

Impact of Yoga on the Human Body's Parasympathetic Nervous System

Sunil Kumar¹, Bharat Kumar², Richa Kumari³, Malti Kumari⁴

¹Tutor, Department of Physiology, Jan Nayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India

²Tutor, Department of Physiology, Jan Nayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India

³Senior Resident, Department of Physiology, AIIMS, Rishikesh, Uttarakhand, India.

⁴Professor and HOD, Department of Physiology, Jan Nayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India

Received: 20-06-2021 / Revised: 15-07-2021 / Accepted: 29-08-2021

Corresponding author: Dr. Bharat Kumar

Conflict of interest: Nil

Abstract

Aim: Effect of yoga on parasympathetic nervous system of human body. **Methods:** The present Prospective study was conducted in the Department of Physiology, Jan Nayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India from June 2019 to June 2020. Case group (N=40): subjects who were performing regular yoga asanas and relaxation techniques for at least 5 years. Control group (N=40): age and gender matched subject who were not performing yoga asanas and relaxation techniques or were not engaged with any other type of physical exercises. **Results:** Amongst the sympathetic nervous system parameters, statistically significant difference existed between cases and controls for the Resting Heart Rate, Resting Diastolic Blood Pressure, Hand grip systolic blood pressure and Hand grip systolic blood pressure ($p < 0.05$) respectively. **Conclusion:** The yogic activity significantly alters the sympathetic activity like heart rate and blood pressure. With expanded mindfulness and enthusiasm for wellbeing, one ought to embrace the non-pharmacological strategies like Yoga exercise, reflection and way of life alteration to control the modifiable hazard factors responsible for cardiovascular morbidity and mortality.

Keywords: Yoga, PNS, Impact.

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

The autonomic nervous system is the portion of nervous system that regulates most of the visceral functions of the body. This system helps to control arterial pressure, gastrointestinal motility, gastrointestinal secretion, urinary bladder emptying and many other activities[1].

Cardiovascular functions are controlled by neural factors primarily concern with the Autonomic Nervous System (ANS), which plays a major role in maintaining and regulating cardiac functions, e.g. systolic and diastolic blood pressure (SBP and DBP) and heart rate (HR). Imbalances in

these lead to cardiovascular disorders such as hypertension, ischemia, infarction, etc. Yoga is considered a holistic practice generating a sense of well-being through its various actions on physiological systems in a seemingly complex, yet integrated manner[2]. There are very few studies done till date to substantiate the gradual practice of yoga and its role on autonomic variables. Hence this study was conducted with an objective to know the effect of yoga on autonomic nervous system of the body.

Material and methods

The present Prospective study was conducted in the Department of Physiology, Jan Nayak Karpooi Thakur Medical College and Hospital, Madhepura, Bihar, India from June 2019 to June 2020. Patients between 20-40 years of age of sex, practicing yogic exercises and meditation for at least 5 years and those who give informed consent were included in this study. Patients suffering any acute or chronic systemic illness, Patients taking anti-hypertensive or asthmatic medication, Patients showing any kind of physical disability and Patients who have not signed the informed consent were excluded from this study.

Case group (N=40): subjects who were performing regular yoga asanas and relaxation techniques for at least 5 years. Control group (N=40): age and gender matched subject who were not performing yoga asanas and relaxation techniques or were not engaged with any other type of physical exercises.

Methodology

After taking detailed history and recording demographic data, a comprehensive clinical examination of each patient was done. The following noninvasive tests were carried out – Blood pressure was measured using OMRON automatic blood pressure monitor HEM-7111, Omron Healthcare Ltd, Singapore. For orthostatic test, normal Sphygmomanometer was used to measure blood pressure readings. Heart rate and ECG were recorded by CARDIART 108T/MK-VI ECG machine; BPL Ltd. Recordings were carried out with lead II.

Statistical Analysis

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. The variables were assessed for normality using the Kolmogorov Smirnov test. Descriptive statistics included computation of percentages, means and standard deviations. Statistical test applied for the analysis was student t-test. Level of significance was set at $p \leq 0.05$.

Results

Amongst the sympathetic nervous system parameters, statistically significant difference existed between cases and controls for the Resting Heart Rate, Resting Diastolic Blood Pressure, Hand grip systolic blood pressure and Hand grip systolic blood pressure ($p < 0.05$) respectively.

Table 1: Demographic and clinical profile

Variables	Mean±SD		p-value
	Case	Control	
Age	27.74	27.01	0.78(NS)
Weight	65.21	64.39	0.69 (NS)
Height	158.73	159.61	0.37(NS)

Table 2: Comparison of mean resting heart rate and QT interval

Variables	Mean±SD		p-value
	Case	Control	
Resting Heart rate	75.61±2.27	80.38±3.01	0.02 (Sig.)
QT interval	0.45	0.48	0.52 (NS)

Table 3: Comparison of mean resting systolic and diastolic blood pressure

Variables	Mean±SD		p-value
	Case	Control	
Resting Systolic Blood Pressure	120.81±12.31	121.24±10.81	0.57 (NS)
Resting Diastolic Blood Pressure	70.23±7.18	78.79±6.41	0.001 (Sig.)

Table 4: Comparison of mean hand grip systolic and diastolic blood pressure

Variables	Mean±SD		p-value
	Case	Control	
Hand grip systolic blood pressure	12.39±4.24	15.32±4.71	0.024(Sig.)
Hand grip diastolic blood pressure	9.56±3.39	11.91±4.02	0.047 (Sig.)

Discussion

A normal response to Valsalva maneuver is characterized by a decrease in the pulse pressure & tachycardia during strain & blood pressure overshoot & bradycardia following the strain. The Valsalva maneuver tests the integrity of both parasympathetic & sympathetic divisions of autonomic nervous system. The hemodynamic changes during the maneuver are mediated via baroreceptors. With parasympathetic affection, the baroreceptor mediated reflex bradycardia response to elevated blood pressure will be reduced. Yoga has been used effectively for voluntarily controlling involuntary functions. Studies have shown the possibilities of attaining exceptional feats physiologically following long term practice of yoga[3]. This was followed by series of studies on Transcendental meditation, suggesting that the long-term practitioners were physiologically distinct compared to non-practitioners[4]. The results found in our study are in conformity with some findings of the previous workers like Bharashankar et al.[5]. The results of present study show a significant lowering of resting heart rate (RHR) by yoga and relaxation techniques. Similar results have been noticed by Murugesan R et al.[6] and

Sundar S et al.[7]. These modulations of autonomic nervous system activity might have been brought about through the conditioning effects of Yoga on autonomic function involving limbic system and higher areas of central nervous system[8]. In our study there is significant difference in the blood pressure response to sustained hand grip exercise between the case and control group. Blood pressure response to Sustained Hand Grip appears to be more sensitive parameters to detect autonomic function amongst the two Sympathetic function tests. Similar to our study Khadka R et al. studied the effect of yoga on cardiovascular autonomic reactivity in essential hypertensive patients. They concluded significant reduction in SBP was found after yogic practices in response to hand grip exercise[9]. A recent report demonstrated that long term meditation practitioners had higher gray matter density in lower brain stem regions compared to age-matched non meditators. Lower heart rates in experienced yoga practitioners can hence be attributed to its influence on the autonomic nervous system through the brain stem region[10].

Conclusion

This study concluded that yogic activity significantly alters the sympathetic activity

like heart rate and blood pressure. With expanded mindfulness and enthusiasm for wellbeing, one ought to embrace the non-pharmacological strategies like Yoga exercise, reflection and way of life alteration to control the modifiable hazard factors responsible for cardiovascular morbidity and mortality. It can be reasoned that Yogic methods may influence the autonomic function and may help in decreasing psychosomatic issues.

Reference

1. Guyton, Hall. Textbook of medical Physiology. 12th edition. Pennsylvania: Elsevier; 2006.
2. Muralikrishnan K, Balakrishnan B, Balasubramanian K, Vishnegarawla F. Measurement of the effect of Isha yoga on cardiac autonomic nervous system using short term heart rate variability. *J Ayurveda Integr Med.* 2012;3(2):91–96.
3. Kothari LK, Bardia A, Gupta OP. The yogic claim of voluntary control over the heartbeat: an unusual demonstration. *Am Heart J.* 1973;86(2):282-4.
4. Wallace RK, Silver J, Mills PJ, Dillbeck MC, Wagoner DE. Systolic blood pressure and long-term practice of the Transcendental Meditation and TM-Sidhi program: effects of TM on systolic blood pressure. *Psychosom Med.* 1983;45(1):41-6.
5. Bharashankar JR, Bharashankar RN, Despande VN, Kaore SB, Gosavi GB. Effect of yoga on cardiovascular system in subjects above 40 years. *Ind J Phys Pharma* 2003; 47:202-6.
6. Murugesan R, Govindarajulu D, Bera TK. Effect of selected yogic practices on the management of hypertension. *IJPP* 2000; 44:207-9.
7. Jain S, Jain M, Sharma CS. Effect of yoga and relaxation techniques on cardiovascular system. *IJPP* 2010;54(2):183-5.
8. Selvamurthy W, Nayar HS, Joseph NT, Joseph S, Physiological effects of yogic practices. *NIMHANS J.* 1983;1(1):71-80.
9. Khadka R, Paudel B, Sharma V, Kumar S, Bhattacharya N. Effect of yoga on cardiovascular autonomic reactivity in essential hypertensive patients. *Health Renaissance.* 2010;8(2):102-9.
10. Chaya MS, Kurpad AV, Nagendra HR, Nagarathna R. The effect of long-term combined yoga practice on the basal metabolic rate of healthy adults. *BMC Complement Altern Med.* 2006; 6:28.