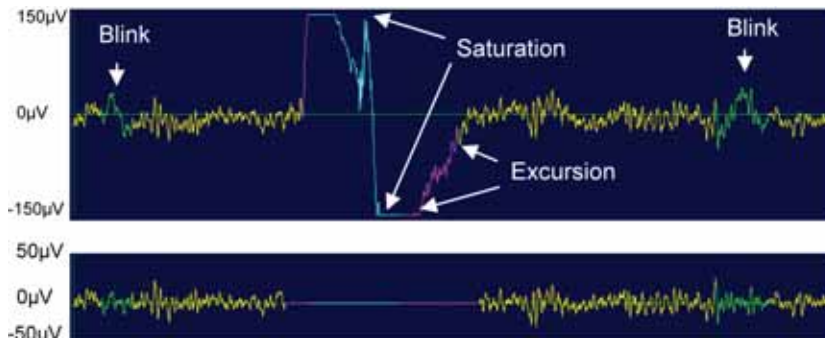


## Continuous Monitoring of Workload over 24-Hour Sustained Operations

For this application the EEG headset was modified so the sensors could be worn under a Kevlar battle helmet. The patented B-Alert artifact identification and decontamination algorithms were applied (e.g., eye blinks, gross head movement, etc.) to the signals and the decontaminated signals and associated power spectra density values were transferred in real time to a third party for their use in a proprietary measure of cognitive effort.

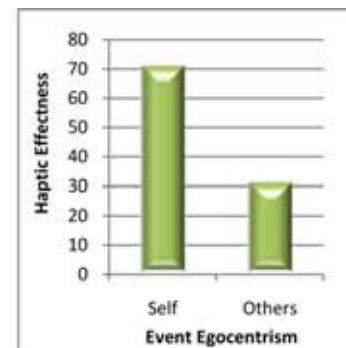
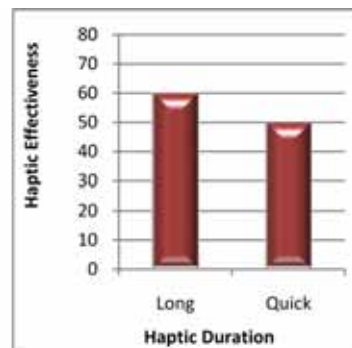
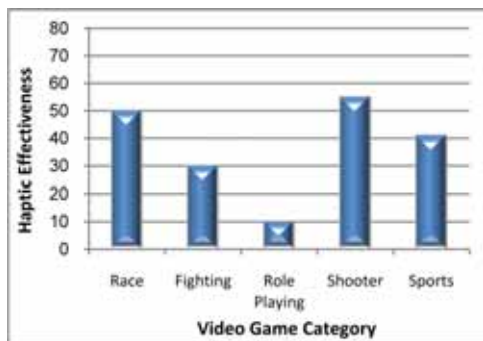
Six members of a 32-member National Guard platoon wore the EEG headset intermittently during a 24-hour sustained training operation at a United States Army training and testing facility. The platoon leaders, platoon sergeants and squad leaders were selected because of the expected variability in cognitive effort imposed as a function of their tactical combat activity and interaction with electronic communication technology. During exercises of entering and clearing buildings in an urban environment with simulated enemy forces and simunitions, approximately 75% of the data were acceptable for analyses using the B-Alert Headset and algorithms.



Mathan S., W. S., Dorneich, M. et al. (2007). Neurophysiological estimation of Interruptibility: Demonstrating Feasibility in a Field Context. *Augmented Cognition*. D. Schmorrow, Nicholson D., Drexler J., Reeves L. Arlington, VA, Strategic Analysis, Inc: 51-58.

## Impact of Visio-Haptic Feedback on EEG Alertness

The use of visio-haptic feedback is increasingly being used to augment and/or substitute for visual or audio cues. To assess the capability of haptic feedback on increased attention/engagement, a study was conducted using a PlayStation 2® gaming console with multiple video games. Game categories were selected based the use of vibrations that occur frequently throughout game and having events that caused different vibrations. Each game lasted between 20 and 30 minutes. The association between haptic events and peaks in the EEG-based high engagement were used to determine effectiveness. Results shows that haptic feedback effectiveness was impacted by both game category and duration of the feedback. Haptic feedback was over 200% more effective during event involving an avatar or virtual player controlled by the user (self) vs. events that occurred in the environment or to another avatar not directly caused by the player (others). These results confirm that haptic feedback provides an effective condition-dependent modality for increasing attention or engagement in virtual reality or simulation training sessions.



Kahol K., French, J., et al. (2006). Evaluating the Role of Haptic Feedback in Multimodal Interfaces through EEG Analysis. *Augmented Cognition: Past, Present and Future*. D. Schmorrow, K. Stanney and L. Reeves. Arlington, VA, Strategic Analysis, Inc.: 289-296.