

Fair and Safe Eligibility Criteria for Women's Sport.

TUCKER, Ross, HILTON, Emma N, MCGAWLEY, Kerry <<http://orcid.org/0000-0002-1273-6061>>, POLLOCK, Noel, MILLET, Grégoire P <<http://orcid.org/0000-0001-8081-4423>>, SANDBAKK, Øyvind, HOWATSON, Glyn <<http://orcid.org/0000-0001-8494-2043>>, BROWN, Gregory A, CARLSON, Lara A, CHEN, Mark A, HERON, Neil <<http://orcid.org/0000-0002-4123-9806>>, KIRK, Chris <<http://orcid.org/0000-0002-6207-027X>>, MURPHY, Marie H, PRINGLE, Jamie, RICHARDSON, Andrew, SANTOS-CONCEJERO, Jordan <<http://orcid.org/0000-0001-9467-525X>>, CHRISTIANSEN, Ask Vest <<http://orcid.org/0000-0001-6115-6314>>, JONES, Carwyn, ALONSO, Juan-Manuel <<http://orcid.org/0000-0003-1350-8746>>, ROBINSON, Rebecca, JONES, Nigel, WILSON, Mathew, PARKER, Michael G, CHINTOH, Arabah, HUNTER, Sandra, SENEFFELD, Jonathon W, O'CONNOR, Mary I, JOYNER, Michael, CARNEIRO, Eva M, DEVINE, Cathy, PIKE, Jon and LUNDBERG, Tommy R <<http://orcid.org/0000-0002-6818-6230>>

Available from Sheffield Hallam University Research Archive (SHURA) at:

<https://shura.shu.ac.uk/34204/>

This document is the author deposited version. You are advised to consult the publisher's version if you wish to cite from it.

Published version

TUCKER, Ross, HILTON, Emma N, MCGAWLEY, Kerry, POLLOCK, Noel, MILLET, Grégoire P, SANDBAKK, Øyvind, HOWATSON, Glyn, BROWN, Gregory A, CARLSON, Lara A, CHEN, Mark A, HERON, Neil, KIRK, Chris, MURPHY, Marie H, PRINGLE, Jamie, RICHARDSON, Andrew, SANTOS-CONCEJERO, Jordan, CHRISTIANSEN, Ask Vest, JONES, Carwyn, ALONSO, Juan-Manuel, ROBINSON, Rebecca, JONES, Nigel, WILSON, Mathew, PARKER, Michael G, CHINTOH, Arabah, HUNTER, Sandra, SENEFFELD, Jonathon W, O'CONNOR, Mary I, JOYNER, Michael, CARNEIRO, Eva M, DEVINE, Cathy, PIKE, Jon and LUNDBERG, Tommy R (2024). Fair and Safe Eligibility Criteria for Women's Sport. *Scandinavian journal of medicine & science in sports*, 34 (8): e14715. [Article]

Sheffield Hallam University Research Archive

<http://shura.shu.ac.uk>

Copyright and re-use policy

See <http://shura.shu.ac.uk/information.html>

Editorial

Fair and safe eligibility criteria for women's sport

Ross Tucker ¹, Emma N. Hilton ², Kerry McGawley ³, Noel Pollock ⁴, Grégoire P. Millet ⁵, Øyvind Sandbakk ⁶, Glyn Howatson ⁷, Gregory A. Brown ⁸, Lara A. Carlson ⁹, Mark A. Chen ¹⁰, Neil Heron ^{11,12}, Christopher Kirk ¹³, Marie H. Murphy ^{14,15}, Jamie Pringle ¹⁶, Andrew Richardson ¹⁷, Jordan Santos-Concejero ¹⁸, Ask Vest Christiansen ¹⁹, Carwyn Jones ²⁰, Juan-Manuel Alonso ²¹, Rebecca Robinson ²², Nigel Jones ²³, Mathew Wilson ²⁴, Michael G. Parker ²⁵, Arabah Chintoh ²⁶, Sandra Hunter ²⁷, Jonathon W. Senefeld ²⁸, Mary I. O'Connor ²⁹, Michael Joyner ³⁰, Eva M. Carneiro ³¹, Cathy Devine ³², Jon Pike ³³, Tommy R. Lundberg ^{34,35}

Affiliations

1. Institute of Sport and Exercise Medicine, Department of Sport Science, University of Stellenbosch, SA.
2. School of Biological Sciences, University of Manchester, Manchester, M13 9PT, UK.
3. Swedish Winter Sports Research Centre, Department of Health Sciences, Mid Sweden University, Östersund, SWE.
4. Division of Surgery & Interventional Science, University College London
5. Institute of Sport Sciences, University of Lausanne, Lausanne, CH.
6. Centre for Elite Sports Research, Department of Neuromedicine and Movement Science, Norwegian University of Science and Technology, Trondheim, NOR.
7. Sport, Exercise and Rehabilitation, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, UK.
8. Department of Kinesiology and Sport Sciences, University of Nebraska at Kearney, Kearney, Nebraska, USA.
9. The Carlson Laboratory, Portland, Maine, USA.
10. Department of Science, School of Health and Life Sciences, Teesside University, UK
11. Centre for Public Health, Queen's University Belfast, Northern Ireland
12. School of Medicine, Keele University, Staffordshire, England
13. Sport and Physical Activity Research Centre, Sheffield Hallam University, Sheffield, UK
14. Physical Activity for Health Research Centre, Moray House School of Education and Sport, University of Edinburgh, Edinburgh, UK
15. Centre for Exercise Medicine, Physical Activity and Health, School of Sport, Ulster University, Belfast, UK.
16. School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, Edgbaston, Birmingham, UK.
17. Population Health Sciences Institute, Newcastle University, Richardson Road, Newcastle, Upon Tyne, UK
18. Department of Physical Education and Sport, University of the Basque Country UPV/EHU, Vitoria-Gasteiz, ESP.
19. Department of Public Health, Aarhus University, Aarhus, DNK.
20. Cardiff School of Sport and Health Sciences, Cardiff Metropolitan University, Cardiff, UK.
21. Sports Medicine Department, Aspetar Hospital, Doha, Qatar
22. Independent, UK
23. British Cycling, UK
24. Institute of Sport, Exercise and Health (ISEH), University College London, London, UK
25. Department of Physical Therapy, University of Mary, USA
26. Department of Psychiatry, University of Calgary, Canada
27. School of Kinesiology, University of Michigan, Ann Arbor, Michigan, USA
28. Department of Health and Kinesiology, University of Illinois Urbana-Champaign, Urbana, Illinois
29. Mayo Clinic, US
30. Department of Anesthesiology & Perioperative Medicine and Department of Physiology & Biomedical Engineering, Mayo Clinic, Rochester, MN
31. The Sports Medical Group, Phoenix Hospitals, London UK
32. Independent, UK
33. Department of Philosophy, Faculty of Arts and Social Sciences, The Open University, Milton Keynes, UK
34. Department of Laboratory Medicine, Division of Clinical Physiology, Karolinska Institutet, Stockholm, SWE.
35. Unit of Clinical Physiology, Karolinska University Hospital, Stockholm, Sweden

Correspondence:

Tommy R. Lundberg, PhD (tommy.lundberg@ki.se)

Department of Laboratory Medicine

Division of Clinical Physiology, ANA Futura

Karolinska Institutet

14152 Huddinge, Sweden

Abstract

N/A

Body text

The Paris 2024 Olympic boxing competition, featuring athletes with alleged male advantages in the female category, has reinvigorated controversy about eligibility criteria for women's sport. Recently, in this journal (1), we explained how endogenous testosterone production during male development leads to performance advantages arising from well-established sex-based differences in body size, muscle mass, endurance, speed, strength and power. These physical advantages are so large that they necessitate a separate and protected female category that excludes male advantage to ensure fair and safe competition for female athletes. The unfortunate developments in the 2024 Olympic Games compel these matters to be revisited.

During press conferences at the 2024 Olympic Games, the International Olympic Committee (IOC) invited solutions to address eligibility for women's sport. We take this opportunity to propose our solution, which includes: a) recognizing that female sport that excludes all male advantage is necessary for female inclusion; b) recognizing that exclusion from female sport should be based on the presence of any male development, rather than current testosterone levels, c) not privileging legal "passport" sex or gender identity for inclusion into female sport; and d) accepting that sport must have means of testing eligibility to fulfill the category purpose.

Historically, administering sex-based eligibility testing has been controversial, mainly due to failures in protecting athlete consent, dignity and confidentiality (2). As early as the 1950s, eligibility was based on visual inspection of entrants into women's sport. In 1968, these 'nude parades' were replaced by more discreet molecular methods including sex chromosome screening, and later by the more specific and sensitive test for the presence of Y chromosome genetic material (3). However, mandatory sex verification was abolished in 1999. Among concerns at the time was the risk that sport would discover that entrants in female events had an XY difference of sex development (DSD), and that the potential for traumatization and stigmatization of these athletes (3) was not justified, given the prevailing understanding that such athletes are not advantaged in the female category.

Today, 25 years later, there is ample evidence that biological sex is a crucial differentiator in ensuring fairness and influencing safety for female athletes (1). The participation of male-born competitors (e.g., transgender women) and athletes with certain XY DSDs in female sport is a growing concern. These athletes experience male-typical development from testes producing testosterone, with resultant physiological differences creating athletic advantages and safety risks (4,5,6), even in athletes with XY DSDs who might have been observed as female at birth.

The ethical failures of sports federations in the past cannot be allowed to obstruct accessible solutions to such an important issue in women's sport. The ethical framework that governs modern genetic testing is thorough and, importantly to overcome the shortcomings of the past, it emphasizes individual consent, confidentiality and dignity. Current technology enables a

screening procedure for "sports sex" that involves a simple cheek swab to determine sex chromosomes. This screen can be performed reliably and quickly and should be done in duplicate to ensure reliable results.

The results of this sex chromosome screening should be used to indicate the need for follow-up tests as part of standard medical care, including counseling and psychological support as part of the ongoing duty of care to the athlete. This will permit greater understanding of a potential medical condition, but also allow for an evidence-based assessment of male advantage in sport (5). However, to preserve confidentiality and dignity, athletes must be screened early - perhaps when they first register in the female category in an affiliated competition and before they are thrust into the global spotlight. This would prevent the individual targeting and unsolicited public scrutiny that has occurred numerous times, most recently in the 2024 Olympic Games. An early, cohort-wide approach that treats all participants equally is overwhelmingly preferable to the current approach that invites targeted testing based on allegation, suspicion, subjective assessment and bias. Despite the potential for unexpected outcomes, a survey of female athletes after the Atlanta 1996 Olympics revealed that 82% supported sex testing, with only 6% reporting discomfort about the test protocol (3). Nearly three decades later, we should revisit and respect the female athlete's voice.

It is crucial that sports federations in sex-affected sports are empowered to protect female athletes and ensure fair competition. At least one major international federation (World Aquatics) is explicit in that the eligibility criteria include genetic sex screening, and more federations should consider this addition to eligibility criteria. Rather than 'policing female bodies', screening followed by comprehensive follow-up in the rare cases that require extra consideration, with emphasis on the duty of care to every athlete, will ensure preservation of the female category for fair and safe sport.

References

- (1) Lundberg TR, Tucker R, McGawley K, Williams AG, Millet GP, Sandbakk Ø, Howatson G, Brown GA, Carlson LA, Chantler S, Chen MA, Heffernan SM, Heron N, Kirk C, Murphy MH, Pollock N, Pringle J, Richardson A, Santos-Concejero J, Stebbings GK, Christiansen AV, Phillips SM, Devine C, Jones C, Pike J, Hilton EN. The International Olympic Committee framework on fairness, inclusion and nondiscrimination on the basis of gender identity and sex variations does not protect fairness for female athletes. *Scand J Med Sci Sports*. 2024 Mar;34(3):e14581. doi: 10.1111/sms.14581. PMID: 38511417.
- (2) Heggie V. Testing sex and gender in sports; reinventing, reimagining and reconstructing histories. *Endeavour*. 2010 Dec;34(4):157-63. doi: 10.1016/j.endeavour.2010.09.005. Epub 2010 Oct 25. PMID: 20980057
- (3) Elsas LJ, Ljungqvist A, Ferguson-Smith MA, Simpson JL, Genel M, Carlson AS, Ferris E, de la Chapelle A, Ehrhardt AA. Gender verification of female athletes. *Genet Med*. 2000 Jul-Aug;2(4):249-54. doi: 10.1097/00125817-200007000-00008. PMID: 11252710.

(4) Handelsman DJ, Hirschberg AL, Bermon S. Circulating Testosterone as the Hormonal Basis of Sex Differences in Athletic Performance. *Endocr Rev.* 2018 Oct 1;39(5):803-829. doi: 10.1210/er.2018-00020. PMID: 30010735.

(5) Handelsman DJ. Towards a Robust Definition of Sport Sex. *Endocr Rev.* 2024 Apr 5:bnae013. doi: 10.1210/endrev/bnae013. Epub ahead of print. PMID: 38578952.

(6) Bermon S. Androgens and athletic performance of elite female athletes. *Curr Opin Endocrinol Diabetes Obes.* 2017 Jun;24(3):246-251. doi: 10.1097/MED.0000000000000335. PMID: 28234801.

Conflict of interest statement

The authors would like to make a joint conflict of interest statement in which we declare the following: Several authors have received payment to provide expert testimony related to this topic. Several authors have received payment for their consultancy work with sports organizations and/or companies. Several authors have received travel and accommodation expenses for speaking engagements related to this topic. Several authors have spoken in the mainstream media on this topic. Three authors (EH, CD, JP) are unpaid advisors to advocacy organizations.

Data availability statement

Not applicable.

Ethics approval statement

Not applicable.