



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

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Biofeedback in childhood psychiatric disorders

Essay

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Abbreviations

ACC	Anterior cingulated cortex.
ADHD	Attention deficit hyperactive disorder.
ASD	Autistic spectrum disorders.
BF	Biofeedback.
CC	Corpus callosum.
CD	Conduct disorder.
EDR	Electro dermal response.
EEG	Electroencephalogram.
EMG	Electromyography.
fMRI	functional magnetic resonant imaging.
GABA	Gamma Amino Buteric Acid.
IEP	Individualized educational program.
LC-NA	Locus coeruleus–noradrenergic system.
MMR vaccine	Measles, Mumps, Rubella.
MNS	The mirror neuron system.
NF	Neurofeedback.
ODD	Oppositional Defiant Disorder.
PDD	Pervasive developmental disorders.
PEP	Pre-ejection period.
PNS	Parasympathetic nervous system.
PSUD	Psychoactive substance use disorder.
PTSD	Post traumatic stress disorder.
qEEG	quantitative electroencephalography .
RBS-R	Repetitive Behavior Scale-Revised.
RSA	Respiratory sinus arrhythmia.
SMR	Synchronus sensorimotor rhythm.

SNS	Sympathetic nervous system.
SUD	Substance use disorder.
TBI	Traumatic brain injury.
TOVA	Test of variables of inattention.
WM	White matter.

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Introduction

Biofeedback is the process of gaining greater awareness of many physiological functions primarily using instruments that provide information on the activity of those same systems, with a goal of being able to manipulate them at will (**deCharms et al.,2005; Mark & David,2009**). Some of the processes that can be controlled include brainwaves, muscle tone, skin conductance, heart rate and pain perception. (**Nestoriuc& Martin, 2007; Nestoriuc et al , 2008**).

Biofeedback may be used to improve health, performance, and the physiological changes which often occur in conjunction with changes to thoughts, emotions, and behavior. Eventually, these changes may be maintained without the use of extra equipment, even though no equipment is necessarily required to practice biofeedback actually(**deCharms et al.,2005**).

Emotional regulation is an essential process involved in neuropathophysiology and therapeutic efficacy in many psychiatric disorders. Yet, traditional psychiatric therapeutic has focused on symptomatic rather than neurophysiological criteria. Therefore, it was proposed to teach patients to modify their own brain activity directly, in order to obtain a therapeutic effect. These techniques, which are named neurofeedback, were

originally developed using electroencephalography. Recent technical advances in fMRI enable real-time acquisition, and open opportunities to its utilization in neurofeedback. This seems particularly interesting in emotion regulation, which, at a neurofunctional level, lies on cortico-limbic pathways that, in great parts, were previously identified by traditional fMRI paradigms. This emotion regulation plays a central role in the etiopathogenesis of psychiatric disorders, especially depressive and anxiety(**Micoulaud-Franchiet al.,2012**).

Neurofeedback ,also called electroencephalogram (EEG) biofeedback or neurotherapy , is an adjunctive treatment used for psychiatric conditions such as attention-deficit/hyperactivity disorder, generalized anxiety disorder, post traumatic stress disorder, phobic disorder, obsessive-compulsive disorder ,bipolar disorder, depression and affective disorders, autism, and addictive disorders (**Moore, 2000; Rosenfeld, 2000**).

Aim of The Study

Biofeedback is a part of an effective non-pharmaceutical program that can help a person successfully to overcome a number of mental health disorders in a way that is possibly more effective than reliance on pharmaceuticals and with no side effects, short or long term.

The aim of this Study is to:

- 1- Review of literaturediscussing the technique of biofeedback and its application in childhood psychiatric disorders.
- 2-Discuss the biofeedback technique and its mechanism of action.
- 3- Highlight the application of biofeedback as a non pharmacological treatment for childhood psychiatric disorders.

Biofeedback

Feedback, in general, can be intrinsic or extrinsic. Intrinsic (inherent) feedback is information provided as a natural consequence of making an action. Examples of intrinsic feedback include vision, proprioception, audition, somatosensation (touch) and smell. The patient may have difficulty using intrinsic feedback when a disease, trauma, or birth injury affects the peripheral or central nervous system (CNS). Extrinsic feedback consists of information from the measured performance outcome that is feedback to the patient by some artificial means. Biofeedback (BF) is a type of extrinsic, feedback (**Schmidt, 1991**).

Biofeedback is a coaching and training process which helps people learn how to change patterns of behavior, physiological response patterns, to take greater self responsibility for their health and for their mental, physical, emotional and spiritual functioning. It enables an individual to gain some element of voluntary control over the autonomic nervous system using a device that produces auditory or visual stimuli (**Wolf, 1991**).

Biofeedback is useful in treating many problems, ranging from re-education of damaged nerves to certain types of

epilepsy, but is most typically used in treating functional illness. Biofeedback therapy is used to teach patients to control physiological processes that are often unconscious (Greenberg & Kall, 1992).

Biofeedback therapy involves using electronic instrumentation to obtain information about specific pathophysiological patterns and then developing voluntary control techniques to change those patterns to reduce or eliminate symptoms. This therapy is cost-effective for treatment of chronic, benign problems because it reduces long term medication use, the frequency of emergency room visits and physician consultations. It is often prescribed to those who want alternatives to medication, no side effects, recovery from chemical dependency, or relief beyond medication (Greenberg & Kall, 1992).

Biofeedback is said to have made its beginnings in the late 60s and grew as a much hyped tool in the 1970s. It has continued to be of interest to the healing community. Biofeedback is also called the mind-body therapy, it is fast emerging as a complementary and alternate healing technique that can help treat a variety of physical and mental health problems. Biofeedback technique lays a singular emphasis on the patient and his

understanding of his physical state, which forms the base upon which the therapist builds his diagnosis and charts further course of treatment.(**Siever,2008**).

Precise instruments measure physiological activity such as brainwaves, heart function, breathing, muscle activity, and skin temperature. These instruments rapidly and accurately 'feed back' information to the user. The presentation of this information often in conjunction with changes in thinking, emotions, and behavior supports desired physiological changes. Over time, these changes can endure without continued use of an instrument.(**deCharmset al.,2005**).

Types of Biofeedback:

I. Respiratory Biofeedback:

Fishman (1996) mentioned that in a study on 40 patients after 7 days of mechanical ventilation, breathing retraining resulted in a more efficient breathing pattern, which in turn decreased dyspnea and anxiety and allowed for quicker weaning time in the treated patients.

II. Position biofeedback:

This technique is indicated when the goal of training is regulation of movement. Examples for the application of position

biofeedback are:

1. Training for head position control.
2. Coordination and control of hand movements in ataxia and following hand surgery.
3. Training for knee-joint position in children with cerebral palsy, and adults with hemiplegia (**Kotses et al., 1991**).

III. Pressure or force biofeedback:

Force monitoring may be indicated when information concerning the amount of forces being transmitted through a body segment or assistive device is desired, as in training of symmetrical standing or gait (**Kotses et al., 1991**).

IV. Neurofeedback:

It's believed that more blood flows to the areas of the brain being trained and eventually, more blood vessels grows there increasing the vascularization of the part of the brain (**Greenberg & Kall, 1992**).

Principles of Biofeedback:

Biofeedback uses instruments that send immediate clues to the patient about how they can control their physical, mental and emotional states. It is founded on two basic mind/body laws: