Partial Differential Psychophysiological Surfaces: A Method for Mapping and Altering Human Mind States

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Abstract

The recent availability of sophisticated computerized EEG analysis equipment, has popularized "brain mapping", bringing many varieties of colorful types of displays, each one capable [with varying degrees of resolution] of imaging happy brains, depressed brains, active brains, resting brains, etc. In spite of their many variations, all of these "brain mapping" techniques are alike in that they are purely descriptive and do not have a predictive or prescriptive capability. The current mapping techniques can describe a happy brain or a depressed brain, but they can not predict or prescribe what brain parameters to change, or what sequence of changes to make, or in what direction to make the changes in order for the person to change from a feeling of depressed to happy, or from sleepy to vigor, or from confused to clear thinking. As a consequence, much EEG feedback is misguided, or worse, ***unguided***.

This deficiency is remedied with a new Brain Activity Mapping And Training (BAMAT) method. Twenty one different psychological mood states were assessed with published mood scales (MAACL, Clyde, POMS) before, during, and after each of the 7 consecutive days of the Biocybernaut Institute introductory alpha feedback training, in which 17 right handed non-meditators (men and women) had 8 channel EEGs (O1, O2, C3, C4, T3, T4, F3, F4) recorded while each channel was filtered into 8 spectral sub-bands (delta, slow theta, fast theta, slow third of alpha, broad-

band alpha, fast third of alpha, slow beta, broad-band beta) while each person had 4 simultaneous channels of EEG integrated amplitude feedback on broad-band alpha from O1, O2, C3, and C4.

Auditory feedback was from 4 spatially separated speakers, each of which used different tonal pitches, optimized to minimize alpha blocking to tone onset. At regular 2 minute intervals, the auditory feedback stopped for 8 seconds, during which time digital displays were illuminated to show trainees their integrated amplitude alpha scores at each of the 4 feedback sites: O1, O2, C3, C4.

The 64 EEG variables (8 channels X 8 filters) were analyzed to produce mean, maximum, and minimum scores on each variable, which were convolved with the mood scale variables in novel ways to minimize individual error variance and maximize the predictive power of the resultant Brain Amplitude Maps. The resultant partial differential psychophysiological surfaces reveal recurring three-dimensional patterns, which are imaged in the predictive Brain Activity Maps for different mood states. These recurring 3-D patterns reveal surprising underlying similarities between certain specific psychological states known as specific moods. Striking visual similarities are immediately apparent between maps from moods we consider similar.

Important applications to mental health and peak performance are readily suggested, since these maps show, in very detailed ways, how to change brain activity to achieve any desired type of mind activity or mind-related activity. This includes skills, abilities, moods, feelings, experiences, mental and personality traits, behavioral characteristics, as well as any aspect of any process in the mind or body which one wishes to alter. The implications of having such detailed prescriptive maps to guide and direct EEG feedback training challenge our current powers of imagination. Fortunately this BAMAT training methodology can be used to improve our imaginative abilities, as well as our abilities to

understand and to integrate the vast cultural changes which this methodology will usher in.