



Biofeedback Certification Institute of America

EEG Biofeedback Certification Blueprint of Knowledge Statements

The provider certified in EEG Biofeedback will have knowledge of:

I. Orientation to EEG Biofeedback

- A. Definition of EEG Biofeedback
EEG Biofeedback is employed to modify the electrical activity of the CNS including EEG, event related potentials, slow cortical potentials and other electrical activity either of subcortical or cortical origin. EEG biofeedback is a specialized application of biofeedback of brainwave data in an operant conditioning paradigm. The method is also referred to as neurofeedback. The method may serve as the basis for neurotherapy (treatment of a clinical disorder) or performance enhancement (enhancement of normal functioning).
- B. History and Development of EEG Biofeedback
 - 1. Pioneers in EEG and EEG Biofeedback (e.g., Caton, Berger, Adrian, others)
 - 2. Seminal studies in EEG Biofeedback (e.g., Kamiya, Sterman, Lubar, Birbaumer, others)
- C. Overview of principles of human learning as they apply to biofeedback
 - 1. Learning theory, e.g. habituation, classical and operant conditioning, discrimination, generalization and extinction.
 - 2. Application of learning principles to EEG Biofeedback (neurotherapy) and (performance enhancement), e.g., generalization to the life situation, discrimination training, length and number of sessions.
- D. Assumptions underlying EEG biofeedback:
Concepts of feedback and control in biological systems.

II. Basic Neurophysiology & Neuroanatomy

- A. Neurophysiology
 - 1. Bioelectric origin and functional correlates of EEG, event related potentials (ERPs), and slow cortical potentials (SCPs).
 - 2. Relationship of post-synaptic potentials and action potentials to EEG.
 - 3. EEG signs of activation via classical and reticular routes, (e.g., alpha blocking as a cortical activation).

B. Neuroanatomy

- 1. Basic neuroanatomy of dual ascending sensory pathways to cortex via classical and reticular routes.
- 2. Related dual control of motor neurons via pyramidal and extrapyramidal routes.
- 3. Thalamic and cortical generators of EEG.
- 4. General cortical anatomy and general subcortical anatomy.

III. Instrumentation & Electronics

A. Essential Terms & Concepts

Basic metrics and terminology in electronics and instrumentation such as Ohm's Law, impedance, differential amplifier principles, analog and digital filters, EEG technical terms, digital signal processing terms and principles.

B. Signal Acquisition

- 1. 10-20 International Standard measurement and nomenclature for 19 recording sites, both classical and modified
- 2. Use of limited number of electrodes (fewer than 19).
- 3. Dense electrode arrays (35 to 250) and volume conduction
- 4. Common Mode Rejection (differential amplifier) as it relates to different montage characteristics and interpretation
- 5. Artifact (signals of noncerebral origin) recognize and correct, such as but not limited to:
 - a. Electromyographic very common, higher frequency invasion
 - b. Electro-ocular very common, low frequency invasion
 - c. Cardiac (pulse)
 - d. Sweat (skin impedance)
 - e. Cable sway
 - f. 60 Hz (grounding)
 - g. Electrode "pop"
- 6. Acceptable impedance, effect of different impedance at different electrodes, gain, effects of scan rate: Nyquist considerations and upper frequency limits.

7. Evaluation of subject variables during acquisition
 - a. alertness-drowsiness
 - b. medication/drug/alcohol effects
 - c. physical relaxation
 - d. eyes closed/eyes open/anxiety
 - e. subject age (child-adolescent-adult development of EEG)
 - f. time of day

C. Signal Processing

1. Analog (“raw” EEG, Time Domain) Metrics and Characteristics Frequency (nomenclature for “classic” frequency bands: delta, theta, alpha, beta, gamma, Mu, SMR) ; clinically significant patterns
2. QEEG and frequency domain metrics and characteristics
3. Normative Databases
 - a. Matousek and Petersen
 - b. John and Prichep
 - c. Thatcher
 - d. Serman
 - e. Hudspeth
 - f. Nova Tech EEG LORETA Database
 - g. Brain Resource Company
4. Multivariate functions such as discriminant and cluster functions.

IV. Research

Interpretation of the methodological and statistical criteria and procedures for determining levels of efficacy and effectiveness of EEG biofeedback, as outlined in the *Template for Developing Guidelines for the Evaluation of Clinical Efficacy of Psychophysiological Interventions*.

V. Psychopharmacological Considerations

- A. Potential effects of prescribed and non-prescribed drugs on clinical presentation.
- B. Potential effects of prescribed and non-prescribed drugs on EEG measures.
- C. Potential effects of different drugs on learning tasks.

VI. Treatment Planning

- A. Distinction between therapy (treatment) and performance enhancement and the ethical considerations involved.
- B. Intake Tasks
 1. Interview techniques which allow charting of presenting problems, medical and personal history, and life-style habits.
 2. Psychophysiology and biofeedback principles used in explaining treatment rationale, expectations, and motivating patient/client compliance. This includes availability and

proper use of demonstrations, audiovisual presentations, and reading material.

3. How the patient' s/client' s condition, history and medications relate to treatment indications and contraindications.
4. How to develop and write a treatment program. This includes knowledge of research, clinical literature, and an understanding of established criteria for treatment selection.

C. Clinical Procedures/Initial Assessment

1. Preparation of client
2. Number of sites to be analyzed
3. Analogue EEG pattern recognition.
4. Evaluation of and removal of non EEG artifact such as EMG, eye movement, blinks and electrical interference
5. Preparation of multi-channel map and quantitative analysis of the EEG

D. Ongoing Assessment

1. Enhancing periodic objective evaluation of patient/client progress
2. Adjusting treatment procedures to improve outcome
3. Interpretation
 - a. Understand how databases are developed
 - b. Compare data to normal database in terms of frequency distribution, amplitude, coherence, phase and asymmetry
 - c. Limitations of databases

E. Treatment Protocol

1. Development of neurofeedback protocols based on results of EEG analysis
2. Treatment of specific clinical conditions
 - a. Attention Deficit Disorder and Learning Disabilities
 - b. Mild Closed Head Injuries
 - c. Chemical Dependency Problems/Addictions
 - d. Epilepsy
 - e. Anxiety and Affective Disorders
3. Other conditions that you agree to treat
4. Adverse reactions and their management
5. Pre and post-treatment assessments such as neuropsychological tests, continuous performance tests, EEG/qEEG, appropriate to your practice and licensure.
 - a. The limitations in applying pre and post treatment assessments in your practice.
 - b. Test characteristics appropriate to your practice and licensure; know reliability and validity.

VII. Professional Conduct

- A. Responsibility and competence
 - 1. Responsibilities and liability in provision of services
 - 2. Demonstrated competence in all aspects of service provided
 - 3. Limiting scope of practice to areas of professional training and qualifications
 - 4. Experimental vs. commonly accepted biofeedback treatment
 - 5. Contraindications to treatment
 - 6. Familiarity with the ethical principles of BCIA and one's primary profession
 - 7. Advertising, marketing of services, and public statements
 - 8. Continuing education and training
- B. Client rights
 - 1. Privacy, confidentiality, and privileged communication
 - 2. Informed consent to assessment and treatment
 - 3. Accepting clients, abandonment, and appropriate referral
 - 4. Universal precautions in biofeedback
 - 5. Equal access to health care
- C. Supervision
 - 1. Appropriate consultation and supervision in biofeedback
 - 2. Purposes of supervision and consultation
 - 3. The process of supervision
 - 4. Guidelines for seeking supervision
- D. Professional relationship
 - 1. Dual relationships
 - 2. Conflicts of interest and exploitation of clients
 - 3. Consultation, referral, and relationships with other professionals
 - 4. Medical and medication monitoring
 - 5. Procedures for dealing with unethical behavior of colleagues
- E. Record keeping
 - 1. Technical and legal records
 - 2. Legally required records and retention
 - 3. Documentation of medical history
 - 4. Security of records to ensure confidentiality

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