Passive Infrared Hemoencephalography for Traumatic Brain Injury:
A Preliminary Investigation

Near Infrared Hemoencephalography for Right Frontal Dysfunction

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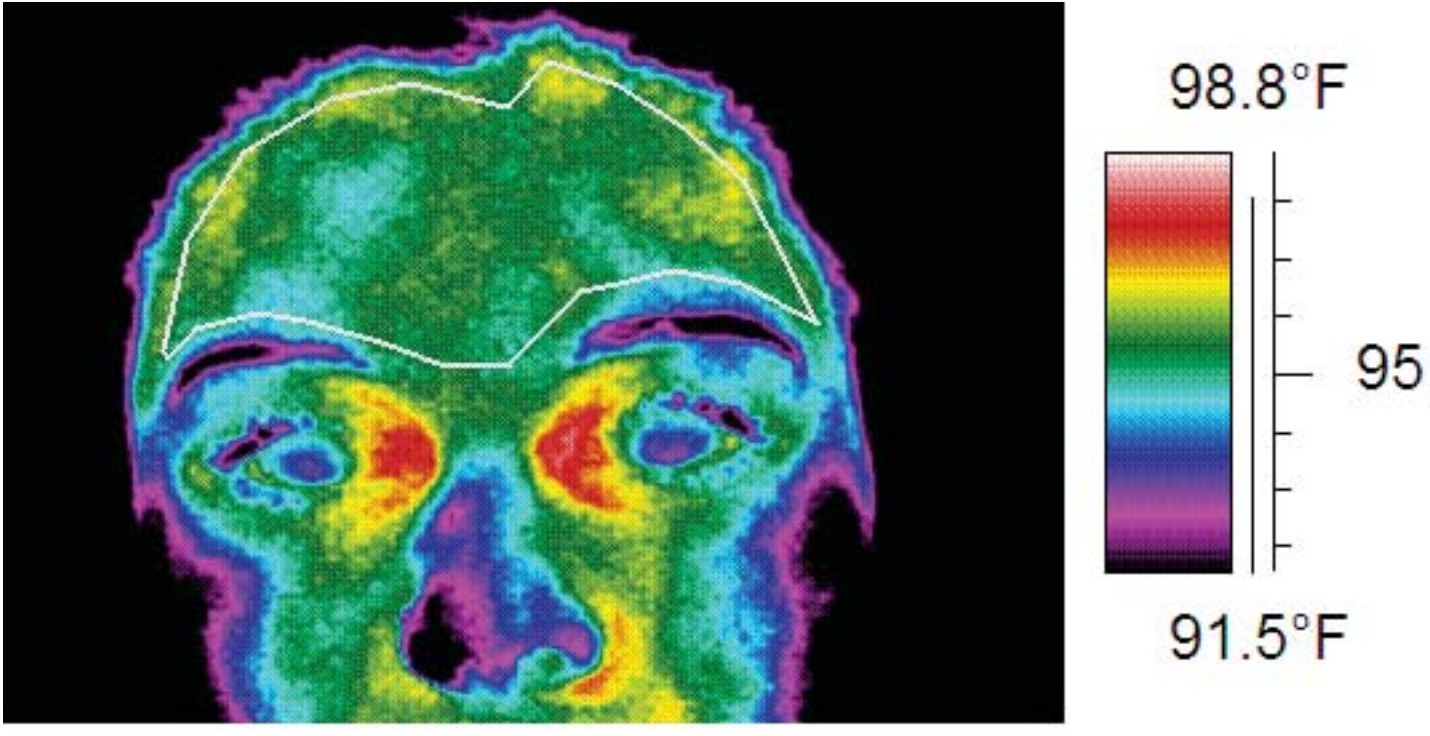
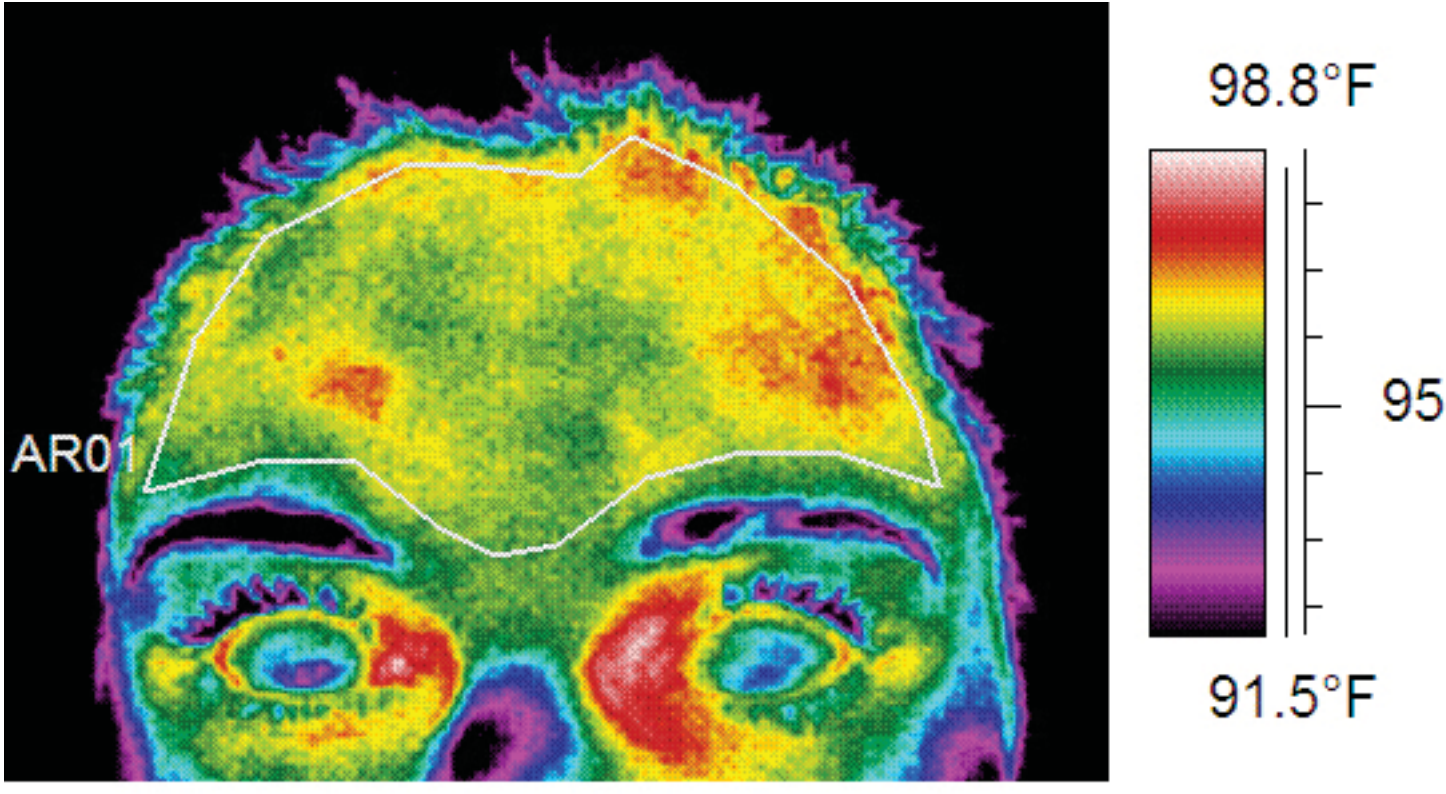
nirHEG

Near Infrared Hemoencephalography
Over the right frontal region, including Fp2, AF8, AF4
Feedback with DVD movies and/or Gamecube video games
Duration anywhere from 15 to 30 minutes depending on tolerance
Two times per week

Infrared Image – Sample pre



Infrared Image – Sample post



Methodology

Patients selected with known or suspected right frontal dysfunction. Information from NP testing, NB assessment, qEEG, and Infrared Image critical for this determination. Assessment guided HEG. Various diagnoses as presented below.

Baseline Neuropsychological testing, Neurobehavioral assessment, qEEG, and Infrared image.

nirHEG for 20 sessions.

Pre and Post infrared images at each session.

Post Neuropsychological testing, Neurobehavioral assessment, qEEG and Infrared image.

Patient Sample

N = 18

Gender: 13 males, 5 females

Race: 17 Caucasian, 1 African American

Age: Mean = 17.24, SD = 3.37, Range: 4 -50

Handedness: 15 RH, 1 LH, 2 Mixed

Marital Status: 14 single, 2 married, 2 separated/divorced

Education: Mean = 6.56 years, SD = 1.28, Range: 0 - 18

Patient Sample (cont.)

- Number of Medications: 10 None; Mean = 1.06, SD = 0.35, Range: 0 – 5

- Diagnoses:
  - 7 ADHD
  - 1 Cognitive Processing Disorder
  - 5 ASD
  - 3 TBI
  - 4 Explosive Disorder
  - 2 CVA
  - 1 LD
  - 2 Secondary Depression

Treatment Success

Treatment Success was defined as patients or parents stating improvement occurred coupled with evidence of gains on NP/NB assessment with no evidence of worsening.

With this definition, 16 of our 18 patients improved over the course of treatment – 89%.

qEEG findings 100% consistent with treatment success classification.

Results - Neuropsychological testing

Memory: $p < .18$, ns

Attention: $p < .05$, 30.63rd – 50.72nd %ile

IVA FS Response Control: $p < .08$, 97.6 – 109.2, increase of .80 sd

IVA FS Attention: $p < .09$, 89.8 – 108.8, increase of 1.33 sd. Of those below 85, average increase of 39 points

Executive Functions: $p < .0002$, 22.24th – 55.72nd %ile

Results – Neurobehavioral Assessment

- PIC-2 Psychological Discomfort: $p < .01$, 75 – 60.17 (T-scores), decrease of 1.5 sd
- PIC-2 Withdrawal: $p < .05$, 60.17 – 50.67, decrease of 1 sd
- BRIEF GEC: $p < .04$, 62.89 – 55.11, decrease of .77 sd
- BRIEF BRI: $p < .07$, 64.11 – 54,89, decrease of 1 sd
- BRIEF MI: $p < .05$, 60.11 – 53.78, decrease of .63 sd
- BRIEF Emotional Control: $p < .05$, 63.44 – 53.33, decrease of 1 sd
- BRIEF Initiation: $p < .04$, 61.25 – 54.38, decrease of .7 sd
- BRIEF Plan/Organization: $p < .09$, 57.11 – 52.22, decrease of .5 sd
- BRIEF Organization: 9 < .05, 54.25 – 49.37, decrease of .5 sd
- **NBAP Depression: $p < .001$, 63.86 – 41.9, decrease of 2.2 sd**

Results – Infrared Imaging

Initial pre range – Last pre range: $p < .07$, 3.77 – 3.45

Initial pre minimum – Last pre minimum: $p < .02$, 92.8 – 93.8

Initial pre maximum – Last pre maximum: $p < .08$, 96.6 – 97.27

Initial pre minimum – Initial post minimum: $p < .00002$, 93.69 – 97.28

Results – Infrared Imaging by Localization

Initial pre R – Initial post R: $p < .01$, 94.5 – 95.5

Initial pre M – Initial post M: $p < .04$, 94.71 – 95.46

Initial pre L – Initial post L: $p < .02$, 94.73 – 95.57

Initial pre R – Last pre R: $p < .09$

Initial pre M – Last pre M: $p < .07$

Initial pre L – Last pre L: $p < .04$

Results – Infrared Imaging

All regions change on the last session as well

1st Rt	1st Mid	1st Lt	Last R	Last M	Last L
1.03	0.69	0.84	1.02	0.72	0.72

What does it mean?