

ReFORM synthesis of the 6th International Consensus Statement on Concussion in Sport

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The sixth International Conference on Concussion in Sport took place 27–30 October 2022 in Amsterdam, Netherlands. It followed the fifth International Conference held in Berlin, Germany in October 2016, and aimed to provide updated recommendations regarding the prevention and management of concussions in sport based on the highest level of scientific evidence, the result of several systematic reviews of the literature.^{1–10} This editorial summarises key processes and recommendations from the Consensus Statement on Concussion in Sport.¹¹

A RIGOROUS SCIENTIFIC PROCESS

The preparation of these recommendations took several years, followed a

robust methodology¹² and was presented in a structured format. The organising committee was composed of representatives from international sports federations (Fédération Internationale de l'Automobile, Fédération Equestre Internationale, Fédération Internationale de Football Association, International Ice Hockey Federation, and World Rugby) and the International Olympic Committee. This organising committee proposed Co-Chairs of the Scientific Committee, who are also part of the Concussion in Sport Group (CISG). The Scientific Committee then invited lead authors and suggested coauthors (these recommendations were reviewed and amended by the lead authors) independent of the organising committee who had no input to the scientific process. A modified Delphi technique was used to devise the initial 12 questions that informed the Berlin International Conference on Concussion in Sport which were subsequently revised to 10 questions for the Amsterdam consensus.^{12 13}

Ten themes around concussion were identified and evolved from previous iterations of the statement: prevention strategies, acute evaluation, office assessment, targeted interventions, rest and exercise, clinical recovery, evaluation of persisting symptoms, role of emerging technologies, retirement from sports and long-term effects. For each identified theme, the author group conducted a systematic review following Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, with meta-analyses whenever possible, and then developed recommendations based on the results of these reviews.^{1–10} These results and recommendations were presented to the conference attendees during the October 2022 conference in Amsterdam. Participants were invited to provide critical feedback on the

stated recommendations. This feedback was systematically collected, analysed by the Expert Panel (to inform the consensus process and define the writing of the consensus statement) and working groups for development of the next iteration of Sport Concussion Assessment Tools (SCATs), and integrated into the final publications related to this international consensus process.

The final versions of this work were published in the British Journal of Sports Medicine (BJSM) in June 2023 in the form of (1) a Consensus Statement¹¹; (2) a description of the methodology¹²; (3) 10 systematic reviews on the specific themes^{1–10}; and (4) several accompanying editorials including a conceptual definition of sport-related concussion¹⁴ and tools for acute and subacute management of concussion in adults, adolescents and children.^{15–19} Supportive material included BJSM podcasts²⁰ and a video abstract.²¹

KEY RECOMMENDATIONS

In line with efforts to disseminate sports medicine knowledge,^{22 23} the French-speaking Olympic Network for Sports Medicine Research (ReFORM) aimed to summarise the consensus recommendations.

The key elements and resulting recommendations include the following and are illustrated in [figure 1](#):

1. Content and methodological advances were made in the consensus process including anonymous voting, summaries of alternate viewpoints, declarations of conflicts of interests, inclusion of the athletes' voice and ethical perspectives, as well as considerations for specific under-represented groups (such as children and para athletes).
2. The definition of concussion in sport has been updated and work continues with other medical and scientific bodies related to concussion and mild traumatic brain injury to achieve a unified conceptual and operational definition.²⁴
3. Prevention strategies for sport-related concussions include rule changes with respect to reducing contacts in several sports such as body checking in most levels of adolescent ice hockey and reduced contact practice in American football; the inclusion of neuromuscular training programmes; the use of mouth guards in adolescent ice hockey; and implementing a specified protocol for removal from sport and

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Concussion in sport

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Figure 1 Infographic of the ReFORM synthesis of the Consensus statement on Concussion in Sport. CRT6, Concussion Recognition Tool 6; ReFORM, French-speaking Olympic Network for Research in Sports Medicine; SCAT6, Sport Concussion Assessment Tool 6.

concussion management to reduce the incidence of recurrent concussions.

4. Regarding assessment, the literature supported the need for an evolution and update of the SCAT (eg, use only 10-word memory recall list, add dual-task tandem gait). The concussion recognition tool (CRT 6 (CRT6)—for non-medically trained personnel¹⁷ and SCATs (SCAT 6 (SCAT6) for adults and adolescents,¹⁵ and Child SCAT6 for children)¹⁶ have been updated and are recommended in the acute phase (first 72 hours up to 1 week after the injury). New tools, the sport concussion office assessment tool (Sport Concussion Office Assessment Tool 6 (SCOAT6) for adults and adolescents,¹⁸ and Child SCOAT6 for children)¹⁹ have been developed to guide evaluation and management by a consultant in the office for the subacute phase (between 3 and 30 days). Concussion evaluation is multidimensional

and extends beyond neurocognitive test results. Additionally, none of these tools is a standalone diagnostic tool but serves as an objective assessment aid for making a clinical diagnosis of a concussion.

5. For management, the strategies for return to learn and return to sport have also been updated. A key change was the inclusion of two phases of the return to sport strategy—a treatment or rehabilitation phase (steps 1–3) and a return to sport phase (steps 4–6). Of note, during the treatment phase (steps 1–3), mild (ie, 0-2/10 on a numeric pain rating scale) and brief (ie, less than 1 hour) symptoms are permitted to enable gradual sensorimotor reintegration and recovery. However, all of the activities in this phase must occur away from any activities that involve risk. Early physical activity and symptom-tolerated aerobic exercises are effective therapeutic interven-

tions. Cervicovestibular rehabilitation is recommended for individuals with ongoing headaches, dizziness and/or balance issues. The average recovery times have also been updated: the average time for return to sport is now 20 days across ages, and for return to learn/school is 8 days.

6. Post concussion symptoms (beyond 4 weeks) require a multimodal clinical assessment including validated symptom scales to guide return to sport decisions.

7. Likewise, decisions regarding discontinuing a high-risk sport are complex and require a multidimensional, comprehensive and individualised approach.

8. Finally, concerning current limitations, many research areas require further exploration. Priorities for future investigation include the potential long-term effects of repeated concussions and head impacts, concussions in

children (5–12 years old) and concussion in para athletes and in females.

These key points are based on the 10 systematic reviews and expert panel voting that guided the recommendations which can be found in the Consensus Statement.¹¹ Among these systematic reviews, meta-analyses were carried out in three of them (Rest and Exercise, Clinical Recovery and Prevention Strategies). A summary of the contents of each systematic review has been provided by ReFORM.²⁵

These systematic reviews identified several limitations in the current scientific literature including: lack of a definition for concussion, lack of validation and operationalisation of the measurement tools used, an over-representation of North American data, a low proportion of research on women, children and para athletes, and low methodological quality (eg, absence of control group, retrospective study, or lack of adjustment for confounding factors). Therefore, a call to action for future concussion research programmes was made and emphasises the importance of greater inclusivity in research to better reflect geographical and cultural considerations. These issues have been extensively discussed in a recent essay focusing, among other things, on ethical aspects.²⁶

Lastly, the new concussion tools presented in this consensus (ie, SCAT6, Child SCAT6, SCOAT6, Child SCOAT6 and CRT6)^{15–19} have also undergone a rigorous French translation with the participation of ReFORM and the support of CISG. The French versions of these tools are freely available online.²⁷

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Competing interests JP is a board member of the Concussion in Sport Group (CISG) and was

co-chair of the scientific committee of the 6th International Conference on Concussion in Sport. He serves as an advisor to South African Rugby, World Rugby, UEFA and the NFL. He's an editor of BJSM and received sponsorship for a schools' concussion programme from Neuroflex. GD was a member of the Scientific Committee of the 6th International Consensus Conference on Concussion in Sport; an honorary member of the AFL Concussion Scientific Committee; Section Editor, Sport and Rehabilitation, NEUROSURGERY; and has attended meetings organised by sporting organisations including the NFL, NRL, IHF, IOC and FIFA; however, has not received any payment, research funding, or other monies from these groups other than for travel costs. KS has received grant funding from the Canadian Institutes of Health Research (CIHR), NFL Scientific Advisory Board, International Olympic Committee Medical and Scientific Research Fund, World Rugby, Mitacs Accelerate, University of Calgary, with funds paid to her institution and not to her personally. She is an Associate Editor of BJSM (unpaid), independent consultant to World Rugby and has received travel and accommodation support for meetings where she has presented (including partial travel and accommodation support for the Amsterdam Conference on Concussion in Sport). She coordinated the writing of the systematic reviews that informed the Consensus statement and 6th International Conference on Concussion in Sport, for which she has received an educational grant to assist with the administrative costs associated with the writing of the reviews (with funds paid to her institution). She is a member of the AFL Concussion Scientific Committee (unpaid position), Brain Canada (unpaid positions) and Board member of the Concussion in Sport Group (CISG) (unpaid).

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