

# Biofeedback, Flight-or-flight Response and Meditation

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## Abstract

Biofeedback facilitates the monitoring and modulation of subconscious activities, which constitute the fight-or-flight response regulated by autonomic nervous system. It let learn to consciously reduce hyperactive autonomic functions, like heart rate and blood pressure. The fight-or-flight response is the outcome of stress stimuli such as threatening, frightening, embarrassing or any such other exciting situation. Whether a person confronts or avoids a stressful situation, the nervous system and endocrine system are involved either consciously or unconsciously. The autonomic part of the fight-or-flight response results in general increase in sympathetic activity. Such response is of adaptive nature because it also enables the individual to resist or move away from a threatening situation. Biofeedback also promotes the adaptive capacity of the individual. Meditation further influences the autonomic performance on the positive lines by improving the state of homeostasis. The pathway of mechanism involves the modulation of neuro-endocrinal processes along with parasympathetic dominance which further promotes the healing processes operating in the reign of biofeedback system. Parasympathetic activation strengthens the adaptive capabilities of individual organs and systems as well which ultimately yield psycho-physiological well being.

**Key words:** fight-or-flight response, psycho-physiological well being and Kayotsarga.

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## Introduction:

Biofeedback is a process in which people get constant signals, or feedback, about various visceral biological functions such as blood pressure, heart rate, and muscle tension. Biofeedback takes advantage of electronic devices or other techniques to monitor and change subconscious activities many of which are regulated by Autonomic Nervous system (Sheeley et al., 2003).

Modus operandi of the feedback may be understood by an example as - A person walking on the deserted street, he suddenly saw a poisonous snake on the road coming towards him. Immediately his body prepares for one or two alternative reactions : (i) Remain and fight till the end, (ii) Run away to reach a safe place. Bodily actions and

preparations are almost same in either of the two courses of actions he choose, and those changes in the body involve faster pulse rate and heart rate, higher systolic and diastolic blood pressures, tense muscles, slower digestion, increased sweating, reduced blood volume in selected upper and lower extremities, dilated pupils etc. All these changes taken place in the body constitute the phenomena of *fight or flight response*. Such changes infact prepare the person for physical actions undertaken in either of the two alternative choices. For example reduced blood supply to hand and its diversion to the belly muscles prepare the person for combat action or running and to brain to ensure that mental coordinations are at peak. Reduced blood flow in the

exposures also reduces the likelihood of bleeding, as hands and feet deliver and block blows and are more likely to be injured. Enhanced sweating in the hands makes it more difficult for an aggressor to grab the person, dilated pupils sharpen the vision, slower digestion paves the way for energy transfer to other active organs as the body senses a need to channel energy to those activities necessary for urgent safety and survival (Andrasik, 1998; Schwartz, 1995) Biofeedback is a type of therapy which let learn the people how to prevent exaggerated bodily reaction from occurring at the onset, or how to tone it down when it happens to be. Biofeedback application involves monitoring various bodily states using the information gained to make meaningful changes. It also trains to sense when bodily response systems are becoming much aroused and to apply strategies to combat the emergency arised.

Biofeedback can be helpful with several psychological problems like anxiety, panic disorder, addictions, attention deficit disorder, self-confidence, self-efficacy, elevated mood, and enhanced problem-solving skills. Its use may be supplemented with other psychotherapy modules. Biofeedback therapists most often should have a very close relationship with other health care providers, particularly medical doctor of other therapy systems. Biofeedback therapist should regularly consult the physician in case of any physical problem arising during his treatment and physician need to rule out medical causes prior to treating selected psychosomatic disorders. A beneficial response of biofeedback may lead to medication adjustments. For example a significant reduction in systolic and diastolic blood pressure after biofeedback therapy may lead the person over medicated and in need of a lower drug use (Andrasik, 1998; Barman, 1998)

### **Fight-or-flight Response and Homeostasis**

Fight-or-flight response is being governed by a division of Nervous System known as Autonomic Nervous System. This division regulates the activities of smooth muscle, cardiac muscle and certain glands. Structurally, the system consists of visceral efferent neurons organised into nerves, ganglia and plexuses. Functionally it usually operates without conscious control. But now it is known that the Autonomic Nervous System is neither structurally nor functionally independent of Central Nervous System and is somehow regulated by higher centres in the brain, particularly by the cerebral cortex, hypothalamus, medulla oblongata and limbic system. (Seeley et al., 2003; Thibodean and Patten, 1996)

The Autonomic Nervous System (ANS) is subdivided into the sympathetic and parasympathetic divisions and enteric nervous system. The sympathetic and parasympathetic divisions differ structurally in (i) the location of their preganglionic neuron cell bodies within the Control Nervous System and (ii) the location of their autonomic ganglia. The enteric nervous system is a complex network of neuron cell bodies and axons within the wall of the digestive tract. An important part of this network is sympathetic and parasympathetic neurons. For this reason, the enteric nervous system is considered to be the part of Autonomic Nervous System. Both divisions of the ANS produce stimulatory and inhibitory effects with the clarification that it is at all not true that one division is always stimulatory and other is always inhibitory. This is again supported by the fact that most organs that receive autonomic neurons are innervated by both the parasympathetic and sympathetic divisions, although it is not universal. Usually sympathetic division decreases the activity of organs not essential in the maintenance of physical activity and

shunts blood and nutrients to the structures that are active during hyperactivity referred to as *fight-or-flight response* against stimulation (Tortora and Anagnostakos, 1990). Stress related stimulation causes the activation of the sympathetic division set into operation a series of physiological responses collectively called the fight-or-flight response, producing following effects :

The pupils of the eye dilate. The heart rate and blood pressure increases. The blood vessels of the skin and viscera constrict.

The remainder of the blood vessels dilate causing faster flow of blood into the dilated blood vessels of skeletal muscles, cardiac muscles and lungs - the vital organs which are directly involved in coping with the stimuli danger.

Rapid and deeper breathing and dilation of air passages

Steep rise in blood sugar level because of the conversion of glycogen to glucose.

The adrenal gland stimulated to produce epinephrine and non-epinephrine hormones which further intensify and prolong the coping effect.

Inhibition of these processes which are not required for meeting the stress situation like muscular movements of gastrointestinal tract.

Homeostasis is a phenomenon of equilibrium in the body with respect to functions, composition of fluids and tissues. Homeostasis is often disturbed by stress stimulus. Fight-or-flight response also plays a significant role in maintaining the state of homeostasis. Maintenance of homeostasis requires no conscious thoughts. The ANS helps to keep body temperature at a constant level by controlling the activity of sweat glands and the amount of blood flowing through the skin. As an another example the ANS helps to regulate the complex activities necessary for the digestion of food. Without

the ANS, all the activities necessary to maintain homeostasis would be overwhelming. Net outcome of ANS regulatory activities and fight-or-flight response are very closely linked with biofeedback regulatory process as both are being operated for similar cause i.e. psychophysical well being. (Penistan and Kulkosky, 1989)

### **Biofeedback and meditation**

No single mechanism could have postulated so far to how feedback works. The mechanism of its operation depends upon the type of feedback used and the type of abnormality. In all the cases, however, awareness about the symptoms, detrimental factors triggering symptoms and relationship between thoughts, emotions, feelings and bodily reactions (Andrasik, 1998; Hatch et al., 1987). Armed with these salient points biofeedback application technique a practitioner can easily modulate the hyperactive states of various physiological processes. Once a detailed clinical observations are recorded the biofeedback therapist typically performs an assessment called a "psycho-physiological stress profile". It consists of recording bodily responses when the person tries to relax, when attempts are made to place mild stress on the person, and when simulating real world behaviors in an attempt to identify which response systems are the most reactive or sensitive and most likely to contributing to the target problem (Andrasik, 1998; Shellenberger et al., 1994; Greed, 1994)

Biofeedback techniques related to healing the after effects of stress stimuli may be augmented by diaphragmatic breathing (breathing that is slow, deep and rhythmic), guided imagery (focussing on pleasant and relaxing scenes), autogenic training (a form of self regulation to enhance feeling of deep relaxation) and progressive muscle

relaxation training (systemic tensing and relaxing of major muscle groups designed to promote deep relaxation of the entire body (Attanasio et. al; 1985)

Meditation helps achieving higher state of consciousness through a fully rested and relaxed body and a fully awake and relaxed mind. One such widely practiced technique for achieving higher consciousness is called Preksha Meditation. This is a system of meditation engaging one's mind fully in the perception of subtle internal and innate pheromone of consciousness. One important component of this meditation is Kayotsarga (total relaxation with self-awareness). Overstimulation is a panacea for many maladies and problems as it produces mental upsets, physiological hyperactivity leading the state of fight-or-flight reactions. The only safe remedy is conscious relaxation and deliberate suspension of all bodily movements. Bodily movements, speech and mental functions are threefold activities of our organism. One of the facets of meditation practice is reduction or total cessation of each of these activities. At one hand meditation reduces the undue pace of bodily activities and on the other hand it promotes the efficacy of biofeedback therapy quickly enhancing the fight-or-flight response against a stress stimuli (Mahaprajna, 1999). Kayotsarga is infect

abandonment of the body coupled with high degree of conscious awareness. In practice, it is conscious suspension of all gross movements of the body resulting in the relaxation of the skeletal muscles and drastic reduction of metabolic activities. (Barnes et al., 2004; Harinath et al., 2004; Chiesa, 2009)

Scientific researches indicate that meditation alters physiological responses and in that way it enhances the beneficial output of biofeedback response, and also bring back various physiological activities in the body to the normal level. Oxygen consumption decreases drastically along with carbondioxide elimination. It has also been observed that following meditation significant reduction in metabolic rate, blood pressure and heart rate and increase in the intensity of alpha brain waves, a sharp decrease in the amount of lactic acid in the blood and also increase in the skin's electrical resistance. Such responses are characteristic of a highly relaxed state of body and mind and denotes the optimum operational level of biofeedback mechanism. It also indicates that regular practice of meditation may enhance manifold the modulating efficacy of sympathetic versus parasympathetic activities leading to a definite level of homeostasis. (Danucalov et al., 2008; Wallace et al, 1970)

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