



RESEARCH ARTICLE

# The Physical and Psychological Wellness of Differences-of-Sexual-Development and Transgender Athletes as Affected by Decisions to Allow or Restrict Competition

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## ABSTRACT

This paper begins by defining differences of sexual development (DSD) and transgender individuals wanting to compete as women, but having higher levels of testosterone than the average woman. To quantify the role of testosterone, physics and kinesiology were applied to running, swimming, speed skating and rowing, to show that the female/male velocity ratio of Olympic Champions from 1980 through 2020/21 was due to the testosterone-driven relative lean-to-weight ratio. Recent and past DSD and transgender athletes are discussed. The International Olympic Committee previously ruled that in fairness and openness, each Olympic sport should separately decide about inclusion of DSD and transgender athletes, in women's events. In March 2026, the IOC reversed course, ruling completely against inclusion, contradicting their own Olympic Creed: "The most important thing in the Olympic Games is not to win but to take part, just as the most important thing in life is not the triumph but the struggle." At the personal level, DSD and transgender athletes who already had huge challenges in life affecting personal and psychological wellness, had those wellness issues amplified by barriers to competing. The ability of reducing testosterone level with wellness considerations is analyzed to bring DSD and transgender athletes closer to the upper range of normal female athletes using hormone therapy. Such reductions could be carried out protecting the physical and psychological wellness of athletes who were simply born that way, either physically or psychologically, and to whom fairness and compassion should apply.

**Keywords:** DSD females, transgender females, testosterone limits, lean-to-weight ratio, gender inclusion, physical wellness, psychological wellness

## Introduction

When the modern Olympics began in 1896, women were not included, but women were allowed and encouraged to compete starting in 1900. Since then, women's place in the Olympics has greatly expanded until they have achieved equality of numbers in most sports. However, a serious and controversial issue arose beginning with competition and medals earned by Stella Walsh starting in 1932 and by the Press sisters, starting in 1960. Questions arose and intensified as to what limitations should apply to athletes whose biological identity are male oriented and might not match the expected biological identify of female athletes.

To understand the two main background issues of unusual biological identity, Differences of Sexual

Development (DSD) and transgender persons are now defined. We also examine how competition by Stella Walsh and the Press sisters ignited those issues.

### Differences of Sexual Development (DSD) and the Case of Stella Walsh

Humans typically have 46 chromosomes, two of which denote sex<sup>1</sup>. A male with normal development has XY chromosomes and is identified as 46 XY having male genitalia and testes. A female with normal development has XX chromosomes and is identified as 46 XX having female genitalia and ovaries. A male or female with differences of sexual development is identified as DSD in Table 1.

**Table 1.** Normal Sexual Development and Differences of Sexual Development (DSD)<sup>1</sup>

Chromosomes	Description	Genitalia	Gonads
46 XY	Male	Male	Testes
<b>46 XY DSD</b>	<b>DSD Female</b>	<b>Mostly Female</b>	<b>Testes</b>
46 XX	Female	Female	Ovaries
<b>46 XX DSD</b>	<b>DSD Male</b>	<b>Mostly Male</b>	<b>Ovaries</b>

A DSD female (46 XY DSD) has genitalia that are mostly female at birth causing identification as a female, but instead of ovaries, the person has testosterone-producing testes. A DSD male (46 XX DSD) has genitalia that are mostly male at birth, causing identification as a male, but instead of testes, the person has ovaries. Testosterone-producing testes for the DSD female triggers a great deal of consideration because that person will have much more testosterone than a normal female, and as we will learn, a higher LTW ratio than a 46 XX female. Conversely, there are no sports-competition issues with a 46 XX DSD male competing against normal males, because the DSD male lacks the testosterone that 46 XY males would have.

A famous case in sports history relates to Stella Walsh<sup>2</sup>, whom we would now identify as being 46 XY DSD. Born in Poland in 1911 as Stanislawa Walasiewicz, her parents emigrated with her to the US when she was young. She used Stella Walsh as her Americanized name. As she grew up, she exhibited skill in athletics. Photos taken during her sports career show a masculine appearance. Due to her status as an immigrant born in Poland, she was unable to find a way to become eligible to compete for the US. Competing for Poland, she won a gold medal at 100m in the 1932 LA Olympics and silver at 100m in the 1936 Berlin Olympics. After WW2, she was still unable to become eligible to compete for the US, so her athletics career ended.

Walsh was shot and killed resisting an armed robbery in 1980. An autopsy showed that she had an incomplete uterus and a non-functioning, underdeveloped penis. Chromosome analysis revealed she was what we would now call 46 XY DSD, having testes instead of ovaries, implying significant testosterone creation. Her birth record, stated that she was female. The Cuyahoga

County coroner, Samuel Gerber, stated that Walsh was "socially, culturally and legally" a woman. The IOC and the IAAF sports federation chose not to take away medals. Their lack of such action indicates an opinion that she was just born that way and no action was called for.

During life, with non-standard genitalia, she would have had psychological wellness issues, but she would have found psychological reassurance, being accepted as an athlete. In death, that acceptance was continued in a sympathetic way.

### TRANSGENDER ATHLETES AND THE CASE OF THE PRESS SISTERS

While limits on testosterone could be created for DSD female athletes, finding an objective method for including transgender female athletes has proven more difficult. The term sex refers to biology while gender refers to preference. A transgender athlete<sup>1</sup> has one biological sex but is driven by the person's mental composition to follow the opposite sex as the preferred gender. A male transitioning to become a transgender female does have an advantage against biological females due to testosterone-induced physicality. The proactiveness now exhibited in sports against transgender female athletes can be traced back to the situation surrounding the Press Sisters.

The Press sisters<sup>3,4</sup> were born in Ukraine of Jewish parents. They went on to compete for the Soviet Union. Tamara Press (1937-2021)<sup>3</sup> won 4 medals in the shot put and discus during the 1960 and 1964 Olympics. Irina Press (1939-2004)<sup>4</sup> won 2 medals in the 80m hurdles and pentathlon during the 1960 and 1964 Olympics. Together, they set 27 world records. In competition, they appeared to be female; however, when traveling and in other contexts, they dressed and

appeared to be brothers, as in a photo<sup>5</sup> that raised questions. Their acceptance as athletes would have provided strong psychological wellness as can be seen from how they appear in competition photographs.

The sexual identity questions about the Press Sisters raised serious issues about the credibility of female competition in world and Olympic competition. It was reasonable, under these circumstances, for the IAAF to create sexual verification. Acting in haste, part of that verification involved the invasive and embarrassing inspection of the athlete, which would have had a strongly negative effect on their psychological wellness. When sexual inspection became required in 1966, the Press sisters both retired from sports competition. We do not know if they were being evasive about their sex or if they were simply insulted and in an undesirable state of mental wellness. All prior-to-1966 and future-to-1966 designations of Tamara and Irina Press have been that they were female. In today's world, it would be fitting for transgender athletes to be dealt with fairly and compassionately, without creating problems with their mental wellness.

Some athletes are born with obvious physical advantages and have no problems being allowed to compete, as identified in the next section. Later sections include analyses essential to understanding options, resulting in criteria of inclusion, with important wellness issues also being included.

### World Record Holders Who Were “Born-That-Way”<sup>6,7</sup>

Although copyright laws make it difficult to include photos of the present or past world record holders that we are about to discuss, the reader can locate photos using Google or other similar online search engines. Weight throwers are born with significant upper body and arm strength, allowing them to generate enough force to be successful. That strength is clearly visible in Valerie Adams (New Zealand) and Ryan Courser (USA), women's and men's shotput world record holders.

Carl Lewis (USA) in the long jump and Keni Harrison (USA) in the 60m hurdles possess the balanced strong lower leg, thigh and upper body strength needed to move their entire bodies upward.

**Table 2.** The Women/Men Velocity Ratio of Elite Rowers, Swimmers, Runners, and Speed Skaters in Terms of Relative Lean-to-Weight Ratio, Relative Training, and Relative Efficiency

Sport	vw/v <sub>M</sub>	
	Lean-to-Weight	Training and Efficiency
Rowing and Swimming	$(LTW_w/LTW_M)^{8/9}$	$[(Tr_w/Tr_M)(e_w/e_M)]^{1/3}$
Running and Speed Skating	$LTW_w/LTW_M$	$(Tr_w/Tr_M)(e_w/e_M)$

Five periods of Olympic history are chosen for Tables 3 and 4, starting when women first competed in swimming in 1912. These periods separately include the dominating effects and recovery from WW1, WW2, the cold war, boycotting, and the current administration of anti-drug policies. The average velocities for the female and male Olympic champions of each era are

Jamaican runners like Usain Bolt in the 100m and 200m are born with a combination of high lean-to-weight ratio and fast-responding muscles, while living in an environment with the weather and nutrition to enhance those advantages, making them highly successful in sprint events. Sifan Hassan, world record holder in the women's 10k, is typical of African distance runners who are extremely slender and have very high oxygen turnover, because of growing up at altitude. To illustrate their success, for the seven Olympic Games, covering 1996 through 2020 (actually held in 2021), African runners in the 5k and 10k runs for men<sup>6</sup> and women<sup>7</sup> have won at least one medal in all those 28 events. We do not see action taken to handicap them or the others mentioned above for the various physical attributes they were born with. The above-mentioned athletes must have strong feelings of psychological wellness, with their successes being accepted.

In the next section, we analyze how testosterone affects performance, to be fair and open about any advantage held by DSD and transgender female athletes. DSD athletes were born-that-way physically while transgender athletes were born-that-way psychologically, which suggests treating them openly and fairly as was done with the above-mentioned strong athletes born-that-way physically but acceptably.

### Using Physics and Kinesiology to Establish the Female/Male Velocity Ratio of Athletes, With Testosterone Implications

Physics and kinesiology were used by Stefani<sup>8,9</sup> to derive the velocity ratio for women/men involving athletes competing in rowing, swimming, running and speed skating. Equations were simplified using a data base of 2286 elite athletes, taken from 10 papers used by Stefani<sup>9</sup>. The relative cranking (arm pulling) ratio, and the relative drag ratio of coefficients for rowing and swimming were both found to be nearly equal to the relative ratio of lean-to-weight, LTW, while the mass ratio, closely equals the square of the relative LTW ratio. By using those equalities to simplify equations, the female/male relative equations for rowing and swimming become the same and the female/male relative equations for running and speed skating become the same as shown in Table 2.

calculated from winning times taken from the International Olympic Committee website. The velocity ratios are compared with available relative LTW ratios from the sources cited by Stefani<sup>9</sup>.

In Table 3 for swimming, the female Olympic champions have increased their relative velocity ratio until we see

equality in the most recent two periods with the 8/9 power of relative LTW. For rowing, we obtain the same values for the most recent period as for swimming: 90% relative velocity ratio and 90% predicted by the 8/9

power of relative LTW. That means women have achieved equity in terms of training and efficiency and that relative LTW is the main physiological determinant.

**Table 3.** Rowing and Swimming Comparisons of the 8/9 Power of Elite Athlete LTW Values with the Velocity Ratios of Olympic Champions

Period	Rowing		Swimming	
	Elite LTW %Ratios N=1789	Rowing Champions Velocity %Ratios N=49	Elite LTW %Ratios N=1815	Swim Champions Velocity %Ratios N=181
1912-1924 (WW1)				83
1928-1952 (WW2)				87
1956-1976 (Cold War)				90
1980-1988 (Boycotts)		90	91	91
1992-2021 (Anti-Drug)	90	90	90	90

In Table 4, for speed skating, the female Olympic champions' relative velocity increased until it was the same as relative LTW in the most recent fourth period used. For running, women also improved their relative velocity ratio but for the most recent two periods their relative velocity ratios are each 1% lower than what we would expect based on relative LTW. As explained in Stefani<sup>9</sup>, there is a known inefficiency for women

because their hip width relative to their height is wider than for men, creating a longer stride, consistent with the 1% inefficiency. Women have 6 times the ACL tears as men, likely the cumulative effect of those longer strides relative to height. We have seen women undergoing knee strengthening exercises, during visits to the Colorado Springs US Olympic Training Centre.

**Table 4.** Running and Speed Skating Comparisons of Elite Athlete LTW Values to the Velocity Ratios of Olympic Champions

Period	Running		Speed Skating	
	Elite LTW Ratios N=156	Running Champions Velocity %Ratios N=103	Elite LTW Ratios N=51	Speed Skating Champions Velocity %Ratios N=46
1912-1924 (WW1)				
1928-1952 (WW2)		88		
1956-1976 (Cold War)		89		89
1980-1988 (Boycotts)	92	91	92	92
1992-2022 (Anti-Drug)	91	90		92

The two conclusions from the four sports above are that women have made advances in training and efficiency, equalizing with their male counterparts and that relative LTW is the dominant effect of velocity differences with men. Since testosterone drives muscularity as defined by LTW, it is important to determine what testosterone levels are typically found in men and women and how could testosterone levels for DSD and transgender athletes be reduced, in such a way as to maintain physical wellness while achieving more equity.

In the following, Caster Semenya is a DSD athlete for whom efforts were made to select and enforce testosterone values, without regard for the fact that enforcement issues could induce physical and psychological wellness harm.

### Testosterone Limits Applied to Caster Semenya, a DSD Athlete

Caster Semenya was born in South Africa in 1991 and identified at birth as female<sup>10</sup>. As a young female, she showed skill in athletics as did Stella Walsh years

earlier. As was true of Walsh, Semenya showed a somewhat masculine appearance. She was designated as 46 XY DSD. The specific testosterone limits required of her clearly show the importance placed by the IAAF in their sponsored work of Handelman et al.<sup>11</sup>.

From 2011 to 2018, as required by the IAAF for a DSD female athlete, Caster kept her testosterone level under 10 nmol/L, although she stated that the medications used to reduce testosterone made her feel ill. She won 6 medals in the world championships and Olympics (5 at 800m and 1 at 1500m).

From 2018 to 2023, the IAAF would not let DSD female athletes compete from 400m to 1 mile who were over 5 nmol/L, but they could compete at shorter or longer distances if their testosterone level was below 10 nmol/L. She could not comply with 5 nmol/L, so she tried 200m and 5000m but could not reach the finals in either.

From 2023, and prior to recent IOC exclusion, the IAAF requires DSD female athletes to be under 2.5 nmol/L

for 2 years to compete from 400m to 1 mile and for 6 months for other events, even though Handelman et al.<sup>11</sup> indicated that the limit ought not to be below 5 nmol/L. Her career was over, but she and other DSD female athletes were born that way, but probably cannot reach 2.5 nmol/L without a gonadectomy.

It is important to her case and to other DSD and transgender athletes wanting to compete as women, to have a thorough and well documented study made of testosterone values and modification as discussed next.

### Understanding Male and Female Testosterone Levels and Issues with Applying Limits, Based on a Definite Study with 185 References<sup>11</sup>

Before puberty, males and females have very similar levels of testosterone<sup>11</sup>. Sports competition in that age bracket allows both sexes to compete together equally. After puberty, male testosterone increases 20 times as fast as for females. The relative lean-to-weight ratio rises for males. As circulating testosterone rate grows for males, so too does the rate of hemoglobin growth which provides increased oxygen flow, enhancing running and swimming skills. Several references dealing with biological processes indicate that the advantage for males in running rises to 10% and the advantage in jumping rises to 20%. Those figures are consistent with Tables 3 and 4, in that a female/male velocity ratio of about 90% implies a 10% male advantage. As for jumping, kinetic energy proportional to the square of velocity equals potential energy created by vertical jumping height, required for both the high jump and to create long jump distance. The square of .9 equals .81, indicating men jump 19% better, close to the 20% quoted.

A definitive 60-page paper with 185 references, includes extensive discussion of the above biological processes involved with testosterone growth, produced Handelman et al.<sup>11</sup>. The paper includes a summary of studies of 3754 healthy men and 2655 healthy women, which was used to calculate 95% confidence intervals for men and women for circulating testosterone.

Women: 0 to 1.70 nmol/L  
Men: 7.7 to 29.4 nmol/L

The paper written when a limit of 10 nmol/L was used, concluded that 5 nmol/L was the lowest reasonable limit to impose, and then it was exceeded against Castor Semanya. DSD athletes were born that way, so a limit of 10 nmol/L would seem fair. Since transgender female athletes undergo therapy, 5 nmol/L might be achievable without medical or psychological side effects, instead of requiring transition before male puberty, which happens rarely.

The paper was sponsored by the IAAF. Action taken by the IAAF after publication, regarding limitation on DSD athletes like Castor Semanya as discussed below, shows reliance on these values. The paper suggests that the

then practice of limiting DSD and transgender athletes to 10 nmol/L was not strict enough. Neither was using 7 nmol/L. Given that many exceptional female athletes have above 1.7 nmol/L for legitimate medical conditions, such as having ovarian cysts, the paper concluded that DSD and transgender female athletes should be limited to <5 nmol/L to compete fairly and yet not to disenfranchise female athletes with legitimate medical conditions.

Those figures are based on the survey of 95% confidence levels and not on the effects on athlete wellness. There are significant physical side effects due to reducing testosterone for DSD female athletes<sup>12,13</sup>. There are also significant psychological side effects when the DSD female athlete must undergo embarrassing physical examinations and when her physicality becomes public as she seeks certification<sup>12,13</sup>. The papers point out that the DSD female was born that way, had sought no advantage and ought not to have experienced such an attack on wellness.

### IOC Fairness Followed by Federation Exclusion

The complex and interrelated decisions for dealing with the Press sisters, Stella Walsh and Castor Semanya were part of a history of attempts to deal with sexual questions in sports<sup>14</sup>. Along with defining sexual identity have been attempts to restrict testosterone levels for DSD female athletes and transgender female athletes<sup>15</sup>

Through 2015, the IOC had required gender-affirming surgery for transgender female athletes. In 2015, they terminated that practice<sup>16</sup>. In 2021, the IOC published a policy statement showing great compassion for transgender female athletes<sup>17</sup>. Included were efforts to promote inclusion, prevention of harm, non-discrimination, fairness, no presumption of advantage, an evidence-based approach, and primacy for health and bodily autonomy. Having opened the doors to compassion and fairness, the IOC then asked the sports federations to use those principles to create their own transgender policies.

Two federations basically slammed the doors shut on transgender females. Hearings were held by FINA, which renamed itself World Aquatics, and by IAAF, which renamed itself World Athletics. Policies were activated by World Aquatics in June 2022<sup>18</sup> and by World Athletics in March 2023<sup>19</sup>. Both federations reached the same conclusion: transgender female athletes could only compete if they transitioned prior to male puberty at about age 12 and if they maintained testosterone levels <2.5 nmol/L for one year. Many jurisdictions do not allow transition for pre-pubescent males or females at all. Further, those that provide health care for early transitioners, such as in Kaltiala<sup>20</sup> and Durden<sup>21</sup>, warned that many pre-pubescent transitioners are showing alarming signs of physical and psychological duress after making that decision. Kaltiala indicated that if they wait until about age 18 post-puberty, 80% who were questioning whether their birth sex is their preferential gender, change their minds and

remain with their sex of birth, rather than decide too late that they did not really want to transition. As these warnings are heeded, few if any elite transgender female athletes will transition before puberty and thus few if any would be eligible to compete in the Olympics or world championships under current World Athletics and World Aquatics rules.

Under that IOC methodology<sup>17</sup>, if a reasonable level of testosterone would be required of all transgender female athletes, regardless of when they transitioned, it would be up to them to try to successfully make the attempt to meet the testosterone limit, rather than be denied that opportunity altogether. In this paper, we are dealing with elite athletes of Olympic caliber, but it is also very important for various jurisdictions to establish fair eligibility requirements for young transgender female athletes at any level who want to compete against those who have been females from birth. It is a matter of fairness for the transgender athletes to be able to compete and for the female athletes born female to be able to compete in a fair environment. Both are important for the integrity of sport in general.

Handelman et al.<sup>11</sup> noted a study in which the reduction of testosterone for transgender female athletes resulted in a reduction of muscle mass by 9.4% and a reduction of hemoglobin by 14%, both of which would reduce performance. A testosterone limitation can achieve its goal, if the limit is reasonable.

As was mentioned related to DSD female athletes, a limit <2.5 nmol/L was considered too low by Handelman et al.<sup>11</sup> because some biological female athletes might exceed any limit below 5 nmol/L due to legitimate medical issues, and unfairly be disqualified. They concluded that a fair limit would be <5 nmol/L. It was important under those limitations to conduct actual tests to see if <5 nmol/L is achievable without requiring a gonadectomy or creating wellness issues.

The discussion of the above IOC policy recently became moot because of the IOC reversal of position below.

## The IOC Policy is Now for Total DSD and Transgender Exclusion for Female Sports, Which Conflicts with the Olympic Creed

On 26 March 2026 the IOC released a complete reversal of the policy just discussed as published in 2021<sup>17</sup>, in which it had been left to the international sports federations to each decide on eligibility requirements for DSD and transgender athletes. The new policy<sup>22</sup>, begins by indicating that the policy is intended to protect female athletes. It states correctly, that DSD and transgender female athletes have a testosterone advantage. However, it does not offer any lowered levels of testosterone to achieve eligibility for female competition. Instead, it indicates that any athletes who have XY chromosomes indicative of DSD status are henceforth ineligible for female competition and that any athletes identified as male at birth with XY

chromosomes and seeking transgender status are also henceforth ineligible for female completion.

This new policy of exclusion completely conflicts with the Olympic Motto, and the Olympic Creed, that the founder of the modern Olympic movement, Baron de Coubertin, articulated to define what the modern Olympic Games were to be all about for future followers and competitors. On 7 March 1891<sup>23</sup>, at an Arcueil College sports assembly in France, Father Henri Didon, a Dominican Priest, said their goal in sport should be to do their best to improve little by little, that is, to run a bit faster, to jump a bit higher and to become a bit stronger than they had been before. He called for self-improvement as the goal; he didn't say anything about beating anyone or setting a record. He gave them a motto in sport and in life: *Citius, Altius, Fortius*. His friend, Baron de Coubertin, was there. When de Coubertin founded the modern Olympic movement in 1894, he chose *Citius, Altius, Fortius* as the Olympic Motto.

Baron de Coubertin clarified and extended the meaning of the Olympic Motto<sup>23</sup>, by creating the Olympic Creed<sup>24</sup>, based on a talk given at the 1908 Olympics by Ethelbert Talbot, Bishop of Pennsylvania. The current wording of de Coubertin's Olympic Creed reads "The most important thing in the Olympic Games is not to win but to take part, just as the most important thing in life is not the triumph but the struggle." The Olympic Creed defines the Olympic genre as being one of openness, acceptance and invitation to try, win or not. There is no sense of concern about an athlete likely to win, just one of invitation to all. That policy certainly accepts and invites the athletes mentioned earlier that were born with special physical attributes. That level of universal acceptance and invitation to try regardless of outcome would foster a strong feeling of psychological wellness.

The Creed does not imply inclusion without any rules. It is reasonable for any sport to set rules for equipment and technique. Certainly the use of performance enhancing drugs is denied where an individual is seeking an advantage not due to personal skills. It is also true that a DSD and transgender athletes having XY chromosomes and wanting to compete against female athletes with XX chromosomes could be subject to some level of testosterone value that is fair and achievable without damage to medical wellness We now consider how the various discussions above can be combined to create a way to allow DSD and transgender female athletes to compete.

## Results: Testosterone Limits to Meet the Important Goals of Reasonable Eligibility Standards, Wellness, Fairness and the Olympic Creed

As mentioned above, the Olympic Creed, "The most important thing in the Olympic Games is not to win but to take part, just as the most important thing in life is not the triumph but the struggle." invites inclusion, but it is reasonable to have rules for competition, denial of

performance enhancing drugs and setting testosterone limits for XY DSD and transgender XY chromosome athletes competing against XX chromosome athletes in female competition. In the spirit of the Olympic Creed, it follows that before initiating testosterone limits, the IOC, the sports federations and organizations handling youth competition should first employ controlled multidimensional medical research studies to find reliable methods for reaching achievable levels of testosterone for which various side effects can be mitigated with appropriate medical interventions. Previously suggest ranges such as <10 nmol/L for DSD female athletes and <5 nmol/L for transgender female athletes may or may not be compatible with a comprehensive medical study aimed at insuring physical and psychological wellness. Following such a study, reasonable and medically acceptable limits could be created.

## Conclusions

Experiences several years ago with Stella Walsh, who upon death was identified as a DSD female athlete, and the Press Sisters, who introduced the issue of dealing with possibly transgender female athletes, led to methods of dealing with those situations. Sports strongly restricted DSD female athletes who were simply born that way physically and ought to have reasonable testosterone restrictions. For example, decreasing testosterone limits were demanded of Caster Semenya, a DSD female athlete, until her health caused her to cease competition. A limit of <10 nmol/L has been suggested. Because of psychological attributes they

were born with, transgender women purposely changed gender from the male sex assigned at birth. Following the very substantive paper mentioned earlier; to compete as an equal to female-born athletes, it was suggested limiting testosterone to <5 nmol/L for transgender female athletes. The IOC first adopted a policy leaving it to recognized sports federations to develop their own rules. Recently, the IOC reversed that openness with a policy denying any DSD or transgender female the right to compete in the Olympics.

The Olympic Creed states "The most important thing in the Olympic Games is not to win but to take part, just as the most important thing in life is not the triumph but the struggle", indicating that inclusion is the genre of the Olympic Games, such as for those athletes who were born with sport-enhancing physicality. Following that Creed, it is reasonable to have rules for competition, denial of using performance enhancing drugs and setting testosterone limits for XY DSD and transgender XY chromosome athletes competing against XX chromosome athletes in female competition.

It is essential to the physical and psychological wellness of athletes to identify comprehensive medical procedures and those dealing with side effects before deciding on implementing limits for DSD female athletes and for transgender female athletes. A comprehensive medical study should insure the physical and psychological wellness of those athletes following testosterone limiting rules.

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