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Controlled Breathing Calms Your Brain

Analysis by Dr. Joseph Mercola ✔ Fact Checked | August 08, 2023

STORY AT-A-GLANCE

- Respiration has traditionally been looked at in terms of automatic brain stem processes, but it's becoming increasingly clear that higher brain mechanisms are also involved
- The rhythm of breathing leads to changes in your brain that may heighten your ability to make emotional judgments or form memories
- People were better able to identify fearful faces during inhalation through their nose, as opposed to when they were exhaling through their mouth; the same was true for remembering images

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The way you breathe — whether fast or slow, shallow or deep — is intricately tied to your body as a whole, sending messages that affect your mood, your stress levels and even your immune system. Yet, breathing is unique in that it's both easily ignored (becoming a basic background of your life) and revered at the same time. In the latter case, it's almost instinctual to advise someone to "take a deep breath" if they're feeling anxious, stressed or fearful.

While it's long been known that breathing is connected to your brain (and vice versa), it wasn't until early 2017 that researchers discovered breathing may directly affect your brain activity, including your state of arousal and higher-order brain function.[1] Breathing is initiated by a cluster of neurons in your brainstem. In an animal study, researchers

were attempting to identify different types of neurons (out of a group of nearly 3,000) and identify their role in breathing function.

They were focused on the pre-Bötzinger complex (or preBötC), which is known as the breathing pacemaker (and has been identified in humans as well as mice).[2] The researchers further honed in on 175 neurons in the breathing pacemaker, which they then "silenced" or essentially eliminated in the mice, with the expectation that this would alter their breathing patterns.

However, this did not occur. The mice had no changes in their breathing patterns after the neurons were knocked out, although they did become noticeably more "chill."[3] It turned out that these neurons positively regulate neurons in a brainstem structure called the locus coeruleus, which is linked to arousal. It is, in other words, the formerly hidden link between breathing rate and emotional state, at least in mice.[4]

Counting Breaths Influences Your Brain's Emotional Centers

This is just the tip of the iceberg when it comes to research highlighting breathing's many effects on your mind. Respiration has traditionally been looked at in terms of automatic brain stem processes, but it's becoming increasingly clear that higher brain mechanisms are also involved, although the link is not very well understood.

"Therapeutic techniques have used conscious control and awareness of breathing for millennia with little understanding of the mechanisms underlying their efficacy," researchers wrote in the Journal of Neurophysiology.[5]

They conducted an experiment asking participants to count how many breaths they took for two minutes. During this time, their brain activity, which was monitored by EEG, showed a more organized pattern, or "increased coherence," in areas linked to emotion than occurred during a resting state.[6,7]

Still other research hinting at the deep ties between breathing and your brain came from a study in the Journal of Neuroscience, which showed that natural breathing is not simply a "passive target of heightened arousal or vigilance."

For instance, your breathing rate changes when you're anxious or engrossed in a mentally challenging task. But the study suggests these changes, rather than being the result of your mental state, may actually be actively used to promote changes in your brain, including those that control goal-directed behaviors.[8]

In short, the rhythm of breathing leads to changes in your brain that may heighten your ability to make emotional judgments or form memories.[9] For instance, people were better able to identify fearful faces during inhalation through their nose, as opposed to when they were exhaling through their mouth. The same was true for remembering images.

Controlled Breathing May Improve Depression, Lower BP, More

Modern research suggests the benefits of controlled breathing may also include improved health conditions ranging from insomnia and anxiety to post-traumatic stress disorder (PTSD) and depression. In a preliminary study presented in May 2016 at the International Congress on Integrative Medicine and Health in Las Vegas, researchers found 12 weeks of daily yoga and controlled breathing improved symptoms of depression similar to using an antidepressant.

Not only did the participants' symptoms of depression significantly decrease but their levels of gamma-aminobutyric acid (GABA), a calming neurotransmitter, simultaneously increased.[10] Controlled breathing exercises have also been found to modify stress coping behaviors and initiate appropriate balance in cardiac autonomic tone, which is a term that describes your heart's ability to respond to and recover from stressors.[11]

Also intriguing is a 2016 study published in BMC Complementary and Alternative Medicine, which found yogic breathing reduces levels of proinflammatory biomarkers in saliva.[12] Controlled breathing is also one way to trigger your relaxation response, which is essentially the opposite of the fight-or-flight response, as it activates your parasympathetic nervous system, which in turn may slow down your heart rate and digestion while helping you feel calm.

By evoking your body's built-in relaxation response you can actually change the expression of your genes for the better, including in areas related to energy metabolism, mitochondrial function, insulin secretion, the inflammatory response and stress-related pathways.[13]

Slow breathing also reduces blood pressure and enhances baroreflex sensitivity, a mechanism to control blood pressure via heart rate, in people with high blood pressure.[14] The finding was so strong that researchers suggested slow breathing "appear[s] potentially beneficial in the management of hypertension."[15]

Different Types of Controlled Breathing

Your body breathes automatically, but it's both an involuntary and a voluntary process. You can alter the speed and the depth of your breathing for instance, as well as choose to breathe through your mouth or your nose. What's more, these choices lead to physical changes in your body. Short, slow, steady breathing activates your parasympathetic response while rapid, shallow breathing activates your sympathetic response, which is involved in releasing cortisol and other stress hormones.

If your goal is to relax, many enjoy pranayama, or yogic breathing, which has been practiced for thousands of years for purposes of enhancing health. Pranayama can be done using nostril breathing (double, single or alternate), abdominal breathing or vocalized (chanting) breathing. There's also the Buteyko Breathing Method, in which you make a conscious effort to breathe through your nose instead of your mouth.

As noted in the journal Breathe, "Since the 1990s, a system of breathing therapy developed within the Russian medical community by Konstantin Pavlovich Buteyko has made its way across several continents: the Buteyko method. K.P. Buteyko began treating patients with respiratory and circulatory diseases using breathing retraining in the 1950s and 1960s."[16]

When you stop mouth breathing and learn to bring your breathing volume toward normal, you have better oxygenation of your tissues and organs, including your brain.

Factors of modern life, including stress and lack of exercise, all increase your everyday breathing. Most people believe that taking bigger breaths through your mouth allows you to take more oxygen into your body, which should make you feel better and more clear-headed. However, the opposite actually happens.

Deep mouth breathing tends to make you feel light-headed, and this is due to eliminating too much CO2 from your lungs, which causes your blood vessels to constrict. So, the heavier you breathe, the less oxygen is actually delivered throughout your body. In fact, one study that pitted pranayama breathing against the Buteyko method revealed the Buteyko group had better improvement in quality of life and asthma control than the pranayama group.[17]

How Many Breaths per Minute Are Ideal?

Typically, the respiratory rate of humans is about 10 to 20 breaths per minute. Slowing your breathing down to a rate of four to 10 breaths per minute appears to offer many benefits, however, including effects on the respiratory, cardiovascular, cardiorespiratory and autonomic nervous systems that may influence:[18]

Respiratory muscle activity	Ventilation efficiency
Chemoreflex and baroreflex sensitivity	Heart rate variability
Blood flow dynamics	Respiratory sinus arrhythmia
Cardiorespiratory coupling	Sympathovagal balance

Further, according to research in Breathe, optimized respiration in humans may be in the range of six to 10 breaths per minute, done in a way that activates your diaphragm. In addition, they noted that nasal breathing (such as taught by the Buteyko method) "is also considered an important component of optimized respiration." Researchers explained:[19]

"Controlled, slow breathing appears to be an effective means of maximizing HRV [heart rate variability] and preserving autonomic function, both of which have been associated with decreased mortality in pathological states and longevity in the general population …

This is easily achievable in most individuals with simple practice and there is yet to appear in the literature any documented adverse effects of respiration in the 6–10 breaths per min range."

Slow, Deep Breathing Relieves Stress

Pranayama breathing involves three phases: inhalation, retention and exhalation, each of which can have varying lengths and tempos. The middle phase, retention (Kumbhaka) is said to be an important part of the breathing process and helps enhance the level of vital energy in your body. According to a study in the International Journal of Yoga:[20]

"Slow and deep breathing is efficient as it reduces the ventilation in the dead space of the lungs. Shallow breathing replenishes air only at the base of the lungs in contrast to deep breathing that replenishes the air in all parts of the lung.

It decreases the effect of stress and strain on the body by shifting the balance of the autonomic system predominantly toward the parasympathetic system and improves the physical and mental health. Many researchers have found pranayama to be beneficial in treating stress-related disorders … The effects of pranayama, when practiced with kumbhaka, are substantially more than pranayama practiced alone."

The study involved 12 weeks of modified slow breathing exercise in a modified pranayama (alternate nostril breathing) form, with equal phases of inspiration, breath holding and exhalation (1-to-1-to-1 ratio). Following the study, and compared to a control group that did not receive any intervention, the slow breathing group had

reduced perceived stress and improved cardiovascular parameters, such as heart rate and blood pressure.[21]

Even in the immediacy, slowing your respiratory rate to six breaths per minute for a period of five minutes has been shown to significantly reduce blood pressure and result in a small reduction in heart rate.

"Slow pace bhastrika pranayama (respiratory rate six/minute) exercise thus shows a strong tendency to improving the autonomic nervous system through enhanced activation of the parasympathetic system," researchers explained.[22] Further research published in the Journal of Ayurveda and Integrative Medicine suggests yogic breathing may:[23]

Modulate cardiovascular variables in patients with hypertension and cardiac arrhythmias	Relieve symptoms and enhance pulmonary functions in bronchial asthma
Enhance mood for patients withdrawing from cigarette smoking	Reduce reaction time in specially abled children
Manage anxiety and stress in students	Modulate pain perception
Improve quality of life and sympathetic activity in patients with diabetes	Reduce cancer-related symptoms and enhance the antioxidant status of patients undergoing radiotherapy and chemotherapy for cancer

Give These Controlled Breathing Techniques a Try

Subtle changes in the way you breathe can lead to significant changes in your body and mind. And different breathing techniques have the potential to offer different advantages to your system. As such, it's a good idea to try out a variety and find out which works best for you (or simply rotate through them randomly).

One of the most effective breathing exercises (a Buteyko method) to reduce stress and anxiety does not involve taking deep breaths at all but rather focuses on small breaths taken through your nose, as follows:

1. Take a small breath into your nose, followed by a small breath out
2. Then hold your nose for five seconds in order to hold your breath, and then release your nose to resume breathing
3. Breathe normally for 10 seconds
4. Repeat the sequence

In their review of scientific evidence into the effects of controlled, yogic breathing, the Journal of Ayurveda and Integrative Medicine compiled 1,400 references that involved the yogic breathing practices such as the following.[24] Give one, or several, a try today and see if it makes a difference for you.

Nadi Shodhana/Nadi Shuddhi (Alternate nostril breathing) — With your right thumb, close the right nostril and inhale through your left nostril. Closing the left nostril, exhale through the right, following which, inhalation should be done through the right nostril. Closing the right nostril, breath out through your left nostril. This is one round. The procedure is repeated for the desired number of rounds.

Surya Anuloma Viloma (Right uninostril breathing) — Closing the left nostril, both inhalation and exhalation should be done through your right nostril, without altering the normal pace of breathing.

Chandra Anuloma Viloma (Left uninostril breathing) — Similar to Surya Anuloma Viloma, breathing is done through your left nostril alone, by closing the right nostril.

Surya Bhedana (Right nostril initiated breathing) — Closing the left nostril, inhalation should be done through your right nostril. At the end of inhalation, close the right nostril and exhale through the left nostril. This is one round. The procedure is repeated for the desired number of rounds.

Ujjayi (Psychic breath) — Inhalation and exhalation are done through the nose at a normal pace, with partial contraction of the glottis, which produces a light snoring sound. You should be aware of the passage of breath through the throat during the practice.

Bhramari (Female honeybee humming breath) — After a full inhalation, closing the ears using the index fingers, you should exhale making a soft humming sound similar to that of a female honeybee.

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