Hemoencephalography-A New Therapy for Attention Deficit Hyperactivity Disorder (ADHD): Case Report

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Abstract:
Background. Hemoencephalography (HEG) is cortical circulatory biofeedback using refracted light tuned to oxygenated hemoglobin, emitted into the skull and detected at the scalp using a photoelectric cell. Red light at 660nm is used as the probe, with changes in the returning refracted light representing changes in cortical circulation. Method. A single-subject design case study was employed. TL, at age twelve, had a well-established diagnosis of ADHD given by pediatric neurologists, and required significant stimulant medication that was clinically effective. He was performing well in school on Concerta 36mg at 7 a.m. and Ritalin 5mg at 4pm. Off medication, he had significant abnormalities on IVA testing (Attention Quotient or AQ = 78) and in the quantitative electroencephalogram (QEEG). Using HEG, the patient engaged the system to exercise increases in signals corresponding to cortical circulation in the prefrontal cortex. QEEG, Continuous Performance Testing (CPT) and clinical status measurements were made before and after 10 sessions of HEG therapy. HEG exercise was typically given in weekly to bi-weekly sessions for 10 minutes in each of three standard prefrontal EEG locations: FP1, FP2 and FPz. Results. During the 10 therapy sessions TL's HEG data showed positive gain indicating success at raising the biofeedback signal. Following the 10 sessions, TL showed a normal QEEG with improved Z scores for relative power and normal IVA testing off medication (mean AQ 99.75 ± 7.85 on three dates), which persisted in the 18-month follow-up. His medication was lowered to Focalin 2.5mg twice daily.

Conclusion. This work documents a patient who showed clinically significant improvement after only 10 sessions using a new form of neurobiofeedback, hemoencephalography. If confirmed in controlled studies, this represents a breakthrough in treatment options for ADHD. Future studies should explore synergies between HEG and EEG neurofeedback therapies.

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