MediTECH

BIOFEEDBACK FOUNDATION OF EUROPE

The Foundation for Learning

HemoEncephaloGraphy

HEG

For Education ONLY Pre-Commercial Edition August 2006

Objectives

- Understand the basics of Hemoencephalography for clinical practice
- Master the use of instrumentation and software to collect data for pilot International Research & Education Projects (IREPs)

International Research & Education Project (IREP)

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- Expert Clinician:
  - Dr. Ernesto Sholomo Korenmen
  - Member of Israeli Biofeedback Society
  - Instructor for the Biofeedback Foundation of Europe
  - Practising Clinical Psychologist

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Training & Education

- Practitioner Training
  - Biofeedback Institute of America (BCIA)
  - Accreditation & Certification
  - Supervision/Mentoring
  - Competency Based Questions

Introduction

- HEG (**H**emo-**E**ncephalo-**G**raphy) biofeedback is an effective and drugless treatment for many neuropsychological conditions which involves the self-regulation of cortical activation.

Introduction

- HEG represents a simple and non-intrusive way for both: monitoring and training cerebral function without the inconvenience of electrode preparation which other neurofeedback methods generally require.

Introduction

- HEG has high compliance by clients and patients and the training can be delivered with a help of entertaining and attractive feedback suitable for children and adults.

Physiological Basis

- HEG devices measure and feed back changes correlated with blood flow dynamics and cellular metabolism in localized parts of the brain cortex. These measurements are closely correlated with brain activation due to a phenomenon called "neurovascular coupling". Briefly, blood carries all the nutrients and oxygen needed to fuel neuronal activation and the localized delivery of blood supply to each part of the cortex is closely linked to the particular metabolic requirements and the level of neuronal activity in that region at every single moment.

Physiological Basis

- The logic behind this biofeedback intervention is that repeatedly engaging in HEG biofeedback, "exercises" the brain in a unique way which confers very promising and long lasting neuro-behavioural benefits for the trainee. Special pre/post SPECT (Single Positron Emission Computerized Tomography) imaging techniques has been already used to verify that HEG biofeedback treatment promotes conspicuous blood flow increases, (activation), below the treated areas.

History

- State of the art HEG methodology is originally based on brain monitoring technologies like nIR Spectrophotometry and Thermoscopy developed in the last 10-15 years.

- In 1994 Dr. Hershel Toomim developed his own nIR Spectrophotometer methodology and subsequently was the first to show that that the monitored activity can be self-regulated by biofeedback means. His early work on the application of nIR HEG biofeedback in the treatment of ADD and ADHD and other neurobehavioral conditions followed soon after that.

History

- Slightly afterwards, Dr. Jeff Carmen started experimenting to build and test a device to measure cerebrovascular activation using passive infrared technology in an attempt to both monitor migraine activity and to train control over the associated abnormal cerebrovascular behavior. In 1998 Dr Carmen formally reported success in the treatment of migraine through pIR HEG biofeedback.

- In the last five years other researchers and clinicians have joined this exciting area of neurofeedback, (mainly in the USA). However, this technology is still considered to be the newest modality addition to the central biofeedback practice and a therapeutic tool with extremely promising future.

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Methodology

- There are two types of HEG measurement in current use:
  - nIR HEG
  - Competency Based Questions

nIR HEG

- **nIR HEG:** Active near infrared HEG measures changes in the relative absorption of red and infrared light passed into the tissue below the nIR sensor. The light traverses scalp and skull and reaches brain tissue and the ratio of red to infrared light received back by the sensor is dependent on localized blood perfusion and oxygenation in the underlying tissue. This method is used by Hershel Tommim in his instruments.

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- **pIR HEG:** Passive infrared HEG measures the heat (IR emission) radiated by the tissue below the pIR HEG sensor, which is dependent on the localized blood perfusion and metabolic activity in that region. This method is used by Jeff Carmen in his instruments.

- With both modalities of HEG, there are no electrodes to be applied to the skin, no electrode gels to be used to improve skin contact and no impedance criteria to insure reliable recordings.