

IMMEDIATE EFFECT OF YOGIC BREATHING EXERCISES (KAPALABHATI) ON HEART RATE VARIABILITY AND BLOOD PRESSURE IN MALE MEDICAL STUDENTS: AN INTERVENTIONAL STUDY

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Abstract

Introduction: Yoga is emerging as an important modifying factor for health and behaviour to achieve better physical and mental well-being. **Aim:** To compare the heart rate variability (HRV) and blood pressure before and after the practice of Kapalabhati pranayama. **Methods:** The study was conducted in the Department of Physiology, Dr. S.N. Medical College and Hospital, Jodhpur. Male Medical students of Dr. S. N. M. C. Jodhpur aged between 18 to 25 years who are co-operative and capable of understanding the procedure were enrolled in study. The procedure of each and every test was explained to the cases before conducting the tests. Detailed history including personal history, drug history and past medical history was taken and recorded in a prefixed questionnaire. **Results:** 25 subjects who fulfilled inclusion criteria with mean age of 21.12 ± 1.94 yr were included. There is an increase in resting heart rate, SDNN, RMSSD, and decrease in RR, NN50, pNN50, after the practice of Kapalabhati pranayama. Increase in LF (nu) and LF/HF and decrease in HF (nu) after the practice, also there is an increase in SBP and DBP after the practice of Kapalabhati pranayama. **Conclusion:** Immediate effect of Kapalabhati Pranayama is a shift of autonomic balance towards sympathetic predominance.

Keywords: Kapalabhati pranayama, Heart arte, Blood Pressure, Immidiate effects.

INTRODUCTION

Yoga is a spiritual discipline based on an extremely subtle science, which focuses on bringing harmony between the mind and the body. It is an art and a science of healthy living. The word 'Yoga' is derived from the Sanskrit word 'Yuj', meaning 'to join' or 'to yoke' or 'to unite'.¹

Yoga is emerging as an important modifying factor for health and behaviour to achieve better physical and mental well-being. Yoga in particular can help to promote cardiopulmonary fitness. Practice of yoga is expected to work at physical and mental levels. The practice of asanas improves the muscle strength, mind-body co-ordination and balance.² Further it improves the blood flow, tissue perfusion and oxygenation, enhancing functions at cellular level. Meditation and breathing technique calm down the mind, improves the concentration enhancing better work output. By maintaining tranquillity of mind, it can promote clear thinking, better judgment and effective decision making.³ It also alters the autonomic balance to promote health. Regulated breathing practice makes the respiration more co-ordinated, facilitating a better ventilation and perfusion.⁴

Ancient yogic texts have described a rapid breathing cleansing practice (kapalabhati) as stimulating, These descriptions have been substantiated by several scientific studies. Kapalabhati was found to cause “autonomic activation”. It was observed that an immediate effect of kapalabhati sessions was an increased heart rate and blood pressure.⁵

However, there is paucity of literature on immediate effect of Kapalabhati pranayama on HRV. In view of this, the present study was aimed to study the immediate effect of Kapalabhati pranayama on HRV and blood pressure in healthy young volunteers.

Aim: To compare the heart rate variability (HRV) and blood pressure before and after the practice of Kapalabhati pranayama.

Methods: The study was conducted in the Department of Physiology, Dr. S.N. Medical College and Hospital, Jodhpur. Male Medical students of Dr. S. N. M. C. Jodhpur aged between 18 to 25 years who are co-operative and capable of understanding the procedure were enrolled in study.

Exclusion Criteria

1. Suffering from any illness at the time of study.
2. History of recent surgery within 3 months
3. Under any medication at the time of study
4. History of Alcoholism or smoking in past one month
5. Previously doing any type of yoga/pranayama regularly

General physical examination of all the subjects including height, weight, measurement and Body Mass Index, was done. All Subjects were tested under similar laboratory conditions and allowed to acclimatize themselves to experimental and environmental conditions for one hour so that they were relaxed and rested. The procedure of each and every test was explained to the

cases before conducting the tests. Detailed history including personal history, drug history and past medical history was taken and recorded in a prefixed questionnaire.

Recordings were made on separate days for the two different practices, maintaining the same time of recording of the day for each subject. The subject was seated in a dimly lit, sound attenuated chamber. Recordings were obtained before as well as immediately after each practice. The subject was seated in a comfortable sitting posture with the back straight, for both practices. The practices were performed at least 3 hours following the last meal.

Kapalabhati pranayama:

The subject was instructed to follow the following technique to Sit in any comfortable posture, Close your eyes and relax the whole body, Inhale deeply through both nostrils, expand the chest. Expel the breath with forceful contractions of the pelvic and abdominal muscles and inhale passively. Continue active/forceful exhalation and passive inhalation. Complete 30 rapid breaths, then take a deep breath, exhale slowly and relax completely. This is one round of Kapalabhati. Each round was followed by being still for a while. Repeat 2 more rounds. Heart rate was measured before both the pranayamas by taking radial pulse and similarly heart rate was measured after both the pranayamas by taking radial pulse. Before and after pranayama blood pressure was measured by using mercury sphygmomanometer with the right forearm horizontal on the table when subjects in seated position.

Heart Rate Variability: For analyzing Heart Rate Variability, lead II ECG was recorded using Digital Student Physiograph- 3 Channels, Medicaid Systems, Chandigarh. The obtained data was then analyzed using Kubios HRV software, Biosignal Analysis and Medical Imaging Group, Finland. The following indices of Heart Rate Variability were assessed to observe both sympathetic and parasympathetic nerve function status: Heart rate (beat/min), Mean R-R interval (sec), Standard deviation of normal to normal intervals (SDNN), Root mean square successive difference (RMSSD), NN50 (%), PNN50 (%), Low frequency (LF), High frequency (HF), LF/HF ratio.

RESULTS:

25 subjects who fulfilled inclusion criteria with mean age of 21.12 ± 1.94 yr were included.

Table 1. Sociodemographic Parameters

Parameter	Mean \pm SD
Numbers	25
Gender	Males
Resident	Urban
Age (yrs.)	21.12 ± 1.94
Weight (kg)	59.56 ± 4.99

Height (m)	1.70 ± 0.03
BMI (kg/m ²)	20.57 ± 2.10

In our study, there is an increase in resting heart rate, SDNN, RMSSD, after the practice of Kapalabhati pranayama but it is statistically non-significant. In our study, there is a decrease in RR, NN50, pNN50, after the practice of Kapalabhati pranayama but it is statistically non-significant.

Table 2 Comparison of HR before and after Kapalabhati Pranayama

Variable	Pre	Post	P value
HR	75.64 ± 7.32	76.36 ± 8.06	0.707 (NS)
SDNN	88.77 ± 71.27	90.97 ± 79.80	0.666 (NS)
RMSSD	78.01 ± 56.21	81.64 ± 72.38	0.667 (NS)
RR	1.27 ± 0.23	1.22 ± 0.22	0.494 (NS)
NN50	40.88 ± 21.24	33.52 ± 15.74	0.102 (NS)
PNN50	20.54 ± 11.66	16.82 ± 9.65	0.118 (NS)

In our study, there is an increase in LF (nu) and LF/HF after the practice of Kapalabhati pranayama but it is statistically non-significant. In our study, there is a decrease in HF (nu) after the practice of Kapalabhati pranayama but it is statistically non-significant.

Table 3. Comparison of Frequency Domain Measures before and after the practice of Kapalabhati Pranayama

VARIABLE	PRE	POST	P VALUE
LF	51.92 ± 13.75	53.76 ± 16.84	0.637 (NS)
HF	48.07 ± 13.75	46.23 ± 16.84	0.637 (NS)
LF/HF	1.38 ± 0.83	1.47 ± 0.96	0.696 (NS)

In our study, there is an increase in SBP and DBP after the practice of Kapalabhati pranayama and this increase is statistically highly significant.

Table 24: Comparison of SBP before and after the practice of Kapalabhati Pranayama.

SBP	N	Mean	SD	P value
Pre	25	120.24	4.70	<0.001(S)
Post	25	122.80	4.71	
DBP				
Pre	25	80.08	3.89	<0.001(S)
Post	25	82.32	3.35	

DISCUSSION:

In our present study, it was found that kapalabhati pranayama had significant effect on cardiovascular parameters in healthy young adolescents. We observed that after three cycles of Kapalabhati Pranayama, there was an increase in mean heart rate from 75.64 ± 7.32 to 76.36 ±

8.06 with a non-significant 'P' value of 0.707, a study done by Rajeev Gupta (2020)⁶ found similar results in their study done in twenty healthy young untrained male volunteers (age range, 18-35 years) for the immediate effect of Kapalabhati Pranayama on HRV. Our results suggest that there is an increase in sympathetic activity immediately after the practice of Kapalabhati Pranayama.

In our study, there is an increase in LF (nu) and LF/HF after the practice of Kapalabhati pranayama but it is statistically non-significant. In our study, there is a decrease in HF (nu) after the practice of Kapalabhati pranayama but it is statistically non-significant. Similar results were observed in their study done in twenty healthy young untrained male volunteers (age range, 18-35 years) for the immediate effect of Kapalabhati Pranayama on HRV. Our results suggest that there is an increase in sympathetic activity immediately after the practice of Kapalabhati Pranayama.

There was an increase in SBP from 120.24 ± 4.70 to 122.80 ± 4.71 with a significant P value of <0.001 . There was an increase in DBP from 80.08 ± 3.89 to 82.32 ± 3.35 with a significant P value of <0.001 . Nayak R et al (2015)⁷ in their study done in forty nursing students for the effect of Kapalabhati Pranayama on cardiovascular parameters. Our results suggest that there is an increase in sympathetic activity immediately after the practice of Kapalabhati Pranayama.

In present times, Pranayama can be incorporated to reduce overall prevalence of hypertension and cardiovascular diseases in the country and can be practiced for mental relaxation and stress of daily life. Long term practice of yoga shows beneficial effects and prevents the occurrence of cardiovascular diseases. If practiced regularly it can play an important role in preventing asthma, hypertension and cardiorespiratory diseases.

CONCLUSION

Yoga is desirable non-pharmacological intervention to preserve and promote positive health in normal subjects as well as hypertensive. It is worth recommending. Immediate effect of Kapalabhati Pranayama is a shift of autonomic balance towards sympathetic predominance.

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