Neurocognitive Performance and Increased Risk of Lower Extremity Injury after Concussion
Kevin Hanneken, Jennifer L Sanfilippo, Scott Hetzel, Alison Brooks
University of Wisconsin – Madison, Madison, WI.

Recent studies have shown increased risk of musculoskeletal injury for athletes returning to play from concussion. It is possible that subtle deficits in neurocognition and neuromuscular control, such as inhibited concentration, balance, or prolonged reaction times could increase risk of subsequent injury. However, there is little understanding of the variables that may help characterize risk during this time of vulnerability.

**Purpose**: To determine if concussed collegiate athletes with worse neurocognitive or balance performance are at increased risk of acute lower extremity musculoskeletal injury (LEI) following return to play (RTP) from concussion.

**Methods**: This retrospective cohort study examined male (n=70) and female (n=14) athletes participating in NCAA Division I football, hockey, soccer, wrestling, and basketball, who sustained a concussion between June 2011- May 2015. Athletes completed symptom score, computerized neurocognitive (ImPACT - Immediate Post-concussion Assessment and Cognitive Testing) and balance (BESS – Balance Error Scoring System) testing at baseline and post-injury time points (0-4, 5-11, 12-18, >30 days). The remaining academic school year following RTP from concussion was reviewed for acute, non-contact LEI, and athletes were divided into two groups (LEI, No LEI). Differences in total symptom, ImPACT composite, and BESS scores were compared using repeated measures ANOVA.

**Results**: 152 cases of concussion were identified. Following strict exclusion criteria, 104 cases in 84 athletes were used for analysis. 31 athletes sustained 32 LEI between RTP from concussion and the end of the academic school year. After analyzing “change-from-baseline” for total symptom, ImPACT composite, and BESS scores, it was found that there were no significant differences between LEI and non-LEI groups at any time point.

**Conclusion**: There was no significant difference in neurocognitive or balance performance in concussed athletes who sustained LEI after RTP compared to athletes who did not sustain LEI. ImPACT and BESS testing may not be sensitive enough to detect athletes with subtle impairments who may be at increased risk of LEI following concussion. Future studies may utilize different methods, such as the Sensory Organization Test or vestibular-oculomotor deficit testing.