

# Respiratory Biofeedback

## *A key component of manual biofeedback*

– Part 2 of a 3 Part Series –

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In this second part of my three-part article, I discuss a very important type of manual biofeedback called *respiratory biofeedback*, with step-by-step instructions on its use. This procedure combines two powerful therapies: The first incorporates manual biofeedback with the key breathing muscles, and the second is EEG biofeedback, or neurofeedback, which helps improve brain function and is associated with alpha wave production. As a component of manual biofeedback, respiratory biofeedback can also be performed without equipment.

Everyone can benefit from respiratory biofeedback. We can use it on ourselves as a quick, effective daily remedy to reduce stress, relax and improve overall health. And, we can use it as a primary technique to treat patients. Most importantly, respiratory biofeedback is best performed before other therapies are used as it can help improve the efficacy of these remedies and often eliminate their necessity.

Respiratory biofeedback is associated with a number of significant health benefits:

1. It can increase oxygen to the brain, potentially improving a variety of neurological imbalances. This is accomplished through more efficient breathing that brings more air into the lungs.
2. It can increase the brain's production of alpha waves. These brain waves can help reduce harmful stress hormones, especially cortisol, balance the autonomic nervous system and promote muscle relaxation – all very important features for a healthier brain and body.
3. Respiratory feedback can help restore and improve normal breathing. Improper breathing is often associated with brain and spinal cord injuries and is sometimes a hidden problem even in relatively healthy people.
4. It can help improve the function of the diaphragm and abdominal muscles. In addition to breathing, these muscles play a significant role in physical activity, improving posture and supporting the spine and pelvis.
5. Because of its effect on the brain and nervous system, respiratory biofeedback can help improve the function of other muscles in the body as well, and help reduce pain – two reasons to perform this procedure before other manual biofeedback.

## Normal Breathing

Before performing respiratory biofeedback, we must first be sure the basic breathing mechanism is working properly. Without normal breathing, many muscles don't work as well, body movement is impaired, oxygen can be reduced and many therapies, including respiratory biofeedback, may not be effective. Normal breathing is associated with proper muscle movement – the most important being the abdominal muscles and the diaphragm muscle. These muscles coordinate movements that allow us to efficiently breathe in and out. Let's look at the two components of normal breathing – inhalation and exhalation:

1. During inhalation the abdominal muscles relax and extend outward, while the diaphragm muscle contracts and moves downward. This movement allows air to enter the lungs more easily and is accompanied by a slight whole-body backward extension, especially the spine.
2. During exhalation the abdominal muscles contract and tighten, and are gently pulled inward; the diaphragm muscle relaxes with an upward movement. This helps push air out of the lungs, with a slight whole-body flexion.

We can observe another person's breathing and often tell if it's correct, especially watching the belly move out on inhalation and in on exhalation. We can also evaluate our own breathing by feeling our muscles move:

- Place the palm of one or two of your hands on the abdomen.
- Slowly breathe in and feel the abdominal muscles expand outward. The belly should get bigger during inhalation.
- Slowly exhale and feel the abdominal muscles tighten and be pulled inward. The belly is more flat on exhalation.

During normal breathing, most movement occurs in the abdominal areas with only slight movement of the chest. The chest expands more during much deeper breathing such as during exercise.

We can assess a patient by watching the abdominal movement, and also by placing our hands on his or her abdomen during breathing – we should feel the muscles expand on inhalation, and flatten and tighten on exhalation. Those who breathe improperly often move their muscles opposite that of normal. This happens for various reasons. Brain and spinal cord injuries can disturb the breathing muscles. In other individuals, poor breathing can come from stress, the stigma of not showing a big belly, and even over-exercising the abdominal muscles, making them too tight to relax.

If breathing is not normal, it's important to re-train the breathing mechanism before using respiratory biofeedback. The procedure is simple – follow those steps just outlined for normal inhalation and exhalation, and continue for about two minutes, three times a day. It may only take a few days to restore the natural habit of normal breathing. Then, performing respiratory biofeedback can help maintain normal movement.

One important note: be aware of the breathing mechanism during times of stress, which is often when normal breathing can switch to abnormal breathing as we hold more tension in our abdominal and pelvic muscles.

### Brain Waves

An important component of respiratory biofeedback is the production of healthy brain waves. As discussed in Part 1, neuromuscular function can be evaluated with manual muscle testing, but evaluating brain waves requires specific equipment. While working with Dr. Coralee Thompson, as she did neurofeedback, we observed that many people who were unable to produce certain healthy brain waves also had abnormal breathing patterns. When we effectively taught these patients to breathe properly, brain wave activity improved. With this in mind, I began teaching respiratory biofeedback without measuring brain waves or using EEG equipment.

Brain wave activity provides us with information on brain function. Understanding some basic information about brain waves is an important component of respiratory biofeedback.

The brain produces different frequencies and amplitudes of electrical waves depending upon levels of consciousness. Sensation, attention (self-awareness), intellectual activity and the planning of physical movement have distinct electrical correlates in the brain that can be measured. Measuring brain waves during various activities, such as reading, performing a math problem, listening to music, with eyes open and closed, provides further information about brain function. Once analyzed through brain mapping such as the *quantitative EEG* (QEEG), areas of the brain can be “trained” to function better through biofeedback, often referred to as neurofeedback.

Four commonly measured brain waves, and at least two others that have been observed:

- *beta waves* (12 – 32 Hz) are associated with full awareness and high cortical activity – a busy brain, such as during a business meeting, planning a trip or mentally doing several things at one time.
- *alpha waves* (8 – 12 Hz) are associated with a sense of “relaxed alertness” and high creativity; Typical during meditation, listening to music, and when eyes are closed. The ability to generate alpha waves is associated with the self-regulation of stress and may contribute to an expanded state of consciousness.

- *theta waves* (4 – 8 Hz) are an awake but dreamy state common just before the onset of sleep; Most prevalent in youth but occurs during deep creativity and meditation in adults at any time.
- *delta waves* (0.5 – 4 Hz) are very slow wave occurring during most stages of sleep. Abnormal if occurring while awake and may indicate a lack of nutrients such as glucose or oxygen, medication effects, or poorly functioning neurons.

Other brain waves include *gamma* (~30 – 80 Hz). Much less is known about this wave. It may be associated with more complex cortical function and higher levels of consciousness. A *sensory motor rhythm* (12 – 15 Hz) above the higher end alpha and entering beta has been associated with alert but muscle-relaxed states. Our brains should make specific waves in certain brain regions at appropriate times. An abnormality might include a normal wave occurring at the wrong time. For example, delta waves that are seen during reading or performing a simple math problem are abnormal and could account for errors. And the appearance of theta waves while in a classroom setting or driving on the highway is abnormal and could account for poor comprehension or “human error.”

The ability to produce alpha waves is associated with an overall healthy brain and body, especially in relation to controlling stress. It is one reason people have, for thousands of years, pursued meditation, the use of psychedelics and other drugs, prayer and other activities that seek to promote the alpha state. Specifically, alpha waves can reduce high levels of the stress hormone cortisol, and help balance the autonomic nervous system. These alpha waves can have dramatic effects on our whole body, such as improved memory, learning and comprehension, better blood sugar regulation, improved gut function, and balanced hormones. When we're relaxed, creative, meditating and happy, our brain produces large amounts of alpha waves. For these and other reasons, one main focus of respiratory biofeedback is the creation of alpha waves.

The *inability* to produce alpha waves is abnormal. Blood sugar problems, inadequate sleep, nutritional imbalance and very high levels of stress hormones can impair the ability to produce alpha waves. Even certain structural problems, such as those in the jaw joint or neck muscles innervated by the cranial nerves (neck flexors and SCM) can significantly reduce our ability to generate healthy alpha waves.

#### Respiratory Biofeedback Procedures

With a better understanding of brain waves and normal breathing, we're ready to perform respiratory biofeedback. While it's important to relax the body as much as possible during this process, if this procedure is new, you may be a little tense as you think of each step. But soon, you'll be able relax and obtain the maximum benefits of respiratory biofeedback.

Here are the five steps for respiratory biofeedback:

1. It's best performed relaxed, in a lying position, although slightly reclined while sitting is also effective.
2. Place your hands or arms on the middle of the abdomen, and keep them relaxed. This sensation and weight provides a biofeedback effect on the diaphragm and abdominal muscles during movement.
3. Close your eyes; this usually increases healthy alpha brain waves.
4. Listen to enjoyable music; also a great way to increase alpha waves, especially if headphones are used which keeps out distracting noise.
5. Breathe easy and deep. Most people can comfortably, slowly inhale for about 5 to 7 seconds; then, exhale for the same 5 to 7 seconds. If 5 to 7 seconds makes you feel out of breath or dizzy, adjust the time – try 3 to 4 seconds during inhalation, for example, and the same for exhalation.

Continue respiratory biofeedback for about five minutes. If you have headphones, plug them in and go to [www.philmaffetone.com](http://www.philmaffetone.com) and listen to the song *Rosemary* (it's on the music player in the lower left) but any enjoyable music will work.

*Caution:* It's very important to not fall asleep, or not even start drifting into sleep. If this happens, immediately discontinue the respiratory biofeedback session. Sleep produces delta brain waves – these should be avoided during respiratory biofeedback. If you start getting sleepy after 2 minutes, perform respiratory biofeedback for just less than that time and gradually work up to 5 minutes – but always avoid getting sleepy. If you consistently get sleepy during respiratory biofeedback, there may be other sleep-related issues such as sleep deprivation or sleep apnea.

Once you've done this procedure a few times, it will become very easy. And if you're helping someone else perform it, make sure he or she is positioned correctly and is breathing properly.

As a therapy, respiratory biofeedback can be performed once or twice daily, or more if necessary. Many people feel invigorated afterwards, and can tell when it's time to perform it. And again, before using manual biofeedback on other muscles, it's best to perform respiratory biofeedback first because it can help make this and other therapies more successful.