Olympic Gender Testing

A historic review of gender testing and its influence on current IOC policy

In the mythology and mindset of the Western world, few institutions command as much prestige and excitement as the Olympics. It is no coincidence that the earliest definite date in Greek history is a foot race that comprised the first Olympic event.[12] For over a thousand years, these ancient games celebrated the athletic prowess of man, but "man" in the narrow sense of the word, as strict social convention forbade women from even watching the competitions. [12] The modern International Olympic Committee righted this wrong when women began competing in 1900. [12] As the number and prominence of female Olympic athletes increased, it seemed that the problem was solved.

Or was it? The line between "male" and "female" Olympic athletes blurred early in the 20th century and the ensuing uncertainty and controversy continues today. This paper will consider the history and biology of Olympic gender testing in the 20th century, with a special focus on how this history may influence recent decisions reached regarding transsexual Olympic athletes.

Pre-Testing

From the beginning, competitive passions and deeply ingrained social beliefs fueled private and public doubts about the "true gender" of those athletes competing as women. [12] Conventional wisdom and scientific evidence of the turn of the century held that men carried an athletic advantage over women—what prevented an unscrupulous male athlete from disguising himself as woman? For the fifty years before performance enhancing drugs, gender provided the most fertile ground for biologic Olympic controversy. These conditions generated endless rumors and suspicions, most of which were unfounded—but not all.

In the 1932 Los Angeles Olympic games, Polish sprinter Stanisllawa Walasiewicz won the gold medal in the 100m dash. [6] In Berlin four years later, she won silver in the same event. After moving the United States and changing her name, Stella Walsh was killed in a random act of violence in 1968.[9] As part of a routine autopsy, coroners discovered that Stella was a masculine pseudohermaphrodite (mosaicism).[9] Externally female, Stella had undescended testicles in the place of a uterus and ovaries. This discovery, in the words of one IOC medical board commissioner, "aroused much comment" in the popular press and the IOC posthumously retrieved Stella's medals. [6]

In the 1936 Olympic Games in Germany, Dora Ratjen took fourth place in the women's high jump. [7] Born with ambiguous genitalia, *Hermann* Ratjen later revealed that he lived nearly all of his life as a man. According to Hermann, the Nazi Youth Movement coerced him into

denying his assumed gender and competing as a woman in the ’36 games and the ’38 European Championships. [7]

In addition to these high profile cases, the IOC received confirmed and unconfirmed reports of female competitors who later underwent reconstructive surgery to remove external, male-like reproductive structures. [2]

After World War II, the Cold War between the Soviet Union and United States aggravated the so-called “femininity” issue. Intense competition and international distrust festered controversy on doping as well as gender verification. The increasing domination of Soviet women athletes in the Olympic Games led to the claims that men were posing as women and participating in these competitions. [11] Western countries, notably the US, applied pressure to the IOC for mandatory gender tests of women athletes.

Early Testing

In 1966 IAAF (International Amateur Athletics Federation) introduced “femininity testing” in the European Track and Field Championships in Budapest to determine an athletes eligibility to compete as a woman. [11] The women had to parade naked before a panel of doctors and in some cases had to undergo a gynecological examination. Shortly after, the IOC announced that the same method of gender verification would be required of every female Olympic competitor. [11]

While the crudely termed “peek and poke” testing did not directly discover any male competitors in disguise, several dozen female competitors suspiciously retired. Among these retirees were the infamous Tamara and Irina Press of the USSR, two sisters who competed in shot put, hurdles, discus, and pentathlon, accumulating five Olympic medals and eight world records.[8] During their competitive years, the western media openly speculated on the “femininity” of these record holders, and their departure from competition was seen by some (especially in the US) as a validation of gender verification. [11]

Sex Chromatin Testing

Many criticized this primitive form of gender verification and some women athletes felt horribly humiliated by the process. Their respective countries complained to the IOC and a new, more scientific method was first tested in the winter Olympics in Grenoble in 1968 and then officially implemented in the Mexico City Olympics the same year. [2] This new method was the buccal smear or sex chromatin test which became possible with the recent discovery of DNA and the differences between male and female chromosomes.

The sex chromatin test, also known as Barr body analysis, distinguishes females through the visual observation a single X chromatin, called a Barr body. In the cells of females, only one

X chromosome is active while the other X remains inactivate. [16] This inactivate X chromosome remains as a condensed pack of chromatin, which we define as a Barr body, located next to the nuclear membrane. Genetic males (46, XY) do not survive if their only X chromosome is inactivate, but genetic females (46, XX) survive well with one inactivate X chromosome. [16] Thus, the sex chromatin test results in normal females score "positive", where as normal males score "negative." The most common method of this test in Olympics was to sample buccal mucosa cells with oral swabs or scrapes. [11] The samples cells are then smeared, stained, and the Barr body presence is visually confirmed under a microscope.

Although the sex chromatin test appeared to be a scientific advancement over the physical examinations conducted before 1968, it had problems with inaccuracy and discrimination. The test aimed to exclude individuals whose muscle strength and body build gave them an unfair advantage over other competitors, but this aim was confounded by natural variations in sexual genotypes and phenotypes. Three categories of individuals could pass the test as normal females even with an unfair advantage over other comepetitors: "normal" females who had taken hormones such as steroids to increase their muscle strength; abnormal females with congenital conditions such as androgen-producing tumors, congenital adrenal hyperplasia or hermaphrodism; and phenotypic males with Klinefelter's syndrome (47, XXY) or XX male syndrome (46, XX). [1]

Furthermore, individuals with certain congenital chromosomal abnormalities would fail the test even though they lacked the implied physical advantages. Individuals with Turner's syndrome (45, X), androgen insensitivity syndrome (AIS) (46, XY), or XY gonadal dysgenesis (46, XY or XX) failed the test although they were phenotypically female in body proportions, external genitalia, and muscle strength. [1]

Problems with the sex chromatin test surfaced almost immediately. The first Olympic athlete to fail the sex chromatin test was1964 bronze medalist Ewa Klubukowska of Poland. [7] Phenotypically female, Ewa unsuccessfully challenged her rejection, and boldly told international pres that "I know what I am and how I feel". Barred from competition and stripped of previous accomplishments, Ewa heaped absurdity on controversy two years later when became pregnant and gave birth to a healthy baby. [7] Far from being alone, at least seven other women failed the sex chromatin test before 1972, none of which were "normally male."

Twenty years later, another high profile case outside of the Olympics contributed to arguments against the sex chromatin test. Before the 1985 World University Games, Spanish hurdler Maria Jose Martinez Patino failed the Barr body test because of her androgen insensitivity syndrome (AIS). [15] Before her race, meet officials told her she could not compete,

and encouraged her to fake an injury and leave. Confident in her gender, and she competed anyway, winning the race and collapsing after the finish line. The test results and her ensuing rebellion made front page headlines, and before long the Spanish Athletic Association barred her from competition and stripped of her titles. [15] Sadly, Patino also lost her university scholarship and boyfriend in the time it took the IAAF to reinstate her two and a half years later. Like Klubukowska, Patino spoke openly with the press, declaring "I knew I was a woman in the eyes of medicine, God, and, most of all, in my own eyes…If I hadn't been an athlete, my femininity would never have been questioned". [15]

PCR Testing

Between 1972 and 1990, one in every 504 elite female athletes failed the sex chromatin test, which had yet to reveal a "normally male" competitor amongst those competing as women. [15] After many years of criticism and studies that discredited the sex chromatin test, the IAAF first considered the matter in 1990 with a convention of specialists in Monte Carlo. The conference recommended that laboratory based gender verification testing to be abandoned. In 1992 IAAF decided to eliminate any form of gender verification screening in its competitions. [15] The IOC, again taking a more conservative approach, decided to drop sex chromatin testing for a newer but still controversial method of gender testing: polymerase chain reaction (PCR). [15]

PCR remains a revolutionary biochemical tool that enables scientists to generate unlimited copies of a DNA strand in an extraordinarily short amount of time. It would be appropriate to refer to PCR as "molecular photocopying" since it can quickly characterize, analyze and synthesize specific fragments of DNA or RNA. [18] Biologists and biochemists have used PCR to research human evolution, diagnose genetic diseases, "fingerprint" DNA for legal purposes, and detect bacteria or viruses—PCR has even been used to clone the DNA of an Egyptian mummy.[18]

Before the discovery of PCR, scientists used in vivo molecular cloning techniques however, they were tedious and difficult to apply. [20] This older method required that fragments be isolated and then incorporated into replicative units that were then placed into living cells for continuous multiplication. [20] In contrast to these old methods, PCR amplifies of genetic material in vitro, making the process much faster, cheaper, and more reliable.

PCR exploits polymerases, a family of enzymes whose job is to not only copy genetic material, but also but also proofread and correct these copies. PCR requires a template molecule which one wants to copy (the "original"), and two primer molecules to get the copying process started (primers are small segments of DNA or RNA). [19]

There're three basic steps in PCR. First there is denaturizing at ~94°C during which the double strand melts open to single stranded DNA and enzyme reactions cease. [19] Second, there is annealing at 54°C during which the primers are moving around due to Brownian motion. During this movement ionic bonds are formed between the single stranded primer and the single stranded template as the primers start to find their complementary bases. The third step is extension at 72°C, which is the ideal working temperature for the polymerase. [19] During this step, DNA is synthesized by a polymerase. The result of these three steps is two new helixes that are each composed of one original strand and its newly assembled complementary strand. As these three steps are repeated as a cycle, scientists can get exponentially increasing numbers of copies, and since each cycle only last 1-3 minutes, in an hour it is possible to generate millions of copies or a single DNA strand. [19]

Because it exactly replicates complex DNA strands, PCR easily distinguishes tiny variations in DNA. [22] For gender testing, PCR is applied to the so-called "Sex-determining Region Y" (SRY) gene. SRY lies on short arm of the Y chromosome, outside the pseudoautosomal region. [22] It acts like a switch that triggers the events which convert an embryo into a male. Without Y-chromosome and thus an SRY gene, typical fetuses fetus become female.

Although the presence or absence of SRY is a key element in determining gender in general, abnormalities among X and Y-chromosomes prevent SRY from being the definite determinant of gender. [22] For example, someone with a mutation in the SRY gene can develop into a female even though there are SRY and the Y chromosome are present. In rare cases, the SRY gene can be transferred to the X chromosome by chromosomal crossover during the production of sperm, and the resulting XX individual would be phenotypically male. [22]

Despite the supposed increase in scientific sophistication, the PCR test unfairly excluded many of the same female athletes unfairly excluded by the sex chromatin test. During the 1992 Olympics five women failed the PCR test; in 1996, eight. [4] At least eight of these thirteen cases involved androgen resistance syndrome (AIS). Ironically, female athletes with AIS actually compete at a biologic *disadvantage* because they are unable to reap the athletic benefits of the small amount of testosterone found in typical women. [4]

The End of Laboratory Testing

Given the ineffective and ultimately tragic results of gender testing, international opinion began to turn against biologic gender testing. More importantly, concerns over anabolic steroids and performance enhancing drugs began to far outweigh concerns over gender. In 1996, the IOC Conference on Women and Sport recommended abandoning laboratory gender tests altogether. [4]

In 1999 the IOC's executive board followed this recommendation and decided to discontinue PCR testing at the upcoming summer Olympic Games in Sydney. [12]

Gender confirmation is still a part of IOC policy. In fact, the IOC's 1999 decision hinged on a previous rule regarding anti-doping measures: athletes must provide a urine sample under direct supervision. [12] The executive committee reasoned that cases of strict of gender disguise would be foiled by this requirement—it's hard to inconspicuously urinate in a cup without revealing external genitalia, and by extension, phenotypic gender. As with many other decisions, the IOC created a backdoor clause. In a recent correspondence, the IOC Medical Director reiterated the official position, stating that "(in a case of suspicion) the IOC still has the right, at the occasion of the Games to start investigation based on physical examination, endocrinology, medical, psychiatric evaluation" (sic). [23]

A New Era

The most recent and controversial decision on gender by the IOC came when on May 27, 2004 when the IOC Executive Committee decided to allow transsexuals to compete in the Olympics and opened the way for transsexual athletes to compete in the 2008 Beijing Olympics.[10] Transsexuals, male-to-female or female-to-male, must meet three requirements to compete:

> "Completion of surgical anatomical changes, including external genitalia changes and gonadectomy; legal recognition of assigned sex by the appropriate official authorities; and sufficiently long and verifiable administration of hormonal therapy appropriate for the assigned sex to minimize gender-related advantages in sport competitions…Eligibility should begin no sooner than two years after gonadectomy." [10]

While the IOC did leave a backdoor clause similar to the one employed in gender testing, the transsexual ruling represents a drastic shift in the IOC's gender mindset. This posture change is especially apparent when the IOC/IAAF relationship is compared: regarding previous gender testing, the IAAF generally leading the way and the IOC following with a more conservative stance. The IOC, consciously or not, broke this pattern with its new transsexual policy, as the current IAAF policy requires a case-by-case consideration of potential competitive advantage.[8]

The Right Choice?

We feel that the IOC's transsexual policy as currently stated is insufficient. More specifically, the IOC has not sufficiently demonstrated that transsexual athletes do not have competitive advantages over typically gendered athletes. [10] Our research has found no clear scientific consensus on this matter, and even within the transsexual activist community there are

critics who doubts about whether the reduction of competitive advantage is sufficient. [8] One such critic is Renee Richards, a male to female transsexual who advanced to the 1978 US Open quarter finals. Renee, in addition to arguing for case-by-case evaluation of competitive advantage, sees a more fundamental discrepancy in the IOCs policies:

> It's ironic that everyone has tried so hard to keep a level playing field - from corked bats to doping - but now the IOC has come up with a decision that defies fairness in a similar vein. Sex-reassignment surgery is based on putting materials into your body. [8]

We feel it is the responsibility of the IOC to reduce the various doubts about transsexual athletics. The popular press has already lampooned the decision, and this criticism will only continue if the IOC's Medical Commission does not provide compelling arguments and evidence.

It is clear to us that the tragic history of gender testing influenced the aggressively progressive decision regarding transsexuals. While we applaud the implicit recognition of previous injustice, we feel that there is still great potential for misunderstanding and strife. In a worst case scenario, post-competition international uproar could force the IOC to recover medals and revoke the accomplishments of a transsexual athlete admitted to the games through insufficiently selective criteria. In addition to harming the specific athlete, this sort of international media debacle would ultimately work *against* the gradual acceptance of transsexuals around the world.

If the IOC and its Medical Commission is truly intent on learning from its past mistakes, they will recognize that blanket policies and broad generalizations regarding gender will always fail.

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