Over 200 million adults and children participate in organized and recreational sports each year. While the benefits of sport participation go without question, the risk for injury is certainly present. Despite substantial effort to understand the various predisposing factors that may contribute to injury, significant risk is inherent with all athletic participation. Researchers are spending considerable effort looking at ways to recognize individuals at high risk for future injury. While a number of mechanical causes for lower extremity injury have been identified, limited information is available on the risk of musculoskeletal injury post-concussion. Concussion has garnered attention recently due to the serious long-term cognitive consequence that may occur from repeated head trauma. This newsletter will review concussion and the current evidence regarding the risk for musculoskeletal injury that may ensue.

Background
Concussions occur at all levels of athletic participation across a myriad of sports. Evidence suggests that up to 3.8 million concussions transpire in sport and recreational activities each year. While the risk of getting a concussion is likely higher in contact sports, all recreation sports likely possess some risk for head injury. Reports indicated that up to 19% of rugby and football players are likely to suffer a concussion during their respective seasons. Evidence also suggests that repeated concussions increase the potential for long-term cognitive, emotional and physical consequences. Thus, recent research efforts have focused on ensuring an athlete is ready to return to sport post-concussion as to avoid further brain injury. However, until recently, the literature has been void of information regarding the risk of musculoskeletal injury following concussion.
The term concussion is used interchangeably with mild traumatic brain injury (mTBI). An mTBI is an injury to the brain induced by a direct or indirect mechanical blow to the head. According to the Zurich Consensus Statement on Concussion in Sport, a concussion is a brain injury and is defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces. The diagnosis of acute concussion usually involves the assessment of a range of domains including clinical symptoms, physical signs, cognitive impairment, neurobehavioral features, and sleep disturbance. Common symptoms of mTBI may include headache, difficulty concentrating, poor memory, fatigue, dizziness, irritability or emotional lability, insomnia, sensitivity to light, and others. While most individuals will recover within 3 months, some will continue to display symptoms after this time.

Diagnosis

While a majority of concussed individuals will display symptoms immediately post-injury, there is a subset who many not show signs of mTBI for days or weeks after the initial injury. (CDC) The CDC’s HEADS UP program recommends health care practitioners that treat concussed individuals use the Acute Concussion Evaluation (ACE) form to guide the examination post mTBI and increase the likelihood of a correct and timely diagnosis. The ACE contains 3 components that look at injury type, the kind and severity of symptoms, and the risk factors that may lead to a prolonged recovery. The concussed individual should be seen by a qualified medical professional who will perform a comprehensive medical evaluation. The qualified medical professional will be able to order the appropriate tests to confirm the diagnosis and rule out any alternative causes for symptom presentation.

Management

Athletes who suffer an mTBI must be carefully managed under the guidance of a qualified physician, a certified athletic trainer, and the entire sports medicine staff. Rest is a key component to the recovery process, and patients should be encouraged to get adequate sleep and nap during periods of fatigue. Current guidelines do not allow for the return to activities while symptoms persist. An athlete will be permitted to begin a five stage graded Return to Play Protocol (RTP) under the supervision of a certified athletic trainer if available following complete symptom resolution and after having passed a physical and neuropsychological test administered by a physician. If there is an inability to properly progress through the RTP protocol, then the steps will be held as needed. When approved by a physician, balance screening may be indicated to address potential deficits and assure a full recovery allowing for a safe return to play.

Considerations for Rehabilitation Post-Concussion:

While efforts have focused on increasing awareness and diagnosis of mTBI, little is known about the prolonged effects on physical performance, motor control, and the subsequent risk of injury once an athlete has been cleared to return to sport. Early evidence demonstrated clear alterations in balance immediately post-concussion, while recent studies have examined the long-term effects on physical function and the resulting risk of injury. Evidence also suggests that repeated concussions play a role in persistent functional defects.

In 2001, Guskiewicz et al investigated the effects of concussion on postural sway in collegiate athletes 1-5 days post-concussion. Using two different measures of postural stability and balance, the authors noted significant postural stability deficits during the immediate post-injury period. The most significant difference between groups was noted at 2 days post-concussion and prior. By day 5, most concussed participants had returned to baseline. This article suggested that early motor control changes occur and may improve to baseline within 5 days of injury.

In 2007, De Beaumont et al published a paper looking at the long-term effects of concussion on motor performance. By using a procedure called transcranial magnetic stimulation to evaluate motor cortex function, they compared controls with and without a history of concussion, those who had a past history of concussion, and those who had sustained 2-5 concussions. The author’s conclusion was that chronic subclinical motor system dysfunction persists long after clinical symptom resolution, and that multiple concussions exacerbate the problem.

In addition to pure motor deficits, Catena et al (2007) examined the effects of adding a cognitive component during gait to assess difficulties with dual task activities. Athletes were assessed 48 hours post-concussion performing dual tasks such as continuous questioning with random audible cuing while walking. Concussed individuals were noted to have significant gait alterations including a conservative gait strategy and increased trunk sway. It is reasonable to assume this would be magnified in the athletic environment where the athlete is typically facing multiple task challenges simultaneously.

While all the aforementioned evidence would certainly suggest an increased risk of injury in previously concussed individuals during sports, it was not until recently that a study was published validating that hypothesis. Just this year, researchers from the University of North Carolina published an article on the incidence of acute lower extremity injury following concussion in college athletes. They followed concussed athletes for 1-year post injury and compared them to a non-concussed control group of athletes during the same time period. Data was abstracted from the University’s electronic medical record. An injury was deemed to have occurred if recorded by an athletic trainer or the team physician and was documented in the medical record. Only acute lower extremity injuries were included in the final analysis. Injury rates were compared at 3 periods: 90 days post-concussion, 180 days post-concussion, and 365 days post-concussion. The results demonstrated that concussed athletes demonstrated a significantly higher rate of lower extremity injury at 180 days and 365 days post-concussion. The authors concluded that despite symptom resolution, college athletes were almost twice as likely to suffer a lower extremity injury following an mTBI.

With this growing body of evidence, it is reasonable to think that concussed individuals may benefit from physical therapy following symptom resolution to address lingering motor control deficits. While there is currently no direct evidence for the efficacy of physical therapy in the asymptomatic concussed athlete, the aforementioned reports certainly dictate further consideration on this matter. The athlete returning from mTBI should be watched closely for alterations in physical performance and any signs of altered motor control should be addressed. Strong consideration should be given for physical performance and balance testing following the resolution of symptoms. The experts at FYZICAL® Therapy and Balance Centers are capable of addressing both the musculoskeletal pain and balance needs of the post-concussed athletic population.