Biofeedback

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Biofeedback is a process whereby you gain information about certain physiological processes in the body using instruments that can give you much more subtle information than you can get from your own senses. Biofeedback can be useful in helping people learn to relax, especially for those who find relaxation difficult.

When you are first leaning to relax, it is sometimes hard to know if you are doing it correctly because you may not feel much right away. Biofeedback will tell you if you are going in the right direction by detecting subtle physiological changes before you can even feel the effect of relaxation. What ever it is you are doing in your mind to start the relaxation process you then learn to keep doing until the effects can become noticeable and reproducible. Typical biofeedback monitoring may include skin temperature, galvanic skin resistance (GSR), heart rate variability, muscle tone (electromyograph-EMG) or brain waves (electroencephalogram - EEG).

Most people can learn relaxation from a relaxation CD, audio file or App. Some people have trouble developing a feeling for what it is like to relax. Some people despite feeling reasonably good at relaxation will still have trouble falling asleep. Some people continue to have trouble falling asleep despite their best efforts with various insomnia programs. Biofeedback may help these people become more successful at relaxing and sleeping.

There are two basic components to our nervous system: the voluntary and the involuntary nervous systems. The voluntary nervous system is called the "somatic nervous system". It enables you to voluntarily control your muscles and movements. The involuntary nervous system is called the "autonomic nervous system". It controls things like heart rate, basic respiration, digestion, blood pressure, etc.

There are two basic components of the autonomic nervous system: the sympathetic and parasympathetic nervous systems. The sympathetic nervous system (SNS) controls what is referred to as the “fight or flight response” to emergencies. The primary hormones and neurotransmitters include cortisol from the adrenal glands along with adrenalin (epinephrine) and noradrenalin (norepinephrine). Some of the fundamental effects of the SNS is to contract

the blood vessels in the skin (to maintain blood volume in the body core) and increase the heart rate to increase blood pressure and blood flow particularly to the muscles and the brain to optimize the body's ability to run or fight in a life-threatening situation. These effects provide a survival advantage in an emergency particularly if there is an injury with blood loss. Breathing tends to be more shallow and rapid. There is also an increased production of glucose for the muscles and brain to use. There is a reduction in urine production to conserve blood volume. Many non-immediately essential functions of the body like digestion and reproductive functions are shut down to conserve energy and blood flow. There is also in increase in sweating.

Even though the effects of the "fight or flight response" take a lot of energy and shut down important functions of the body, they have a survival advantage when operational for the short periods of an emergency. However, when people are chronically stressed or tired and pushing themselves to function and the effects are maintained for long periods of time, the imbalances can lead to dysfunction and disease.

For example, you may become more prone to fast heart rate and palpitations or arrhythmia. You blood pressure may become elevated. Your hands and feet may be cold, and you may become more sweaty. Elevated blood sugar can aggravate diabetes. Reduced urine production may result in fluid retention. Impaired digestion and reproduction function may result in indigestion, ulcers, and infertility. Muscle tension can lead to headaches.

Opposing the SNS is the parasympathetic nervous system (PNS) which helps the body calm down and return to normal functioning after an emergency. The main neurotransmitter is acetylcholine. It slows the heart and breathing rate, lowers the blood pressure, increases blood flow to the skin, controls digestion and reduces sweating among other things. When the heart rate and breathing slow down there is more beat to beat variability in your heart rate.

When you relax, the SNS reduces its activity and the PNS increases resulting in increased blood flow to the skin which causes the skin to warm. Small degrees of relaxation may result in minor changes that are not noticeable. However, even small skin temperature changes can be easily measured using a sensitive skin thermometer probe. The changes will show a visible deflection on a needle or a graph, or it can be registered as a change in the tone of a sound. As you relax and the skin warms the tone goes down. This enables you do your relaxation technique with your eyes closed and get feedback about minute changes in your state of relaxation. This helps you learn what works and what does not.

Sweaty skin is a good conductor of electricity. As you relax and sweat less, the resistance of your palms to an imperceptible current of electricity applied to the skin will increase. This is called the "Galvanic Skin Response (GSR)". The resistance can be measured with a simple GSR device that will give you feedback with an audible tone. As you relax, you sweat less, the resistance increases, and the tone goes down.

Heart rate variability is another fairly simple parameter to measure with current computerized technology giving another way of measuring subtle changes in relaxation. Heart variability increases with a reduction of SNS and an increase in the PNS activity associated with general relaxation.

Muscle tone can be measured by Electromyography (EMG). Muscle weakness or spasm can be rehabilitated using EMG biofeedback of the affected muscles. However, this is not usually used for overall relaxation training.

EEG biofeedback is the most effective way of learning to control the brain that in turn controls everything else in your body. One of the first uses of EEG biofeedback was to control intractable seizures in children. If you thought about malfunctions in your body that you would have the least control over, seizures would probably be high on that list. And yet some children with debilitating seizures that were uncontrollable by medication, were able to significantly reduce their seizures through EEG biofeedback. EEG biofeedback was then used to help children with ADHD and is now used for a variety of other medical problems including fibromyalgia and insomnia.

As you can probably imagine, EEG biofeedback is much more complicated than the other forms of biofeedback listed here. However, with a trained therapist, using the right kind of EEG feedback for the particular problem, the client will find it as easy to do as other forms of biofeedback. Because it requires significant therapist training, expensive equipment, and multiple sessions, it can be fairly costly.