Personalized, Repetitive Trans-cranial Magnetic Stimulation (PrTMS): A Non-invasive Therapeutic Approach for the Treatment of PTSD and other Neurocognitive Disorders

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Typical Neuronal Response to Trauma

- Whether from tumor, surgery, chemotherapy, radiation, physical (concussion) or emotional trauma…

Neurons **slow** their oscillation or frequency (number of cycles per second or Hz)

And become **irregular and disorganized** in their frequency
Typically, Drugs are used to Manage the *Symptoms*. Drugs do NOT address the root of the problem. Operate at the Synapse Level.
Drawbacks of Medical Management (Drugs)

• Non-specific, affects whole brain functioning
• Overall effectiveness can be marginal
• Delayed onset of benefits, can be addictive
• Significant side effects of long term use
• Don’t cure the problem, often requiring indefinite consumption
A Better Idea…

Physical or Magnetic Neuro-restoration of the Brain?

“Restoring and/or Maximizing Brain Function and Efficiency Without the use of Drugs”
In PTSD, Executive function areas of brain become disrupted, negatively affecting mood and behavior.
Process Flow for PrTMS (Neuromodulation)

1. Obtain qEEG
2. Data analysis phase
3. Treatment delivery
4. Repeat qEEG for fine tuning
Process Flow for PrTMS (Neuromodulation)

Obtain a qEEG (simple, passive test, takes < 15 min)
**Electroencephalography (EEG)**

Brain firing too fast = hypervigilance, anxiety, lack of impulse control

Brain firing at comfortable, resting rate

Brain firing too slow = lack of focus, depression

- **Gamma waves**: (30 Hz to 100 Hz)
- **Beta waves**: (13 Hz to 30 Hz)
- **Mu waves**: (8 Hz to 13 Hz) and partly overlaps with other frequencies
- **Alpha waves**: (8 Hz to 13 Hz)
- **Theta waves**: (4 Hz to 8 Hz)
- **Delta waves**: (up to 4 Hz)

EEG rhythmic activity frequency bands reflect symmetry formation (rhythmic waves) and symmetry break (desynchronized waves) in the brain.

The electroencephalogram (EEG) is a recording of the electrical activity of the brain from the scalp. The recorded waveforms reflect the cortical electrical activity.

Signal intensity: EEG activity is quite small, measured in microvolts (μV).

Signal frequency: the main frequencies of the human EEG waves are:
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- **Beta waves**: 13 Hz to 30 Hz
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“Neurotypical (normal) EEG shown over 20 seconds of continuous monitoring”

Roughly 10 cycles per sec (Hz) in every lead

Leads on Scalp

Front of Brain

Middle of Brain

Back of Brain

1 sec
Normal Distribution of Brain Wave Energy
Sum-Averaged over time from all 19 leads:
Example Patient is “In-Sync”

Example of Ideal EEG Pattern
Very synchronized and harmonic
Example of Disruption of Brain waves
Personalized, Repetitive, Trans-cranial Magnetic Stimulation has the ability to re-align brain waves.
Most Studied Uses for rTMS to date

• FDA approved device & treatment with reimbursement codes for:
  – Clinical Depression (not responsive to anti-depressant medications)
  – Migraine headache
  – Current methods DO NOT personalize the treatment. ALL patients receive 10 Hz at the same location, same amplitude
PTSD: Slowed frontal processing disorder, combined with anxiety

Patients typically experience the following symptoms:

• Lack of focus, problems with impulse control
• Poor short-term memory
• Difficulty with personal relationships
• Decreased motivation and ambition
• Increased periods of depression, mood swings
• Difficulty reading, focusing, paying attention
PTSD

Example qEEG

Mixed pattern of increased delta & theta wave throughout, with scattered areas of increased beta (anxiety)
Sample of neuro-restoration in patient’s qEEG Following PrTMS for PTSD

01/14/14
01/30/14
02/19/14
03/07/14
Ideal
Observed improvement in self reported emotions following PrTMS

- Self Regulation
- Feeling
- Thinking
- Emotion

○ Pre-treatment  • Post-treatment
36 Vets w/PTSD after 10 PrTMS Sessions (2 Weeks)

- All 36 had anger issues and anger problems while driving prior to treatment. The majority of patients exhibit little to no anger issues after 2 weeks of PrTMS treatment (most after 1st week)

- 17 Carried weapons (knives, hand guns, etc), Few continue to do so after 2 weeks of PrTMS treatment.

- 29 started with tinnitus (ringing of the ear), 28 showed major reduction, most with a complete resolution of symptoms

- 22 started with severe alcohol and/or substance abuse. Majority have lessened or quit alcohol use after 2 weeks of MRT treatment.
PTSD Checklist – Military Version (PCL-M)
Score Change: 61% in 2 Weeks
Process Flow for PrTMS (Neuromodulation)

Obtain qEEG

Data analysis phase

Treatment delivery

Repeat qEEG for fine tuning, and possible tune-up treatment
PrTMS Treatment Center in San Diego

The Medical Synchrony Center
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