



## U.S. Marines Use B-Alert EEG to Assess Fatigue and Improve Training with Interactive Neurotechnologies (I-Net)



Subject wearing the EEG Sensor Headset while completing a neurocognitive test.

With funding from DARPA and ONR, Advanced Brain Monitoring EEG Team is working with the USMC at Twentynine Palms training facility to objectively quantify fatigue, sleep debt, and stress and if possible, to relate them to decision-making and cognitive skills relevant to operational performance.

The initial study protocols included a combination of physiology (EEG, heart rate variability, actigraphy, hormone sampling), cognitive test performance and self-reported levels of stress, fatigue and mood acquired at four sessions repeated weekly over the 28-day Mohave Viper training program. Phase one involved instructors, initiating the study with a control group who were mildly sleep-deprived but did not face the full rigors of marines in training. The initial group evaluated what worked in

the operational environment and shaped the implementation of phase two which evaluated two battalions of marines. Subjects were required to undergo EEG, HR, self-reported levels of stress, fatigue and mood and cognitive performance testing at four weekly sessions. The study revealed a decrease in vigor on the POMS self-report as well as increasing sleep debt throughout the program, decreasing accuracy on a vigilance test and overall decreases in HR and increases in HRV—all evidence of fatigue significant enough to negatively impact performance.

In addition to providing foundational research for implementing a comprehensive fatigue management program within the U.S. Military, the 29 Palms study demonstrated the versatility and resilience of the B-Alert headset and software. Subjects wore B-alert systems in tents during the desert warfare training and were exposed to extreme heat. The wireless B-Alert EEG system is also being em-

ployed in an upcoming study using Interactive Neurotechnologies (I-Net) to increase the efficiency of marksmanship training in the classroom and on the field. I-Net is being developed through ABM's partnership with UCLA CRESST and the Learning Chameleon with DARPA funds under the new Accelerated Learning Program, directed by Dr. Amy Kruse. Marksmanship training is unique in that it is highly specific and incorporates classroom study as well as physical skill and expertise. One objective of this study is to further describe psychophysiological indices associated with levels of skill acquisition and associated efficiency measurements as subjects progress from novice to expert in simple and complex task environments. Another study objective is to determine to what extent interventions triggered by neurophysiologic measures can improve performance when compared to controls with no interventions.



Outdoor testing facilities in the desert at Twentynine Palms

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