

# Concussions in Cyclists for Team Managers and Coaches

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One of the most feared consequences of contact sport is traumatic brain injury.

**Concussions are a form of brain injury resulting from direct blow or rapid acceleration and deceleration of the brain inside the skull altering the cellular processes in the brain. Concussion or brain injury can occur without direct impact or loss of consciousness. It can result in symptoms that are evident immediately, or may evolve over the course of hours, days, or even months.** Perhaps more concerning is that some symptoms are only evident with specific testing or questioning. Furthermore, after an initial injury, the brain is susceptible to repeat injury. Equally important, disequilibrium and slowed reaction times that may be caused by an initial injury increase the athlete's risk for further head injuries.

By wearing helmets, cyclists significantly decrease their odds of head and skull injury, but cannot prevent concussion completely. Ideally, following any suspected concussion, a properly trained medical staff member would perform a complete neurologic exam. However, teams may not have access to a team physician and the peloton may not wait for this type of thorough investigation. A group of attendees at the 2010 Medicine of Cycling Conference formed a focus group to put together information for coaches and team managers to increase awareness of concussion and improve safety for cycling athletes. This group includes:

Anna K. Abramson M.D. – Internal Medicine physician at University of California in San Francisco, co-chair of Medicine of Cycling Conference

Matthew Bitner M.D. - Emergency Physician at Duke University Health System, Associate Director of Pre-Hospital Medicine and race physician

Keith Borg M.D. and Ph.D. – Emergency Department physician at the Medical University of South Carolina and race day physician

Jason Brayley M.D. – Sports Medicine physician with MultiCare Orthopedics and Sports Medicine, Team Physician for Kenda Pro Cycling presented by GearGrinder

Julie Emmerman, Psy.D. – Psychotherapist specializing in performance for professional athletes, including Garmin-Slipstream ProTour team since 2008. Professional cyclist 1999-2005

Don Gerber Psy.D. – Clinical Neuropsychologist at Craig Hospital

Mark Greve M.D. - Emergency Medicine physician at Brown University and medical director Team Type 1

Kevin Sprouse D.O. – Sports Medicine Fellow at the Steadman Hawkins Clinic of the Carolinas and team physician for Chipotle Development Team / Slipstream Sports.

The following guidelines are intended for education of cycling team managers, coaches and athletes of the symptoms and management of concussion in athletes but are not a surrogate for evaluations by appropriately trained medical professionals. These guidelines pertain to adult athletes, as children and adolescents are at an even higher risk of concussion and protracted recovery requiring a medical professional. This concussion statement is based on current knowledge and best practices, and will need to be modified as more information emerges.

Actions to take in the pre-season:

- Education of athletes on importance of taking responsibility of their own health is imperative. Cyclists should be encouraged to be honest with any new symptoms they develop, especially after injury or concussion sustained during the season.
- Assess athlete's baseline neurologic function. This is one of the most important aspects of good neurological care for all athletes. Establishing an athlete's baseline neurological function allows for a more accurate diagnosis in case of injury and for safe return to sport. Cyclists with history of prior concussion are at an increased risk of repeat injury, so it is particularly imperative for these athletes to have a baseline cognitive assessment performed with the SCAT2 or computer based ImPACT testing prior to the start of the racing season. See links to these websites below.
- Most accurate assessments would occur with a baseline functioning test by a trained neuropsychologist or primary care physician using established tests such as SCAT2 or ImPACT as a means of assessing baseline data. Athletes without access to formal testing, should at least have access to the following three items would to aid evaluation by a trained medical professional in case of concussion evaluation:
  1. Document history of possible head injury or concussions in the past, including when the injuries occurred, what symptoms the athlete experienced, what testing was done, length of recovery, and how the athlete was cleared for competition. Cyclists with prior concussions resulting in extended symptomatic periods are at increased risk for prolonged recovery after any additional injury.
  2. Romberg test of balance – can the athlete stand feet together, eyes closed for 30 seconds without tilting, becoming unsteady or falling. If athlete is unable to do this, he or she needs a professional evaluation.
  3. Reaction time tests – can attempt several simple tests listed online and can time how long it takes for cyclist to recite months of the year backwards. These tests can help guide return to play decisions in concussed athlete. See link at the end of this article for examples.

### Evaluation for concussion after injury:

1. Communicate to riders and staff the importance of immediate assessment for possible concussion after a crash by medical staff. This includes any damage to rider's helmet, face, or neck. In the event of a high-speed impact, an evaluation for concussion is warranted regardless of the rider's complaints.
  - Fast and effective evaluation can ensure proper triage and safety for the athlete.
  - Cooperating with medical staff performing the exam will speed up the process. If the athlete is safe to return to competition following these guidelines will help him or her get there faster.
  
2. In many situations medical staff will not be on hand after a crash but team staff may be present. In these situations it is important to be aware of symptoms of severe injury to the brain or spine that can become life threatening. Should riders develop these symptoms, they need to immediately be withdrawn from competition and transported by emergency medical personnel to a medical facility. These include:
  - Loss or change in consciousness
  - Nausea and/or Vomiting
  - Severe headache
  - Disorientation
  - Inability to speak or swallow
  - Amnesia
  - Significant trauma to the head
  - Clear fluid leakage from the nose or ears
  - Inability to walk or ride their bike in a straight line
  - Seizure
  
3. Riders, who have sustained a more minor injury leading to concussion, can be more challenging to identify. The tests immediately following trauma are imperfect as symptoms of concussion can evolve over time. Symptoms of concussion listed below (see #5) should signal that the athlete may need medical attention, and if still on the bike, to immediately withdraw from competition for further assessment.
  
4. Cyclists suspected of a concussion would ideally be observed for 15 minutes following guidelines established in other sports. This may not be possible in the context of most bicycle racing. Those athletes that are suspected of having a concussion but do not demonstrate life

threatening or initial symptoms of concussion outlines in #2 and #5, should have at the minimum the following brief exam prior to clearance to continue the race:

- Observe the athlete stand feet together, eyes closed, and head tilted back. If the athlete is unable to maintain their balance they have failed this assessment and cannot be returned to competition until assessed by a medical professional.
- Ask questions like the following four, to assess memory and comprehension (if you know this information, otherwise ask questions you are able to answer yourself):
  - What is the name of this race?
  - Which city did you race in last week?
  - Can you name four teammates in this race?
  - Can you name the months backwards, starting with December?

5. Initial symptoms and signs of a concussion may include<sup>6</sup>:

- Any loss of consciousness
- Headache
- Neck pain
- Poor balance
- Nausea
- Decreased reaction time
- Memory disturbance
- Confusion
- Blurred vision
- Sensitivity to noise or lights
- Dizziness
- Emotionality
- Head shaking, trying to “clear the fog”
- Difficulty concentrating
- Fatigue
- Irritability or anxiety

6. Regardless of if the cyclist finishes the race after a suspected concussion, symptoms can evolve for up to 14 days and persist for many weeks afterwards. Monitor for following symptoms and signs as these may suggest the need for further medical evaluation:

- Changes in mood or memory noted by team members/family
  - Increased irritability
  - Disinhibited behavior
  - Increased sadness, anxiety, or nervousness
  - Aggressiveness
  - Change in sexual drive or behavior
- Ongoing headaches
- Fatigue or low energy
- Ongoing difficulties with concentration or “fogginess”
- Insomnia / trouble falling asleep
- Changes in reaction time, especially if athlete has increased number of crashes

7. Any athlete suspected of having a concussion should AVOID the following or consult a physician prior to:

- Strenuous physical and cognitive activity for at least 24 hours or until previous symptoms are completely resolved as such activity can delay recovery
- Consuming Alcohol
- Taking Sleeping pills or anti-anxiety medications
- Taking aspirin, ibuprofen, naproxen, or narcotics. However, can consider using acetaminophen for headaches and general aches instead
- Driving or operating machinery, including their bike

Return to Sport considerations after concussion:

1. The return to normal activities is a critical step in the recovery of concussed cyclists. However, to do this safely it requires supervision by a physician trained in the care of concussed athletes. Though each cyclist’s recovery has to be evaluated on a case by case

basis, a few basic premises should be followed to maximize safety and allow for proper recovery. These should serve only as educational guidelines and not rules for unmonitored return to competition:

- a. The primary treatment for concussion is to rest the brain, so await complete resolution of post-concussive symptoms such as headache and dizziness prior to initiating any physical activity
- b. Once concussed cyclists are asymptomatic use a step-wise approach when increasing level of activity
  - i. Start with a low impact stationary bike or trainer, keeping the goal HR <70% maximum and monitor for symptom recurrence. If the athlete becomes symptomatic, stop the activity immediately, and rest the athlete for 24 hours. Reattempt exercise only if the athlete is asymptomatic
  - ii. Gradually increase level and duration of activity only if there is no recurrence of symptoms over the following 24 hours. Continue this daily progression until the athlete is able to train at pre-injury level without recurrence of symptoms. If the athlete develops symptoms during any stage of the step-wise progression, rest the athlete 24 hours, and then if asymptomatic, resume the progression at the last level the athlete could complete without symptoms.
  - iii. Pay special attention to the athletes balance and reaction times as these may take longer to return and ongoing deficits may cause repeat injury once the cyclist is back on the road or mountain.
  - iv. Delayed presence of symptoms or recovery may indicate ongoing trauma or mark another serious condition that requires attention by a physician

Sample return to competition protocol adapted from the Zurich Concussion Consensus 2008<sup>7</sup> advised by a physician will typically look as follows:

1. No activity - complete physical and cognitive rest until symptom free
2. Stationary riding at a HR <70% of max, short duration, and not on rollers as full coordination of the cyclist may not yet be assured
3. Solo riding on a road, track, or trail of low intensity and short duration
4. Solo riding on a road, track, or trail incorporating intervals and/or hill workouts at higher levels of intensity and duration.
5. Group rides with sprints and/or climbs, pacelines

## 6. Return to competition

\*if concussion symptoms return during any portion of the cyclist's return to competition protocol, the athlete must inform the managing physician of their recurrent symptoms, and rest a minimum of 24 hours before resuming the level of activity where symptoms recurred, and then only with physician clearance.

### List of Resources and Helpful Websites:

1. SCAT2 Assessment - <http://www.neurosurgery.net.au/SCAT2.html>
2. ImPACT Resources - <http://www.impacttestoffice.com/>
3. Reaction test examples - <http://www.topendsports.com/testing/reaction-tests.htm>
4. CDC info sheet for coaches - [http://www.cdc.gov/concussioninyouthsports/images/coaches\\_Engl.pdf](http://www.cdc.gov/concussioninyouthsports/images/coaches_Engl.pdf)
5. [http://www.cdc.gov/concussion/sports/cdc\\_ncaa.html?source=govdelivery](http://www.cdc.gov/concussion/sports/cdc_ncaa.html?source=govdelivery)
6. Concussion\_Symptom\_Inventory\_rem.pdf
7. Zurich Concussion Consensus 2008 - <http://www.sportconcussions.com/html/Zurich%20Statement.pdf>

### **Editor's Note:**

**The material presented in this chapter should not be used as a substitute for evaluation by a medical professional. A coach or athlete suspecting a concussion has occurred should seek medical evaluation and treatment for the patient. Along those lines, if the athlete has suffered a concussion (or any other injury), the medical professional should determine when the athlete can return to training or competition.**