

# Post-Concussion Syndrome

BY DAVID COPPEL

Over the last decade, sport-related concussions have become an important focus within the general sports injury and sports medicine field. Clinical and research studies regarding this form/context of mild traumatic brain injury have increased geometrically as its position as a public health concern elevated and the Centers for Disease Control and Prevention (CDC) became involved.

The CDC has compiled guidelines and resources for health care providers, coaches, parents and athletes regarding concussions. Great progress has been made in understanding and managing sport-related concussions, especially in terms of:

- Incidence and prevalence of sport-related concussion at all levels of sports participation,
- Delineating acute symptoms and sideline management,
- Describing the general course of recovery for most athletes, and
- Identifying risk factors or modifiers associated with prolonged recovery and/or persistent symptoms.

Expert reviews of available scientific evidence have resulted in a series of consensus or position statements that have guided concussion definitions, evaluation, management and return-to-play guidelines.

The current definition of concussion is a brain injury involving a “complex pathophysiological process affecting the brain, induced by mechanical forces.” Concussion has a number of described features:

- Concussion may be caused by either a direct blow to the head, face, neck or elsewhere on the body with impulsive force transmitted to the head.
- Concussion typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously or may evolve over minutes or hours.
- Concussion may result in neuropathological changes, but the acute clinical changes largely reflect a functional disturbance rather than structural injury.
- Concussion results in a graded set of clinical symptoms that may or may not involve a loss of consciousness, and resolution of clinical and cognitive symptoms typically follows a sequential course, with some cases having prolonged symptoms.

Diagnosing concussion may be complicated in some instances, as most do not involve a loss of consciousness or overt neurological signs, and impact on functioning can be quite mild and temporary. No consistent biomark-

## SIGNS AND SYMPTOMS

According to the Diagnostic and Statistical Manual of Mental Disorders – 4th edition (DSM-4) – an individual with post-concussion disorder experiences objective declines in attention, concentration, learning or memory. The individual also reports three or more subjective symptoms, present for at least three months:

- Becoming fatigued easily
- Disordered sleep
- Headache
- Vertigo
- Irritability or aggression on little or no provocation
- Anxiety, depression, or affective lability
- Changes in personality
- Apathy or lack of spontaneity

The symptoms result in a significant impairment in functioning, which can include impairment in social and occupational functioning.

## ATHLETICS CONSEQUENCES

- Student-athletes who experience post-concussion syndrome will likely miss games and practices over a prolonged period. Those who return to play while symptomatic and sustain an additional injury are at risk of magnified neurologic consequences. To minimize the net amount of time that a student-athlete is held out of practice and competition, early detection and removal from play, and ensuring that the student-athlete does not return to play before it is medically indicated, are critical risk-reducing behaviors.

ers or neuroradiological findings have been delineated, although the research continues in these areas.

The neuro-pathophysiology of sport-related concussion has been described in terms of changes in brain metabolism and evidence of temporary metabolic-based vulnerability to secondary injury. Typically, concussion events produce physical, cognitive and emotional/neuro-behavioral symptoms that are generally most severe in the acute post-injury timeframe (one to two days) and then reduce/resolve over subsequent days and weeks.

Recent consensus guidelines indicate that 80-90 percent of concussions resolve in seven to 10 days, sometimes longer for children and adolescents. The diagnostic

### WHAT CAN COACHES DO?

- Make sure student-athletes who sustain a concussion are immediately removed from play and that they do not feel pressure from the coaching staff to return to play before fully recovered. Communicating with team members before the season about concussion safety, and verbally reinforcing the importance of concussion safety throughout the season are important ways to encourage student-athletes to feel comfortable reporting concussion symptoms to medical personnel.
- Student-athletes who are experiencing post-concussion syndrome may feel isolated from their team and from their normal social roles. These changes can manifest in mental health issues, such as depression, that are not a direct consequence of the initial injury. Be in touch with your student-athletes during their recovery period, communicate that they remain valued team members, and encourage help-seeking from relevant medical professionals, including mental health professionals as appropriate.

complexity emerges when symptoms are delayed or prolonged, or when symptoms are not specific to concussion, but instead are temporally related to the concussive event or experienced/perceived as having been brain-injury related. Due to the range of symptoms (physical, cognitive, emotional) and the individual factors influencing recovery, a multidisciplinary management approach is often indicated. Physicians, athletic trainers, neuropsychologists, academic advisers, physical therapists and clinical/sport psychologists all play roles in clarifying symptoms and providing support.

The strong desire and motivation of some athletes to return to play provides the opportunity for these motivational factors to be manifest in symptom reporting. Since tracking self-reported post-concussion symptoms over time (typically with checklists) is the main aspect of management, some athletes will minimize or report resolved symptoms in order to be seen as “symptom-free” and begin the return-to-play protocol or be cleared. Knowing the athlete and his or her baseline or pre-injury functioning can be crucial in evaluating post-injury symptom reports and presentations.

Acute sport-related concussion signs may include loss of consciousness, headache, dizziness and alteration of mental status (confusion or foginess). Headache, nausea,

fatigue, irritability, sleep disturbance and sensitivity to light and noise may continue over the next few days. Other symptoms seen on post-concussion symptom checklists include attention and concentration difficulties, slowed processing, distractibility, memory problems, slowed visual tracking or vision problems, balance disturbance, and anxiety or depressed mood. Typically, depressed mood or

### WHAT CAN ATHLETIC TRAINERS DO?

- Make sure coaches are appropriately educated about concussion safety and post-concussion syndrome. Talk to them explicitly about the role they can play in creating a team culture that encourages symptom reporting and early detection of concussions. For some coaches, it may be useful to emphasize the negative athletics performance consequences of continued play while symptomatic, and the long-term athletics consequences if a student-athlete sustains an additional impact while still symptomatic.
- Be aware that student-athletes who are experiencing post-concussion syndrome may experience other related mental health issues as an indirect consequence of this injury. Screen and refer student-athletes to mental health professionals as appropriate.
- Ensure that your athletics department has a protocol for helping student-athletes experiencing post-concussion syndrome manage their academic demands during the recovery process. If your school has a policy for academic accommodations and support during the concussion recovery process, make sure that your student-athlete is aware of this policy and that all relevant stakeholders in its implementation are engaged in supporting the student-athlete. If your school does not have such a policy, work with other stakeholders at your institution to develop and implement one. Additional information about recommendations for managing academic demands during the concussion recovery process is available in Marcia Ridpath’s article in Chapter 3.

anxiety levels improve as the physical symptoms resolve, but it is important to assess and intervene if these emotional issues persist.

While most sport-related concussions (concussion symptoms) resolve over days and weeks (most within three weeks), a subset of sport-related concussion patients

may not resolve in this expected timeframe and have persistent post-concussion symptoms, or be seen as developing post-concussion syndrome/disorder. Diagnostically, according to the International Classification of Diseases, post-concussion syndrome occurs after a head trauma (which may include a loss of consciousness), and includes at least three of the following symptoms:

- Headache
- Dizziness
- Fatigue
- Irritability
- Difficulty in concentration and performing mental tasks
- Memory impairment
- Insomnia
- Reduced tolerance to stress, emotional excitement and alcohol.

Symptoms of depression or anxiety resulting from loss of self-esteem or fear of permanent brain damage are seen as adding to the original symptoms.

Treatment/management of sport-related concussion is often based on self-reported symptoms, and these symptoms may reflect other conditions and/or factors not related to concussion, but more with post-traumatic stress disorder. Thus, based on the nonspecificity of symptoms, there is some controversy about the validity of a “post-concussion syndrome.” In general, when athletes continue to be significantly symptomatic (or worsen) beyond the three- to four-week recovery period, the symptoms could be more influenced by psychological factors than the original physiological factors associated with the acute injury.

Following a sport-related concussion, athletes are told initially to observe relative physical and cognitive rest. Reducing physical activity for an active student-athlete can be a difficult and stressful adjustment. A prescribed reduction in cognitive demands often involves reduced class time or assignments and is described by some as “cognitive or brain rest.” These restrictions and reductions appear appropriate in the initial week of recovery, but may become harmful later in recovery, as other stressors may emerge with falling behind in school (making up and keeping up demands upon return) and concern over training/conditioning effects.

As student-athletes recover and are cleared, they begin a return-to-play protocol that incrementally increases the physical exertion level, and ultimately the risk of re-injury over days, leading to a return to full

## QUESTIONS FOR REFLECTION

1. How do you communicate with student-athletes about concussion safety? How do you think your actions influence the likelihood that student-athletes report their concussion symptoms immediately after injury?
2. Do you know to whom you should refer student-athletes who are experiencing symptoms that are directly or indirectly related to post-concussion syndrome?

practice and participation. Student-athletes must complete each stage without emergence of symptoms. Similar “return to learn” approaches have been proposed for academic re-entry.

Strong somatic focus, hyper-vigilance to symptoms, sleep disturbance (often due to mental activation or worry), general stress/rumination behaviors, or a pattern of maladaptive coping styles may also be factors associated with prolonged or persistent symptoms. Family or social network/support problems, which include negative/nonsupportive responses or reactions from teammates, coaches or other primary relationships can result in more emotionally based symptoms.

During sport-related concussion recovery, if significant mood swings, depressed mood, or increasing anxiety or panic symptoms arise, they are indicators for referral to clinical or counseling psychologist/sport psychologist or other health care providers with expertise in these management areas.

Most concussed student-athletes recover symptomatically relatively quickly and return to their sport and academic activities. However, some have persistent symptoms, or delayed symptom resolution, which often impacts their athletics, academic, social and emotional functioning.

In addition to the basic approach of monitoring symptoms over time, interventions aimed at sport-related concussion education, management of recovery expectancies, symptom attributions and addressing emotional issues have been positive factors in recovery from sport-related concussions.

Ideally, management and treatment of sport-related concussions should include opportunities to evaluate and address the psychological impact and emotional responses that can be activated in student-athletes in varying degrees. When student-athletes are unable to practice or

train, or when they feel significant physical, cognitive or emotional vulnerability, they often perceive/feel challenges to their identity – particularly their athletics identity, self-esteem, and in some cases, their future plans or goals.

Discussion of sport-related concussion as an injury with varying degrees of concurrent neurophysiological *and* psychological components appears to be the most ef-

fective approach with student-athletes. It helps avoid concussion being seen with the false dichotomy of the athlete having physical *or* mental issues. Referrals to licensed health care providers or counseling centers can help the student-athlete deal with those challenges, as well as the fear of re-injury, and address potential concerns over long-term consequences of concussions.



**David Coppel** is a professor in the department of neurological surgery and the director of neuropsychological services and research at the University of Washington Sports Concussion Program. He is a clinical professor in both the department of psychiatry and behavioral sciences and the department of psychology at Washington, where he has provided clinical supervision to graduate students, psychology residents and postdoctoral fellows for more than two decades. Since 1996, Coppel has been the consulting neuropsychologist and clinical/sport psychologist for the Seattle Seahawks. His work at the Sports Concussion Program continues his strong involvement in the evaluation of the cognitive and emotional aspects of sport concussion, research regarding the sports concussion recovery factors, and the role of neurocognitive factors such as attention, concentration and focus in sports performance.

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