Passive Infrared Hemoencephalography for Traumatic Brain Injury

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http://www.thebrainlabs.com/pirhegtbi.pdf

pirHEG

- Passive Infrared Hemoencephalography
- Over Fpz only
- Feedback with DVD movies and/or Gamecube video games
- Duration anywhere from 15 to 30 minutes depending on tolerance
- Two times per week

Methodology

- Patients sent to our treatment facility with diagnosis of Traumatic Brain Injury with no other previous neurological or psychological difficulties. Two patients were accepted that had suffered previous head injuries.
- Baseline Neuropsychological testing, Neurobehavioral assessment, Headache monitoring, qEEG, and Infrared imaging.
- pirHEG for 20 sessions.
- Pre and Post infrared images at each session.
- Post Neuropsychological testing, Neurobehavioral assessment, Headache monitoring, qEEG and Infrared imaging.

Patient Sample

- N = 32
- Gender: 16 males, 16 females
- Race: 100% Caucasian
- Age: Mean = 40, SD = 13.6, Range: 12-65
- Handedness: 27 RH, 3 LH, 2 Mixed
- Marital Status: 16 single, 10 married, 5 separated/divorced,1 widowed
- Education: Mean = 13.76 years, SD = 3.09, Range: 6 - 20

Patient Sample (continued) – Medical/TBI

- Number of Medications: 15 none, Mean = 0.96, SD = 1.48, Range: 0 – 6
- TBI Severity: 15 Mild, 7 Moderate, 7 Severe; Mean = 1.72 (1 = Mild, 2 = Moderate, 3 = Severe)
- Time Since Injury: Mean = 42.36 months, SD = 85.85, Range: 2.7 – 420.
- 14 patients were more than a year since their injury.

Control Groups

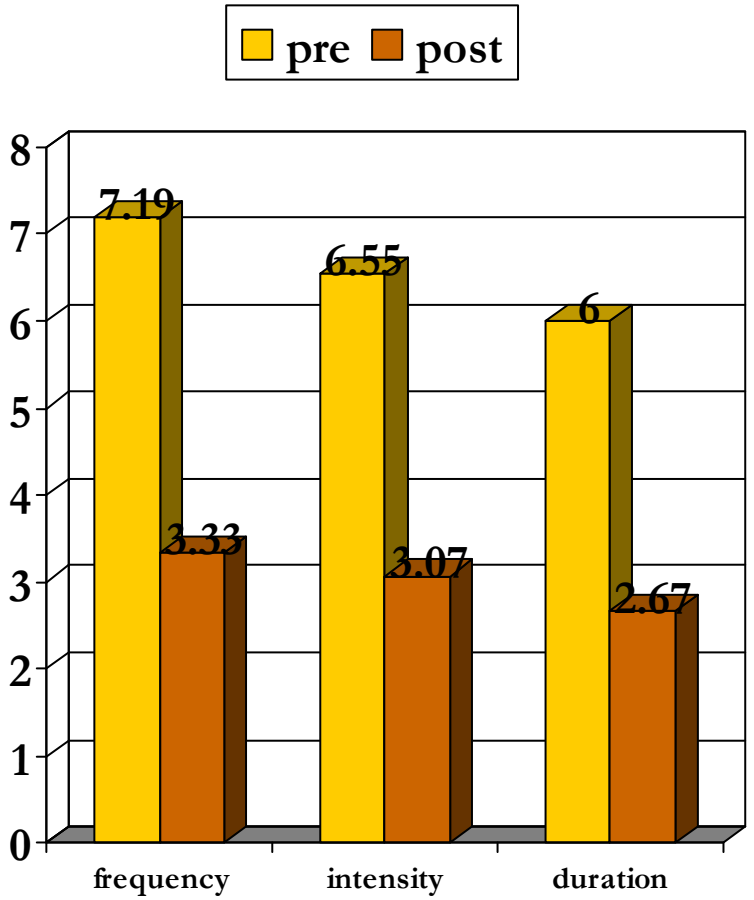
- 7 Patients seen pre and post Occipital nerve stimulation for Infrared Imaging. Matched for gender, age, race, and education. No significant pre-post differences.
- 10 Patients seen for individual psychotherapy (10 sessions) with pre and post testing. Matched for gender, age, race, education. No significant pre-post differences for headaches, neuropsychological measures, Infrared or QEEG connectivity. There was a trend towards improvement ($p<.08$) in FrSBe Affect of 0.5 sd, but this is clearly surpassed by pirHEG, which was statistically significant ($p<.05$).

Treatment Success

- Treatment Success was defined as a significant decrease in headaches associated with significant improvement on Neuropsychological and/or Neurobehavioral measures with no worsening of problems on any measure. The patient had to also concur that they had improved.
- With this definition, 29 of our 32 patients improved over the course of treatment – 90.6 %.

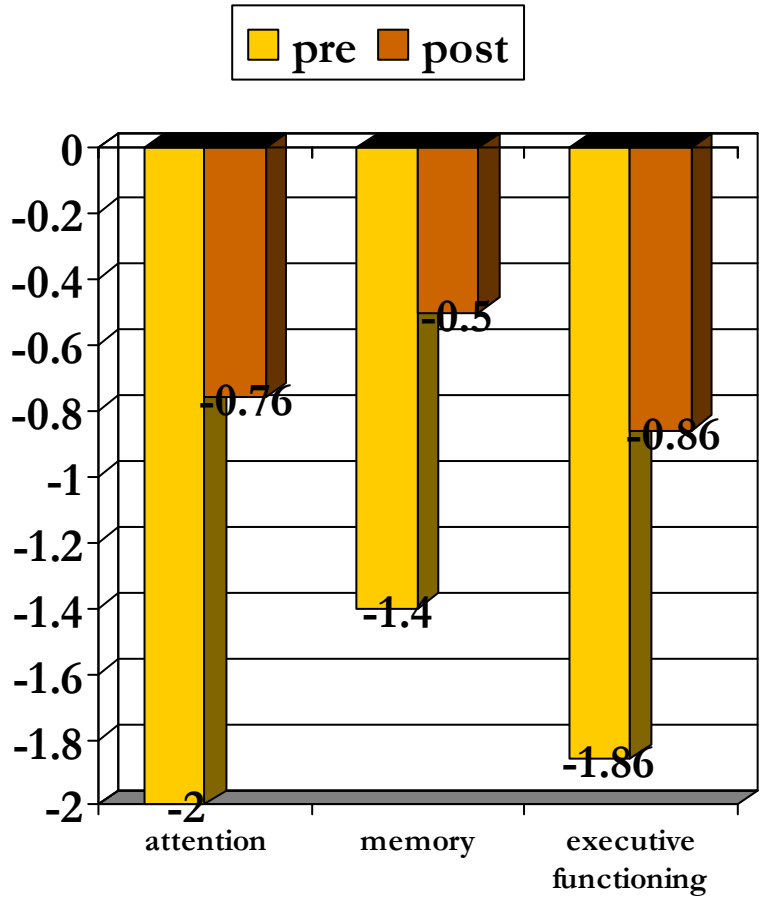
Results - Headaches

- All rated on a 1 – 10 scale.
- Frequency: $p < .0001$
- Intensity: $p < .0001$
- Duration: $p < .0001$



Results – Neuropsychological Testing

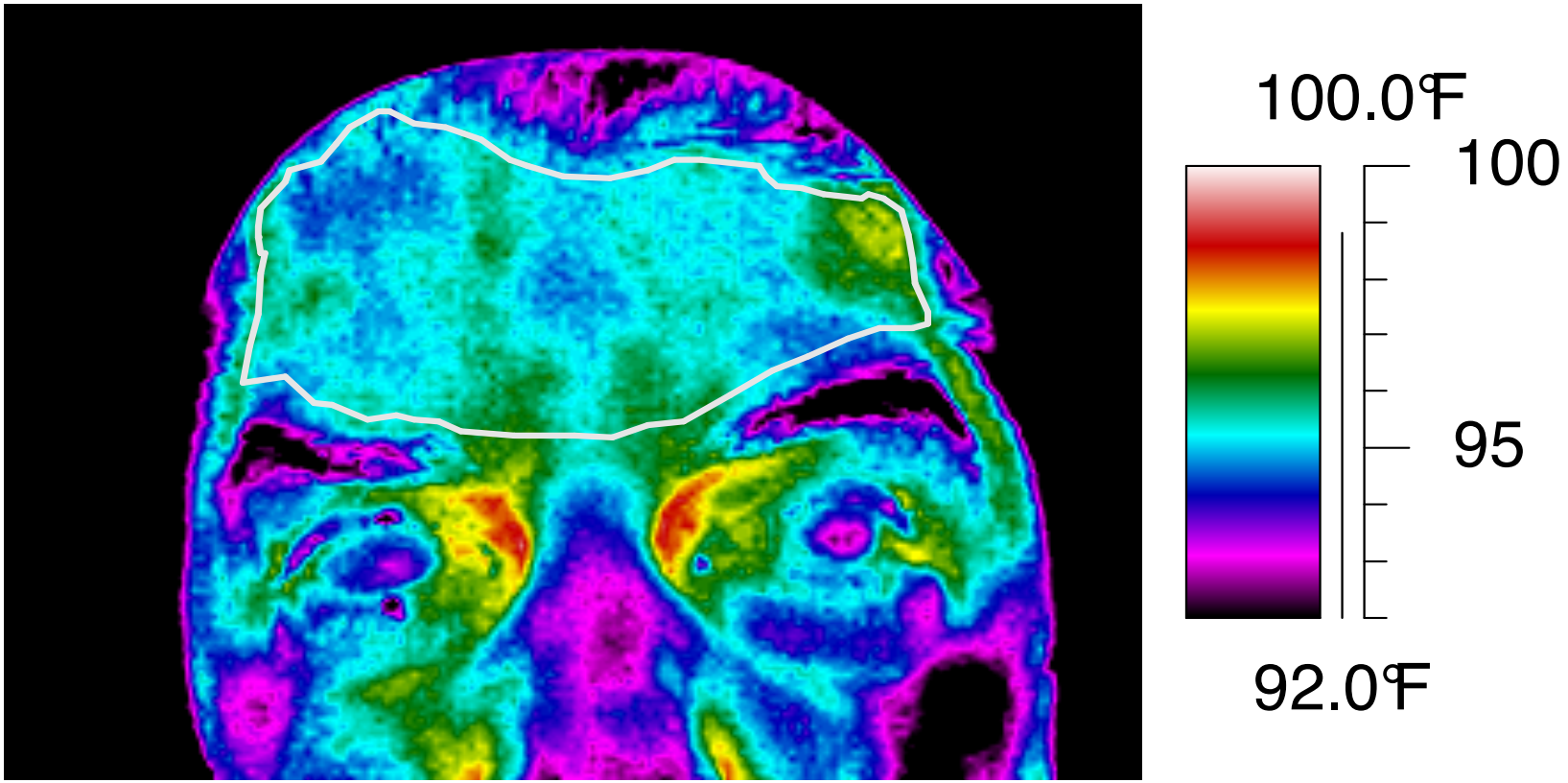
- Attention: $p < .0001$
- Memory: $p < .0001$
- Executive Functions: $p < .0001$



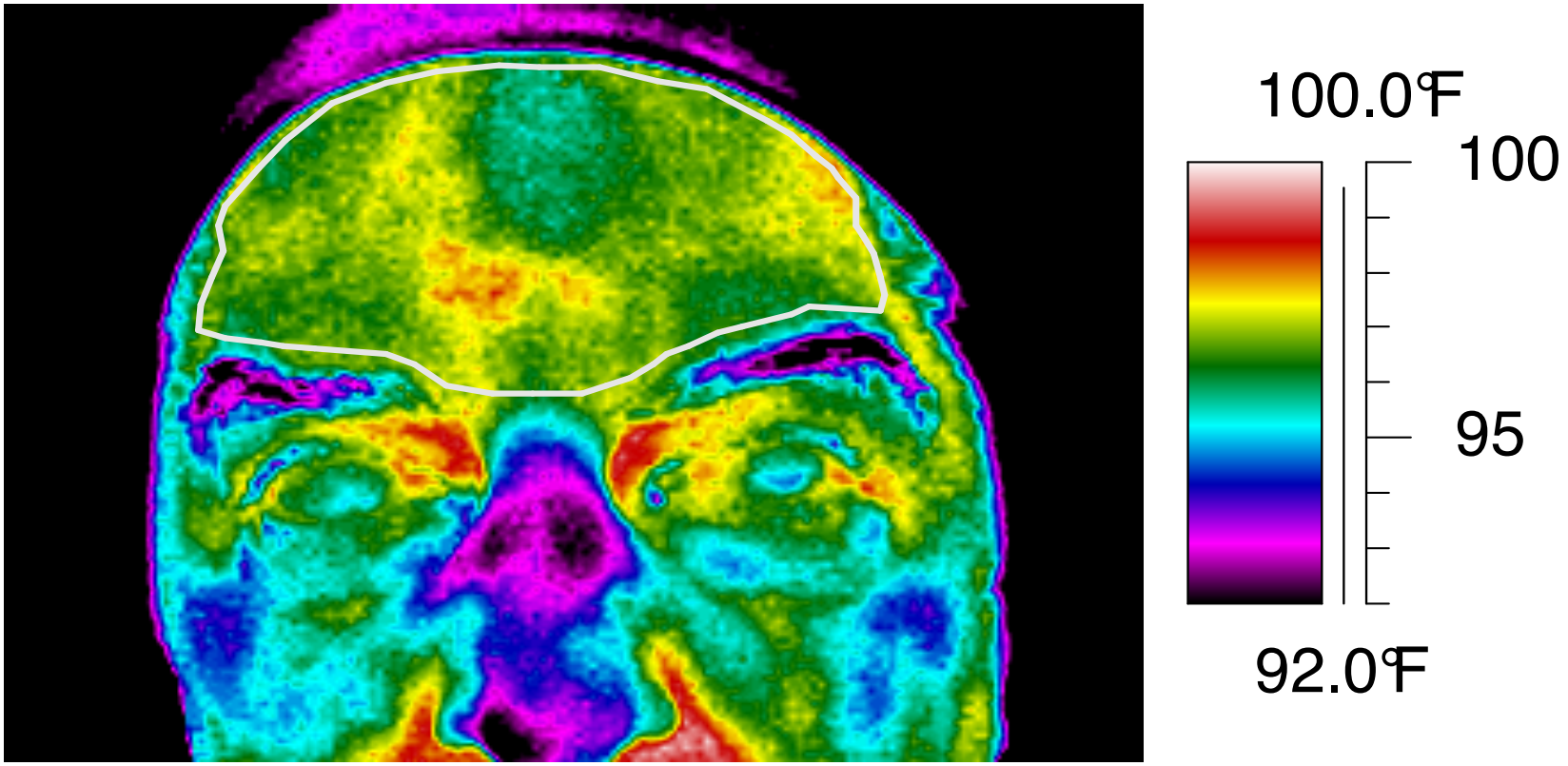
Results – Neurobehavioral Assessment

- NBAP Pragnosia: $p < .01$
- NBAP Indifference: $p < .02$
- FrSBe Total: $p < .001$
- FrSBe Executive Functioning: $p < .002$
- FrSBe Inhibition: $p < .003$
- FrSBe Affect: $p < .006$

Infrared Imaging – Sample pre

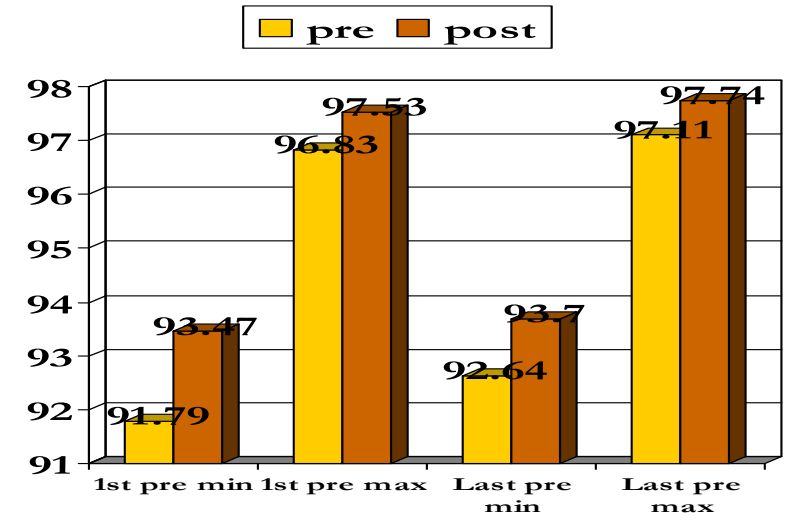


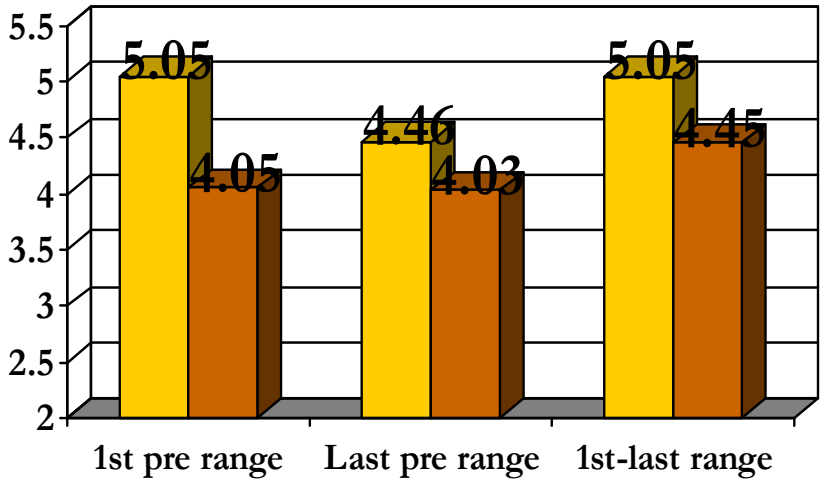
Infrared Imaging – Sample post



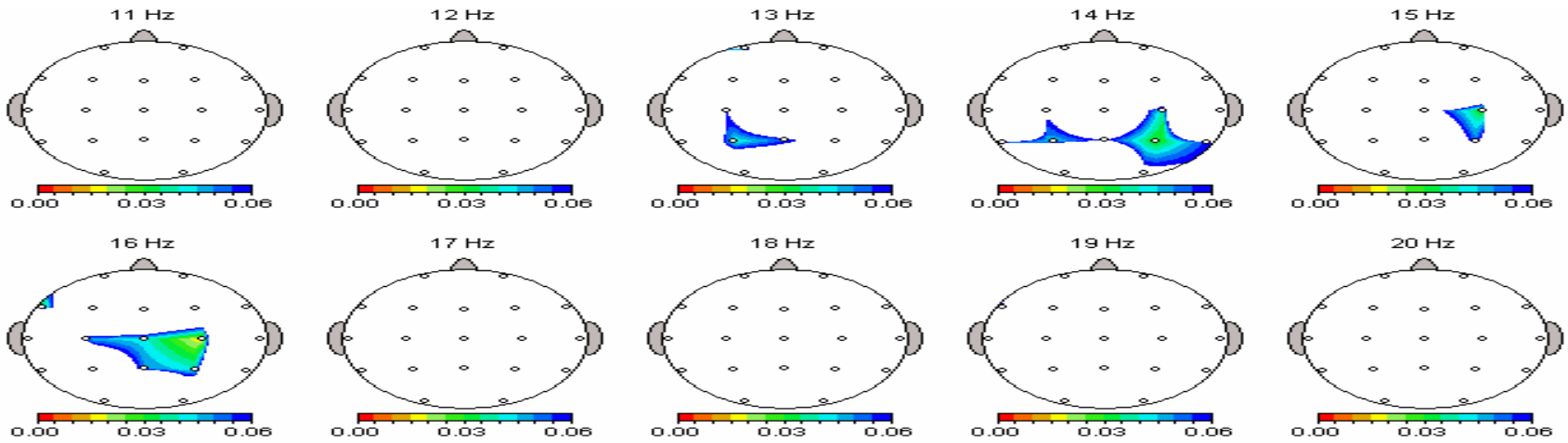
Results: Infrared Imaging

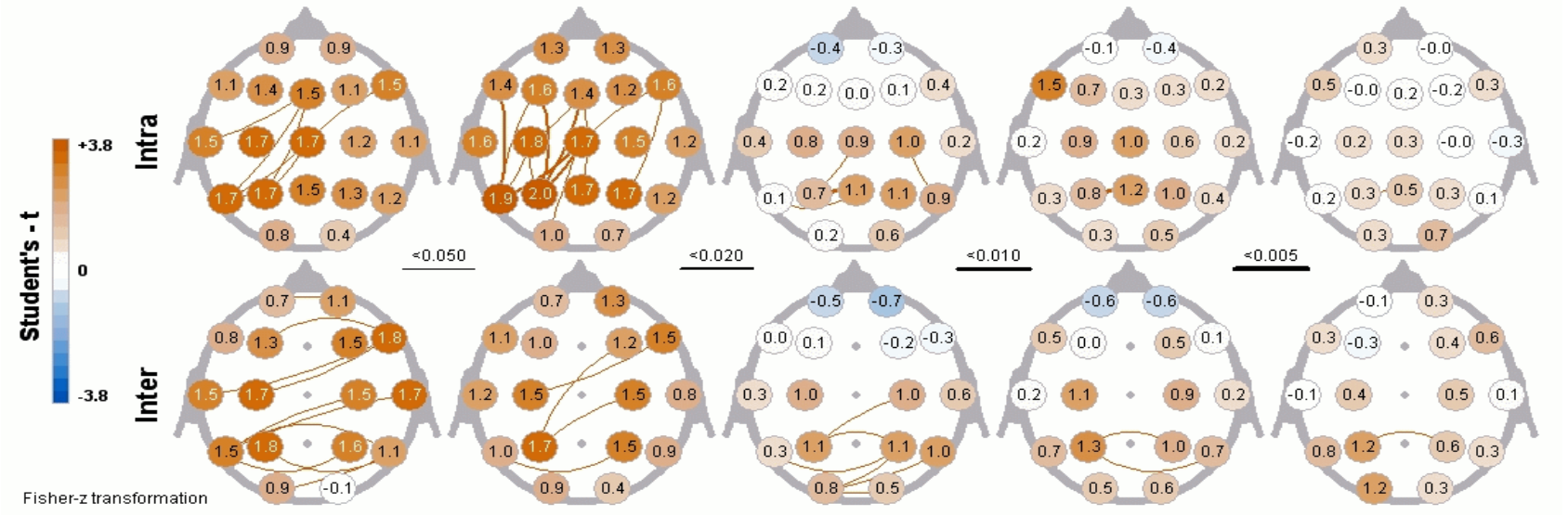
- First Pre Min: $p < .0005$
- First Pre Max: $p < .005$
- First Pre Range: $p < .002$
- Last Pre Min: $p < .003$
- Last Pre Max: $p < .005$
- Last Pre Range: $p < .03$
- 1st pre range – last pre range: $p < .05$





QEEG Changes





Results: QEEG Connectivity

- Global Connectivity (nZ) pre – post, $p < .04$ (sign test). 77% of sample showed decrease in connectivity anomalies.
- First Pre IR Min – Last Pre IR Min, $p < .003$ (sign test). 87% of sample raised min IR temp.
- IR min change – nZ EO change: $r = 0.44$. Linear regression model $R^2 = .20$, $p < .02$. Changes in connectivity lead to increases in temp and CBF.
- Severity and Time since injury are unrelated to connectivity and infrared changes changes.

Conclusions

- The many effects of TBI can be treated effectively with pirHEG.
- Time since injury and severity of injury are not barriers to improvement.
- Reduces headaches and improves cognitive, behavioral and personality issues common in TBI.
- pirHEG leads to global improvements in cerebral connectivity.
- This leads to enhancement of CBF and greater regulation of cerebral activity, which translates into clinical improvements.