

## [ Editorial ]

# Return to Sports After Concussion

Sports-related concussion continues to haunt athletes, parents, coaches, and sports medicine clinicians like no other injury associated with athletics. Hardly a week goes by without a news report or publication on another worrisome statistic or victim. Reporting of the injury by athletes remains an issue due to the known consequences and the desire to “stay in the game.” Although reporting has likely improved with the increased education of athletes, many episodes of head trauma that produce mild symptoms remain in the “gray zone.” There remains a lot of uncertainty about some mild episodes of head trauma.

Once the diagnosis of concussion is made, the daunting task of determining if and when the central nervous system (CNS) returns to normal function begins. With slowed mental performance and learning difficulties well documented, student life can be compromised. While most of these learning difficulties are temporary, more worrisome is the later-life potential for premonitory mental deterioration resulting from chronic traumatic encephalopathy (CTE), *if* it occurs. Evaluating the function of the CNS is a critical determinant not only for safe return to play but for long-term mental health. Consequently, numerous mental, physical, and neuropsychological testing systems have been devised to challenge the recovering athlete. The success and validity of these testing systems can be judged in both the short and long terms. In the long term, successful return-to-play screening would likely mean the absence of premature mental deterioration, while in the short term, return to normal mental and physical functioning. Herein lies the current dilemma: We won't know the long-term outcomes of current return-to-play guidelines for years to come. Hopefully we're on the right track. Unfortunately, there are indications that the short-term outcomes of recent guidelines for return to play are not good, which may hint at what we'll face in the long term.

To explain this further, it is appropriate to examine the musculoskeletal injury rates for athletes after return to play following concussion. I think it's reasonable to assume that if an individual athlete is fully recovered from a concussion, the musculoskeletal injury rate should be no different than that for an athlete who has never been concussed. If neuro response times, reflexes, and coordination have returned to normal parameters, we would hope that injury rates in previously concussed athletes would not be elevated. But the facts are that several recent musculoskeletal reports on previously concussed

athletes suggest that musculoskeletal injuries are higher after return to play. In 2015, Lynall et al<sup>6</sup> reported that college athletes who had suffered a concussion were 1.97 times (95% CI, 1.19-3.28;  $P = 0.01$ ) more likely to experience an acute lower extremity injury within 1 year compared with that before a concussion. In 2016, Brooks et al<sup>2</sup> reported in a study of NCAA Division 1 football, soccer, hockey, softball, basketball, wrestling, and volleyball athletes that the odds of sustaining an acute lower extremity injury during the 90-day period after return to play were 2.48 times greater in concussed athletes than controls (95% CI, 1.04-5.91;  $P = 0.04$ ). Gilbert et al,<sup>3</sup> also in 2016, showed a significant association between concussion and lateral ankle sprain ( $P = 0.012$ ) and knee injury ( $P = 0.002$ ) in collegiate athletes from 13 sports. Most recently, Herman et al<sup>4</sup> reported that in men's football and women's lacrosse, soccer, and basketball, the odds of sustaining a musculoskeletal injury were a shocking 3.39 times greater in concussed athletes (95% CI, 1.90-6.05;  $P < 0.01$ ). All 4 of these recent reports suggest that these athletes were not back to “normal” from a neuromuscular standpoint and, consequently, were at greater risk for injury. While the musculoskeletal injuries sustained in these athletes are of concern, most will recover. More important, however, is the suggestion that the screening methods used to judge return to play in these studies were not sensitive enough to detect deficiencies in neuro performance that led to a higher rate of injury. It is true that even the most recent report cited<sup>4</sup> reviewed athletes' injuries back to 2006, so there is hope that more recent guidelines will perform better in identifying those with deficits and delaying their return to play.

As knowledge of concussion pathology, society's attitudes toward concussion,<sup>7</sup> and the physical<sup>8,9</sup> and neurocognitive<sup>1</sup> testing systems available for concussion assessment improve, it is my hope that safer screening systems for return to play will evolve. Publications related to this concussion dilemma are found in this issue of *Sports Health*.<sup>1,7-9</sup> Furthermore, a detailed clinical review by Lepley et al<sup>5</sup> on eccentric exercise to enhance neuromuscular control offers rehabilitative hope for those who suffer a concussion and musculoskeletal injuries. It is a step away from traditional training and conditioning but may offer improvement for those slowed by the effects of concussion. Let's hope so!

—Edward M. Wojtys, MD  
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