

Science Behind Pranayama

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Pranayama means regulation and control of prana or breath. It is one of the major tenets of Indian Yogic System. The first definition of *Pranayama* was given by [Sage Patanjali in his Yoga Sutras](#) (sutras II:49-53). *He also identified prana as breath and nothing else.* Nevertheless, lots of commentators and practitioners later on defined it unscientifically as a vital force, cosmic energy, etc.

I feel prana is the air we breathe which consists of particles, molecules, microbes, viruses, or any other material in the air surrounding us. And its physiological interaction with our mind and body is the real meaning of prana. Prana in Sanskrit means life. There is no life without oxygen and hence the ancients considered air, which was pristine in those times, as prana.

A minute portion of the air we breathe goes to the brain directly via the [olfactory bulb](#) – a section above the nose which gives us the sense of smell. This input to the brain tells us immediately about the nature of the environment. Depending upon this input, brain then sends appropriate signals to the various parts of body to take necessary action. If brain senses danger, then auto-immune system is activated and if not then the system does not do anything, and the body is relaxed and helps sometimes in producing [serotonin](#) (the happiness molecule) giving us a sense of well-being.

Nanoparticles Reaching Brain Directly

In 1941 medical researchers discovered for the first time that small amounts of fine particles that were inhaled [through nose could be lodged in the brain by breaching blood brain barrier \(BBB\)](#). The [BBB barrier](#) isolates the brain and prevents it from getting infected from outside. However, this field of research remained dormant till 1990s when scientists, alarmed by rising environmental pollution, revisited the early research and started discovering the harmful effects of toxin invasion of brain through breathing.

Recently researchers have also shown that [nanoparticles \(particle size of 10-30 nanometers which are almost 10-20 times smaller than those emitted in cigarette smoke\), can directly reach the brain breaching the BBB.](#)

The majority of air that we breathe however goes to our lungs and helps in producing energy by interacting with the molecules of the food we eat. The waste product of this interaction is the carbon dioxide which has to be expelled. Both these functions; inhaling oxygen and exhaling carbon dioxide is done by the lungs.

This is similar to internal combustion (IC) engine which takes in oxygen; interacts with the fuel and throws out carbon dioxide. Through this process IC engine produces power. Similarly, the gas exchange in [our lungs also produce energy](#) which is the source of power for our muscles. Probably this could be the basis of prana as life force.

When we inhale pure air then the conversion efficiency in our lungs is high. [It reduces when we inhale polluted air.](#) Thus, inhaling air from good and clean surroundings gives us a sense of well-being. We get this feeling when the environment is pristine and without any pollutants and also when we smell very pleasant and fresh air. Thus, the air we breathe changes our mood and subsequently our body and this probably also gave rise to the meaning of prana or life force!

All life forms have evolved so that the signals from the surroundings are first sensed by the brain either through olfactory lobe or by specialized receptors like [forked tongues](#) in reptiles. After their receipt the brain then sends appropriate messages to different parts of the body.

This is possibly the reason why nose and mouth are on the face and near the brain. Otherwise, a simple engineering design of the body, purely from the utility point of view, would have put the nose next to the lungs and mouth near the stomach!

The superior natural design which took millions of years to evolve made all the external inputs (from ears, nose, mouth, eyes) first go to the brain which assess the situation so that appropriate signals by it could be sent to the rest of the body for necessary action.

Beneficial Effects of *Pranayama*

One of the *Pranayama* technique's is breathing in from one nostril and breathing out from other – [also called *Anulom Vilom*](#). Scientists have found out that [breathing through one nostril affects the part of the brain on that side](#), and thus the practice of inhaling through one nostril during *Pranayam* is to stimulate that side of the brain and not for cleaning the nostril as explained by experts in *Pranayam*. Similarly, deep slow breathing allows enough time for the nanoparticles or *Pran* to pass through the BBB and into the brain.

Often the practitioners of *Pranayama* claim that it helps them calm their nerves and gives them a sense of well-being. A possible reason is that the act of *Pranayama* allows us to easily focus on breathing and this focus on anything for considerable time is meditation. Patanjali also states that *Pranayama* helps in concentration. Besides, [different *Pranayama* exercises also help the lungs, nasal cavities and general well-being](#).

[Many studies all over the world have shown the beneficial effects of *Pranayama* and meditation](#). Even [when it is done in polluted environment](#) it helps though the benefits are reduced. Therefore, when it is practised in a pristine environment the feeling of well-being increases manifold times.

So how does breathing affect our mind and body? A minute quantity of what we breathe in goes directly to the brain via the olfactory lobe. These particles, microbes, viruses, etc. somehow change the [communication among the neurons](#) which allows the brain to send appropriate signals via the [vagus nerve](#) alerting the rest of the body. The exact mechanism of how this happens is still not known.

Such signals in the long run therefore condition the body. Thus, people who live in a pristine environment and breathe fresh air have healthy mental and body make up. People who live in polluted environments and breathe unhealthy air have more problems with their mind and body. This was probably the reason why yogis in ancient times preferred pristine atmosphere of Himalayas.

Nevertheless, if *Pranayama* is practiced daily in clean air environment then it can negate the problems of modern life. A possible mechanism is explained below.

Purifying Air through Solar Energy

It has also been known for quite some time that antibiotics-resistant bacteria can get neutralized [with fresh air and plenty of sunlight](#). Researchers are finding that the enclosed environment of hospitals and offices with air conditioning and artificial air breeds bacteria which create diseases in the people residing in these buildings. Exposing them to plenty of sunlight and fresh air has brought down the incidence of disease significantly.

A possible mechanism for this is that UV radiation of sunlight interacts with nanoparticles in air and produces [free radicals and these reactive free radicals when inhaled have tremendous therapeutic value.](#)

In the mountains the proportion of UV rays in sunlight is higher than in the plains and with higher altitude and less pollution the creation of free radicals also increases. Thus, mountain sojourn has always been recommended for improving health. Probably that could also be a reason why *Rishis* and *Yogis* went to mountains for meditation and practicing Yoga.

Cleaning indoor air by [appropriate room air cleaners have shown the positive effect on health.](#) There is therefore a need to create and [use indoor air cleaners](#) which can duplicate the mountain air conditions inside rooms in cities. In such environment *Pranayama* can be done easily.

Recently scientists have also found out that [good deep sleep helps in flushing out the toxins from the brain.](#) Since [deep sleep is like meditation](#) hence detoxification through *Pranayam*, good sleep and meditation can be a basis of healthy brain.

Fragrant Smells Help Pranayama

One of the most important parts of breathing is smell. It is perhaps our most memory-evocating sense. The smell signals from the nose go directly to the limbic system-the seat of emotions. Thus, smells evoke deep emotional responses and memories.

Studies have also shown that [fragrance can change moods and influence judgment.](#) That could possibly be the reason why throughout the ages, humans have always had a love affair with flowers and their fragrance. Beautiful flowers are not only balm to our eyes, but their fragrance is food for our soul. No wonder [fragrance and perfume is more than 45 billion dollars](#) strong industry today. Use of mood enhancing incense has been used in religious practices in almost all societies through immemorial times.

Thus, the clean crisp mountain air with a whiff of pleasant smell from flowers literally evokes the abode of gods since *Pranayam* in such an

environment provides the mechanism for detoxifying and cleaning the brain for better meditation and hence liberation. Even in our daily life, we can do *Pranayam* in open and clean air.

For a healthy planet we need to improve the air quality wherever we live. We can then inhale pristine air or prana and live a healthy and fulfilling life.

[HOME](#)

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