

Concussion in sport: the consensus process continues

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Our understanding of the prevention, detection, management and potential longer-term effects of concussions in sport have evolved rapidly over the last 20 years. In 2001, the International Ice Hockey Federation (IIHF) initiated a meeting to discuss the diagnosis and management of sport-related concussion (SRC).¹ This meeting was held in conjunction with the International Olympic Committee (IOC) and Fédération Internationale de Football Association (FIFA) in Vienna, Austria.

Every 4 years researchers and clinicians with expertise in SRC are brought together to summarise the published literature and provide updated, evidence-informed recommendations regarding the evaluation and management of

concussions.^{1–5} To date, there have been five consensus statements. This 20-year journey has been supported by sports organisations including the IOC, IIHF, FIFA and later by Fédération Equestre Internationale, World Rugby and the Fédération Internationale de l'Automobile. The sporting bodies are then able to take the evidence summaries and consensus recommendations that are created and develop concussion guidelines specific to their sports.

The authorship group of the Consensus Statements has led the development and writing of the resulting output of the meetings including a quadrennial consensus statement and the accompanying Concussion Recognition Tool and Sports Concussion Assessment Tools (SCAT) for adults and children.⁴ Authors have been selected based on their research and clinical expertise in the area of concussion, including consideration for representation from broad geographical and content areas. The concussion consensus group remains aware of the need for a rigorous scientific process and has ensured since its inception that all outputs are made freely available to athletes and their medical providers.

AN EVER-CHANGING 'FIELD'

As the evidence has evolved, so too have the recommendations. The SCAT Card, first published in Prague, 2004 has evolved to include the evaluation of additional domains such as balance assessment, cervical spine evaluation and a neurological screen in its most comprehensive iteration, the SCAT5 (fifth International Consensus Conference in Berlin, 2016).^{6,7} Gone are the days of resting for a prolonged time period in a dark room or 'grading' a concussion. Previous recommendations were to rest until asymptomatic and then gradually introduce increased levels of physical and cognitive exertion. However, given the mounting evidence for a more active approach to recovery following SRC,

the current return-to-play progression evolved to advocate for a brief period of 24–48 hours of relative cognitive and physical rest prior to progressing to activities of daily living and then proceeding through a subsymptom threshold graduated return to sport strategy.^{4,8} The literature continues to evolve as we learn more about this common and heterogeneous injury. It will be exciting to see where the discoveries in the next 20 years will take us!

PLANNING AHEAD: THE PROCESS

The sixth International Consensus Conference on Concussion in Sport was first postponed to October of 2021 due to the pandemic. Given the interactive nature of the conference, the consensus format lends itself far better to an engaged on-site meeting rather than an online or hybrid format. Global time zones posed additional challenges in agreeing on optimal scheduling of key sessions online. Unfortunately, due to travel limitations and the lack of ability to have participants from around the globe participate meaningfully in two full days of meetings followed by the expert panel consensus seminar, virtually or in a hybrid format, the Conference was again rescheduled—this time to Amsterdam on 27 October 2022–29 October 2022. This conference brings together researchers, clinicians and stakeholders with an interest in concussion in adults, children and athletes with disabilities, to summarise and present the latest science, discuss the current state of the evidence and write the sixth International Consensus Statement on Concussion in Sport.

A series of systematic reviews on key topics in SRC (acute screening, follow-up postinjury evaluation, rest and exercise, treatment/rehabilitation, persistent symptoms, recovery, return to sport, residual/long-term effects, retirement, risk reduction/prevention) are currently in preparation. The conference begins with 2 days of open meetings where the latest evidence is summarised and discussed. The accepted abstracts for each topic area will be presented as posters and the two top ranked abstracts in each category will be presented as podium presentations at the beginning of each topic of discussion. Each systematic review will then be presented, followed by a discussion period, which will be scribed for reference during the panel meeting. The third day is a consensus meeting that focuses on answering predetermined

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clinically relevant questions. The participants in the consensus meeting have been selected based on their expertise and/or publishing record in SRC, while keeping in mind geographical and specific areas of content knowledge. Finally, the fourth day will focus on development and updating of tools such as the SCAT. The scientific committee is cognisant that SRC is a critical area of public health interest and will embrace a broader spectrum of topics, experts and participants than ever before. A separate manuscript will describe the details of the methodology used. While consensus will be sought, dissenting opinions will be acknowledged and taken into full consideration. Athletes' input will also be sought as part of this process. The science will be robust, the emerging advice will be athlete-centred, and the accompanying tools freely accessible.

ABSTRACTS

In order to acknowledge the work of researchers in the build-up to 2020/2021 and delays due to the COVID-19 pandemic, the scientific committee has decided to publish a first group of abstracts. These abstracts have undergone a peer-review process and cover all aspects of concussion science and clinical care. We invite you to submit your current research on concussion in sport during the second call for abstracts, which will close on 15 June 2022. Following the conference, the systematic reviews, methodology paper, abstracts submitted during the second call, and updated tools that result from the meeting will be submitted for publication and external peer-review alongside the consensus statement. Of note, the resulting papers are completed and approved by the co-authors of each manuscript, with no review or requirement for approval from the Sport Organisations who contribute educational grants and funding for the meeting.

SEE YOU THERE!

Since the conference was delayed for 2 years, when we meet again it will be 6 years since our fifth Consensus Statement on Concussion in Sport was published. We look forward to seeing you in Amsterdam on 27 October 2022–29 October 2022 to discuss concussions in sport! For more details on the conference, please see: <https://www.concussionconference.org>

Correction notice This article has been corrected since it published Online First. Typographical errors have been corrected.

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Collaborators Lars Engebretsen is signing on behalf of the Organising Committee of the 6th International Consensus Conference on Concussion Sport.

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Competing interests KJS is a lead and coinvestigator on grants related to concussion and traumatic brain injury funded by several government or other organisations (including but not limited to the Canadian Institutes of Health Research, Canadian Academy of Sport and Exercise Medicine, National Football League Scientific Advisory Board, Public Health Agency of Canada/Parachute Canada, Hotchkiss Brain Institute, Wellcome Trust, International Olympic Committee, Highmark Innovations Inc, Mitacs Accelerate, University of Calgary) with funds paid to her institution and not to her personally. She is an Associate Professor and Clinician Scientist at the University of Calgary in the Sport Injury Prevention Research Centre and is a Physiotherapy Consultant, primarily working with patients with concussion and traumatic brain injuries. She is an Associate Editor of BJSM (unpaid) and has received travel and accommodation support for meetings where she has presented. She is coordinating the writing of the systematic reviews that will inform the 6th International Consensus 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. She is a member of the Scientific Advisory Board for Eye Guide (share options), member of the AFL Concussion Scientific Committee (unpaid position) and Brain Canada (unpaid positions). She did not receive any financial support directly related to this manuscript. JP is an Editor of BJSM for which he receives an honorarium. He is a lead author of a systematic review that will inform the 6th International Consensus on Concussion in Sport. Jon is on the scientific advisory board of EyeGuideTM, is on the Concussion Advisory Board of World Rugby and an advisor to South African Rugby (all unremunerated). He has received sponsorship from academic institutions to present at concussion-related meetings. RJE is a paid consultant for the NHL and co-chair of the NHL/NHLPA Concussion Subcommittee. He is also a paid consultant for Major League Soccer and Princeton University Athletic Medicine. He is currently a co-PI for a grant funded by the NFL (NFL-Long) through Boston Children's Hospital and occasionally provides expert testimony in matters related to MTBI and sports concussion. MM is a consultant Sport and Exercise Medicine Physician. He is the Chief Medical Officer at the Australian Football League (AFL) and works as an Independent Concussion Consultant for World Rugby. He has honorary research positions at the Florey Institute of Neuroscience and Mental Health and La Trobe Sport and Exercise Medicine Research Centre in Melbourne. He has previously received non-financial research support from CogState Pty Ltd. He has attended meetings organised by sporting organisations including the NFL, NRL, IIHF and FIFA, but has not received research funding or other monies from these groups other than for travel costs. He is an honorary member of the International Concussion in Sport Group and the Australian Rugby Union Concussion Advisory Group. He did not receive any form of financial support directly related to this manuscript. GAD is an honorary member of the AFL Concussion Scientific Committee and has attended

meetings organised by sporting organisations including the NFL, NRL, IIHF and FIFA. However, he has not received payment, research funding or other monies from these groups other than for travel costs. OHA receives payment for adhoc consultancy work with the Football Association (England) for work with their Para squads. He is involved in the following voluntary (unpaid) leadership roles in Para sport: Cochair of the Concussion in Para Sport Group; Medical and Sport Science Director of the International Federation for Cerebral Palsy Football; Medical Unit Co-Lead for the Para Football Foundation. He is also an Associate Editor (unpaid) at BJSM. CB has received a research grant from the Barbara Noonan Family Foundation and received a speaking honorarium for a panel presentation related to diversity and equity in healthcare in October of 2021 from Electives, Inc. She is in leadership roles including a member of the Board of Directors for United States Olympic and Paralympic Committee and the Boston Athletic Association. She is a member of the Medical & Scientific Commission and Mental Health Working Group for the International Olympic Committee and a member of the Medical Committee for the International Paralympic Committee and has received travel and accommodation support for meetings related to these roles. She serves as a BJSM Associate Editor (unpaid). She receives share options from Strava. She did not receive any financial support directly related to this manuscript. JD has acted as FIFA CMO and Chairman of F-MARC (FIFA Medical Assessment and Research Center) until 2016. He is a Senior advisor to BJSM. LE is an editor for BJSM IPHP (injury prevention and health protection) and is employed part time by the International Olympic Committee and has received grants as part of the International Olympic Committee from FIFA, IIHF, WR and FEI and FIA for the running of the 6th International Consensus Conference on Concussion in Sport. OHA, CB, GAD, JD, RJE, MM, JP, KJS are Board members of the Concussion in Sport Group (CISG) Association.

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REFERENCES

- 1 Aubry *Met al.* Summary and agreement statement of the first International Conference on concussion in sport, Vienna 2001. *Br J Sports Med* 2002;36:6–7.
- 2 McCrory P, Johnston K, Meeuwisse W, *et al.* Summary and agreement statement of the 2nd International Conference on concussion in sport, Prague 2004. *Br J Sports Med* 2005;39:i78–86.
- 3 McCrory P, Meeuwisse W, Johnston K, *et al.* Consensus statement on concussion in sport: the 3rd International Conference on concussion in sport held in Zurich, November 2008. *Br J Sports Med* 2009;43 Suppl 1:i76–84.
- 4 McCrory P, Meeuwisse W, Dvořák J, *et al.* Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016. *Br J Sports Med* 2017;51:838–47.
- 5 McCrory P, Meeuwisse WH, Aubry M, *et al.* Consensus statement on concussion in sport: the 4th International Conference on concussion in sport held in Zurich, November 2012. *Br J Sports Med* 2013;47:250–8.
- 6 Echemendia RJ, Meeuwisse W, McCrory P, *et al.* The sport concussion assessment tool 5th edition (SCAT5): background and rationale. *Br J Sports Med* 2017;51:848–50.
- 7 Davis GA, Purcell L, Schneider KJ, *et al.* The child sport concussion assessment tool 5th edition (child SCAT5): background and rationale. *Br J Sports Med* 2017;51:859–61.
- 8 Schneider KJ, Leddy JJ, Guskiewicz KM, *et al.* Rest and treatment/rehabilitation following sport-related concussion: a systematic review. *Br J Sports Med* 2017;51:930–4.