Automated Cerebral Assessment: An effective screening tool for mild TBI
Francis R. Saradeo, Ph.D.,1,2,3 Andrew Karp, M.A.3 & David Petrocelli, BA,4
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Abstract
Mild traumatic brain injury (mTBI) is the most prevalent form of brain injury in the United States. It is often the case that people who have experienced mTBI experience persistent cognitive deficits although there is a body of research that suggests full recovery of cognitive and functional impairment in people above the age of 55. The measure (Cognivue) is the first computerized cognitive assessment device given FDA clearance and is stated to be a method of detection of cognitive impairment that may signal the early phases of progressive dementia. Failure on cognitive in people above the age of 55 successfully predicts functional decline.

Cognivue was created to provide healthcare practitioners with rapid, quantitative assessments of an individual’s cerebral function. Cognivue is related to psychophysics in that it engages an individual in continuous stimulus-response paradigms that demand intervening cerebrocortical processes. Cognivue technology is a non-invasive and non-intrusive computerized assessment device. The viability of Cognivue in detection of cognitive difficulty related to dementia has been supported by a number of investigations. In view of its sensitivity with very early cognitive change in patients who experience prolonged cognitive difficulty it was thought that Cognivue could possibly be a sensitive screening measure of cognitive impairment and function in people diagnosed with mTBI, who are complaining of cognitive difficulty despite being greater than 32 months post-injury.

In this investigation mTBI patients referred for neuropsychological evaluation who had a documented concussion, at least 12 months or greater prior to the referral, were hypothesized to demonstrate impairment on Cognivue as compared to normal controls. The average number of months since the injury was over one year (14 months).

Methods
Subjects
Subjects for this investigation were individuals referred for neuropsychological evaluation who had a formal diagnosis of post-concussion syndrome (mTBI) for a period of time not less than 12 months. Normal Control subjects were healthy volunteers with no history of neurological trauma or disease and no history of ADHD, LD or any other chronic systemic illness. Subjects with mTBI who failed standard validity testing were eliminated from the analysis.

The mTBI subjects and normal control subjects were assessed using Cognivue: There were 24 subjects in the mTBI group and 18 subjects in the Normal Control Group. mTBI was diagnosed according to established criteria of the American Congress Of Rehabilitation Medicine (Mild Traumatic Brain Injury Committee) in 1993, which requires the presence of at least one of the following clinical symptoms: initial loss of consciousness ≤30 min; PTA lasting ≥24 h; a GCS score of 13–14 at time of injury; a GCS of 13–15 after 30 min; altered mental state at the time of the accident (e.g., confusion, disorientation, etc.), or a focal neurological deficit that may or may not be transient. These patients were referred for a neuropsychological evaluation by their neurologist or primary care physician.

Measures
Each subject was introduced to the Cognivue device and the testing procedure was described to the subject. The Cognivue device is pictured in Figure 1.

Figure 1

Figure 2 depicts the Cognivue Testing Algorithm and Figure 3 depicts sample screens for each subtest.

Data Analysis
Analysis of variance (ANOVA) comparing means on age was not significant. The average age for mTBI subjects was 43 and normal was 45. Analysis of Variance (ANOVA) comparing all of the cognitive variables and the composite scores was significant indicating that mTBI subjects performed significantly lower on all measures (perceptual tests and memory tests).

Results

Summary
This investigation compared the mean scores on 10 subtests and a composite score of the Cognivue device of a group of people with mTBI and a healthy normal control group. This is the first known automated test of neurocognitive functioning designed to be sensitive to subtle cognitive changes. The results of this analysis reveals that mTBI patients performed significantly lower on all subtests. These findings are consistent with the patient’s complaints of persistent cognitive difficulty following mTBI. The level of impairment of mTBI group is mild to moderate with only one measure demonstrating severe impairment.

These results validated further research suggest that Cognivue is a viable cognitive screening device that can be used in addition to clinical interviews in addition to treatment programs, primary care offices, chronic pain programs and other specialty medical practices as a method of identifying patients with cognitive impairment. The presence of cognitive impairments impacts medical compliance, specific treatment approaches and general quality of life. A weakness of the Cognive system is it relies completely on the visual system, so visually impaired patients cannot be evaluated with Cognivue.

1. Center for Community Independence, Boston, MA
2. Salve Regina University, Newport, RI
3. Saradeo and Associates, West Warwick, RI
4. University of Massachusetts-Dartmouth, Dartmouth, MA

Correspondence: FSRhydrude@disopad.com