

Immediate effect of short duration of slow deep breathing on heart rate and blood pressure in healthy young adults

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Abstract

Background: Pranayama is an ancient technique involving rhythmic and slow breathing. It is proven that regular practice of pranayama decreases sympathetic activity, increases parasympathetic tone, improves physical and mental health, decreases the effect of strain and stress on the body and improves respiratory and cardiovascular functions. **Methods:** Heart rate and blood pressure of the subjects (n=140, age=18-25 years) was recorded following standard procedure. First, subject had to sit comfortably. The subject is directed to inhale through both nostrils slowly up to maximum for about 5 seconds and then exhale slowly up to maximum through both nostrils for about 5 seconds. These steps complete one cycle of slow deep breathing (respiratory rate 6/min). After 5 minutes of this breathing practice, both the parameters were recorded again. **Results:** It was noted that after slow deep breathing (respiratory rate 6/min) for 5 minutes, heart rate and blood pressure decreased. **Conclusion:** This study suggested that practicing of slow deep breathing (respiratory rate 6/minute) for 5 minutes could improve autonomic nervous system imbalance towards parasympathetic dominance.

Keywords: Slow deep breathing, Heart Rate, Blood Pressure

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Introduction

In today's world stress is very common due to busy life and advancement in technology. According to researchers, problem is distinguished through set point of action of hypothalamopituitary axis causing aggravation of autonomic nervous system, out coming in instant impacts in blood pressure, heart rate, respiratory rate and temperature. Various yoga are there which relief stress and cause well-being of an individual, both mentally and physically [1]. Pranayama is primitive method involving rhythmic and slow breathing. This is proven that constant practice of pranayama decreases sympathetic activity, enhances vagal tone, upgrades physical and mental health, decrease the impact of strain and stress on the body and reforms respiratory and cardiovascular functions[2-6]. Constant practicing of slow deep breathing has been demonstrated to reduce chemoreflex activation and increase baroreflex sensitivity[7] and to alleviate diastolic, systolic and mean blood pressure also heart rate in hypertensive patients[8]. Various studies show that pranayama and yoga are beneficial for the treatment of psychological or stress-related disorders, cardiopulmonary diseases and autonomic nervous system imbalances[9,10]. Slow breathing has been proven as the

most effective relaxation technique[5].

Materials and methods

This study was carried out in the department of Physiology, Teerthankar Mahaveer Medical College & Research Centre, Moradabad, over a period of 12 months. The present experimental study was conducted among 140 healthy young adults. This study started after approval through institutional ethical committee. Written informed consent was obtained from each participant before starting the study. They were explained about the procedure

Methodology

Study method

The participants reported in the Department of physiology Teerthankar Mahaveer Medical College & Research Centre, 2 hours after meal between 2.00 PM to 4.0 PM. The participants were commanded to stave off smoking, coffee and tea at least 6-8 hours before recording of base line parameters. They were explained about the procedure. This study started after approval through institutional ethical committee.

Inclusion criteria

- Males and females between ages of 18-25 years[11].
- Subject not practicing yoga, meditation or any other exercise[11].

Exclusion criteria

- Subject not willing to participate[11].
- Subject practicing yoga, meditation etc[11].
- Subject who are smokers[11].

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After obtaining informed consent, general anthropometric parameters (Height, Weight and Body Mass Index) of the participants were recorded by using standard methodology. After a rest of 5-10 minutes a comfortable sitting posture in a well-ventilated room, their baseline/resting Heart rate, Systolic blood pressure and Diastolic blood pressure were measured with the help of digital sphygmomanometer (Diamond). After measuring the baseline parameters, participants were commanded to do slow deep

Results

Table 1: The comparison of heart rate before and after slow deep breathing (n=140)

Heart Rate (beats/min)	Mean	Std. Deviation	Mean difference	t-test value	p-value
Baseline	75.64	5.72	5.19	21.566	0.008*
After slow deep breathing	70.45	5.26			

Paired t-test

The mean heart rate was compared between baseline and after slow deep breathing using the paired t-test. The mean heart rate decreased significantly after slow deep breathing. The p value is 0.008.

Table 2: The comparison of systolic blood pressure before and after slow deep breathing (n=140)

Systolic Blood Pressure (mmHg)	Mean	Std. Deviation	Mean difference	t-test value	p-value
Baseline	118.04	6.77	5.39	28.948	0.022*
After slow deep breathing	112.64	6.97			

Paired t-test

The mean Systolic Blood Pressure was compared between baseline and after slow deep breathing using the paired t-test. The mean Systolic Blood Pressure decreased significantly after slow deep breathing. The p value is 0.022.

Table 3: The comparison of diastolic blood pressure before and after slow deep breathing (n=140)

Diastolic Blood Pressure (mmHg)	Mean	Std. Deviation	Mean difference	t-test value	p-value
Baseline	76.39	6.60	3.31	29.833	0.028*
After slow deep breathing	73.07	6.57			

Paired t-test

The mean Diastolic Blood Pressure was compared between baseline and after slow deep breathing using paired t-test. Mean Diastolic Blood Pressure decreased significantly after slow deep breathing. The p value is 0.028.

Discussion

In a study done by Pramanik T et al. in 2009 it was noticed that after 5 minutes of slow bhastrika pranayamic breathing (respiratory rate of 6 per min), decline in both systolic and diastolic occurred substantially with a minute reduction in Heart rate because pranayamic breathing enhances the recurrence and length of inhibitory neural impulses through the stimulation of pulmonary stretch receptors like in Hering Bruer reflex, that leads the reduction of sympathetic tone in the blood vessels of skeletal muscle, causing widespread vasodilatation, thus leading to reduction in peripheral resistance and thus falling in the diastolic blood pressure[5]. In the study done by Pal GK et al in 2004, after 3 months practice of slow pranayamic breathing exercises, enhanced vagal activity was observed caused a substantial decrease in basal heart rate[12]. Our discovery authenticates with the observation of Pal GK et al that slow deep breathing decrease heart rate and blood pressure by reforming vagal tone and by decrement of sympathetic activity[12]. Like other breathing techniques, slow deep breathing techniques induce a change in the physiology of the body by changing different parameters regulated by the autonomic nervous system.

Conclusion

The motive of this study was to evaluate the immediate effect of short duration of slow deep breathing on Heart Rate and Blood Pressure in healthy young adults. The findings of this study are decline in Heart rate and Blood Pressure due to Improvement in autonomic functions by slow deep breathing which causes decrease in sympathetic and increase in parasympathetic activity. The present study suggested that practicing of slow deep breathing (respiratory rate 6/minute) for 5 minutes could improve autonomic nervous system imbalance towards parasympathetic dominance.

breathing (6breaths/min) for 5-6 minutes. After slow deep breathing, Heart rate and Blood pressure were again measured.

Breathing training

After measuring of above baseline parameters, participants were then guided to do slow deep breathing (respiratory rate 6 breaths per minute). In slow deep breathing inhalation is equals to exhalation. Participants were demanded to inhale when counting 1,2,3,4,5 and exhale when counting 1,2,3,4,5. There was no stoppage between inhalation and exhalation.

* Significant difference

* Significant difference

* Significant difference: After practicing slow deep breathing regularly, anyone could exhibit a significant improvement in stress-related disorders, anxiety, depression, cardiovascular and respiratory diseases.

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