Technology Assisted Self Regulation

EEG operant conditioning does not stimulate the brain directly – rewards come in through the eyes and ears and mind of the individual. But by rewarding EEG changes with visual and auditory rewards a therapist is able to help shape an individual's brainwave activity toward normal patterns of activity. The advent of powerful personal computers and advances in miniaturization and amplification have allowed anyone who doesn't mind getting gel in their hair the ability to visualize the electrical activity of their own brain. And once you can visualize your behavior, you can change it.

Brainwaves are minute electrical voltages generated by the top layer of the brain (cortex) which can be detected by modern electrical equipment. Sensors placed on the scalp record these tiny voltage changes across the scalp and analyze the signals looking for specific rhythms. When brain rhythms are normal, an individual is rewarded, usually by means of a sound (bell or chime) or light or video event. But when his or her brainwave activity deviates from normal, this positive feedback stops. In this fashion good brain-behaviors are exercised and undesirable brain-behaviors are not reinforced with a goal being the accumulation of good brain-behaviors. A reasonably large repertoire of healthy behaviors is the basis for cognitive flexibility and self-regulation. An important point to realize is that no electrical current is put into the brain. The brain's electrical activity are merely registered passively at the scalp and these brain energies are relayed to a computer. Not just employed by the Italian soccer team or Lance Armstrong for peak performance, but by singers and performers, the US military, and students, neurofeedback promotes executive functioning in the prefrontal cortex.

Human EEG consists of random events and rhythms. By means of operant conditioning – rewarding the presence of certain brain activity patterns and not others – healthy brain behavior can be learned and unhealthy brain behaviors unlearned. Therapists typically focus on brain rhythms which have been studied for decades, which are called alpha (8-12 Hertz) or cycles per second, beta (15 – 40 Hz), gamma (40 + Hz), delta (0 – 4 Hz), theta, 4 – 8 Hz), and SMR (12 –15 Hz), which stands for sensorimotor rhythm.

When someone closes their eyes, alpha activity occurs across most or all of the brain. When he or she opens the eyes in a well-lighted room, alpha rhythms are replaced by beta rhythms, which are fast and low-amplitude waves. The amount of replacement and brain locations where these replacements occur varies depending upon the complexity, novelty, and meaningfulness of the environment, among other factors. Alpha rhythm replacement may involve all of the sensor positions or be selective and only occur at a few sites. Drugs, drowsiness, drive, and time of day generally influence every part of the brain whereas sensory and cognitive demands activate only a selected few brain areas. State flexibility results in resilience, regulation and recovery in feelings, thoughts, and behaviors.

For more information on neurofeedback for resilience, regulation and recovery, call our office at 752 6634 or visit our new web site: www.neuro-gnosis.com.

Electrodes are positioned on the scalp according to a 50-year standard known as the International 10-20 system which divides the head into proportional distances – 10% or 20% of the way between the dent of the nose (nasion), protrusion in the back of the head (inion), and preauricular points directly in front of each ear. Labels reflect underlying brain areas: FP for frontal pole, F for frontal, P for parietal, and C for central, T for temporal, and O for occipital. Sites are numbered with zero or “z” in the middle of the head (midline) followed by larger numbers as electrodes are positioned farther out to either side, with odd numbers alternating with even numbers between the left and right hemispheres (i.e., odd on the left, even on the right). Electrodes are spaced 6 or 7 cm apart on most heads. If more coverage is needed, additional electrodes may be placed halfway between any pair of electrodes. This system owes its endurance to its simplicity and fortuitous division of the scalp into brain regions that remain useful for cognitive and psychiactric research. Finally an EEG signal is always the difference in electrical potential between two electrodes on the scalp. Each electrode may be compared to its neighbor (e.g., C3 to Cz, P3 to Pz), or every electrode can be compared to the same electrode (C3 to Cz, P3 to Cz, O1 to Cz, etc). 720