

## **Baseline and Post-concussive Neurocognitive and Physiological Assessments in Minor Student Athletes**

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### **ABSTRACT**

**BACKGROUND:** There is a higher risk of post-concussion syndrome among minor athletes. This has resulted in The Immediate Post-Concussion Assessment and Cognitive Testing (ImpACT), which is currently the primary test for collegiate and high school athletes for concussion assessment and return to play. Previous work from our lab has indicated a significant detection of cognitive deficit with a battery of cognitive testing including the Test of Variables of Attention (TOVA) and dual task testing incorporating balance testing along with the Stroop and number recall. In the previous findings these tests identified cognitive decline including reaction time and fine motor deficiencies either not tested by the ImpACT or determined non-deficient in the Post-concussive participants already determined fit to return to play. However the results from the ImpACT are variable and may not be sensitive enough to detect the same abnormalities in younger minor patients. **PURPOSE:** To determine whether there is a significant difference in neurocognitive function between prepubescent and pubescent minor students age 10-18 during our battery of cognitive testing and if there is a greater decline in function in young minor athletes. Additionally we aimed to compare baseline and post-concussed minors in order to determine whether mild traumatic brain injury causes a change in neurocognitive abilities. **METHODS:** Participants were asked to perform the measurements of the SCAT 3, the dual task Stroop, Minnesota Spatial Recognition (MSR) test, the Perdue Peg Board (PPB), a Reaction Time test (RTT) using a weighted dowel, and the administration of the TOVA to assess the Attention Comparison Score: a composite cutoff score comparing the subject's performance to a study of independently diagnosed ADHD individual. **RESULTS:** Significant declines between the minor concussed and controls were found in the incorrect answers during the Stroop and the follow-up balanced dual task Stroop, Hopkins Verbal Learning Task, dominant right hand RTT, and MSR time and increasing errors for both hands. When comparing the pubescent and pre-pubescent boys control groups there is a significant negative scoring in pre-pubescent scores on left hand RTT, Stroop errors, PPB mistakes, MSR mistakes and time, Dual-task Stroop balance error and number balance correction foot taps. Finally, the TOVA Attention Comparison Score in the concussed versus non-concussed minors indicates a significant difference with the concussed indicating symptoms of moderate ADHD. **CONCLUSION:** The complexities of a large cognitive battery for assessing concussive symptoms for return to play protocols for the minor athletes have been shown in the results from this study. As hypothesized the hour long battery indicates a broad area of significant identification markers of neurocognitive and neurophysiological dysfunction compared to non-concussed. The tests also reveal the difficulties in assessing concussive symptoms in minor athletes as there are a large number of differences in the battery between pre-pubescent and pubescent children.