

Effect of Bhastrika Pranayam on Various Physiological Functions: A Review

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Abstract—The ancient practice of pranayam is one of the most beneficial lifestyle changes that have ever been curated in the history of mankind. In the post-COVID era, attaining respiratory fitness has become one of the vital components of maintaining general health and well-being. Pranayam, a key component of Yoga practice, is widely recognized for its remarkable capacity to enhance the immune system, making the body more resilient against infections and illnesses. This breathing technique not only boosts immunity but also helps in reducing the chances of falling sick by strengthening the body's natural defense mechanisms. However, the regular practice of Bhastrika Pranayam in particular, and other types of pranayam is yet to gain popularity amongst the general population. This review emphasizes how the practice of Bhastrika Pranayam can impact various physiological functions. It also encourages individuals to inculcate Bhastrika Pranayam as a part of their daily exercise regime.

deep inhalation followed by forced expiration. It is outlined as “Bellow’s Breath” in Hathayoga(4). In general, Bhastrika Pranayam is a combination of Kapalbhatai Pranayam and Ujjayi Pranayam(5). By balancing the body, mind, and soul, and raising the level of control over life energy, this pranayam helps to extract maximum benefits from respiration which is otherwise an unconscious act. Given that breathing is a prerequisite for all other bodily processes, it might be argued that breathing is the most significant bodily function(1). Bhastrika activates and rejuvenates the entire body(6). Practicing Pranayam is a simple, cost-effective approach supported by evidence-based research that suggests several therapeutic advantages for diseased populations. The accessible pieces of evidence demonstrate both physiological and psychological benefits(7).

I. INTRODUCTION

Pranayam is a Sanskrit word for “Prana” (Vital Energy) and “Ayam” (Control). It is a manipulation of normal breath through its conscious control involving a series of voluntarily controlled breathing exercises aimed at controlling respiratory frequency(1). First of all, it is to remind us that Pranayams are the ancient breathing help to improve and maintain a healthy respiratory system in humans(2). The age-old practice of pranayam is an integral component of yoga and is known to bring psychophysiological integration and mindfulness(3). Breathing exercises like Bhastrika Pranayam are used routinely, nowadays to improve lung function and respiratory fitness. It enhances heart, lung, and mental health. Bhastrika Pranayam involves bellow-type breathing and is characterized by rapid,

II. INTERVENTION

It is necessary to sit with our eyes closed and spine straight when performing Bhastrika Pranayam. The neck should align with the trunk (8). After that take a deep, full breath to achieve diaphragmatic breathing. This is followed by a forced and controlled exhalation involving both nostrils. Three rounds of 20 counts each are included, and then regular breathing is resumed. While doing this, thoracic breathing is given priority over abdominal breathing(9). Thus, one upholds the continual movement of breath with consciousness and a steady posture(10). “Bhastrika” is concerned with active inhalation and active exhalation(11). It is a controlled activity that requires the usage of lung regions that are not often employed during regular breathing(12). It increases surface area and diffusion

across the membrane. The bronchioles widen when the breathing pattern improves, allowing for effective alveolar perfusion(3). Any physical exertion increases the body's oxygen consumption which results in elevation in heart rate. However, while performing Bhastrika Pranayam, the body pumps more oxygen even when it is not a demand from the body. Bhastrika Pranayam is also known as the "Yogic breath of fire" because it involves rapid intake and exhalation that energizes the body. Bhastrika Pranayam is practiced on an empty stomach. Pregnant women should avoid practicing it. Individuals who suffer from hypertension and panic disorders should do it under the supervision of a mentor or a yoga expert. It is advised that patients suffering from insomnia, high blood pressure, heart disease, hernia, gastric ulcer, stroke, epilepsy, glaucoma, and retinal problems should avoid practicing Bhastrika Pranayam(10). Bhastrika Pranayam appears to be a promising factor in improving physical fitness parameters(13). Patients with brain tumors, intestinal ulcers, dysentery, or diarrhoea should also refrain from practicing Bhastrika(11).

III. REVIEW

EFFECT ON RESPIRATORY SYSTEM

FVC [Forced Vital Capacity] represents the volume of air that can be forcefully expelled from the lungs after taking the deepest breath feasible. Conversely, the forced expiratory volume in the first second is implied by FEV1. The forced vital capacity is regarded as an essential element in staying healthy and for analysing respiratory and cardiovascular conditions. A prior study suggests that daily practice of yoga and breathing techniques, continuously recruits the muscles of the chest cavity, which might improve the engagement of the muscular structures, and ultimately the FVC is improved. This leads to the expansion of the thoracic cavity, enhances the forced expiratory lung volumes, and improves the breathing capacity. The improved respiratory muscle strength elevates the elasticity of the lungs and the thoracic cavity, and hence the FVC and FEV1. Following the practice of Bhastrika Pranayam, there is an observed increase in the peak expiratory flow rate(PEFR), maximum voluntary ventilation(MVV), and lung functions(10). Furthermore, Bhastrika Pranayam also shows significant and advantageous effects on lung disorders

like asthma, chronic bronchitis, or emphysema(1). Pranayam might allow the bronchioles to dilate by returning the breathing pattern to normal. It also reduces the amount of tension in the respiratory muscles. Both expiratory and inspiratory muscles are engaged in Bhastrika Pranayam as it is a bellows-type breathing(14). Bhastrika Pranayam is a type of breathing in which one has to breathe quickly and vigorously while using both inspiratory and expiratory muscles(7). Bhastrika Pranayam reduces the CO₂ levels (15). Due to the equal rate of inhalation and exhalation in this pranayam, hyperventilation doesn't occur and it leads to a subsequently relaxed center (16). While performing pranayam, the lungs, and chest expand and are deflated to their maximum capacity(5). Bhastrika pranayama has a beneficial effect on respiratory muscle function and serves as an effective yoga exercise(17). Regularly practicing pranayam enhances the expansion of the thoracic wall and improves nearly all lung capacities(14). There is a decrease in end-tidal oxygen tension after Bhastrika Pranayam(18). Both Anulom Vilom and Bhastrika Pranayam improve maximal oxygen consumption in individuals with normal health but Bhastrika Pranayam was found to be more efficient (18). Bhastrika Pranayam rapidly activates the kundalini energy, providing a delightful and pleasurable experience while clearing blockages caused by excessive accumulation of mucus at the beginning of the Brahma nadi(10). Bhastrika Pranayam significantly increases the vital capacity of an individual. A study revealed that there is a rise in O₂ consumption, which has been observed in both C1 (with slow breathing in Ujjayi breath) and C3 group (fast breathing in Bhastrika)(19). In this pranayam body gets the maximum amount of oxygen(20). Bhastrika Pranayam is acknowledged as an oxygen-based breathing exercise that enriches the lungs with more oxygen(21). Bhastrika Pranayam may potentially enhance the ability of the thoracic compartment to generate positive as well as negative pressures during the cycle of respiration(22). As a result, Bhastrika Pranayam and Kapalbhati are safe, low-cost practices that can aid in the prevention of a range of non-communicable diseases(11). Bhastrika Pranayam increases airflow into the body, which generates heat both physically and subconsciously, igniting internal fires in the body and mind(23). This fast-breathing Pranayam boosts vitality, detoxifies and

regenerates the lungs, and tones the diaphragm(23). Bhastrika Pranayam's breathing exercise encourages the use of the diaphragmatic and abdominal muscles to tone more efficiently. This pranayam also withdraws the broncho-constrictor effect(24).

IV. EFFECT ON COGNITIVE FUNCTIONS

It is proven that Bhastrika Pranayam is highly effective in reducing stress. Its training resulted in a significant alteration in stress and anxiety, and these changes were associated with adjustments in functioning and connectivity of specific regions of the brain responsible for emotion processing(25). It is observed that Bhastrika Pranayam may stimulate sympathetic activity(15). Both types of pranayams offer an advantage to cognitive functions, however, fast pranayam exhibits additional beneficiary effects in enhancing the executive functions related to auditory working memory, central neural processing, and sensory-motor performance(3). If the practice of fast pranayam techniques like Bhastrika Pranayam is consistently maintained over an extended duration, the resulting outcome is a significant influence on the parasympathetic nervous system, possibly leading to a heightened state of relaxation and improved overall well-being(26). Bhastrika Pranayam can balance and strengthen the nervous system and the endocrine system, so contributes to boosting emotions like peace, tranquillity, and mind focus(27). Practice of Bhastrika Pranayam showed a positive impact, as the amygdala, anterior cingulate, anterior insula, and prefrontal cortex were among the brain areas with the most significant changes in activity during Bhastrika Pranayam(11). Though, it should be noted that Bhastrika Pranayam could be the cause of vasoconstriction, and it might decrease the cerebral blood flow in the intracranial arteries(15). Bhastrika Pranayam can establish equilibrium between the sympathetic and the parasympathetic aspects of the nervous system(28). Moreover, Bhastrika seems to have characteristic frequencies with specific cortical localizations(29). Bhastrika Pranayam is a useful non-medicinal treatment for physical and psychological disorders(27). Slow pace Bhastrika pranayam (respiratory rate 6/min) exercise thus indicates a strong inclination towards improving the autonomic nervous system by increasing activation of the parasympathetic

nervous system(30). It also cures headache, migraine, depression, and neurological problems(20).

V. EFFECT ON THE CARDIOVASCULAR SYSTEM

Based on a study, after performing this pranayam, there is a remarkable rise in cardiac output(31). Bhastrika, a 'Yogic Kriya' is a form of Pranayam that is acknowledged as beneficial for preventive and curative aspects of hypertension and linked disorders(27). Previously, it has been detected that Bhastrika Pranayam can reduce hypertension, and symptoms related to it, as it not only provides symptomatic relief but also enhances the mental capacities, and, a significant enhancement was observed in the metabolic activity of the patients. Hence, Bhastrika Pranayam can be adequately utilized for preventive and therapeutic purposes in healthy people as well as patients with hypertension(27). The systolic blood pressure is lowered markedly, by practicing Bhastrika Pranayam(27). Diastolic hypertension was relieved up to some extent and was statistically significant(27). The cholesterol that is present in excessive amounts in the blood vessels may be reduced by increasing the blood circulation in the body, and this can be achieved by practicing Bhastrika Pranayam regularly(27). The cumulative effect of Pranayam is found to reduce cholesterol levels. This is suggestive of Bhastrika Pranayam playing a role partly in the reduction of cholesterol levels when practiced along with other Pranayam types(32). It also enhances microcirculation(27).

VI. EFFECT ON DIGESTIVE SYSTEM

Morbid Vata, Pitta, and Kapha are destroyed by this pranayam and the digestive capacity (the gastric fire) is found to be increased. It quickly stimulates the Kundalini, detoxifies the body, gives a sense of delight, and is found to be beneficial. Kundalini emphasizes breathing techniques with more spiritual dimensions and it is more appropriate for physically fit people(33). Bhastrika pranayam effectively clears phlegm and purifies toxins deposited at the entrance of the Brahma Nadi. Ideally, Bhastrika Pranayam is advised to be practiced daily, as it helps to break the three knots (Three Granthis placed in the Sushumna), Brahma granthi (in the chest), Vishnu

granthi (in the throat) and Rudra granthi (between the eyebrows) of the body. As per Gherand Samhita, If a Sadhak performs Bhastrika Pranayam thrice, he will never suffer any disease and will maintain perpetual health(5). Bhastrika Pranayam aids in relieving constipation and makes digestion proper(27). Additionally, Bhastrika Pranayam removes the excess of the Vata, Pitta, Kapha, enlivens the Agni, stimulates the Kundalini energy and removes defects in the buccal cavity, bestows auspiciousness, removes obstacles such as Kapha remaining in the interior of the opening of the Brahma Nadi and is capable of bursting through the three knots as the result of effectively practicing Bandhas(27). Bhastrika Pranayam also has a critical role in the regulation of metabolism(34).

VII. EFFECT ON BLOOD SUGAR LEVELS

The practice of Bhastrika Pranayam has been found to have a therapeutic impact on people with type 2 diabetes mellitus having elevated blood sugar(35). Conversely, it activates the parasympathetic nervous system, thereby enhancing the cardiovascular activities. This pranayam can drop blood sugar levels by stimulating the pancreas to secrete more insulin(11). As a result, healthcare professionals and yoga practitioners alike have advocated for the regular inclusion of Bhastrika Pranayam into one's daily routine as a natural and holistic approach to controlling diabetes and promoting overall well-being(36).

VIII. EFFECT ON BODY WEIGHT

A recent study conducted on individuals who practice Bhastrika pranayam revealed a noteworthy discovery: a substantial reduction in body fat percentage coupled with a noticeable increase in lean body mass(10). This finding underscores the potential benefits of incorporating Bhastrika pranayam into one's routine as a means to effectively address weight management concerns (11). Furthermore, this specific breathing exercise has been linked to potential therapeutic effects on conditions such as obesity and arthritis, making it a promising approach for individuals seeking to improve their overall health and well-being through natural means(20).

IX. EFFECT ON INSOMNIA

Bhastrika Pranayam, a powerful breathing exercise, has been found to greatly enhance the quality of sleep based on a study(11). The research showed significant improvements in insomnia symptoms for those who consistently engaged in this pranayam practice as detailed in a prior study(10). The controlled breathing technique of Bhastrika Pranayam appears to play a crucial role in promoting better sleep patterns and combating insomnia, making it a valuable addition to one's daily routine for overall sleep health improvement(10).

X. EFFECT ON HANDGRIP STRENGTH

Bhastrika, a rapid breathing exercise, not only enhances hand grip strength but also promotes overall respiratory health through its vigorous yet controlled rhythmic breathing pattern(26).

XI. EFFECT ON ENDOCRINE SYSTEM

This pranayam regulates the pituitary, pineal, and adrenaline glands. These glands perform the metabolic functions(27). Bhastrika modulates the functions of three knots, the pineal, pituitary, and adrenaline glands which are also known as Trayagranthi(27). Bhastrika Pranayam exerts its influence on the pituitary gland, thyroid gland, and adrenal gland, regulating their functions and contributing to both physical and mental relaxation. It has a blood pressure-lowering effect on our body(27). Bhastrika Pranayam brings about a sense of calmness, serenity, and a persistent mind by equilibrating and reinforcing the hormones and the nervous systems(11).

XII. CONCLUSION

Bhastrika Pranayam holds significant importance within the ancient practices of yoga. It is a powerful breathing exercise that extends a great number of benefits. This pranayam restores the flow of energy throughout the body. It can be used as a powerful instrument to enhance the health, vital functions, and overall well-being of an individual. Including Bhastrika Pranayam as a part of daily yoga and pranayam regime can be extremely beneficial to

attaining respiratory fitness and maintaining respiratory health.

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