The Effects of Traumatic Brain Injury (TBI) on Cognitive Performance in a Sample of Active Duty U.S. Military Service members

Valerie J. Rice[1], Paul J. Schroeder[2], Daniel Cassenti[3], & Gary L. Boykin[1]

[1]AMED Field Element, Fort Sam Houston, TX [2]DCS Corp, Alexandria, VA, & [3]Army Research Laboratory, Aberdeen Proving Grounds, MD

Background:

Traumatic Brain Injury (TBI) is considered one of the 'signature combat-related injuries' from the war in Afghanistan. Since 2000, over 370,000 active duty service members have been diagnosed with TBI. Although research has shown that even mild forms of TBI are associated with impaired cognitive performance, it is not clear which facets of cognition (computation, memory, reasoning, etc.) are impacted by injury. In the present study we compared active duty military volunteers with and without TBI on six measures of cognition.

Methods:

87 US Military service members (34 with symptoms of TBI & 53 healthy) completed:

- Demographic survey
- 6 measures of cognitive performance on the Automated Neuropsychological Assessment Metrics (ANAM) software suite: code substitution learning (CDS) and delayed code substitution(CDD), matching to sample (M2S), mathematical processing (MTH), and two rounds of simple reaction time tasks (SRT and SRT2).

Measured performance metrics were:

- throughput (# correct responses per unit of available response time),
- % of correct responses, and
- mean response time for correct responses (RT).

All data were analyzed using descriptive, frequencies, and multivariate analysis of variance (MANOVA) analyses. A significance level of $\alpha = .05$ was used.

Results:

Participants in both the TBI and healthy groups were predominately male (97% vs. 71%), African-American (60% vs. 71%) and had previously deployed (94% vs. 100%). Participants in the healthy group were significantly older (mean age = 39.13 ±10.15) and had spent significantly longer time in military service (M = 16.14 ± 8.38), compared with participants in the TBI group (mean age = 30.71 ± 7.54 and mean time in service = 9.08 ± 7.11), p's < .0001.

Throughput scores were significantly different between the two groups, $F(6, 80) = 2.30$, $p < .04$, $\eta p^2 = .15$. Participants in the TBI group had significantly lower throughput on the MTH and SRT2 tasks p's < .05. No significant differences were found for CDS, CDD, M2S, and SRT scores p's > .05.

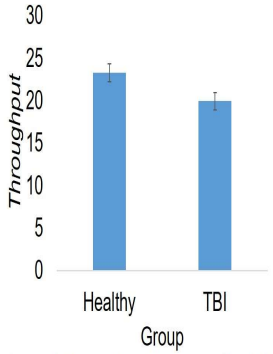

Figure 1. Throughput scores on the MTH

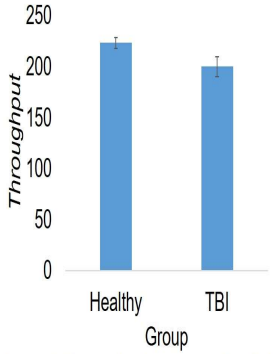

Figure 2. Throughput scores on the SRT2

The *% of correct responses* on the MTH and SRT2 tasks were not significantly different for the two groups, p's > .05,

The combined mean RT's for correct items on the ANAM tasks were significantly different, $F(6, 80) = 2.78$, $p < .02$, $\eta p^2 = .17$. Participants in the TBI group had significantly longer RT's on the MTH (M = 3018.57 ms, ±819.47) and SRT2 tasks (M=330.12 ms, ±129.89) as compared with participants in the healthy group (M = 2562.70 ms, ±800.91 and (M = 278.65 ms, ±63.98), p's < .02.

Conclusions:

The results of the present study indicate that cognitive impairments associated with TBI effect performance on tasks that require working memory and basic neural processing (speed/efficiency). Although response accuracy was similar for TBI and healthy participants, participants with TBI took longer to respond to task items, thus impacting throughput scores. These findings suggest that individuals with TBI may benefit from additional time to encode and process information.