

Abstract: Neuropsychiatric Aspects of Sport-Related Concussion

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Sport-related concussion (SRC) is a common form of traumatic brain injury, particularly among adolescents and young adults participating in contact-collision sports. Global estimates suggest 42 million concussions occur annually, with up to one-third attributed to sports or recreational activities. Despite its prevalence, accurate incidence rates are difficult to determine due to variations in definitions, surveillance systems, and underreporting. In collegiate athletes, concussion rates average 4.13 per 10,000 athlete exposures, with the highest rates in men's ice hockey and women's soccer.

The 6th International Conference on Concussion in Sport defines SRC as resulting from biomechanical forces transmitted to the brain, initiating metabolic and inflammatory changes that can lead to a constellation of clinical symptoms. Symptoms may appear immediately or evolve over time and typically resolve within days to weeks. Diagnosis is primarily clinical, as standard imaging is often normal. The SCAT6 tool is valuable for acute assessment, although its utility diminishes beyond 72 hours post-injury.

Recovery from SRC generally occurs within four weeks; however, about 10% of athletes experience persisting symptoms beyond this period. These symptoms, which may include headache, dizziness, cognitive dysfunction, sleep disturbances, anxiety, and depression, are often not indicative of ongoing structural brain injury but reflect maladaptive recovery. Several risk factors increase susceptibility to developing concussion, including repetitive head impact as well as psychological factors such as meanness, aggression, and psychoticism. Pre-existing mental health symptoms, family history of mental health disorders, significant life stressors, and sleep dysfunction are associated with an increased likelihood of developing persisting symptoms following concussion.

Emerging studies have begun to assess long-term mental health outcomes related to SRC and repetitive head impacts, though few provide objective concussion metrics. Current evidence does not suggest increased rates of depression or suicide among former athletes, including American football and professional soccer players, despite their exposure to head trauma.

Management strategies emphasize early, active rehabilitation. Sub-symptom threshold aerobic exercise initiated within 2–10 days post-injury reduces the likelihood of persistent symptoms and may alleviate ongoing mental health issues. Cognitive rehabilitation and neurocognitive training are also beneficial, especially for attention and executive function deficits. Addressing sleep dysfunction is critical, though specific post-concussion sleep disorder protocols remain underdeveloped. There are no approved pharmacological treatments for mental health symptoms post-concussion; interventions should be tailored to individual clinical presentations.

Elite Para athletes represent a unique population in SRC management due to the interplay between their primary impairments and the effects of concussion. Standard diagnostic tools like SCAT are not yet validated for this group, though adaptations (e.g., Para SCAT-WC) are in development. Para athletes may underreport concussions, and baseline evaluations are especially important. Modifications in exercise protocols and academic accommodations should be considered in their care plans.

In conclusion, while most athletes recover fully from SRC, a significant minority develop persistent symptoms with neuropsychiatric implications. Ongoing research, individualized care approaches, and validated assessment tools—especially for diverse populations such as Para athletes—are essential for advancing effective management and prevention strategies.