



## Effect of Six Week Pranayama Practice on Selected Physiological Variables of Young Males

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### KEYWORDS

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### ABSTRACT:

The practise of pranayama is renowned for its impact on cardiorespiratory processes. In light of this, the current study's objective was to ascertain the impact of practising Ujjayi and Bhastrika pranayama for 30 minutes per day, five days a week, on breath holding capacity, blood pressure, and pulse rate. For this study, Sixty (60) healthy, normal male volunteers participated who were classified into two groups of thirty (30) subjects each. The subjects ranged in age from 15 to 17 years old. None of the study's participants had any prior exposure to pranayama. The subjects were very motivated to take part in the current research programme. The training schedule consisted of five days per week, from 5 to 6 p.m. Prior to and following the introduction of the training schedule, measurements of all the chosen physiological parameters were made. The study's findings showed that after practising Ujjayi and Bhastrika Pranayama, the subjects' ability to hold their breath significantly improved. The subjects' pulse rates, however, did not significantly change in relation to the training programme. Systolic blood pressure showed a comparable outcome as well. The training programme had a significant impact on diastolic blood pressure. According to the current study, Bhastrika and Ujjayi Pranayama enhance some physiological parameters. The findings of this study suggest that these pranayama techniques could be beneficial for individuals seeking to improve their overall health and well-being. Further studies with a larger and more diverse population could help establish the potential therapeutic benefits of these practises.

### 1. Introduction

Yoga originated in ancient India more than 5,000 years ago, long before modern society existed. The term "yuj," which implies unity in Sanskrit, is the source of the entity's name. Yoga is a kind of exercise that focuses on building the connection between the mind and body while improving mental and physical attributes. These days, health and natural therapies are more well-known and in demand. One popular yoga practise that is widely acknowledged by the scientific and contemporary worlds is pranayama. The Sanskrit terms "Pran" (for breath) and "Ayama" (for control) are the origin of the phrase "Pranayama". Yoga and pranayama, combined with physical exercises, have been shown to be beneficial in asthma treatment, aiming to control breathing, reduce hyperventilation, and improve respiratory muscle strength in children [1]. Pranayama, or "control of the breath," is a physical activity that promotes health by maintaining internal organs and improving the

respiratory system. It involves regular breathing exercises, including inhaling and exhaling. The ideal position for pranayama is Padmasana and Sidhasana, with "puraka" meaning "filling" and "rechaka" meaning "emptying." The term "retention" is known as kumbhaka, which means "hold" [2]. Prana, or life energy, is the essence of yoga practice, focusing on its control and nature. Pranayama is an essential element of yoga, examining the nature and control of this mysterious energy. Prana encompasses all forms of energy in the cosmos, including the life force, which is embodied in the act of breathing. A study on adolescents found that regular yoga training can increase cortisol responsiveness, with an initial rise followed by a rapid fall [3]. This is the reason why regulated breathing is frequently associated with pranayama. A yogi may finally regulate manifestations of prana even beyond his body using pranayama, in addition to other bodily functions. An essential component of yoga, pranayama is said to offer a host of health advantages. Regular practise



of pranayama can help in reducing stress, improving lung function, and enhancing overall well-being [4].

Pranayama, a practice in yoga, involves focused thought and regular breathing, focusing on the vitality of prana, the soul of all force and energy. This practice, often included in yoga courses, improves health, reduces stress, and quiets the mind. Pranayama is the control of the muscular force that activates the lungs, demonstrating the vitality of prana in every living being. It is often combined with asanas and meditation for a comprehensive practice. Pranayama not only improves health but also facilitates subtle chemical changes due to the high oxygen intake required. The practise of asana removes impediments to the flow of prana (life force), and the practise of pranayama regulates the flow of prana throughout the body. The study compared anulom vilom pranayama (AVP), kapal bhati pranayama (KBP), diaphragmatic breathing exercises (DBE), and pursed-lip breathing (PLB) for breath holding time (BHT) and rating of perceived exertion (RPE) during COVID-19 lockdown. Results showed AVP and DBE decreased RPE, while KBP and PLB did not. DBE increased BHT more than AVP [5]. Pranayama is a yogic practice that involves rhythmic movement of the respiratory organs, focusing on exhalation and breath retention. Parka and kumbhaka are key techniques, stimulating the system, expelling toxins, and distributing energy. This practice enhances physical and mental well-being, and has been studied for its impact on athletes during exercise tests. Results showed that Pranayama led to higher work rates, reduced oxygen consumption, and decreased blood lactate levels [6]. Through regular practise, pranayama can help improve lung capacity, reduce stress and anxiety, and increase overall vitality. A study on Pranayama's effects on QT dispersion in arrhythmia patients found it significantly reduced ventricular repolarization dispersion [7].

Ujjayi Pranayama, derived from Sanskrit terms "ud" and "ji," is a breathing exercise that promotes relaxation and focus. It involves inhaling and exhaling through the nose, tightening the throat to produce a gentle ocean-like sound. This sound helps practitioners stay mindful and focused during yoga practice. Pranayama, also known as "sound breath" or "ocean sound breath," helps regulate inhalations and exhalations, promoting oxygenation and internal warmth. Regular practice can improve respiratory function, reduce stress, and promote relaxation.

Bhastrika pranayama are Sanskrit words meaning "breathing like a bellows." Bhastrika involves inhaling and exhaling forcefully through the nose to increase

oxygen supply and stimulate the nervous system, similar to an ancient device used to fan fire. Bhastrika pranayama training significantly reduces anxiety and negative affect in healthy young adults, affecting brain regions involved in emotional processing [8]. Pranayama is a yoga technique that involves rapidly releasing breath, extending its breadth like a blower, to calm the mind, reduce stress, improve lung function, and increase oxygen levels. It involves inhaling and exhaling simultaneously. The study examined the impact of slow pace bhastrika pranayama on heart rate and blood pressure, and the same exercise after oral intake of hyoscine-N-butylbromide. Results showed a significant decrease in blood pressure and heart rate after pranayama, while no significant changes were observed in the same exercise after hyoscine-N-butylbromide [9]. Bhastrika pranayama is a traditional yoga technique that purges the body of impurities and increases oxygen levels, aiding in respiratory system function and reducing stress and anxiety. This practice involves forceful inhalation and exhalation, improving lung capacity and strengthening respiratory muscles. It has been practiced for centuries and is recommended under a trained yoga instructor to avoid potential side effects. The present study examined the effects of Ujjayi and Bhastrika pranayama on breath holding capacity, pulse rate, and blood pressure in young, healthy male subjects.

## 2. Methods

### *Selection of the Subjects:*

This research was conducted at the Anand Yoga Center in Kolkata. A total of sixty (60) healthy male volunteers were recruited and divided into two groups: the study group and the control group. The participants ranged in age from 15 to 17 years. The subjects were extremely enthusiastic about taking part in the current study programme. Thirty (30) subjects were found to be highly motivated to participate in the study, as the experimental group could perform the exercise as instructed. As the control group, 30 subjects participated. The parameters of the study included breathe holding capacity, pulse rate, blood pressure, systolic blood pressure, and diastolic blood pressure. The experimental group was subjected to a 6-week training program while the control group did not receive any intervention.

### *Selection of the Variables:*

The researcher used the following variables to collect information for this particular study:

*Independent Variables:* Ujjayi and Bhastrika Pranayama

*Dependent Variables:* 1. Breath Holding Capacity



2. Pulse Rate
3. Blood Pressure

**Criterion measures and tools used:**

Sl. No	Variables	Methods	Unit
1.	Breath Holding Capacity	Stop Watch	Sec
2.	Pulse Rate	Radial Pulse Test	Beats/mint.
3.	Blood Pressure	Sphygmomanometer and Stethoscope	mmHg

**Study Protocol:**

A six-week Ujjayi and Bhastrika programme was given to the young male participants in this study. The five-day training schedule was recommended by experts. The training schedule was designed to last 30 minutes per day during the evening session. In this study, selected subjects received a total of six weeks of experimental training. The subjects were monitored closely throughout the six weeks to track their progress and ensure proper technique.

**Ujjayi and Bhastrika Pranayama Training:**

Before the training was scheduled, all the chosen physiological parameters were measured, and the first recording of the data was made. All selected subjects receive Ujjayi and Bhastrika Pranayama training for 30 minutes per day in the evening. The aim of the training was to observe the effect of Ujjayi and Bhastrika Pranayama on the selected physiological parameters. The data recorded after the training was compared with the initial recordings to determine any changes.

**Starting Posture**

**Ujjayi Pranayama:**

They were in sukhasana (the comfortable posture) and controlled their breathing as follows:

- Open the right hand and bend index and middle fingers against the palm. The thumb was used for closing the right nostril while the fourth and fifth fingers were used for the left nostril.
- Place the right thumb against the ala at the end of the nostril to close it and similarly press the fourth and fifth fingertips against the left nostril.
- Start the exercise in a relaxed, focused position in the "comfortable posture."

- Take a long, deep breath slowly from both the nostril (inhale or breath in).
- While breathing in, trying to contract the throat and feel the touch of air in the throat.
- Remember one thing air should not touch inside the nose.
- As air touches the throat a peculiar sound is produced.
- As the person slightly tighten the back of the throat and hiss lightly as a person inhales and exhales, allow the breath to be light and relaxed. Although the sound isn't forced, it should be loud enough for someone to hear it if they approached the person.
- Now exhale by closing the right nostril and doing so through the left as well. While exhaling, try to make the sound "HHHHHAAAAA."

**Bhastrika Pranayama:**

- The preferred sitting position for Bhastrika Pranayama is Sukhasana or Padmasana (The Comfortable Posture), with the main emphasis being on stabilising the body.
- When performing Bhastrika Pranayama, keep the mouth shut and make sure the back, spine, head, and throat are all straight.
- Take a deep breath right now from both nasal cavities at the same speed. Exhale at the same rate as you inhaled. Like a blower, one must maintain a rapid rate of inhalation and exhalation.
- Breathing in and out while performing Bhastrika pranayama should cause the lungs to expand, and breathing out should cause them to contract.
- 2.5 seconds should be spent breathing in, and 2.5 seconds should be spent breathing out during this exercise.
- It should be assumed that the person is being energised by the good vibrations and energy as they breathe in (inhale).
- It should be assumed that all of the body's toxins were expelled during the exhale. It was recommended to incorporate this into a daily routine for maximum benefits to all the participants.



### Collection of data:

Data were collected on the Ananda Yoga Centre campus in Kolkata, India. The testing process and the experimental training regimen - Ujjayi and Bhastrika Pranayama—that the subjects had to follow during the experiment were both thoroughly explained to them by the researcher. The subjects were instructed to practise Ujjayi and Bhastrika Pranayama for the development of pulse rate, blood pressure, and breathe holding capacity for six weeks in order to achieve their best performance in the final or post-test. The subjects' performance in breath holding capacity, pulse rate, and blood pressure were measured at the start and end of the six-week experimental training period.

### Approval and Consent Information:

This study was authorised by University's Research Committee, and the methods utilised in the study have been approved by the institution's Committee for Human Subjects Protection. According to institutional requirements, 60 male volunteers were given informed about the protocols thoroughly, and the study was authorised by the University Research Committee. The methods utilised in the study do not harm to any human being in any manner.

### 3. Results

The measurements for pre-test and post-test were presented through Table 1.

Variables	Pre Test		Post Test		t - ratio
	Mean	S.D.	Mean	S.D.	
Breath Holding Capacity	Mean	39.697	Mean	42.933	2.216*
	S.D.	5.33	S.D.	5.78	
Pulse Rate	Mean	79.86	Mean	73.33	0.484
	S.D.	3.12	S.D.	2.77	
Systolic Blood Pressure	Mean	132.93	Mean	131.46	1.33
	S.D.	6.71	S.D.	5.09	
Diastolic Blood Pressure	Mean	75.73	Mean	77.70	2.67*
	S.D.	2.84	S.D.	2.40	

### Statistical Technique:

All values obtained before and after pranayama, resting, and quiet breathing were expressed as means and standard deviations (SD), and the t-test was used to compare parameters between groups at the 0.05 level of significance.

### Transparency and Openness:

The authors declare that the individuals were chosen at random using the Simple Random Sampling Method and that there were no data exclusions or manipulations in the study.

**Table – 1**

According to Table 1, the subjects' pre-test results for their ability to hold their breath were a mean of 39.697 and a standard deviation of 5.33, while their post-test results were a mean of 42.933 and a standard deviation of 5.78. The result showed a significant difference at the 0.05 level of significance because the calculated t value, 2.216, was higher than the table value, 2.00. This suggests that the intervention had a positive effect on the subjects' ability to hold their breath. However, further research is needed to determine the long-term effects of this intervention.

Pre-test score pulse rate was discovered to be mean 79.86 and SD 3.12. There were discovered post-test scores of 73.33 and S.D. 2.77. The calculated pulse rate of the subjects, which was found to be 0.484, was less than the



value listed in the table, which was 2.00. Therefore, the outcome showed that there was no statistically significant difference but a decline in pulse rate at the 0.05 level of significance. This suggests that the intervention did not have a significant effect on the subjects pulse rates. However, further studies with larger sample sizes may be needed to confirm this finding.

Systolic blood pressure was found to be mean 132.93 and SD 6.71 for the pre-test score. Post-test results were discovered to be 131.46 and S.D. 5.09. Systolic blood pressure for the subjects was calculated with a t value of 1.33, which was found to be lower than the value in the table (2.00). Consequently, the outcome showed that there was no difference that was statistically significant, but it did show that systolic blood pressure had decreased at the 0.05 level of significance. This suggests that the intervention or treatment may have had some effect on lowering systolic blood pressure, but further studies with larger sample sizes may be needed to confirm this finding. Additionally, it is important to consider other factors that may have influenced the results, such as lifestyle changes or medication use.

Pre-test results for diastolic blood pressure had a mean of 75.73 and a standard deviation of 2.84. The post-test scores were discovered to be 77.70, with an SD of 2.40. The calculated t value of 2.67 for the subjects' diastolic blood pressure was discovered to be higher than the value from the table, or 2.00. Therefore, at the 0.05 level of significance, the outcome showed a significant difference. In contrast, control subjects' respiratory and cardiovascular parameters did not significantly change. This suggests that the intervention had a specific effect on the respiratory and cardiovascular parameters of the experimental group, indicating that further research is needed to determine the potential benefits of this intervention.

#### 4. Discussion

The results of the current study showed that Ujjayi and Bhastrika pranayama have positive effects on bodily processes. Yoga aims to perfect the body and mind, so it is only natural to wonder if this process is accompanied by objectively verifiable changes in physiological variables. In general, yogic practises have been proposed to lower heart rate and blood pressure [4]. Additionally, studies have shown that regular yoga practise can also improve lung function, increase flexibility and balance, and reduce stress and anxiety levels.

The practise of breathing control is known as pranayama. When practising pranayama, a person not only tries to breathe but also to focus their attention on the act of breathing, which promotes concentration. Pranayama has been demonstrated to lower heart rate and lengthen breath holds. Additionally, pranayama has been found to have a positive impact on mental health, reducing symptoms of anxiety and depression and promoting a sense of calmness and relaxation. It is often used as a complementary therapy in the treatment of various mental health conditions [2,12]. In the current study, a significant increase in breath holding time was noted. Although there was no discernible difference, there was a significant decline in pulse rate. Both the significant changes in diastolic blood pressure that were seen and the non-significant changes in systolic blood pressure. This suggests that pulse rate may be a more sensitive indicator of the effects of the intervention than blood pressure. Further research is needed to confirm these findings and explore potential mechanisms underlying the observed changes. Daily practise could contribute to better physical and mental health maintenance. Engaging in physical activity on a regular basis can improve cardiovascular health, reduce the risk of chronic diseases, and enhance mental well-being. Yoga is a holistic practice that involves toning the body and mind through various body postures, promoting control over breathing, muscle movements, and human passions [20]. Additionally, incorporating mindfulness practises such as meditation or yoga into daily routines can also have positive effects on mental health by reducing stress and anxiety levels. According to the current study, Bhastrika and Ujjayi Pranayama enhance some physiological parameters. Also, different types of yoga exercises can improve flexibility and balance [21]. More research with a larger sample size is required to clarify the mechanisms at play in the human body. It is important to conduct further studies to fully understand the potential benefits of these breathing techniques and their effects on overall health. This could lead to the development of more targeted and effective breathing exercises for individuals looking to improve their physical well-being.

#### References

- [1.] Das, R. R., Sankar, J., & Kabra, S. K. (2022). Role of Breathing Exercises in Asthma-Yoga and Pranayama. *Indian journal of pediatrics*, 89(2), 174–180. <https://doi.org/10.1007/s12098-021-03998-w>





- [2.] Joshi, L. N., Joshi, V. D., Gokhale, L. V., "Effect of short term 'Pranayam' practice on breathing rate and ventilatory functions of lung", *Indian J Physiol Phamscol*, vol. 36, no. 2, pp. 105-108, 1992. <https://pubmed.ncbi.nlm.nih.gov/1506070/>
- [3.] Maheshkumar, K., Dilara, K., Ravishankar, P., Julius, A., Padmavathi, R., Poonguzhali, S., & Venugopal, V. (2022). Effect of six months pranayama training on stress-induced salivary cortisol response among adolescents-Randomized controlled study. *Explore (New York, N.Y.)*, 18(4), 463–466. <https://doi.org/10.1016/j.explore.2021.07.005>
- [4.] Bijlani, R. L., Manjunatha, S., "The yogic practices: asanas, pranayamas and kriyas", *Understanding medical physiology*, ed. 3, pp. 883-885, 2004.
- [5.] Shukla, M., Chauhan, D., & Raj, R. (2020). Breathing exercises and pranayamas to decrease perceived exertion during breath-holding while locked-down due to COVID-19 online randomized study. *Complementary therapies in clinical practice*, 41, 101248. <https://doi.org/10.1016/j.ctcp.2020.101248>
- [6.] Raju, P. S., Madhavi, S., Prasad, K. V., Reddy, M. V., Reddy, M. E., Sahay, B. K., & Murthy, K. J. (1994). Comparison of effects of yoga & physical exercise in athletes. *The Indian journal of medical research*, 100, 81–86.
- [7.] Dabhade, A. M., Pawar, B. H., Ghunage, M. S., & Ghunage, V. M. (2012). Effect of pranayama (breathing exercise) on arrhythmias in the human heart. *Explore (New York, N.Y.)*, 8(1), 12–15. <https://doi.org/10.1016/j.explore.2011.10.004>
- [8.] Novaes, M. M., Palhano-Fontes, F., Onias, H., Andrade, K. C., Lobão-Soares, B., Arruda-Sanchez, T., Kozasa, E. H., Santaella, D. F., & de Araujo, D. B. (2020). Effects of Yoga Respiratory Practice (Bhastrika pranayama) on Anxiety, Affect, and Brain Functional Connectivity and Activity: A Randomized Controlled Trial. *Frontiers in psychiatry*, 11, 467. <https://doi.org/10.3389/fpsy.2020.00467>
- [9.] Pramanik, T., Sharma, H. O., Mishra, S., Mishra, A., Prajapati, R., & Singh, S. (2009). Immediate effect of slow pace bhastrika pranayama on blood pressure and heart rate. *Journal of alternative and complementary medicine (New York, N.Y.)*, 15(3), 293–295. <https://doi.org/10.1089/acm.2008.0440>
- [10.] Bhargava, R., Gogate, M. G., Mascarenhas, J. F., "Autonomic responses to breath holding and its variations following pranayama", *Indian J Physiol Pharmacol*, vol. 32, no. 4, pp. 257-264, 1988. [https://www.ijpp.com/IJPP%20archives/1988\\_32\\_4/257-264.pdf](https://www.ijpp.com/IJPP%20archives/1988_32_4/257-264.pdf)
- [11.] Udupa, K. N., Singh, R. H., Settiwar, R. M., "Studies on the effect of some yogic breathing exercises (Pranayams) in normal persons", *The Indian journal of medical research*, vol. 63, no. 8, pp. 1062-1065, 1975. [https://www.ijpp.com/IJPP%20archives/2003\\_47\\_1/vol47\\_no1\\_orgn\\_artcl\\_1.htm](https://www.ijpp.com/IJPP%20archives/2003_47_1/vol47_no1_orgn_artcl_1.htm)
- [12.] Nayar, H. S., Mathur, R. M., Kumar, R. S., "Effects of yogic exercises on human physical efficiency", *The Indian Journal of Medical Research*, vol. 63, no. 10, pp. 1369-1376, 1975. <https://pubmed.ncbi.nlm.nih.gov/1222951/>
- [13.] Wenger, M. A., Bagchi, B. K., Anand, B. K., "Experiments in India on "Voluntary" control of the heart and pulse", *Circulation*, vol. 24, no. 6, pp. 1319–1325, 1961. <https://doi.org/10.1161/01.cir.24.6.1319>
- [14.] Shirley Telles, K. V. Naveen, Manoj Dash, "Yoga Reduces Symptoms of Distress in Tsunami Survivors in the Andaman Islands", *Evidence-Based Complementary and Alternative Medicine*, vol. 4, pp. 503-509, 2007. <https://doi.org/10.1093/ecam/nem069>
- [15.] Naveen, K. V., Nagarathna, R., Nagendra, H. R., Telles, S., "Yoga breathing through a particular nostril increases spatial memory scores without lateralized effects", *Psychological reports*, vol. 81, no. 2, pp. 555–561, 1997. <https://doi.org/10.2466/pr0.1997.81.2.555>
- [16.] Jella, S. A., Shannahoff-Khalsa, D. S., "The effects of unilateral forced nostril breathing on cognitive performance", *The International journal of neuroscience*, vol. 73, no. 1-2, pp. 61–68, 1993. <https://doi.org/10.3109/00207459308987211>
- [17.] Tomar, R., Singh, N., "Effect of Ujjayi Pranayama on selected physiological variables", *Academic Journal Ovidius University Annals, Series Physical Education & Sport/Sci*, vol. 11, no. 1, pp. 140, 2011. <https://analefefs.ro/anale-fefs/2011/issue-1/pe-autori/30.pdf>
- [18.] Pramanik, T., Sharma, H. O., Mishra, S., Mishra, A., Prajapati, R., Singh, S., "Immediate effect of slow pace bhastrika pranayama on blood pressure and heart rate", *Journal of alternative and complementary medicine (New York, N.Y.)*, vol. 15, no. 3, pp. 293–295, 2009. <https://doi.org/10.1089/acm.2008.0440>
- [19.] Bal, B. S., "Effect of anulom vilom and bhastrika pranayama on the vital capacity and maximal



ventilatory volume”, *Journal of Physical Education and Sport Management*, vol. 1, no. 1, pp. 11-15, 2010.

[https://academicjournals.org/article/article1379343050\\_Bal.pdf](https://academicjournals.org/article/article1379343050_Bal.pdf)

- [20.] Mishra, S. (2020). Physical Fitness – A Need of the Society. *JIGYASA- an Interdisciplinary Peer Reviewed Refereed Research Journal*, 13(III), 32–41.
- [21.] Naskar, S., Mishra, S., Singh, S., & Kapri, B. C. (2023). Differences of Selected Physical Fitness Parameters in Yoga and Gymnastics. *Journal of Physical Education, Recreation and Sports in Science and Technology*, 7(I), 8–13.