**Technology**

Researchers at the VA have designed a novel approach to elucidating a neurophysiological biomarker for PTSD based on electroencephalograph (EEG) recordings during stages of sleep. Using both micro-level quantitative EEG analysis and macro sleep staging, the proposed invention utilizes several neurophysiological signatures centering around coherence and phase delays of EEG waveforms from PTSD patients during sleep and awake cycles. The deviations in EEG waveforms correlate with the severity of PTSD symptoms, providing an objective biological measurement of the psychiatric state in PTSD patients.

The inventor demonstrated proof-of-concept in a pilot study assessing EEG signatures in a cohort of 7 war veterans and 7 age-matched normal subjects. Through the pilot study, the inventor elucidated seven separate putative neuromarkers of PTSD that exhibited significant deviations between the PTSD and control group. Six of these markers were based on EEG coherence, while the seventh was based on EEG phase delay. Overall, the inventor found that intra-hemispheric coherence increased on the right side of the brain in PTSD patients compared with normal subjects during stage 1 and stage 2 of slow-wave sleep. The increase in coherence occurred across multiple EEG waveforms, including alpha, beta, gamma, and sigma. These increases were strongly correlated with increased scores in the patients PTSD checklist (PCL-C), a standard clinical measure of PTSD severity. In addition, a deviation was observed in phase delays of PTSD patients across the sigma band during REM sleep. These results suggest that the EEG neuromarkers could be used for diagnosis of PTSD, quantifying its severity, and assessment of treatment outcomes.

**Opportunity**

Epidemiologic studies indicate that nearly 56% of people will experience a traumatic event in their lifetime, and 8-12% of the general population will develop the criteria for PTSD. The risk of US military veterans developing PTSD is higher than that of the general population, with approximately 17% of active duty soldiers and 25% of reserve soldiers from the Iraq and Afghanistan wars meeting PTSD criteria 3-6 months post-deployment. The global therapeutics market for PTSD was $1.3 billion in 2011, and is expected to grow at a CAGR of 3.2% to reach $1.7 billion by 2019 due to an increased patient population, more veterans returning from active duty, and better diagnostic procedures.

**Competitive Advantage**

The only approved diagnostic assessments for PTSD are clinical rating scales, which can be subjective. The proposed invention presents a new method of diagnosing PTSD in war veterans based on objective EEG measurements, which are standardized across patients and far less variable than rating scales. In addition, the proposed invention could potentially serve as a prognostic indicator to evaluate treatment response in PTSD patients receiving behavioral or pharmacological therapy.

**Partnership**

The Veterans Affairs is looking for a partner to further the development and commercialization of this technology through a license or through a collaborative agreement such as a Cooperative Research and Development Agreement (CRADA).