

Conventional Medicine and Pranayama

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What does conventional biomedicine have to say about pranayama? Little analysis has been done related specifically to prayanama; however, a good deal of science is available on the subject of breathing. This article looks at some general principles and is a cursory overview of research related to controlled breathing. This information is reported in the interest of stimulating thought. The sources cited within the body at the end of this article should be evaluated carefully before drawing conclusions.

What Happens When One Breathes?

In normal, relaxed breathing, there is a balance between the amount of air taken in and breathed out. Residual air remains in the lungs. Under stress, breathing becomes shallow and rapid, reducing the amount of oxygen taken in and producing a still-greater amount of residual air. This breathing also occurs more from the chest than from the diaphragm. As this residual air stays in the lungs for longer periods of time, its oxygen content drops, and the level of water vapor and carbon dioxide increases. A health risk arises for individuals prone to respiratory difficulties, since the increased water vapor creates a more favorable environment for bacterial growth and pulmonary infection.

What Are the Main Types of Breathing?

High breathing refers to what takes place primarily in the upper part of the chest and lungs, and involves raising the ribs, collarbone and shoulders. High breathing is shallow, and little air reaches the alveoli to enter into useable gaseous exchange. The upper lobes of the lungs are used, but these have only a small air capacity.

Middle breathing involves mainly the middle parts of the lungs and is called thoracic or intercostal breathing; the ribs and chest expand sideways.

Low breathing takes place primarily in the lower part of the chest and lungs. It consists mainly of moving the abdomen in and out, and changing the position of the diaphragm.

Complete breathing involves the entire respiratory system. It includes portions of the lungs used in high, low and middle breathing, and expands the lungs so as to take in more air. This is the deepest breathing possible. Not only does one raise the shoulders, collarbone and ribs, as in high breathing, but the abdomen is expanded and the diaphragm lowered (as in low breathing), expanding the lungs to their fullest capacity.

This type of breathing has the following characteristics:

- More air is taken in when inhaling, due to greater movement of the lungs and the fact that the lower lobes of the lungs have a larger capacity than the upper lobes.

- Diaphragmatic movements expand the base of the lungs, allowing them to take in more venous blood. The increase in venous circulation improves general circulation.
- The abdominal organs are massaged by the end up-and-down movements of the diaphragm.
- Low breathing has a beneficial effect on the solar plexus, a very important nerve center.

Abstracts of Studies

Alternate Nostril Breathing: Does it Reduce Blood Pressure?

In a study performed by Mallika Rao of Hampshire College, the physiological effects of alternate nostril pranayama were studied. Results showed a significant decrease in blood pressure. Nearly all of the subjects showed a decrease in blood pressure. The mean change was -11.076 mm Hg.

Richard Miller, writing "The Psychophysiology of Respiration: Eastern and Western Perspectives" in *The Journal of the International Association of Yoga Therapists*, explains that slow diaphragmatic breathing increases CO₂ levels in the arterioles and shifts the body's acid-base balance, causing the body to go into a slight state of acidosis. Acidosis involves relaxation of vascular tone, increased coronary and cerebral circulation, cleansing of acidic metabolites, and increased O₂ transfer from hemoglobin to tissues (Miller, 1991).

The results of Rao's study showed a general decrease in systolic blood pressure and a slightly increased heart rate - features similar to hypercapnia, or respiratory acidosis, as Miller described. Alternate nostril breathing forces the practitioner to perform deep, slow, diaphragmatic breathing that gradually accumulates CO₂ in the blood. This increases the carbonic acid and H⁺ concentrations in the blood, increasing the acidity.

Can Pranayama Improve Memory in Children?

One study attempting to distinguish the mental effects of pranayama included 108 children ages 10 to 17. At the beginning of the study, all of the children took spatial memory and verbal memory tests. After these baseline tests, the children practiced a variety of pranayamas for 10 days. There was a significant difference between post-test verbal and spatial scores, leading to the conclusion that general breathing exercises improve verbal and spatial memory (Naveen, 1997).

Does Deep Breathing Stop Hot Flashes?

In an article by Carol Krucoff in the *Washington Post* (August 18, 1998), Robert Freedman, a professor of psychiatry and behavioral neurosciences from the School of Medicine at Wayne State University in Detroit, Michigan, reported studies showing that the frequency of hot flashes can be reduced by about 50 percent through slow, deep breathing. Women going through menopause who use abdominal breathing and slow down their respiratory rate to seven or eight cycles of inhalation and exhalation a minute at the onset of a hot flash can apparently either "abort" it or reduce its severity.

Can Diaphragmatic Breathing Help Your Heart?

Recent research suggests a relationship between shallow upper-chest breathing and heart attacks. Donna Farhi, in *The Breathing Book*, discusses heart attack victims being taught to integrate diaphragmatic breathing into their routines. "In doing so," says Farhi, "they significantly reduced their chances of having a second heart attack." Another study showed that all 153 patients of a coronary

unit breathed predominantly in their chests.

Does Focused Breathing Reduce Stress and Pain?

Neuroscientist Candace Pert, in *The Molecules of Emotion*, posits that bringing attention to the breath during meditation brings many benefits. "Mindful breathing" helps one "enter the mind-body conversation without judgments or opinions, releasing peptide molecules from the hindbrain to regulate breathing while unifying all systems." Peptides mediate stress and pain in the body, and can be thousands of times more powerful than the equivalent amount of narcotics.

Is There an Optimum Number of Breaths?

The May 2, 1998 issue of *The Lancet* contained a study in which researchers working with cardiac patients at the University of Pavia in Italy established an optimum healthy breath rate of six breaths a minute. (The average resting breath rate is 12 to 14 times a minute.) Patients who learned to slow down their breathing through special deep-breathing exercises had higher levels of blood oxygen and performed better on exercise tests.

Why Breathe Through the Nose?

Breathing through the nose filters out particles of dust and dirt that can injure the lungs. When particles accumulate on the membranes of the nose, the body secretes mucus to trap them and help expel them. The mucus membranes of the septum, which divides the nose into two cavities, prepare the air for the lungs by warming and humidifying it.

Breathing through the nose maintains the correct balance of oxygen and carbon dioxide in the blood. Breathing through the mouth involves inhaling and exhaling air quickly in large volumes. This leads to mild hyperventilation.

The amount of carbon dioxide in the blood regulates breathing. Rapid release of carbon dioxide causes the arteries, including the carotid arteries, to constrict; oxygen in the blood is unable to reach the cells in sufficient quantity. The lack of sufficient oxygen going to the cells of the brain stimulates the sympathetic nervous system, initiating the "fight-or-flight" response.

Live Lung and Prosper!

University of Buffalo (New York) researchers, in a nearly 30-year follow-up study of the relationship between impaired pulmonary function and all causes of mortality, showed that lung function is a marker for longevity, and that the risk of death was increased even in those with only moderately compromised lung function.

Winning by a Nose: Professional Athletes and Breathing

Peg Jordan, a registered nurse and founder of *American Fitness Magazine*, recounts the story of John Douillard, an ayurvedic physician and chiropractor who worked with tennis stars like Martina Navratilova. Douillard convinced them to bring their workout intensity "down to the level where they could breathe through their noses." Though they resisted this at first, Douillard was able to convince them through a battery of sports tests that training in this way "actually improved their performance, stamina, focus and coordination." Jordan writes: "Douillard knew that breathing through the mouth tends to inflate only the upper lobes of the lungs, which are connected to sympathetic nerve fibers, the

branch of the nervous system that activates the fight-or-flight response. Nose breathing inflates the entire lung, including the lower lobes, which are connected to the parasympathetic branch of the nervous system, the branch that calms the body, slows the heart rate, and is the meditative aspect of the autonomic nervous system."

Research From China on Breathing and Pulmonary Problems

Patients with severe pulmonary problems benefit from regulated breathing. In experiments at Shanghai No. 2 Tuberculosis Hospital, 27 patients with pulmonary emphysema increased the average range of their diaphragmatic movement from 2.8 centimeters at the beginning of their treatment to 4.9 centimeters after a year of training - an increase in diaphragmatic movement of more than 57 percent.

Conclusion

In summary, there is a significant body of research that lends to credence to what yogis and yoginis have been saying for centuries. It's food for thought.

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