



Title: Concussion assessment in cycling: a systematic review and call to action

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Introduction: Concussion is a recognised risk in road cycling and can have serious health consequences¹, especially when mismanaged. Epidemiological studies estimate that concussions account for 4-13% of all cycling injuries²⁻⁴ and that the incidence of concussions is increasing⁵. The high-profile case of Toms Skujins in the 2017 Tour of California, who was initially allowed to continue riding despite demonstrating obvious ataxia following a crash, highlighted the lack of protocol for concussion assessment in road cycling.

Aim: a systematic review of the literature on concussion assessment in cycling.

Methods: literature describing concussion assessment in cycling was identified by searching MEDLINE, EMBASE, PsycINFO & Web of Science. Two reviewers independently screened titles and abstracts for eligibility. Figure 1 demonstrates the flow diagram of reviewed and included studies. A qualitative analysis was undertaken of included studies.

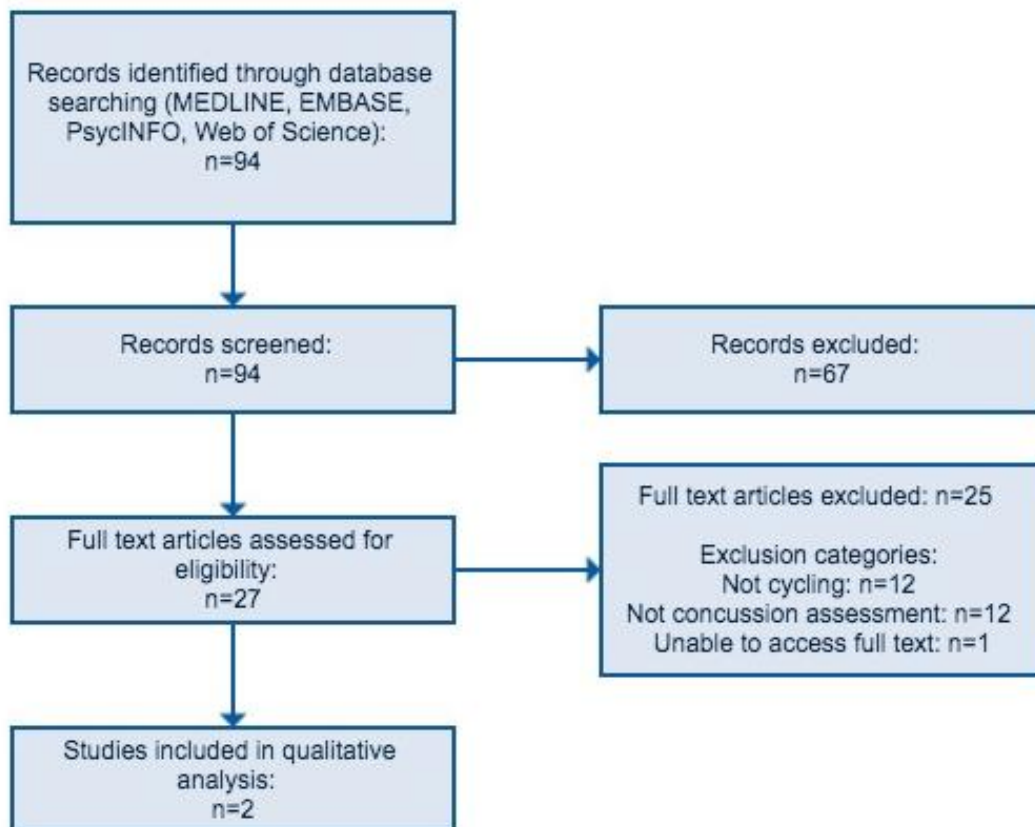


Figure 1: Flow diagram of reviewed and included studies



Results: From 94 studies identified, 2 were included for review. Gordon et al. 2013⁶ describes the presentation of a single case of paediatric concussion following a cycling crash and highlights the utility of evaluation using the Sport Concussion Assessment Tool⁷ (SCAT5) as well as the importance of a stepwise return-to-play exertional protocol. Greve & Modabber 2012⁸ discusses a number of traumatic brain injuries that occurred during the 2011 road cycling season and, as a minimum, calls for riders to be withdrawn from riding following loss of consciousness or amnesia.

Discussion: Road cycling poses a unique challenge for the assessment of concussion and we have found there is little published evidence to advise effective means of in-race assessment. Following a potentially concussive impact, the decision to allow a rider to continue or not to continue, must be made quickly and in sub-optimal conditions, it is not possible to temporarily withdraw a rider for a 'sideline assessment'. Often medical personnel are unable to observe the rider directly and rely on radio communication for assessment.

The recent Berlin Consensus Statement on Concussion in Sport⁹ states that *"Adequate facilities should be provided for the appropriate medical assessment both on and off the field for all injured athletes. In some sports, this may require rule changes to allow an appropriate off-field medical assessment to occur without affecting the flow of the game or unduly penalising the injured player's team."* Action must be taken to increase adherence to the Berlin Consensus statement within cycling. Whilst the UCI Cycling Regulations¹⁰ discuss multi-modal assessment in suspected concussion and the need for immediate withdrawal from competition/training if concussion is suspected, no internationally-agreed assessment protocol for concussion in road cycling has been published. The UCI regulations advise the use of SCAT5 for concussion assessment but this tool is impractical to use in-competition and would require modifications for use in road cycling in-competition assessment.

Abramson et al. of USA Cycling/MedicineofCycling.com have produced a concussions in cycling consensus statement¹¹ but with limited race-specific assessment instructions and the statement has not been published in a peer-reviewed journal.

Conclusions: We would like to call on the UCI to hold a consensus meeting to establish an evidence-based concussion assessment protocol and return-to-riding protocol for road cycling. These protocols would need to be multi-lingual and should consider the role of both medical and non-medical personnel, e.g. neutral mechanics, who may be the first responder following a crash.

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