

# Sideline Sports Concussion Assessment



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## KEYWORDS

• Concussion • Sideline assessment • SCAT • Assessment

## KEY POINTS

- The sideline concussion assessment is the first line of defense in preventing a player from sustaining more severe effects from concussion through the rapid and accurate detection of concussion during a practice or in competition.
- Sideline assessment of concussions is a complex multisystem assessment to detect whether an athlete is evidencing signs or symptoms of concussion and should be removed from practice or competition.
- Sideline concussion assessments are challenging given some of the environmental conditions, substitution rules of some sports, possibility of athletes underreporting symptoms, and the difficulties of defining a concussion.
- Concussions can evolve or worsen over time and serial assessment of concussions acutely is important and critical.

Concussions are one of, if not the, single most prominent medical issue in sports today. There are more than 8 million athletes participating in organized competitive sports at the high school and collegiate level annually with many playing in a contact sport.<sup>1</sup> One of the most difficult aspects of sports concussion is the initial diagnosis during a competition.<sup>2,3</sup> It is critical to identify a concussion that occurs during a competition as soon as possible and to be able to remove a player immediately because of the significant risk of short- and long-term neurologic consequences of playing concussed.<sup>4</sup>

Although the understanding of sports-related concussions (SRC) and diagnostic ability have improved tremendously over the past several years, the ability to accurately and quickly diagnose a concussion during competition is an extremely complex and challenging task<sup>5</sup> for several reasons: (1) players often underreport concussion

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symptoms during competition and feel pressured to continue playing while concussed<sup>6-11</sup> or simply may not be aware they sustained one; (2) most concussions do not involve loss of consciousness or any pathognomonic neurologic signs<sup>12</sup>; (3) there is not a single, truly objective measure of concussion<sup>13</sup>; and (4) constraints placed on the evaluation by the rules of the sport (limited substitution or time limits for evaluation) makes the task of accurately diagnosing concussion during a competition that much more daunting. The current adage of “when in doubt, sit them out” is easy to apply to the youngest athletes, but it gets harder and more complicated as the competition and importance of the game (ie, higher level collegiate and professional) comes into play. This places a lot of pressure on the health care provider tasked with the responsibility of either detecting a possible on-field concussion during competition or practice (referred to as a spotter), or accurately diagnosing it once the player has been removed to be evaluated.

As described by McCrea and coworkers,<sup>2</sup> the last 20 years or so has seen a concerted effort to standardize the sideline assessment of concussion with the development of more objective, performance-based techniques that improve specificity and sensitivity. This article reviews the current state-of-the-art tools in acute assessment of concussion during athletic competitions on the sideline, bench, or on the pitch. We review the current standard of care, the components involved in the sideline assessment, and the sensitivity and specificity, and critique the current literature and make recommendations for future practice.

## DEFINITION OF CONCUSSION

Before discussing how to diagnose an SRC it is important to have a clear definition of concussion. This is what makes having specificity and sensitivity in concussion diagnosis difficult. Unlike many other neurologic disorders/diseases, concussions have no pure pathognomonic finding (short of loss of consciousness) or any true gold standard in making a diagnosis. The multifactorial signs and symptoms of concussion overlap with many other disorders that occur during athletic competitions (eg, heat stroke or dehydration). Therefore having a clear and accurate, and as objective as possible, definition of concussion can help improve the actual diagnosis.

Traumatic brain injury (TBI) is often considered a blunt trauma to the head causing acceleration/deceleration or torqueing (rotational shearing) of the brain resulting in one or more signs or symptoms, such as brief (<30 minutes) loss of consciousness, retrograde or posttraumatic amnesias, confusion, disorientation, various somatic or physiologic symptoms (eg, sensory sensitivity, dizziness, impaired balance), and memory impairment.<sup>14</sup> TBI severity is defined along a continuum from mild to severe with mild TBI typically defined as a Glasgow Coma Scale (GCS) of 13 to 15 with loss of consciousness less than 30 minutes and posttraumatic amnesia of less than 24 hours.<sup>15</sup>

Oftentimes SRC and mild TBI are interchangeably used, however concussions are typically considered to be on the milder end of mild TBI<sup>16</sup> because there rarely is loss of consciousness (<10% of the time<sup>17</sup>) and rarely is there retrograde and posttraumatic amnesias lasting a few hours. Some groups have altered the definition of concussions as it pertains to sports. For example, the fourth international conference on concussions in sports in 2012 defined a concussion as “a complex pathophysiological process affecting the brain, induced by biomechanical forces...” caused by a direct blow to, or “an impulsive” force, transmitted to the head.<sup>3</sup> Inclusive of this definition is unremarkable standard structural neuroimaging. However, others have noted subtle structural changes associated with concussions.<sup>18,19</sup> More recently, others have advocated for diagnosing concussions along a continuum of possible, probable,

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