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### *Review article*

## **The history and current policies on gender testing in elite athletes**

**<sup>1</sup>Professor Arne Ljungqvist, MD, <sup>2\*</sup>Professor Maria José Martínez-Patiño, PhD; <sup>2</sup>Professor A. Martínez-Vidal, PhD, <sup>3</sup>Professor Luisa Zagalaz PhD, <sup>2</sup>Professor Pino Díaz, PhD, <sup>4</sup>Professor Covadonga Mateos, PhD**

<sup>1</sup> International Olympic Committee Medical Commission

<sup>2</sup> Faculty of Sciences in Education and Sport, University of Vigo, Spain

<sup>3</sup> Department of Physical Education, Faculty of Physical Education, University of Jaen, Spain

<sup>4</sup> Department of Physical Education, University of Las Palmas de Gran Canaria, Spain

### **Abstract**

The purported rationale of sex verification tests in elite sports was to ensure women competed on equal terms by preventing male impostors masquerading as women from obtaining unfair gender-related advantages in women-only sports events. This review traces the developments and current policies on gender verification of elite women athletes since the inception of sex controls in the 1960s. In the advent of sex controls women athletes were forced to parade in the nude before a panel of gynaecologists and were subjected to traumatic and degrading visual genital inspections. Subsequently, screening of female athletes involved genetic-based laboratory testing which was initially based on a simple technique of evaluating a buccal smear for the presence of a Barr body, and more recently the determination of the presence of Y chromosomes or male-related genetic material using PCR amplification of chromosomal DNA extracted from nucleated cells.

The publicity surrounding the notorious case of the Spanish national champion hurdler, Maria Patiño, in the 1980s prompted calls for the elimination of sex controls in elite sports. Maria Patiño, who was publicly humiliated when she failed her sex verification test due to androgen resistance, was stripped of her titles and disqualified from competing in women-only sport events, only to be reinstated 3 years later. By then, however, her career as a professional athlete was over. Maria Patiño's case and those of other athletes who had been unjustly excluded from competitive sport prompted changes in the regulations regarding sex verification which brought them in line with the development of elite sport and biomedical science.

Women athletes with rare sex-related genetic abnormalities, such as 5- $\alpha$ -steroid-reductase deficiency, complete or almost complete androgen insensitivity, and chromosomal mosaicism, have no unfair gender-related advantages and should not be disqualified from

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\* Corresponding author. Address at the end of text.



competing in elite sports events. Nor should they be stigmatised and their right to privacy should be guaranteed by sports organizations during the process of gender verification.

The abandonment of compulsory sex verification tests of female athletes which was initiated by the International Association of Athletics Federations (IAAF) was later followed by most international sports federations, and in the end also by the International Olympic Committee (IOC), although initially only provisionally. The abandonment of sex verification tests brought an end to the traumatic, demeaning, and unjust regulations bringing them in line with advancements in sport, modern medicine, and science. **Keywords:** gender identity; sex determination; gender verification; sex discrimination, sport

#### **Professor Arne Ljungqvist, MD,PhD**

Professor Ljungqvist is the Chairman of the Medical Commission of International Olympic Committee, and a Board member of the World Anti-doping Agency (WADA).

Contact details:

Email: [Arne.Ljungqvist@rf.se](mailto:Arne.Ljungqvist@rf.se)

#### **Professor Maria José Martínez Patiño, PhD**

Professor Martínez Patiño is a Senior Research Lecturer in the Faculty of Sciences in Education and Sport, Vigo University, Spain. She supervises several research projects on women in elite sport. She is an ex-elite athlete who was part of the Spanish Olympic Team in the 1980s, and a pioneer in the campaign to eliminate sex verification controls from elite sport.

#### **Professor Aurora Martínez Vidal, PhD**

Professor Martínez Vidal is the Head of the Special Didactics Department, Faculty of Sciences in Education and Sport, Vigo University, Spain.

He heads the HI6 Group Research Project, and his main research areas are women and performance in elite sport.

Contact details:

Tel.: +34.988.38.72.24

Email: [aurora@uvigo.es](mailto:aurora@uvigo.es)

#### **Professor Luisa Zagalaz Sánchez, PhD**

Professor Zagalaz is Head of Research of the Human Evolution Research Project, funded by several European universities. She is also Head of the Department of Physical Education, Faculty of Physical Education, Jaén University, Spain. Her research interests are women, sports and paleoanthropology

Contact details:

Email: [lzagalaz@ujaen.es](mailto:lzagalaz@ujaen.es)

#### **Professor Pino Díaz Pereira, PhD**

Professor Díaz is a Senior Research Lecturer in the Special Didactics Department, Faculty of Sciences in Education and Sport, Vigo University, Spain. Professor Díaz is a researcher on the HI6 Group Research Project and with research interests in women in elite sports, with a specific interest in elite rhythmic gymnastic athletes.

Contact details:

Email: [pinod@uvigo.es](mailto:pinod@uvigo.es)



**Professor Covadonga Mateos Padorno, PhD**

Professor Mateos is a Senior Lecturer and Head of Research in the Department of Physical Education, Las Palmas de Gran Canaria University, Spain. His main research interest is women in competitive athletic sports, particularly elite high jump athletes.

Contact details:

Email: [cmateos@def.ulpgc.es](mailto:cmateos@def.ulpgc.es)

**Introduction**

While women began to actively participate in competitive sports in the 1920s, it was not till after the World War II that significant numbers of women began to compete in elite sports events. The explosion in the number of female competitors was coupled with an increasing number of sports available to women, and a spectacular improvement in the performance marks which matched or even exceeded those of men<sup>19</sup>. The sensational performance of Zhang Shan representing the Chinese delegation in the skeet shooting event at the 1992 Barcelona Olympics highlighted the parity. Zhang finished first and became the first woman to win a mixed sex shooting event<sup>19</sup>.

The high performance marks of female athletes in the 1960s led to rumours that questioned the gender of some female athletes. This led to a call for sex verification tests to safeguard fair competition by preventing men disguised as women from participating in women-only sport's competitions. Initially, women athletes were forced to parade naked and undergo a visual genital inspection by a panel of gynaecologists. Genetic-based laboratory testing such as the Barr chromatin test and later Y chromosome detection were subsequently introduced<sup>16,9</sup>.

Since their inception sex verification tests have been controversial with leading geneticists such as Prof. De la Chapelle and other members of the scientific community campaigning for the abandonment of such tests in competitive sports<sup>10,6,17</sup>.

The move to eliminate sex controls in elite sports in the 1980s was spurred by the notorious case of the Spanish

athlete, Maria Patiño, and the intercession of the Chairman of the IAAF Medical Commission, Prof. Arne Ljungqvist,<sup>8,9,17</sup> who initiated change fundamentally on the grounds that the rationale for introducing sex controls in the 1960s was no longer pertinent and the procedure discriminated against female athletes with rare genetic disorders of sexual differentiation and development<sup>10</sup>.

Women athletes with rare sex-related genetic abnormalities, such as 5- $\alpha$ -steroid-reductase deficiency, complete or almost complete androgen insensitivity, and chromosomal mosaicism, do not have unfair gender-related advantages in women-only sports events and should not be excluded from elite sports competitions. Most importantly, professional sports organisations are committed to respect the rights of female athletes who undergo sex verification tests<sup>6</sup>.

**The introduction of gender verification tests**

The growth in popularity of women's sports, the stunning performance marks achieved by some women athletes in the 1960s, and Cold War rivalries brought forth concerns about the "femaleness" of certain female participants in women's events. National federations had relied on a medical certificate attached to the application form to validate the gender of a female athlete but, due to the suspicions raised as to the legitimacy of these documents, the first medical inspections were performed on women athletes<sup>4</sup>. Sex testing of all female entries was introduced at the 1966 European Athletics Championships in Budapest after allegations that some female competitors were technically male. Initially, all female athletes were



required to parade naked and undergo visual genital inspection by a panel of doctors to obtain eligibility to participate in competitive sport<sup>4</sup>.

Subsequently, female athletes were forced to undergo manual gynaecological examinations during the 1966 Commonwealth Games held in Kingston (Jamaica). In the 1967 Pan-American Games held in Winnipeg (Canada), and the European Athletics Championships held in Kiev (former Soviet Union, now Ukraine) female athletes had to endure a visual genital examination<sup>4,10</sup>.

Two years later, in the 1968 Grenoble Winter Olympic Games and in the summer Mexico Olympic Games, the IOC introduced the sex chromatin test, a simple and quick genetic sex determination test developed Barr and Bertram in 1949 that detected X inactivation as evidenced through the presence of "Barr Bodies"<sup>4,3,18</sup>.

Since the inception of the chromatin sex test for the verification of female athletes, the Finnish geneticist, Albert De La Chapelle has been at the forefront of the movement calling for the revision of the IOC's stance on the grounds that if the aim of the gender tests is to detect and exclude male impostors or women whose condition causes masculine muscle development and confers them a "masculine" competitive advantage, the sex chromatin test failed to serve the intended purpose. It would detect women with genetic abnormalities that had no gender related advantages. Conversely, the test failed to detect women with hormonal conditions that could give them a competitive advantage over other female athletes, namely conditions which cause masculine muscle development.

De La Chapelle underlined that buccal smears were technically unreliable and detected female athletes with genetic disorders, such as androgen insensitivity syndrome and gonadal dysgenesis, who were unassailably women<sup>12</sup>. From a scientific perspective, the genetic sex verification

tests used by athletic organizations provided potentially inaccurate results that undermined the efficacy of sex chromatin for human sex determination and differentiation, and to diagnose rare genetic abnormalities.

Above all, the test detected athletes who were unassailably feminine but had an XY chromosomal pattern. Many of these individuals had variants of androgen resistance, either complete or partial -- in which case, they are naturally resistant to the strength-promoting qualities of testosterone. Others had variants of XY gonadal dysgenesis. Paradoxically, in theory, the sex chromatin test would have permitted men with chromosomal abnormalities such as XXY karyotype, or Klinefelter's syndrome, and XX males, who have a portion of the testicular determining gene (SRY) transposed onto the X chromosome, to 'pass' the test and compete in women-only sports events. As the test exclusively analyses sex chromosomes and disregards physiological, hormonal, and psychosocial factors it fails to meet its essential objective i.e., sex differentiation<sup>2,11</sup>.

Likewise, legal experts, particularly those involved in sports law, have argued that from a legal and human rights point of view sex controls are unconstitutional, and women should not be forced to prove their femininity<sup>10,17</sup>.

Prior to the introduction of sex controls in sports, geneticists<sup>11,12</sup> had expressed his reservations regarding the efficacy of sex chromatin tests, and stressed that the sex chromosome component of gender is misleading in determining an individual's femininity or masculinity. Once the sex chromosomes have given the message to develop testes or ovaries, they cease to play a role in sex differentiation given that other gender factors such as hormone levels, internal and external organs, environmental and social phenotype, and the psychosocial predisposition are more decisive.

Despite the compelling evidence the IOC and the international federations



ignored these arguments and continued to apply sex chromatin tests contrary to the findings and recommendations of geneticists and other medical experts<sup>5</sup>.

### **The abandonment of sex verification tests**

In accordance with the recommendations of the IAAF workshop in 1990, the IAAF Council in 1991 abandoned laboratory-based gender verification tests<sup>1,5</sup>. The IAAF workshop, which included a number of specialties, among them geneticists, paediatricians, endocrinologists, psychiatrists, sports governors, and women athletes, concluded that:

1. women with birth defects of the sex chromosomes do not possess an unfair advantage and should be permitted to compete as females;
2. the only purpose of gender verification was to prevent men from masquerading as females;
3. people who have been both legally and psycho-socially female since childhood (including pre-pubertal sex re-assignments) should be eligible for women's competition regardless of their chromosomal pattern;
4. post-pubertal sex re-assignments should be handled on a case-by-case basis;
5. women athletes should undergo pre-participation health examinations.

Nevertheless, due to the lack of unanimity concerning the precise criteria for gender examinations, a second IAAF working group in 1992<sup>1</sup> recommended that screening for female gender at IAAF competitions be abandoned and that the medical delegate at a competition should have the authority to arrange for the determination of the gender of an athlete at his/her discretion.

Neglecting the IAAF's proposals and the concerns over scientific accuracy and ethical debates about testing for gender, the IOC refused to abandon gender verification by replacing

chromatin tests with DNA-based methods for the determination of the presence of Y chromosomes or male-related genetic material using PCR amplification of chromosomal DNA extracted from nucleated cells<sup>1</sup>. Such a procedure was introduced at the Albertville Winter Olympic Games in 1992, and also used at the Barcelona Olympic Games in 1992, where 2,406 athletes were screened to detect the SRY and DYZ1-L sex-determining locus on the Y chromosome<sup>1</sup>.

In response to the IOC's refusal to abolish gender verification tests, the Norwegian government denied the IOC assistance with sex verification tests during the 1994 Lillehammer Olympic Games declaring the tests illegal and unethical<sup>1</sup>.

In spite of the opposition, the IOC persisted with the need for on-site sex verification for the eligibility of female athletes at the Olympic Games, and included this requirement in the contract signed by the Organizing Committee of the 1996 Atlanta Olympic Games.

The Executive Committee of the IOC, convened in Seoul in 1999, unanimously approved the recommendation of the IOC Athlete's Commission to follow the IAAF example and decided to provisionally discontinue genetic-based sex testing of female athletes at the Sydney Games Olympic (2000)<sup>7</sup>. The attempt proved successful and at the Games that have followed (Salt Lake City 2002, Athens 2004, and Torino 2006) no sex screening of female athletes has been conducted. Nor is the requirement for such testing included in the host city contracts of the coming Games (Beijing 2008, Vancouver 2010, and London 2012). The International Volleyball Federation was the last to apply the sex control tests in 2004; thereafter, they too discontinued such testing 20 years after the first protests were voiced by the geneticist Albert de la Chapelle<sup>7</sup>.



## Conclusion

The abolishment of sex verification tests as a condition for women's participation in competitive sport has closed a dark chapter in elite female sport which has had a permanent impact on the evolution and performance of female athletes. Gender verification has forced professional sports organizations to address the scientific and ethical implications of gender in competitive sport.

## Address for correspondence:

Professor María José Martínez-Patiño,  
Special Didactics Department. Faculty  
of Sciences in Education and Sport,  
University of Vigo. Pontevedra, Spain  
Tel. +34.986.80.17.45  
Email: [mjpatino@uvigo.es](mailto:mjpatino@uvigo.es)

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