



US DEPARTMENT OF DEFENSE  
**BLAST INJURY RESEARCH PROGRAM**  
**COORDINATING OFFICE**

## **Neurocognitive Function and Psychological Health Assessment of Subtle Cognitive Changes Following Low Level Blast Exposure**

The neurological deficits of mTBI can be subtle. This may be especially true in cases involving repeated sub-concussive events. Inferential statistics on neuropsychological scores may not be appropriate for detecting between-group differences in these scenarios. A sub-group of individuals with poor performance may be masked by others in the normal range. A more sensitive methodology may be calculating the reliable change interval (RCI) between pre- and post-test measurements, then determining whether individuals fall into this range. Researchers at DVBIC, NMCSO, Space and Naval Warfare Systems Command, NSWC, and the USUHS investigated the RCI as a methodology for detecting neuropsychological deficits associated sub-concussive blast events. The researchers collected pre- and post-test neuropsychological measurements on learning (Hopkins Verbal Learning Test-Revised [HVLTR]), delayed recall (HVLTR DR), processing speed (Trail Making Test Part A), and executive function from Service Members who participated in a combat training course. Participants fired shoulder-mounted munitions while sensors on their person recorded blast events above 2.5 psi. The researchers compared pre-training to post-training measures using three methods: inferential statistics (paired samples t-test), individual change with reliable RCI using a 90 percent confidence interval, and RCI with a correction for practice effects. Service Members experienced a median of five blast events above 2.5 psi in a one-hour period. The paired sample t-test showed no difference between pre- and post-test groups. The RCI methodology showed a larger than expected ( $p < 0.001$ ) number of participants had lower scores on the learning (HVLTR: 15.6 percent) and delayed memory tasks (HVLTR DR: 20.3 percent). The RCI adjusted for practice effects did not appreciably change the number of participants with lower-than-normal scores. The study found that the paired t-test was unable to detect differences between pre- and post-test neuropsychological measures. However, the RCI methodology found that a higher-than-expected percentage of participants with low HVLTR scores after combat training. The results suggest real cognitive deficits are associated with the repeated sub-concussive blast exposure. Specialized analysis of neuropsychological data may be necessary to detect this condition.