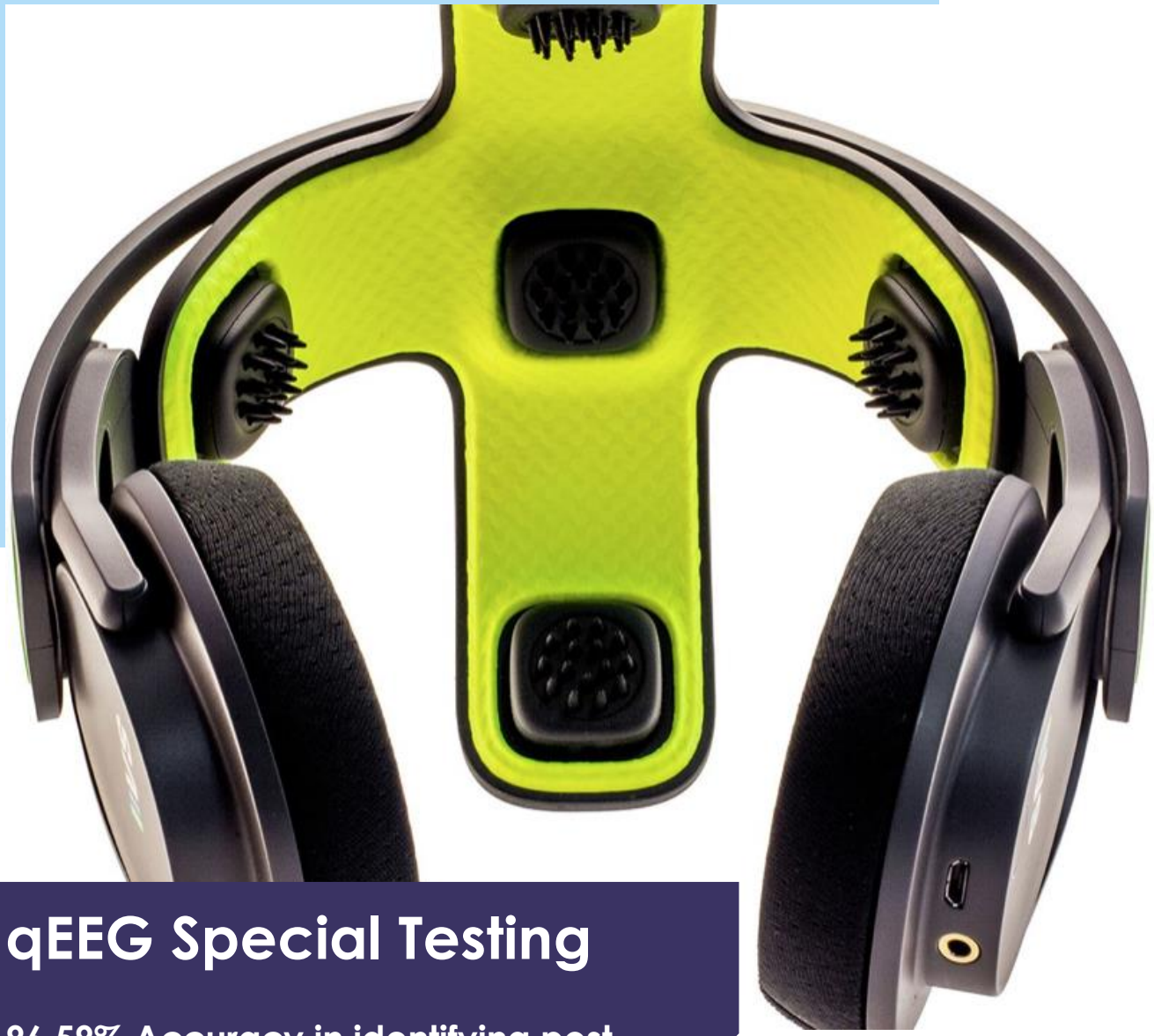
Functional Brain Imaging for Concussion!



qEEG Special Testing

96.59% Accuracy in identifying post-concussion syndrome after motor vehicle accident injury.

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Electrophysiological Brain Wave Analysis: How it Works!

When a mild traumatic brain injury occurs, there are electrophysiologic abnormalities that are visible on electroencephalography (EEG) recordings through changes in the electrical brain wave activity.

Quantitative EEG performs a spectral analysis which evaluates brain activity of neural networks associated with sensor position and digitize this activity so it can be analyzed mathematically with Artificial Intelligence.

Concussion Special Testing Options:

- CT Scans: These rule out significant trauma such as bleeding in the brain, but does little to evaluate the presence or effect of concussion on an individual.
- EEG: This test detects electrical activity in your brain, but research has shown that it is not useful as a routine screening measure among individuals with mTBI or post-concussive symptoms.
- PET, fMRI's and Certain Biomarkers such as GFAP and UCH-L1 have promise, but do not have the reliability currently to be used exclusively. These tests are also expensive and not available to the general population at large.
- Medical Assessments: Chiropractors, Medical Doctors, Neurologist, Psychologist and Neuropsychologists can be used to perform physical examinations of those with concussion. However, most concussion symptoms are subjective, and these doctors cannot perform objective diagnostic testing in office. This results in varying opinions of injury and impairment within the same profession and between professions.
- qEEG – Gold Standard, please see below.

The Committee on Sports-Related Concussions in Youth writes in *Sports-Related Concussions in Youth: Improving the Science, Changing the Culture,* **that QEEG "can detect differences in performance and neural responses in concussed versus non-concussed student athletes." And "Research results suggest that QEEG techniques could provide a more effective means to identify athletes with impairments following concussion."**

The authors found that in concussed individuals, "QEEG showed immediate reduction in mean alpha frequency, with increased theta, increased delta, or increased theta alpha ratio."

Ianof and Anghinah concluded QEEG "appears promising as a diagnostic assessment for mTBI and post-concussive symptoms."

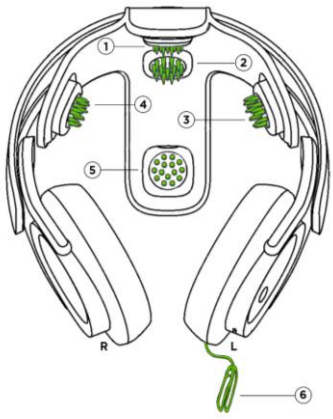
86 Billion Neurons in the Human Brain….. Now we can see how and if they are functioning!

Brain Electrophysiological Results

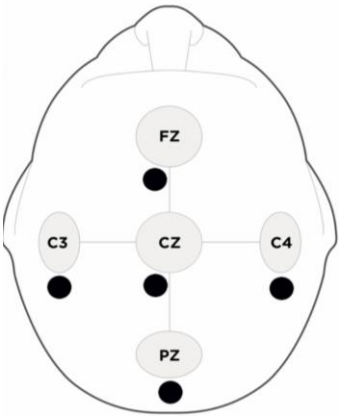
When the Brain is activated localized electrical current is produced which qEEG can measure in Amplitude values. With an injury, a change in normal Amplitude values will present!

Our Device

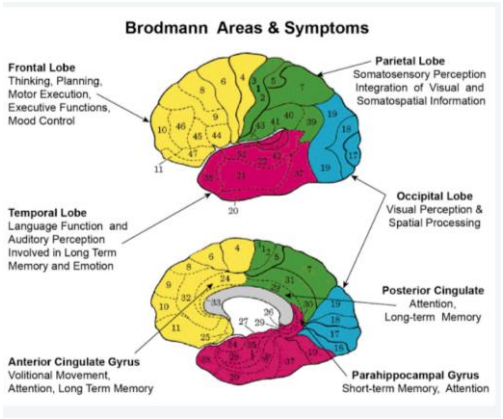
1. **Fz:** Located over the Prefrontal Cortex.
   - •Attention Regulation
   - •Emotional Inhibition
   - •Processing
2. **Cz:** Located over the Sensorimotor Cortex.
   - •Attention Regulation
   - •Sensorimotor Integration
3. **C3:** Located over the Sensorimotor Cortex.
   - •Short-Term Memory
   - •Attention Regulation
   - •Sensorimotor Integration
4. **C4:** Located over the Sensorimotor Cortex.
   - •Attention Regulation
   - •Sensorimotor Integration
5. **Pz:** Located over the Midline Parietal.
   - •Spatial Orientation
   - •Attention Shifting
   - •Sensory Vigilance
6. **Ear Clip:** Serves as the ground and reference.



What We Test



How We Evaluate Injury



What the Experts have to Say…

"qEEG is particularly suitable for the evaluation of post-concussion syndrome, as it is empirical objective, nonintrusive and have been shown to be highly accurate in identifying and discriminating various neurophysiological patterns of brain dysfunction." (Duff 2004)

"Post-concussion qEEG analysis can detect a person's abnormal brain patterns related to post-concussion headaches and is associated with the qEEG Theta/Beta Ratio." (Linden 2004)

There have been "Approximately 1,672 citations to peer reviewed journal articles in which a quantitative EEG was used to evaluate traumatic brain injury". (Budzynski 2009)

1. Duff J: Clinical EEG and neuroscience: official journal of the EEG and Clinical Neuroscience Society (ENCS) 35(4):198-209 · November 2004
2. Linden M: The Effects of qEEG-Guided Neurofeedback on Post-Concussion Syndrome. Biofeedback. Vol 43, Issue 1, pp. 42-44.
3. Budzynski T, Budzynski HK, Evans J, Abarbanel A: Introduction to Quantitative EEG and Neurofeedback. Advanced Theory and Applications. Second Edition. Elsevier. 2009

Medical Legal Approval

- ***In 16-000324 v. Wawanesa Insurance, (CanLII 2299 (ON LAT), the Arbitrator included qEEG as a special medical test described by s. 15(1)(a) of the schedule.***
- ***Duff states, "*** qEEG is particularly suitable for the evaluation of post-concussion syndrome, as it is empirical objective, nonintrusive and have been shown to be highly accurate in identifying and discriminating various neurophysiological patterns of brain dysfunction." Duff J: Clinical EEG and neuroscience: official journal of the EEG and Clinical Neuroscience Society (ENCS) 35(4):198-209 · November 2004
- ***Budzynski states, "***There have been "Approximately 1,672 citations to peer reviewed journal articles in which a quantitative EEG was used to evaluate traumatic brain injury". Budzynski T, Budzynski HK, Evans J, Abarbanel A: Introduction to Quantitative EEG and Neurofeedback. Advanced Theory and Applications. Second Edition. Elsevier. 2009.
- ***The US Supreme Court states, "***Thatcher showed that qEEG met the four factors of the Daubert criteria: (a) hypothesis testing, (b) estimates of error rates, (c) peer reviewed publication and (d) general acceptance (Daubert v. Merrell Dow Pharmaceuticals, 61 U.S.L.W 4805 (U.S. June 29, 1993)). Thatcher also argued that the technical aspects of QEEG in measuring the effects of neurological and psychiatric dysfunction match the Supreme Court standards of "technical" and "other specialized" knowledge (General Electric Co v. Joiner, 1997; Kumho Tire Company, Ltd. v. Carmichael, 1999). QEEG "scientific," "technical" and "other specialized" knowledge meet the standards of the Supreme Court rulings, thereby supporting QEEG as an admissible and clinically valid method in the evaluation of the nature and severity of neuropsychiatric disorders". Thatcher RW, Biver CJ, North DM. Quantitative EEG and the Frye and Daubert standards of admissibility. Clin Electroencephalogram 2003; 34(2):39-53}.