# Proposed testosterone testing of some female olympians challenged by scientists

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Proposed Olympic policies for testing the testosterone levels of select female athletes could discriminate against women who may not meet traditional notions of femininity and distort the scientific evidence on the relationship between testosterone, sex and athletic performance, says a Stanford University School of Medicine bioethicist and her colleagues.

They also warn that the proposed policies would not only be unfair, but also could lead to female athletes being coerced into unnecessary and potentially harmful medical treatment in order to continue competing. The critique was published online today in *The* American Journal of Bioethics.

The testing policies, adopted a year ago by the International Association of Athletics Federations and now under consideration by the International Olympic Committee, call for using testosterone levels to decide whether an athlete is "feminine" enough to compete as a woman. The problem, the authors explain, is that there is insufficient evidence to set a benchmark for a normal testosterone levels in elite female athletes, let alone persuasive research showing that testosterone levels are a good predictor of athletic performance.

"What makes sex testing so complicated is that there is no one marker in the body we can use to say, 'This is a man,' or, 'This is a woman,'" said first author of the paper Katrina Karkazis, PhD, a medical anthropologist and senior research scholar at Stanford's Center for Biomedical Ethics. "These new policies try to get around that complexity by singling out

testosterone levels as the most important aspect of athletic advantage. But what causes athletic advantage is equally complex and cannot be reduced to testosterone levels."

Although it is widely believed that chromosomal testing or genital exams can indicate definitively a person's sex, such methods are flawed. Contrary to the general understanding that women have two X chromosomes and men have an X and a Y, there are actually too many variations on chromosomal markers to use the test accurately in all cases. While it is uncommon for women to have a Y chromosome, it does occur in a small number of women.

What's more, regardless of chromosomes, female anatomy and physiology vary in ways that may make it difficult to quickly classify a person as male or female. There are individuals with intersex traits who are born with reproductive or sexual anatomy that doesn't fit the typical definitions of female or male.

The new polices for testosterone testing arose from the controversy surrounding South African runner Caster Semenya, who won a gold medal in the women's 800 meters at the 2009 World Championships. After complaints from competitors that she was "too masculine" — including the comment that, "These kinds of people should not run with us... For me, she is not a woman. She is a man" — she was forced to undergo tests that turned a private question of personal identity into a humiliating and distressful public spectacle. The IAAF ultimately ruled that Semenya is eligible to compete as a woman, but the experience led the organization to issue new rules when the sex of an athlete is questioned. The IOC is considering adopting these rules, or some variation of them, in time for the London Games this summer.

The IAAF policies state that female athletes with unusually high testosterone levels, a condition known as hyperandrogenism, will be

banned from competition unless they undergo surgery or take drugs to lower their levels. "The new regulations rest on the assumption that androgenic hormones (such as testosterone and dihydrotestosterone) are the primary components of biologic athletic advantage," the authors write. In practice, the policies focus specifically on testosterone, they added.

Under the IAAF rules, all female athletes with a condition leading to hyperandrogenism must report this knowledge to sporting authorities. And beyond that, if suspicions or complaints arise about a specific female athlete — something as simple as an athlete looking "too masculine" — a confidential evaluation can also be initiated. This part of the policy is worrisome, the authors write, because athletes can be targeted for testing by anyone, including their competitors, based on arbitrary concerns about "masculine traits" such as too much body hair, musculature or an unusually deep voice. The resulting required evaluations would include some combination of three types of exams: a clinical exam; testing urine and blood for hormone levels; and/or a full exam that includes genetic testing, imaging and psychological testing. If testosterone levels are found to be too high, the athlete will then be required to undergo medical intervention in order to continue competing.

While such a process is supposed to protect an athlete's privacy, the ability of the governing committees to keep such testing confidential has proven difficult in the past. The high-profile, elite athletes who undergo testing are banned from competition while it is under way, leading to speculation and gossip within the media and sports world. This is what happened in 2009 in the case of Semenya, whose predicament received widespread media coverage despite claims of confidentiality.

Routine sex testing has been done in past Olympic competitions but was dropped 10 years ago because of repeated inaccuracies, stemming from its reliance on a single trait, such as chromosomes, to verify sex. The

problem is similar when relying on testosterone levels alone to determine if an athlete is "too masculine" to compete.

"Individuals have dramatically different responses to the same amounts of testosterone, and it is just one element in a complex neuroendrocrine feedback system," said Rebecca Jordan-Young, co-author of the paper and associate professor of women's, gender and sexuality studies at Barnard College and Columbia University.

"We don't even know what typical testosterone levels are for elite female athletes," Karkazis added.

The authors also contend that, even if high testosterone levels were found to be a marker of improved athletic ability, it is not reason enough to bar women with naturally occurring high levels of the hormone from competing.

"There are many biological reasons some athletes are better than others," the authors write, pointing to several runners and cyclists who have rare mitochondrial variations that give them extraordinary aerobic capacity, or basketball players who have acromegaly, a hormonal condition that results in exceptionally large hands and feet. Such biological differences don't cause them to be banned from competition, they write.

"It bears noting that athletes never begin on a fair playing field; if they were not exceptional in one regard or another they would not have made it to a prestigious international athletic stage," the authors note.

Of particular concern with the potential policies is the possible coercion of athletes into undergoing unnecessary and potentially harmful medical treatment if they are found to have hyperandrogenism. "If the athlete does not pass, she is banned from competition until she lowers her testosterone levels," the authors write, noting that the treatment options

would entail either pharmaceutical intervention or gonadectomy, both of which carry serious potential side effects.

Instead of adopting such policies, the authors recommend against gender policing by international sporting authorities. Historically, the rationale for sex testing was based on the long-standing concern that men could masquerade as females in elite sports, and must be weeded out. Yet, decades of routine sex testing in international sport have revealed that, at most, there have only been two instances of this. "Men trying to compete in women's competition is not, nor ever has been, a significant problem," the authors write.

In an accompanying commentary to the journal article, Spanish hurdler Maria Martínez-Patiño, a high-profile athlete with an intersex condition, is also critical of the IAAF policy. Martínez-Patiño was stripped of her 1986 national championship in the 60-meter hurdles because an earlier test showed that she had XY chromosomes, typical in males, and yet she developed as a female. A couple of years later the IAAF reinstated her.

"Only those who have lived through having their eligibility and gender identity contested can attest to its egregious impact," Martinez-Patio writes along with co-author Hida Viloria, chair of the Organization Intersex International. "The psychological consequences of this experience are excruciating."

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