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Effect Of 12 Weeks Yoga Training And 12 Weeks Detraining on Heart Rate Variability on Subjects with Hypertension

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Abstract

Background: *Healthy lifestyle modifications can prevent hypertension, an early predictor of cardiovascular disease. Yoga is an effective way to manage stress-induced disorders, such as hypertension.* ***Objective:*** *This study investigated the effects of yoga training on hypertensive individuals receiving routine treatment over a 12-week period, comparing and analyzing heart rate variability (HRV) parameters at and after the 12-week yoga training period (the 12th week) with hypertensives receiving routine treatment (the non-yoga group).* ***Materials and methods:*** *A total of 132 hypertensive subjects between the ages of 25 and 45 were randomly assigned to control or experimental groups (N=66), and 66 of these subjects were exposed to yoga therapy (N=66). Before, after, and during the study period, HRV parameters were obtained.* ***Results:*** *RM ANOVA was used to compare time domain and frequency domain parameters of HRV of the control group at pre, post, and detrain, and it was found that no significant difference existed between the groups. Test group mean values show a significant increase in time domain parameters compared with pre-training values after training. Test group post-training and detrain values significantly increased when compared to control group post-training and detrain values. Test group detrain values decreased significantly from post-training to test group detrain values.* ***Conclusion:*** *Yoga therapy increases the HRV values in essential hypertension at rest. An increase in vagal modulation, a reduction in sympathetic activity, and an increase in baroreflex sensitivity may be responsible for the harmonization of autonomic cardiovascular rhythms. The results of detraining from yoga did not result in an increase in HRV. As a result, the present study shows that regular yoga practice reduces hypertension, and deep rest keeps the body healthy.*

Keywords: *Hypertension, yoga, parasympathetic tone, sympathetic activity*

1. Introduction

India is catching with the developed world in the incident of cardiovascular disease. Hypertension is a hazard risk factor which majorly contributes to the global burden of cardiovascular disease. The present estimate of 11.8 crores hypertensive in India is anticipated to double by 2025. Prolonged hypertension enhances the possibility of stroke, cardiovascular diseases like progressing coronary heart disease such as heart failure [1,2]. In the Primary Health Care, Hypertension is a general diagnosis and the societal amoount of investigation and treatment for hypertension and its importance

are considerable [3]. It is related with autonomic dysfunction distinguished by sympathetic overactivity, alternated vagal modulation of the sinus node, and alteration in variability of heart rate and balance in sympathovagal. A huge amount of patients are facing economic burden by taking drug therapy for lifelong and unwanted side effect cause of intake of allopathic drugs. In heart rate supremacy and Blood Pressure the Autonomic Nervous System (ANS) gives a vital role and it might be a crucial factor of pathophysiological for causing hypertension.

The autonomic nervous system (ANS) is the reflection of Heart rate variability (HRV) and Baroreceptor reflex sensitivity (BRS) [4,5,6]. Measurement of HRV is the most sensitive way to detect the effect of an intervention [7]. The previous studies clearrly shown the imbalance in sympathovagal that occurs in patients with HT [8] and then practice of yoga helps reinstating the balance of sympathovagal. In hypertension patients the parameters Blood Pressure (BP) and Basal Heart Rate (HR) are supposed to be decreased in a report after Yoga training [9,10].

Yoga has been found to be very effective in managing hypertension and other stress related disorders. The study reported that new-onset hypertension is characterized by diminished short-term heart rate variability as a result of altered Sympatho-vagal balance [11]. To decrease the stress and also to reimpose the Autonomic Nervous System balance [12], yoga is used as an intervention in lifestyle. To manage the stress, yoga is referred as a "mind-body medicine" which is recommended as a tool of non-pharmacological by the National Centre for Complementary and Alternative Medicine (NCCAM)[12,13].

There were no other studies done on the detrain effect of detraining from yoga. Therefore, this study was planned to determine the effect of lifestyle modification through the intervention of yoga practice and its impact on cardiac autonomic activity after the yoga training for 12 weeks and evaluates the effect after yoga for the same group after detraining of yoga intervention.

2. Material and Methods

The Study obtains the approval from the Institute called Human Ethical Committee before the commencement.

Selection of the subjects:

The hypertensive subjects between the age of 25 -45 years were selected from the Outpatient Department (OPD) of Medicine and Yoga Institute called Mahatma Gandhi Medical College and Research Institute (MGMC&RI) which is located in Puducherry. Subjects with alcoholic or nicotinic dependence, acute illness, morbid obesity, Patient not able to do yoga, Patients on steroids, autonomic nervous system modulating drugs, and antipsychiatric drugs (antidepressant) were excluded. After obtaining informed consent, subjects were randomized by the standard procedure. Allocation sequence was generated using block randomization, and the subjects are allotted to either to yoga or control group using a technique called Serially Numbered Opaque Sealed (SNOSE).

Experimental Design:

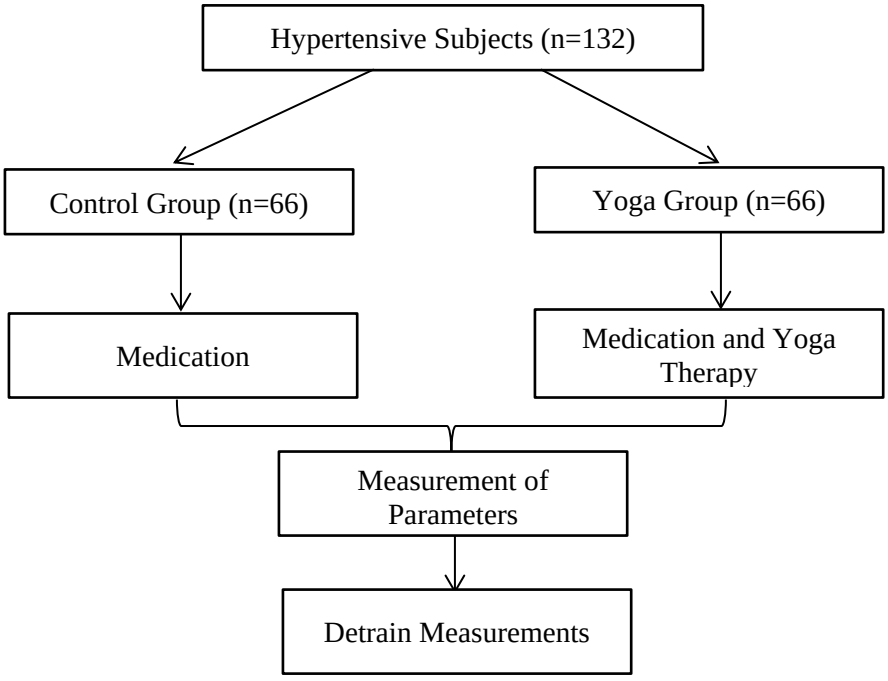
All the parameters were recorded between 9 a.m. and 11 a.m in the Research lab, Department of Physiology, MGMC&RI. The environment of laboratory was quiet; the the lighting was toned down and the maintainance of temperature is between 25°C and 27°C. With an empty bladder and bowel after 1 hour of breakfast, the subjects were asked to present themselves. The subjects are clearly advised to avoid consuming alcohol and smoking on the same day and also for the whole study period. Also the subjects were advised to avoid the intake of an antihypertensive agent in morning before the procedure, as it may obstruct with the blood pressure.

The environment of laboratory and the recording methods are elaborated to subjects to familiarize themselves. Without any help of stimulants in the period of pre-recording between the duration of 9a.m. and 11 a.m. the recordings ae collected. Considering the comfot level of subjects, the temperature of a laboratory is maintained. The respiration and Lead II ECG were recorded after rest of 15 min in supine at the samples of 500 per sec by using an INCO Polyrite-D for every 5 minutes. The entire 5 min ECG recording was intervented manually and artifacts were edited and removed in R-R intervals

by KubiosHRV Version 2.0, Department of Physics, University of Kuopio in Finland. The above mentioned all parameters were recorded for both the control and the yoga group before 12 weeks and after 12 weeks of training in yoga and also after 12 weeks of detrain.

Interposition (12 weeks):
The OPD in MGMCRI prescribed the antihypertensive drugs and it is received by both the groups of subjects. In addition to drug therapy, the approved yoga therapy is received by the yoga group. The Centre named Yoga Therapy Education and Research (CYTER) approves the therapy given to the Yoga groups which is located in Sri Balaji Vidyapeeth, Puducherry by following the guidelines of a trained Yoga teacher of Morarji Desai National Institute of Yoga (MDNIY). There were 45 minutes of yoga therapy sessions for three days in a week for the yoga group and motivated them to continue the same for remaining days of a week at home. Patients were motivated to practice the same days at home and maintain an attendance register. The attendance of patients who were highly motivated was atleast 70% were included in the study. To assess the effect of detraining of intervention , the recordings were taken again after 12 weeks for both the contol and yoga group.

Elements of Therapy
The classes normally start with a cursory prayer for 5 Min and the preliminary practices like joint loosening exercises and breath–body coordination for 10 Min followed by Module for yoga training. It was followed by 10 min of asans, 10 min of pranayam, and 15 min of Shavasan practice. The attendance were taken at the end of the yoga class, then the subjects were motivated to practice it on the other days in home itself. Few of the classes were preceded by a talk on lifestyle modification and diet in controlling disorders of chronic lifestyle.



Module of Yoga therapy
1. Yogic comforting
2. Preliminary Practices: Coordination practices of Breath–body and practices of joint loosening
3. Asans or fixed postures: Talasan, Ardhakati chakrasan, Ardha chakrasan, Uttanpadasan, Ardha halasan, Pavanmuktasan, Makarasan, Bhujangasan, Vajrasan
4. Pranayam or Techniques of Breathing:Chandra Nadi, Pranav, Nadi shuddhi
5. Techniques of Relaxation: Kayakriya in shavasan, Shavasan with savitri pranayam

Data analysis
The SPSS version 16.0. is used to analyse the data statistically, the data was firstly analyzed for

normality by the Shapiro Wilke test. Intra-groupand intergroup analysis were done by using the unpaired students t-test, and also the Repeated measure ANOVA (RM ANOVA) respectively.

3. Result and Discussion

Parameters	Control (N= 63)			Yoga (N= 61)		
	Pre	Post	Detrain	Pre	Post	Detrain
HR	72.49 ±5.74	71.87 ± 5.64	72.92 ± 8.17	73.41± 7.81	69.31 ± 6.54$^{\#***}$	71.57 ± 8.31$^{*\$\$}$
Mean RR	779.01±98.3	774.59±85.49	786.57±93.38	767.67±82.81	829.53±102.34$^{\#\#\#***}$	841.77±123.76***
SDNN	33.21 ± 13.38	34.27 ± 7.43	33.34 ± 6.99	31.47 ± 8.87	37.64 ± 9.67$^{\#***}$	36.50 ± 9.92***
RMSSD	26.49 ± 10.56	27.38 ± 10.79	26.84 ± 11.72	24.73 ± 6.98	27.71 ± 7.25***	26.50 ± 8.04*
PNN50	9.03 ± 4.19	9.21 ± 4.32	9.32 ± 4.28	8.58 ± 3.41	10.10 ± 4.59*	10.39 ± 4.65**

#p < 0.05; ##p < 0.01; ###p < 0.001 comparison between post control and post yoga group by unpaired t-test. *p < 0.05; **p < 0.01; ***p < 0.001 comparison within the group with pretraining by using RMANOVA; $p < 0.05; $$p < 0.01; $$$p < 0.001 comparison between post yoga and detrain yoga group by RMANOVA.

Time domain parameters of HRV:

There was no significant difference in the control group in the time domain parameters of HRV in the preintervention, postintervention and postdetraining. In the yoga group, time domain parametres were significantly increased after intervention and after detraining when compared with the pretraining values. The yoga group posttraining parameters showed significant increase compared to control group.

Effect of intervention and detraining detrain on HRV (Frequency domain parameters) on hypertensive patients						
Parameters	Control (N= 63)			Yoga (N= 61)		
	Pre	Post	Detrain	Pre	Post	Detrain
VLF	396.587 ± 175.07	398.714 ± 181.96	397.746 ± 185.61	421.098 ± 170.95	434.262 ± 160.49	410.557 ± 176.93
LF	551.585 ± 255.32	545.905 ± 242.622	571.143 ± 239.03	555.492 ± 164.95	498.115 ± 207.95	506.738 ± 236.82
HF	163.142 ± 47.15	165.683 ± 43.35	163.937 ± 45.44	158.951 ± 45.56	206.033 ± 51.75$^{\#\#\#***}$	174.885 ± 51.89$^{\$\$\$}$
Total Power	1111.314 ± 320.05	1110.302 ± 332.32	1132.825 ± 326.85	1135.541 ± 223.71	1138.41 ± 270.38	1092.18 ± 293.33
LF:HF	3.662 ± 2.09	3.563 ± 1.97	3.726 ± 1.91	3.743 ± 1.33	2.553 ± 1.16$^{\#\#\#***}$	3.217 ± 2.08$^{\$}$
LF nu	49.568 ± 22.83	53.037 ± 19.27	51.806 ± 20.57	60.449 ± 16.45	50.02 ± 21.69***	52.703 ± 20.66*
HF nu	50.426 ± 22.43	46.963 ± 19.27	48.194 ± 20.57	39.551 ± 16.26	49.98 ± 21.69***	47.297 ± 20.66*

#p < 0.05; ##p < 0.01; ###p < 0.001 comparison between post control and post yoga group by unpaired t-test. *p < 0.05; **p < 0.01; ***p < 0.001 comparison within the group with pretraining by using RMANOVA; $p < 0.05; $$p < 0.01; $$$p < 0.001 comparison between post yoga and detrainyoga group by RMANOVA.

Frequency domain parameters of HRV:

There was no difference in the HRV frequency domain parameters of pre, post, and detrain values of the control group. In yoga group, the post training mean values of HF shows significant increase and LF/HF ratio shows significant decreasewhen comparing with post training control values.Post training yoga group mean values of HF and HF nushows significant increaseand LF/HF ratio, LF nu shows significant decreases compared with pre training yoga group.

A good health is measured by finding an increase in HRV and decreased HRV shows that it is associated with cardiovascular mortality and morbidity [14]. In the present study, three months of yoga training program increased time domain measures such as mean RR, SDNN, RMSSD, pNN50 providing evidence of the increased cardiac vagal activity. Among the 89 Time domain indices of Heart Rate Variability, RMSSD is an accurate marker of vagal drive on modulation of cardiac [15]. Frequency domain measures such as HF component increased after yoga interventionprovides evidence that practicing yoga improves autonomic functions of heart for three months while enhancing sympathovagal balance of heart.

Reduction in HRV and increase in BP indices can be utilised as a hypertension predictor, diabetic neuropathy development, congestive heart failure, lethal arrhythmic complications and cerebrovascular disease after an acute myocardial infarction. The adaptability of impaired cardiovagal is a reflection of baroreflex sensitivity and Low HRV and also suggests that insufficient parasympathetic tone and/or excessive sympathetic tone which are in turn of independent and strong 90 predictors of cardiovascular mortality and morbidity. A good SVB and cardiovagal adaptability is indicated by baroreflex sensitivity and higher HRV, permitting greater sensitivity and responsivity to the changing demands of environment. It has been reported recently that improvement in vagal tone is not only essential for stable CV health, but also for maintaining the fitness of the body as a whole, the integral health [16].

The study findings are cooperated by the reports from the Streeter et al [17] who proposed a theory to explain the yoga benefits in diverse, frequently co-exist medical conditions that are based on the concept which shows that yoga reduces the allostatic load in the response systems of stress such like an optimal homeostasis is replaced. They hypothesized the induces of Stress as an: 1. Imbalance of ANS with increased sympathetic and decreased parasympathetic activity, 2. Under activity of Gamma Amino-Butyric Acid (GABA) system, the primary system of inhibitory neurotransmitter and 3. An increased allostatic load. They further hypothesized that the practices yoga-based are: 1. Correct the underactivity of parasympathetic nervous system and systems of GABA in part through the vagus nerves stimulation, the important peripheral pathway of parasympathetic nervous system, and 2. Reduced allostatic load.

Conclusion:

It was found that 12-week practice of yoga training increases HRV values. The positive changes in HRV may be attributed to an enhancement of parasympathetic tone and reduction in sympathetic activity. Moreover, the reversal of beneficial effect of yoga practice after detrain suggest that practicing yoga continuously keeps the balance between sympathetic and parasympathetic activity on heart.

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