of relaxation technique on cardiac autonomic nerve function activity by analyzing the HRV in sedentary females in order to find out its role in reducing cardiovascular morbidity and mortality in this group of people.

Methods

This interventional study was carried out in the department of physiology of Bangabandhu Sheikh Mujib Medical University between July 2012 to June 2013. Institutional review board approved the protocol of this study. 30 apparently healthy sedentary females, aged from 25-35 years who were experienced with DRT for 3 months participated this study and 30 age and BMI matched sedentary females who were never exposed to relaxation technique constituted control. Control subjects were sedentary housewives living in Dhaka city and study subjects were the sedentary housewives who had previous experience of practicing DRT for 3 months in a private yoga center in Dhaka city. Subject suffering from systemic diseases, obesity, psychic disorder and drug users specially drug affecting nervous system were excluded from the study.

The aim and objectives of the study were explained and they were encouraged for voluntary participation. A written informed consent was taken from each subject. A thorough clinical examination was done and personal histories of all subjects were recorded in a data schedule. The subject was also asked to avoid tea or coffee at breakfast and to report at the Autonomic Nerve Function Test Laboratory of the Department of Physiology of BSMMU between 9:00 am to 11:00 am on the day of examination. Then the subject was kept under complete bed rest in supine position for 20 minutes in a cool and calm environment at the laboratory.

During this test period, she was restricted to talk, eat, drink, any physical or mental activity and even sleep. Then a 5 minutes ECG recording was taken in resting supine position and the frequency domain measures of the HRV were assessed by a digital RMS polyrite-D. All data were expressed as mean ± SD. Data analysis was performed by using SPSS for windows version 16.0. Independent Sample t-test compares the mean frequency domain measures between groups. P value < 0.05 was accepted as level of significance.

Results

The resting pulse rate ($p<0.001$), DBP ($p<0.01$) and SBP ($p<0.01$) were significantly lower in DRT subjects than those of non DRT control. (Table I).

The mean values of resting total power ($p<0.001$), HF power ($p<0.01$), HF norm ($p<0.05$) were significantly higher whereas LF power ($p<0.001$), LF norm ($p<0.05$), LF/HF ($p<0.01$) were significantly lower in DRT subjects in comparison to those of sedentary females . (Table II).

Table I : *Baseline cardiovascular parameters in different groups (n=60)*

Parameters mean ± SD	Non DRT (n=30)	DRT (n=30)
Resting pulse rate(bpm)	77.47±6.78(68-88)	71.90±5.60*** (65-86)
SBP(mm of Hg)	116.30±2.65(110-118)	113.27±3.70** (105-118)
DBP (mm of Hg)	75.30±3.39(65-78)	72.20±4.16** (68-78)

Data expressed in mean± SD. Figures in parentheses indicate ranges. SBP-Systolic blood pressure DBP-Dystolic blood pressure. DRT = Deep Relaxation Technique***=p<00.1 **p<0.01

Table II : Frequency domain measures of HRV in different groups (n=60)

Parameters mean ± SD	Non DRT(n=30)	DRT(n=30)
Total power (ms^2)	1941.55±1127.02	3967.28±1279.18***
	(1010.88-4918.78)	(1905.33-6621.21)
HF (ms^2)	530.03±332.10	795.20±406.89**
	(189.78-1134.56)	(204.34-1340.03)
HF norm (n.u)	39.45±13.66	46.87±10.33*
	(22.19-65.4)	(30.46-69.75)
LF power (ms^2)	1375.12±378.98	980.67±434.73***
	(645.45-1845.34)	(423.68-1698.76)
LF (n.u)	76.16±16.86	66.58±16.72*
	(40.50-95.91)	(36.47-97.6)
LF/HF	1.95±0.34	1.45±0.39**
	(1.01-3.57)	(1.01-2.55)

Data expressed in mean± SD.Figures in parentheses indicate ranges HF= High frequency, ms^2 = square millisecond, nu= normalized unit LF= Low frequency, LF/HF= Low frequency high frequency ratio DRT = Deep Relaxation Technique***=p<00.1 **p<0.01*=p<0.05

Discussion

The present study assessed mean total power, HF power, HF norm and LF power, LF norm, LF/HF which reflect cardiac vagal and sympathetic activity respectively in sedentary females to observe the impact of practicing DRT on cardiac autonomic nerve function in sedentary life style[8]. In this study, higher mean total power, HF power, HF norm and lower LF power, LF norm, LF/HF were found in the sedentary females who practiced

DRT than those of the non relaxation group. There was no published data available to compare these observations in sedentary females.

In this study, the values of HRV measures in the sedentary females practicing DRT suggested increased cardiac vagal with concomitant reduction in sympathetic modulation in the subjects of the present series. Though the exact cause of this change under DRT is not clear but literature proposed, increased beta receptor responsiveness[17], activation of the neural network[2,6,18-23] may be responsible for the changes in cardiac autonomic nervous activity associated with deep relaxation technique. From the above feature it is apparent that DRT may play an important role by modifying cardiac autonomic nervous activity towards parasympathetic dominance to maintain cardiovascular health and thus to prevent cardiac morbidity and mortality.

Conclusion

From this study it can be concluded that cardiac vagal activity may be increased with concomitant reduction in sympathetic modulation in subjects who practice deep relaxation technique. Therefore, deep relaxation technique may be beneficial to maintain cardiac health and in preventing the occurrence of cardiovascular diseases in sedentary females.

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