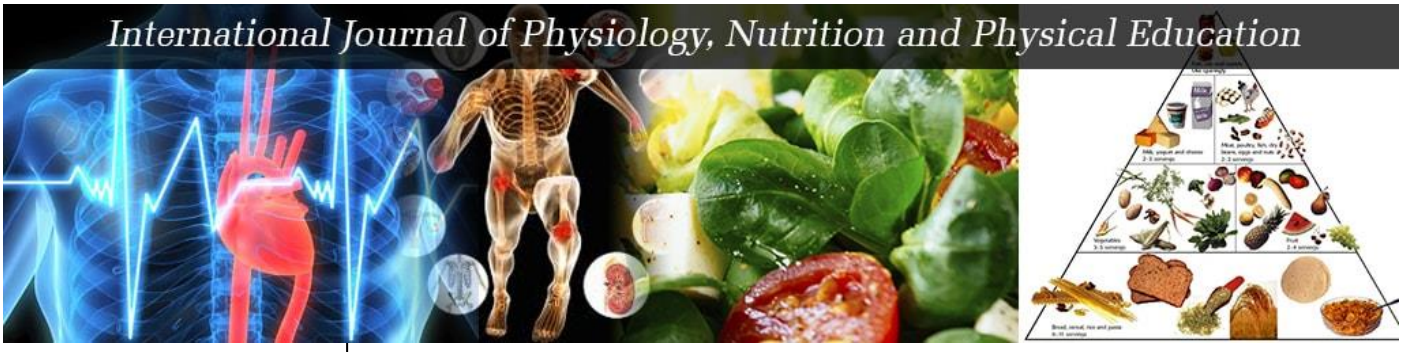

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Immediate effect of slow bhastrika pranayama on blood glucose, heart rate and blood pressure

Das Payel and Pandey Vivek

Abstract
The present study aimed at comparing the immediate effect of slow Bhastriaka Pranayama practice on blood glucose level, heart rate and blood pressure. The study was conducted on female yogic practitioners from LNIPE, Gwalior (N=10, mean and SD of age respectively 20±2 as the scores were normally distributed). The data were collected on the subjects on selected physiological variables before and after the immediate practice of Bhastrika Pranayama. The blood glucose level, heart rate and blood pressure were measured by glucometer, heart rate monitor and sphygmomanometer during mentioned time. The tests were administered before pranayama and immediately after Bhastrika Pranayama practice at early morning in empty stomach. Paired t-test was employed as statistical analysis to compare the mean at 5% level of significance. Finally, significant difference was shown in blood glucose level from 85.00± 3 to 79.90±4.50 and heart rate was significantly decreased from 67.8±6.67 to 65±6.33. No significant difference was found in systolic blood pressure (from111±5.15 to 114±4.20) during bhastrika pranayama where diastolic blood pressure was significantly decreased after bhastrika pranayama (from 77±7.83 to 68±7.93). Thus, it can be concluded that slow Bhastrika pranayama could reduce the blood glucose level, heart rate and blood pressure by activating the parasympathetic nervous system which enhance the healthy cardiovascular functioning of the body control high blood glucose by stimulating the insulin secretion from pancreas.

Keywords: bhastrika pranayama, practitioners, practice

Introduction
Now a day's stress is a common problem that affects almost all of us at some point in our lives and increasing day by day. Prolonged psychological stress may negatively impact health such as cognitive impairment with aging, depressive illness, and expression of disease through accelerating the sympathetic nervous activity which results on increased heart rate, blood pressure and hormonal activity. It is observed that stress increases both short-term and long-term blood glucose levels and if it increases beyond the normal limits, then it can cause persistent high blood glucose levels resulting into diabetes mellitus. Many ways can be adopted (e.g., regular physical exercise, change of lifestyle, change of food habit, etc.) to cope up with stress. Earlier it has been reported that yoga and slow pranayamic breathing are beneficial for the treatment of cardiopulmonary diseases, autonomic nervous system imbalances, and psychological or stress-related disorders as one of the best relaxation techniques.

Prana means breath and ayama is lengthening or widening through control. The agency of the breath was used to access the pranic field, to attain balance in the body by getting control over autonomic nervous system and control of the mind. Different types of pranayama techniques are adopted resulting different physiologic responses. Kapalbhati paranyama was found to cause autonomic activation results in increased blood pressure and heart rate whereas nadishodhana pranayama act as parasympathetic activation (Raghuraj P. *et al*., 1998) [5].

In bhastrika pranayama, inhalation and exhalation are equal and are the result of systematic and equal lung movement. Most of the studies have shown the effect of different regular pranayama practices for a period a time (eg. 1 month, 2 month, 3 month). In this present study the immediate effect of slow bhastrika pranayama has been examined on heart rate variability, blood pressure and blood glucose level and hypothesized that there would be significant difference between before and after the bhastrika pranayama practice of 30 minutes.

Methods and Materials

Subjects –Healthy young 10 yogic practitioners were taken aged ranged from 19-24 for the purpose of the study who was familiar with the Bhastrika Pranayama practices.

Design of the study

Recording were made on separately before and after bhastrika pranayama practice of 30 minutes on blood pressure, blood glucose and heart rate.

Training protocol

The subjects were practice the bhastrika pranayama for 30 minutes. The subjects were instructed to inhale from both the nostril slowly up to the maximum of 2 seconds and exhale slowly for same time. The pace of the inhalation and exhalation should be same from the abdomen movement. The subjects were directed to sit in firm soft position with back straight and relaxed shoulder for the whole duration of the practice. The subjects were performed bhastrika pranayama first for 5 sets of 50 strokes with 10 seconds rest between each set.

Test administration

The subjects were asked to sit in comfortable position at morning after overnight sleep and blood pressure, heart rate and fasting blood glucose level were tested. After those 30 minutes bhastrika pranayama was performed by the subjects under the guidance of researcher and again blood pressure, heart rate, blood glucose level were tested immediately by using sphygmomanometer, heart rate monitor and glucometer respectively.

Statistical test- paired t- test were employed for analysis of the results of selected physiological parameters at 5% level of significance.

Results

Paired t-test was employed to analyze the result as the same subjects were tested before and after the Bhastrika Pranayama. Table no. 1 shown that significant difference were found (p >0.05) in blood glucose level. The mean blood glucose level was decreased significantly after 30 minutes of Bhastrika Pranamaya from 85ml/dl to 79ml/dl and the mean heart rate was also decreased significantly (p>0.05) during immediate practice of 30 minutes from 67beat/min to 63 beat/min at 0.05 shown in table no.2. The diastolic blood pressure was decreased significantly after the pranayama from 77mmHg to 68 mmHg at 0.05 where systolic Blood pressure of the participants shown no significant difference (P<0.05) after bhastrika pranayama 111.80 mmHg to 114.90 mmHg shown in table 4 and 3 resectively.

Mean and standard deviation for the different variables are given below: blood glucose level, heart rate, systolic blood pressure and diastolic blood pressure are shown in table 1, and 2, 3 and 4 respectively.

Table 1: Mean Differences of Blood Glucose before and after bhastrika pranayama.

		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	blood glucose before bhastrika - blood glucose after bhastrika	5.10000	5.27994	1.66966	3.055	9	.014

*The mean difference is significant (p<0.05) at 0.05

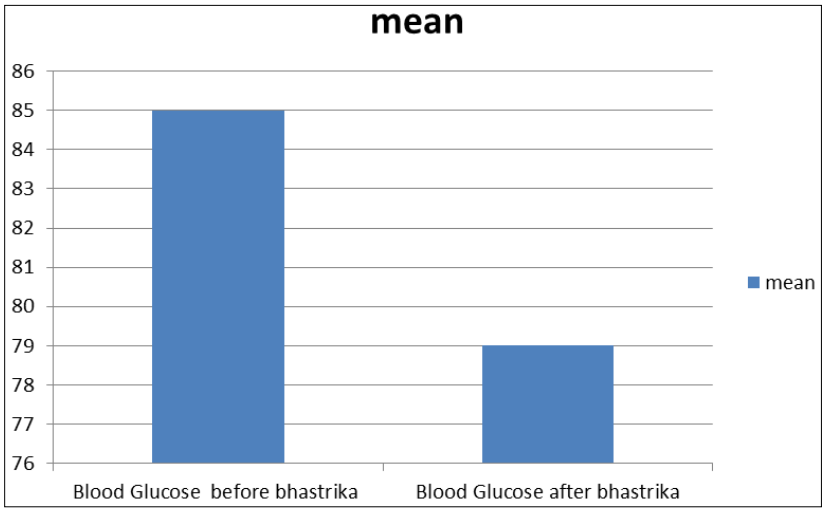

Fig 1: Mean Score of Blood Glucose Level before and after pranayama

Table 2: Mean Differences of heart rate before and after the bhastrika pranayama.

		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	heart rate before bhastrika - heart rate after bhastrika	4.00000	3.82971	1.21106	3.303	9	.009*

*The mean difference is significant (p<0.05) at the 0.05.

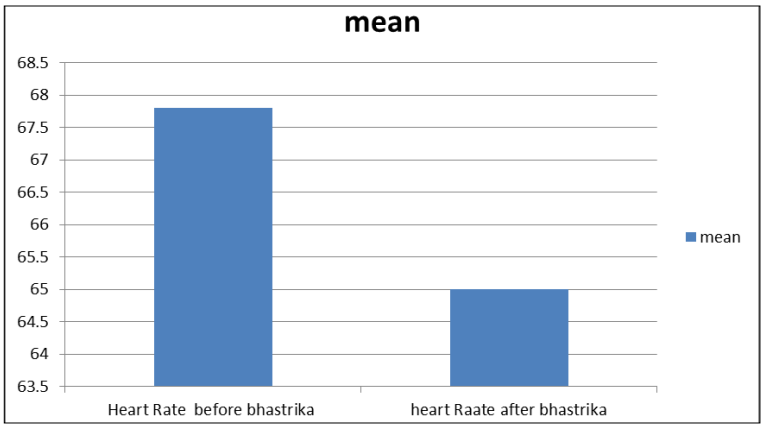

Fig 2: Mean Score of Heart Rate before and after pranayama

Table 3: Mean Differences of Systolic Blood Pressure Before and After Bhastrika Pranayama

		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	Blood pressure before pranayama - bp after pranayama	-3.10	6.29	1.99	-1.5	9	.154

*The mean difference is not significant (p>0.05) at the 0.05.

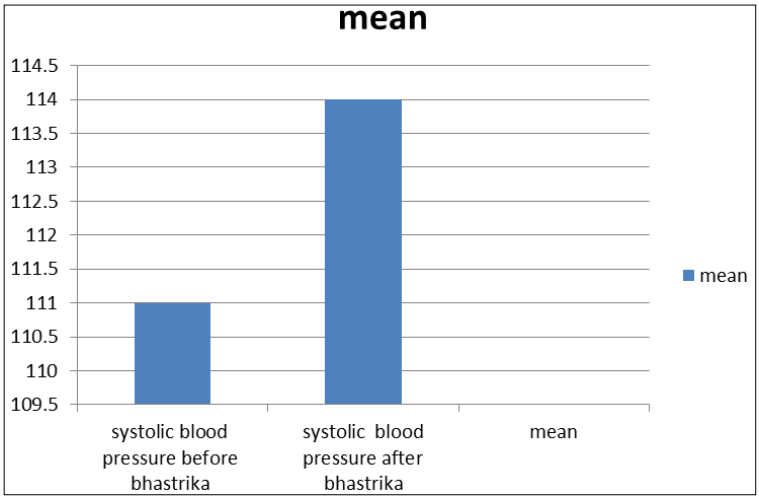

Fig 3: Mean Score of Systolic Blood Pressure before and after pranayama

Table 4: Mean Differences of Diastolic Blood Pressure Before and After Bhastrika Pranayama

		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	Daistolic blood pressure before bhastrika - diastolic blood pressure after blood pressure	9.50	8.03	2.53	3.74	9	.005*

*The mean difference is significant (p<0.05) at the 0.05.

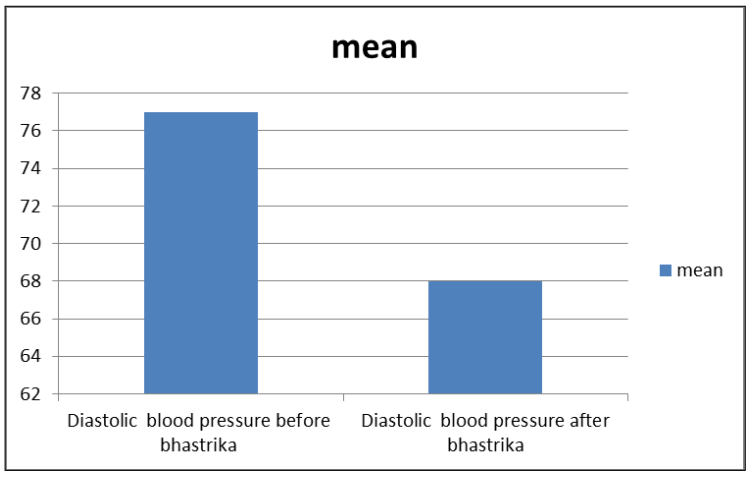

Fig 4: Mean Score of Diastolic Blood Pressure before and after pranayama

Discussion/ findings

Frequency and duration of inhibitory neural impulses during inspiration is increased during pranayama as lung tissues are being stretched, producing inhibitory signals by action of slowly adapting stretch receptors (Jerath, R., 2006) [3] and hyper polarization current. Both inhibitory impulses and hyper polarization current are known as synchronized neural elements which create modulation of the nervous system such as sympathetic vascular resistance and decreased metabolic activity which is the indication of the parasympathetic state. In such way, during slow bhastrika pranayamic breathing parasympathetic response is induced due to synchronization within the hypothalamus and the brainstem which activates increased vagal activity resulting in small reduction in the heart rate (Raghuraj, P., 1998) [5] which was significantly decreased after immediate practice of bhastrika pranayama. Both through right and left nostril breathing has been shown an increased base-line oxygen consumption which is the indication of sympathetic discharge of the adrenal medulla (Telles, S., 1994) [6].

Earlier studies shown that both systolic and diastolic blood pressures are significantly decreased due to decreased in peripheral resistance. Sympathetic tone in the skeletal muscle blood vessels has been withdrawal due to pulmonary stretch receptors leading to widespread of vasodilatation which causing decreased in peripheral resistance (Daly, M. et. al, 1968) [11]. In this present study diastolic blood pressure also decreased significantly but no significant difference is found in systolic blood pressure.

It has been found that if the carbon dioxide level in the blood decreases through increased elimination of carbon dioxide, the normal respiratory rate becomes slower. There is an increased release of carbon dioxide causing subsequently relaxed centre and hyperventilation does not occur due to the equal pace of inhalation and exhalation in bhastrika pranayama.

It is claimed that during slow bhastrika pranayama practice metabolism and utilization of glucose is increased in peripheral tissues, liver and adipose tissue through enzymatic process taking place causing rejuvenation or regeneration of cells and pancreas. During the increased strokes practice of slow bhastrika pranayama(inhalation and exhalation) pancreas get messages due to the frequent movement of abdomen (inward and upward) enhancing the insulin secretion which maintain the blood glucose level through glucose utilization and shown significant mean difference (table no.2) before and after bhastrika pranayama.

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