

# The protected category for female athletes.

## Why is a woman not more like a man?

By Dr Tim Welborn

The next Tokyo Summer Olympics (postponed until July 2021 because of Covid-19) is expected to be the first games where the proportion of female athletes reaches 50%. Since the initial modern Olympics in 1896, when there were no women competing, their participation has risen progressively. In 1988 at the Seoul Games, a quarter of competitors were female, and by 2012 in London, the proportion of female competitors was 42% and they took part in every major sporting category. The International Olympic Committee (IOC) which was founded to harness the power of sport for the service of humanity, has pledged to achieve gender equality in the numbers of women in sport, as well as at all levels of its administration.

The obvious advantage that men show in size, strength, speed and endurance, determined the need for a “protected” female category in competitive sports. Comparison of World Record data confirms this, for example, the records for running 100 meters (men 9.58 seconds versus women 10.49 seconds), 5000 meters (men 12 minutes 37.35 seconds versus women 14 minutes 11.15 seconds), the high jump (men 2.45 m. versus women 2.09 m.), and javelin throwing (men 98.48 m. versus women 72.28 m.). The fact that shotput world records are much closer (men 23.12 m. versus women 22.63 m.), is because the weights have been adjusted (7.26 Kg for men, 4.0 Kg for women). Equestrian events do not distinguish between males and females.

Females also have to deal with the impositions of the menstrual cycle and its complications, including endometriosis. More than half of elite athletes report that their hormonal fluctuations negatively affect training and performance. Those with amenorrhoea (lack of periods) may run the risks of low bone density

and stress fractures. The combination of amenorrhoea with dietary restriction and low bone density is known as the “female athlete triad”.

Clearly the eligibility of athletes to compete in the female category requires careful definition and regulation. Historically some men have competed as women, and it has long been suspected that intersex conditions confer an unfair advantage. Fairness is paramount in sporting achievement, which is very exacting and is measured within millimetres, 100<sup>ths</sup> of a second or to the second decimal place in performance scores. Fairness is all the more important now that sport is a multimillion dollar business, and creates opportunities for great wealth, scholarships, contracts, and careers.

As long ago as 1936 Avery Brundage recommended formal screening of female athletes. Not until 1950 did the International Association of Athletic Federations (IAAF) institute compulsory physical inspections to confirm the sex of a female athlete, but this was widely opposed (there are accounts of athletes parading naked in front of panels of physicians and gynaecologists). In 1968 the International Olympic Committee (IOC) added chromosome testing using buccal smears at the Mexico Games, but this was later abandoned because of insufficient qualified laboratories and common errors of interpretation. In the 1990s, routine sex verification screening was officially ceased, but the authorities retained the right to investigate any individual cases that raised suspicion, on the basis of physical appearance or unusually good performance. At the time, compulsory urine testing was mandated to exclude doping, and since this required an official witness to confirm that every single urine sample came from the athlete’s urethra, it was used as a surrogate means of identifying masquerading males.

Athletes of interest could be asked to have a measurement of blood testosterone levels to identify any deviation in hormonal characteristics, and an arbitrary threshold of serum testosterone less than 10 nmol/L was initially promulgated. But in 2015, with a case of disputed and unfair suspension, the Court for Arbitration in Sports decreed that there was insufficient evidence to support the notion that higher testosterone levels in females enhanced their performance, and the criterion was scrapped.

Such scientific evidence is available now from substantial peer-reviewed medical studies and it is compelling. Careful and unambiguous regulations have been publicised. Professor David Handelsman, an Australian Endocrinologist from the University of Sydney, is perhaps the leading authority on testosterone and athletic performance, and his comprehensive reviews in the medical literature are prominently cited by the international regulators, and is summarised in the following paragraphs.

Circulating testosterone levels are identical in girls and boys until puberty. But after the completion of male puberty, men have levels that are consistently 10 to 15 times higher than women. Male testosterone comes from the testicles, and female circulating testosterone arises equally from the adrenal glands, the ovaries, and from peripheral extra-glandular conversion of steroid precursors in fat and liver tissues. Fully developed healthy females have a range of serum testosterone of 0.12 to 1.79 nmol/L, as compared to the male range of 7.7 to 29.4 nmol/L, with clear bimodal separation. The “cut-points” to separate females from males, initially 10 nmol/L, have recently been brought down to 5 nmol/L. Importantly the measurements have to be made by liquid chromatography/mass spectrometry, previous immunological methods being variable and unreliable.

Measurements of performance over a wide range of ages from children to adults show no sex differences until the age of 12 to 13 years, when the male advantage becomes evident. Norwegian studies of running and jumping events, and Polish measurements of track and field skills confirm this. Detailed comparisons of the top levels of performance in five styles of swimming, and multiple track and field events, and studies of hand-grip strengths from the USA and Canada all indicate a progressive sex-related divergence in performance which is virtually parallel to testosterone levels from the age of 12 onwards, reaching a plateau in the late teenage years.

There is a “dose-response” relationship between measured testosterone levels and muscle mass and strength. Much observational research confirms this, but

there is also interventional data where performance is measured after manipulating testosterone levels. Volunteer males, having agreed to temporary chemical castration, were given stepwise doses of testosterone to measure outcomes. In males with a testosterone level as low as 6.9 nmol/L, a measurable effect is evident. Similar short-term experiments in post-menopausal females show a physical advantage with levels of 7.3 nmol/L. Most recently, Dr Angelica Hirschberg has reported a double-blind trial of low-dose transdermal testosterone versus placebo, in 48 females aged 18 to 35 years of age. Those given the active hormone showed a rise in testosterone levels from 0.9 nmol/L to 4.3 nmol/L after 10 weeks, and even at this low level there was a significant enhancement of stamina and improved lean muscle mass.

Testosterone also directly stimulates the bone marrow causing a rise in haemoglobin levels, which improves the oxygen-carrying capacity of the blood. Higher haemoglobin levels generate an 8% to 12% ergonomic advantage (that is why “doping” with EPO and/or the use of illicit blood transfusions is banned). Bone size also plays a part, greater height giving an advantage in most, but not all sports. There is an interesting hypothesis that high levels of testosterone provide a psychic competitive benefit but this is extremely difficult to prove.

The IAAF and the IOC State now state that the protected category for the female sex requires diligent definition. It is clearly necessary to avoid the unfair advantage conveyed by high testosterone levels that can occur in intersex conditions and in transgender females. But sex classification and proof of eligibility to compete as a female in sport and athletics must always respect individual dignity and privacy, and carefully avoid stigmatisation.

Note that “sex” and “gender” are not interchangeable. Sex is an objective state with precise genetic, chromosomal, gonadal, hormonal and phenotypic forms. Gender in contrast is a subjective, self-identified and highly malleable construct. It indicates an individual’s perceived gender role and social orientation. At birth, gender and biological sex are congruent, but throughout life an individual can express a wish to be different, and a man can state that he has female gender if desired.

Disorders of sexual development, known as DSDs, are rare (see Table). They usually recognised at birth by the presence of ambiguous genitalia. If these people are brought up as females, they are likely to have very high androgen levels and thereby achieve a significant enhancement of athletic performance. Most have male (46 XY) chromosomes with subtle enzyme deficiencies that lead to internalised testicles. In addition there are cases of the Androgen Insensitivity Syndrome, also with internal testes but female external features. Those identified with complete androgen insensitivity should be allowed to compete for their male hormone levels are inactive, but partial cases will demonstrate an unequivocal testosterone benefit. There is some evidence that these DSDs are 140 times more prevalent in elite female athletes than in the general population.

A rare DSD known as Congenital Adrenal Hyperplasia can cause high levels of adrenal androgens. It is usually diagnosed and treated at birth, but there are late onset cases. The treatment is with corticosteroids, and although this condition and its treatment is unlikely to be a factor in competitive sports, it must be declared to the authorities.

Polycystic Ovarian Syndrome (PCOS) is a common condition that occurs in at least 5% of the healthy female population, and it is a common cause of hyperandrogenism. It is characterised by irregular periods and relative infertility. Although the frequency of PCOS in female athletes, especially in power sports, is said to be disproportionately high, the great majority have testosterone levels well below 5 nmol/L, and it is reasonable that they should be allowed to compete.

The IAAF have issued new Eligibility Regulations for the Female Classification (Athlete with “Differences” of Sexual Development) effective from 21st November 2018, recognising the singular influence of circulating testosterone levels and their impact on sporting performance, as described in the broad medical and scientific consensus and peer-reviewed data. The defined eligibility criteria for relevant athletes having one of the listed DSDs, and competing in specific restricted events (400 m, 400 m hurdles, 800 m, 1500 m, 1 mile):

*“...must be recognised at law as female or intersex: and must reduce her blood testosterone level to below 5 nmol/L for a continuous period of at least six months (for example by the use of hormonal contraceptives), and must maintain her blood testosterone level below 5 nmol/L so long as she wishes to maintain eligibility”.*

To open her case, a relevant athlete must advise IAAF Medical Management at least three months in advance of the entry date that she wishes to compete in the female classification in a restricted event, and agree to provide samples.

The World Athletics Eligibility Regulations for Transgender Athletes, in a separate publication, espouses very similar principles. “Transgender” is defined as an individual whose gender identity is different from the sex designated at birth. IAAF requires evidence in such cases that the athlete’s gender identity is female, and that the blood testosterone concentration has been less than 5 nmol/L continuously for at least 12 months. That level must be maintained as long as eligibility to compete is required. The athlete must agree to random or targeted laboratory monitoring. The official document has an appendix containing a detailed and very competent summary of the treatment for transgender females, including oestrogen regimes and several anti-androgen (testosterone lowering) therapies.

These rulings outline clear and straightforward criteria that are simple, and as fair as possible, avoiding the unnecessary complications of physical examination, chromosome testing, and DNA analysis. Needless to say, strict laboratory requirements are specified including that all measurements of serum testosterone must be conducted by liquid chromatography-mass spectrometry, in accredited laboratories with international standing.

The personal story of Caster Semenya is well known in the international athletic community, and her history exemplifies the personal triumphs, repeated conflicts, and huge disappointments of being a dedicated high achieving athlete, being confronted by official intrusions that can threaten and destroy her standing. Born in Pietersburg South Africa, and educated in Sports Science at the North-West University, she started running at the age of 17 in order to get fit for

soccer. But with her superb running skills she was quickly channelled her into competitive athletics. In her career, she won multiple gold medals in Africa, the Commonwealth Games, World Championships, and in the Olympics. In 2009 she was voted The Women's 800 meter runner of the year by Track and Field News. In 2012 she carried the South African flag at the opening ceremony of the London Olympic Games. In 2016 she won all of the three titles at the South African National Championships four 400 m, 800 m, and 1500 m.

Her gender has been female since birth but she has become the unwitting victim of her biology. Early in her career, her fast times led to the suspicion of doping. Investigation by the IAAF was negative and she was allowed to keep her 2009 gold medal. There were unverified claims in the international media that she had an intersex trait. In South Africa the press responded by implying European bias and racism, and by stating that the controversy disrespected her privacy and human rights.

In the 2011 World Championships, she was second in the 800 m event to Russia's Mariya Savinova, but the latter's gold medal was disallowed after proof of doping, and the prize reverted to Semenya. One year later, the Russian athlete again won gold at the Olympics, but doping violations were upheld again, and the medal was again passed on to the South African.

By 2018, the IAAF's new criteria disallowing female athletes with high testosterone was promulgated, and recommendations were included that such athletes could submit to treatment as necessary. So well in advance of the 2019 Commonwealth games, Semenya mounted a high level legal challenge to the Court of Arbitration in Sport, which was unsuccessful. She then appealed to the Federal Supreme Court of Switzerland, which initially postponed a decision but ultimately supported the IAAF ruling. It emerged that Caster Semenya has the 46 XY male chromosome (and thus is likely to have the partial Androgen Insensitivity Syndrome also known as testicular feminisation). As a result, Semenya, heartbroken, had to miss the Doha World Championships. At the time she stated that the case had "destroyed her mentally and physically". But she appears to have bounced back now. The Los Angeles Times recently quoted her saying "I am the girl from Africa, the most powerful runner in the world". She

has gone back to soccer, joining the JVW Football Club (named after Janine van Wyk), which fields five teams, and aims to identify, develop, improve and publicise female football players).

The long history of battling for female equality, perhaps since women's suffrage in the mid 19<sup>th</sup> century, has been one of progress and successful achievement. Equal rights for primary education, healthcare, political representation are better worldwide now than ever before. Women's entry into sport will culminate with an equal numbers of participants of each sex, hopefully when the next Summer Olympic Games take place. Since 2012, there are no countries that prevent women from taking part. Obvious discrepancies persist in funding and sponsorship of female events, and differences exist in the degree of publicity and media representation for female athletes and sports. The International Olympic Committee has not yet achieved its own target of at least 20% female membership.

Discrimination persists in that the protection of female athletes, to achieve fairness in specified competitions (distance races of 400m. to 1 mile), requires sex and gender testing in the form of mandatory measurement of testosterone levels in those females with differences of sexual development and/or those who are transgender. No such testing is required in male competitors. But the rules are as fair as they can be, and must be implemented with great sensitivity, and special care to ensure privacy, the respect of human rights, and the avoidance of stigmatisation.



## TABLE

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Differences of Sexual Development (DSDs) as listed by the IAAF.

- *5 alpha-reductase type 2 deficiency*
  - *Partial androgen insensitivity syndrome*
  - *17 beta-hydroxysteroid dehydrogenase type 3 deficiency*
  - *Congenital adrenal hyperplasia*
  - *3-beta hydroxysteroid dehydrogenase deficiency*
  - *Ovotesticular DSD*
  - *Any other genetic disorder involving disordered gonadal steroidogenesis*
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