In recent years, transgender athletes have increasingly become a target of anti-LGBTQIA+ legislation, particularly in women's sports. Often overlooked in these discussions are the regulations that international athletic governing bodies have placed on women athletes with differences of sex development, or intersex status. These regulations constitute violations of several human rights, such as the right to participate in cultural life, the right to bodily and medical autonomy, and the right to be protected from gender-based discrimination. My paper seeks to contribute to the discourse on the role of sex and gender in sport through an intersectional, intersex perspective, utilizing a historical, ethical, and medical lens. It was written for my Research Seminar in Sexual and Gender Minority Health (PUBPOL 378S).

Sex Testing of Intersex Women in Sport:

History, Controversies, and Health Implications

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Introduction

During the 2021 Tokyo Olympic Games, two teenage runners from Namibia made headlines when they were banned from competing in the women's 400-meter race due to their naturally high testosterone levels (Granville, 2021). Indeed, international athletic governing bodies have passed and upheld hormone regulations that require women to maintain testosterone levels below 5 nmol/L to qualify for the female category in certain events (IAAF Athletics, 2018). The regulations that have been in place since 2018 are specifically targeted at athletes with differences of sex development (DSDs), otherwise known as intersex status.

Included under the LGBTQIA+ umbrella, intersex individuals are "born with primary and secondary sex characteristics that do not fit binary medical definitions of male or female reproductive or sexual anatomy" (National Academies of Science, Engineering, and Medicine [NASEM], 2020). In international sport, numerous top athletes with DSDs, such as South African runner Caster Semenya and Kenyan runner Margaret Wambui, have been prevented from competing in their preferred events because of their naturally high testosterone levels (López, 2021). Excluding intersex athletes undermines the idea of sport as a fundamental right.

Given that sex testing impinges on international sport's potential to promote inclusion and dignity for all, this report will investigate the historical, social, and cultural construction of "womanhood" and its rigid definition in sport, according to White American/European standards. I will also explore the controversies and contradictions of athletic governing bodies, including the flaws in their research and the ethics of restricting natural traits. Finally, I will review the literature regarding the impact of sex testing on intersex athletes' health and discuss gaps in the literature and implications for future research.

The report will use an intersectional framework to synthesize the existing literature surrounding sex testing. I used Duke University Libraries (primarily) and Google Scholar (secondarily) to find the peer-reviewed journal articles referenced in this paper. Keywords for source identification, used in various combinations, include: Intersex, DSD, Athletes, Testosterone Regulations, Sex Testing, Hyperandrogenism, International Sport, History. Studies with purely quantitative results (i.e., studies testing the association between testosterone level and performance) were excluded. Qualitative studies analyzing the legitimacy, ethics, and/or effects of sex testing were included.

Finally, the athletic governing bodies relevant to this exploration include World Athletics—formerly known as the International Association of Athletics Federations (IAAF)—and the International Olympic Committee (IOC). These entities are responsible for creating the guidelines that athletes must adhere to to compete (Adkins, 2020). Also relevant is the Court of Arbitration for Sport (CAS), where athletes can challenge these rules (Adkins, 2020).

The History of Sex Testing

Scholars have long argued that although women have participated in sports for centuries, organized sports have historically been designed for men (Case, 2017). Pierre de Coubertin, who founded the modern Olympics, posited that the "Olympic Games must be reserved for men" and that women's participation would be "improper" (Case, 2017). In the nineteenth century, physical exertion was thought to reduce a woman's reproductive capacity, making her less attractive by heteronormative, patriarchal standards (Case, 2017).

Organized sports are divided into men's and women's categories based on the underlying assumption that men are more adept to excel athletically (Gleaves & Lehrbach, 2016; Pieper,

2014; Brömdal et al., 2020). These dichotomous categories purportedly create space for women to participate (Gleaves & Lehrbach, 2016). However, the assumption of female physiological inferiority means that, while there is no assumed limit on men's athletic capabilities, women are only expected to perform up to a certain level (Brömdal et al., 2020).

The assumption that female athletes should only perform up to a certain level is where sex testing originated. The first documented instance of sex testing was at the 1936 Berlin Olympics when American sprinter Helen Stephens set a world record for the 100-meter sprint (Pieper, 2014). The public was quick to accuse Stephens of being a man posing as a woman, citing her perceived masculine features as evidence (Adkins, 2020). Stephens underwent a physical examination to dispel these rumors (Adkins, 2020).

While the origins of sex testing are rooted in the patriarchal, binary structure of organized sports, sex testing evolved over time to encompass geopolitical tensions. It became a means to "other" women who did not conform to White American/European standards. The racialized othering of women through sex testing can be divided into three eras.

I. The Cold War Era and the Othering of Eastern European Women

After World War II, the United States and the Soviet Union emerged as world powers. The rivalry between the two nations manifested in many domains, including sport. In 1948, the Communist Party Central Committee stated that one of the USSR's policy goals was to "win world supremacy in the major sports" to demonstrate the "superiority of socialist culture" (Beck, 2005). In 1952, the Soviet Union made its debut at the Helsinki Olympic Games (Pieper, 2014), with the East-West rivalry modulated by an unofficial medal count (Guttmann, 1988).

The final tally was close, with the Soviet Union accumulating 71 medals and the United States accumulating 76 (Pieper, 2014). However, it would not have been close if not for the contributions of Soviet women, who dominated in strength-based events (Pieper, 2014). Western Bloc women athletes were limited by notions of Western femininity, such as grace and submissiveness. Whiteness was also implicitly an element of Western femininity. In the US, White middle-class women often did not participate in track-and-field events (Pieper, 2014).

In contrast, in the Eastern Bloc, femininity was compatible with strength and muscularity (Pieper, 2014). Soviet women dominated in gymnastics and track-and-field events not only in Helsinki but in the Olympic Games that followed for years (Pieper, 2014). In the context of Cold War tensions, their divergence from Western femininity led to hostile accusations that they were not "real" women. Across the Western world—from individuals to the press to medical journals—people called on the IAAF and the IOC to implement a formalized version of sex testing (Pieper, 2014).

In response, the IAAF implemented sex testing in 1966 (Pieper, 2014). The first iteration of sex testing consisted of "nude parades," physical examinations in which female athletes would undress and line up to have their genitals scrutinized by an all-male medical committee (Adkins, 2020; Brömdal et al., 2020). By 1967, due to ethical concerns, the IAAF transitioned from nude parades to the Barr Body Test, a mouth swab test intended to identify a chromatin clump present only in cells with XX chromosomes (Adkins, 2020). The IOC followed suit in the 1968 Grenoble Winter Olympics (Pieper, 2014).

In 1967, Polish sprinter Ewa Klobukowska was the first person to face disqualification based on the chromatin test (Adkins, 2020). While she had previously passed visual

examinations, her chromatin test yielded an XX/XXY result (Adkins, 2020; Pieper, 2014). She was subsequently stripped of her medals and banned from competition (Pieper, 2014).

Thus, sex testing was formalized in alignment with geopolitical Cold War tensions, resulting in the othering of Eastern women who deviated from the Western definition of femininity. It was not until sex testing began to affect Western women—like Spanish hurdler María José Martínez Patiño in the 1985 World University Games—that the reliability of chromatin testing was called into question (Pieper, 2014). By 1992, the IAAF had discontinued chromatin testing (Brömdal et al., 2020) and replaced it with physical examinations that both men and women were subject to (Pieper, 2014). However, this more equitable practice was soon challenged as new geopolitical tensions arose.

II. US-China Tensions and the Heinonen Sixteen

After the collapse of the Soviet Union in 1991, China—experiencing rapid economic growth—emerged as a new rival to the United States (Pieper, 2014). As a result, the othering of Eastern European women in sport evolved to encompass Chinese women instead.

In the 1992 Olympic Games, China nearly doubled its medal count from the 1988 Olympics (Pieper, 2014). Like Soviet women, Chinese women excelled at track-and-field. In parallel to the response to Eastern Bloc athletes in the Cold War era, Western media disparaged these athletic achievements, frequently accusing Chinese athletes of fraud (Pieper, 2014). It was under these circumstances that calls to reinstate gender verification emerged.

In 1994, Janet Heinonen, the editor of a track-and-field newsletter, called for the IAAF to implement a gynecological examination and supplementary blood testing on all female athletes (Pieper, 2014). Thereafter, a group of sixteen female runners—known as the Heinonen Sixteen—

wrote a petition to the IAAF requesting "gender testing of females at 'high stakes' events" (Ferguson-Smith, 1994). Since the measures the petition called for—buccal smears, pelvic exams, and blood testing—were still not considered scientifically sound biological markers of gender, the IAAF did not oblige to their requests (Ferguson-Smith, 1994; Pieper, 2014).

Nevertheless, the Heinonen Sixteen brought gender verification back into the public spotlight. For instance, the 1994 Asian Games included a conference about gender verification procedures (Pieper, 2014). While the Heinonen Sixteen never explicitly mentioned Chinese athletes in their petition, the experts who responded to it recognized it as a result of the "sudden meteoric prominence of the Chinese long-distance runners" (Ferguson-Smith, 1994).

Notably, the members of the Heinonen Sixteen were all White, and 15 out of the 16 were American (Pieper, 2014). Athletic governing bodies originally implemented sex testing in response to public discourse (Pieper, 2014), but it has been propagated by women athletes with competitive stakes. Specifically, sex testing has been upheld by White American/European women in situations where non-White, non-Western women have pushed the boundaries of athletic achievement in the female category.

III. The Modern, Testosterone-Based Era of Sex Testing

Following in the footsteps of the IAAF, the IOC abandoned mandatory sex testing by the 2000 Olympics, but athletic governing bodies reserved the right to subject individual women to gender verification if deemed necessary (Brömdal et al., 2020). Thus, sex testing was performed based on suspicion—a racialized process that disproportionately affected women from the Global South who were perceived to have "masculine" features (Winkler & Gilleri, 2021). By

2006, the IAAF had enacted a one-page *Policy on Gender Verification* (Winkler & Gilleri, 2021).

In 2009, South African runner Caster Semenya set a world record in the 800-meter race, beating the runner-up by a wide margin of more than two seconds (Winkler & Gilleri, 2021; Pieper, 2014). She was subsequently subject to tremendous backlash. As a Black, African woman with a deep voice and muscular stature, Semenya was criticized for not conforming to White American/European standards of femininity (Pieper, 2014). For example, Italian runner Elisa Cusma stated: "These kinds of people should not run with us. For me, she's not a woman. She's a man." (Pieper, 2014).

In response to the controversy surrounding Semenya, both the IAAF and the IOC enacted regulations on hyperandrogenism prior to the 2012 London Olympics (Pieper, 2014). The IAAF's *Hyperandrogenism Regulations* held that women with testosterone levels above 10 nmol/L (considered to be within the male range) were ineligible for the female category (Winkler & Gilleri, 2021), instigating the modern, testosterone-based era of sex testing. Women had to reduce their circulating testosterone through medical treatment to return to competition, and pre-approved reference centers existed predominantly in the West (Pieper, 2014). With no reference centers in Africa or South Asia, athletes from these regions were disproportionately affected by the regulations (Pieper, 2014).

In 2014, after Indian sprinter Dutee Chand had been suspended from competition due to hyperandrogenism, she challenged the *Hyperandrogenism Regulations* in the Court of Arbitration for Sport (CAS) (Adkins, 2020; Winkler & Gilleri, 2021). CAS ruled in her favor, suspending the *Hyperandrogenism Regulations* on the grounds that the IAAF had not proven that testosterone regulations were necessary. However, the IAAF was given two years to build a case

to support such regulations. In 2018, the IAAF returned with the *Eligibility Regulations for the Female Classification (Athletes with Differences of Sex Development) (DSD Regulations)*, which limited circulating testosterone to an even lower level, 5 nmol/L, for certain track-and-field events (Adkins, 2020).

The semantics of the modern era are worth noting. Over time, athletic governing bodies have transitioned away from using phrases like "gender verification" to describe sex testing, opting instead for "hyperandrogenism" and "differences of sex development." These phrases depict sex testing as something that is purely medical and scientific, obscuring sex testing's complex ties to factors like gender, race, income, and geopolitical tensions. Furthermore, while the 2018 *DSD Regulations* are the first instance in which sex testing has explicitly pertained to intersex women, women athletes with DSDs have been the primary target of sex testing throughout its history.

The 2018 IAAF regulations are still in effect today. In 2019, Caster Semenya challenged the *DSD Regulations* in CAS but lost the case and the appeal that followed (Winkler & Gilleri, 2021). Interestingly, CAS agreed with Semenya's claim that the regulations were discriminatory (Adkins, 2020). However, the Court ultimately prioritized the IAAF's claim that the regulations promoted fair competition in women's sport, allegedly backed by scientific evidence (Adkins, 2020). In the following section, we will dissect this claim about fairness.

Contradictions and Controversies of Athletic Governing Bodies

Sex testing today limits the amount of blood testosterone a woman can have to qualify for the female category. Athletic governing bodies justify these regulations under the assumption that testosterone enhances athletic performance, which was allegedly proven through scientific

research after the *Hyperandrogenism Regulations* were suspended (Adkins, 2020). However, the research behind the current *DSD Regulations* was impaired by confirmation bias—the tendency to search for and interpret evidence to fit one's existing beliefs (Brömdal et al., 2020).

To reinstate testosterone regulations after *Chand v. IAAF,* CAS required the IAAF to provide "substantial" evidence of the "degree or magnitude of the advantage" that high testosterone levels allegedly provided (Winkler & Gilleri, 2021). Under pressure to obtain significant numbers, the IAAF's research process had numerous flaws.

Firstly, the researchers involved in the process that informed the *Hyperandrogenism Regulations* and *DSD Regulations* were predominantly men, a limited number of Western women, and medical institutions that were politically affiliated with the IAAF (Brömdal et al., 2020). Women from the Global South—who would be disproportionately affected by the decision—were not adequately represented.

Moreover, a substantial number of critics have raised concerns about the methodology and data analysis of the primary study that informed the *DSD Regulations* (Winkler & Gilleri, 2021). This study was a 2017 paper by IAAF medical experts Stéphane Bermon and Pierre-Yves Garnier (Winkler & Gilleri, 2021; Brömdal et al., 2020). Namely, critics have said that it fails to establish causality between elevated levels of natural testosterone and performance (Brömdal et al., 2020). The correlations established in the paper may be due to chance because the researchers failed to control for confounding factors that may have contributed to performance (Winkler & Gilleri, 2021).

Finally, replications of the primary study, used to legitimize the testosterone restrictions, have also been criticized. For one, these studies have also failed to establish causality between

testosterone and performance (Brömdal et al., 2020). Furthermore, these complementary studies that were meant to be external to any athletic governing body have frequently been IAAF-funded (Brömdal et al., 2020).

The unreliability of the IAAF-affiliated data begs the question: Is testosterone actually a reliable predictor of athletic performance? There is no clear scientific consensus—some studies conclude that testosterone does provide a performance advantage, while others assert that such claims are unsubstantiated, especially in studies that use observational data (Winkler & Gilleri, 2021; Karkazis & Carpenter, 2018). To establish causality between testosterone and athletic performance, researchers would have to compare elite athletes who only differ in testosterone, and are equal in all other domains, which would be nearly impossible (Brömdal et al., 2020).

However, even if testosterone was a reliable predictor of athletic performance, there are ethical considerations surrounding the regulation of a naturally produced hormone. Testosterone is the only biological marker that determines female eligibility (IAAF Athletics, 2018) on the grounds of ensuring fairness (Adkins, 2020). The assumption underlying sex testing is that women are on a level playing field if those with naturally high testosterone are eliminated. But scholars argue that sport was never intended to be a level playing field (Cooky & Dworkin, 2013). There are other physiological and non-physiological factors (e.g., nutrition, build, VO2 max) that elevate performance, and elite athletes depend on these advantages to excel in their sports (Cooky & Dworkin, 2013). In contrast to blood testosterone, these performance-related factors remain unregulated by athletic governing bodies.

Another consideration is that women's bodies are policed more than men's bodies. Although testosterone allegedly provides a performance advantage, men who have testosterone levels above the regular male range are not required to medically reduce their circulating

testosterone (Cooky & Dworkin, 2013). Furthermore, while intersex status is treated as something abnormal, many physical irregularities in male athletes are not treated as such and are perhaps even admired—like the acromegaly that makes some basketball players extremely tall, or swimmers' webbed feet (Cooky and Dworkin, 2013; Gamble & Pruski, 2020). This difference in treatment demonstrates the higher level of scrutinization of women's bodies.

Here, it is relevant to revisit the notion that binary categories of sport exist under the assumption that women are physiologically inferior to men, thus imposing a limit on expectations of women's performance (Gleaves & Lehrbach, 2016; Pieper, 2014; Brömdal et al., 2020). When the lines between women's and men's athletic performances become less defined, there is a weaker justification for these dichotomous categories. Testosterone regulations, therefore, serve to reinforce the longstanding notion of women's inferiority in sport.

Health Effects on Intersex Athletes

In addition to the argument about fairness, athletic governing bodies justify testosterone regulations under the guise of protecting intersex athletes' health, claiming that undiagnosed and untreated DSDs pose health risks to these individuals (Brömdal et al., 2020). It is likely that the opposite is true—sex testing may be associated with adverse physiological and psychological health effects for intersex athletes (Winkler & Gilleri, 2021; Karkazis & Carpenter, 2018; Brömdal et al., 2020; Pieper, 2014; Rajan, 2009).

I. Physiological Effects

Athletes with testosterone levels that exceed 5 nmol/L are expected to lower their blood testosterone through hormonal contraceptives (IAAF Athletics, 2018). The potential side effects of these contraceptives are numerous, including electrolyte imbalances, abnormal carbohydrate

metabolism, weight gain, abdominal pain, headache, fatigue, nausea, and liver toxicity (Winkler & Gilleri, 2021; Karkazis & Carpenter, 2018). These effects could affect athletes' performance independently of testosterone reduction, but these potential consequences have been minimized by athletic governing bodies. In justifying the *DSD Regulations*, CAS contended that the side effects are "not different in nature to those experienced by thousands, if not millions, of other XX women, who take oral contraceptives" (Winkler & Gilleri, 2021). However, the key difference between XX women and 46XY women taking contraceptives is voluntarism. XX women can elect to take hormonal contraceptives—their eligibility and status as a woman is not determined by this choice. In contrast, intersex women's participation is contingent on consenting to oral contraceptives. The 2018 *DSD Regulations* go so far as to include a section on "athlete consent," implying that intersex athletes are consenting to the hormonal contraceptives (IAAF Athletics, 2018). However, since the only pathway to participation is artificially lowering one's testosterone, this is an ingenuine form of consent.

Hormonal contraceptives lower testosterone pharmacologically. Circulating testosterone can also be reduced through surgical procedures. The *DSD Regulations* emphasize that "surgical anatomical changes are not required in any circumstance," and recommend that relevant athletes consult with their medical teams to make decisions about treatments (IAAF Athletics, 2018). However, surgical procedures could be included in these medical teams' recommendations. The IAAF has been criticized for subjecting four 46XY women to medically unnecessary procedures by referring them to IAAF-approved centers that recommended gonadectomies for them to continue competing (Winkler & Gilleri, 2021; Karkazis & Carpenter, 2018). The side effects of gonadectomies can be severe and permanent, including weaker bones and muscles, frailness, chronic fatigue, and sleep disruption (Karkazis & Carpenter, 2018).

II. Psychological Effects

The consequences of sex testing on athletes' mental health are harder to study, but nonetheless vitally important. This can be illustrated through the case of Indian middle-distance runner Santhi Soundarajan. After winning the silver medal at the 2006 Asian Games, she was subjected—without explanation of the purpose—to sex testing under the IAAF's Policy on Gender Verification (Brömdal et al., 2020; Winkler & Gilleri, 2021; Pieper, 2014). When she failed the test, she was stripped of her medals and banned from future competition. Thereafter, she attempted suicide. In the aftermath of her attempt, Soundarajan explained in Tamil that she was "shattered by the failed test" and felt that she had "lost everything" (Rajan, 2009).

There is a dearth of literature about the mental health of intersex populations, much less the mental health of intersex athletes. Minimal population data about people with intersex traits exists (NASEM, 2020). However, existing data highlights mental health disparities amongst intersex individuals. For example, in the dsd-LIFE study, a multicenter European study of people with intersex traits, participants had higher rates of depression and anxiety relative to the general population in their countries (NASEM, 2020). Comparable to these findings, a national study on the physical and mental health of intersex individuals in the U.S. found a high prevalence of mental health disorders; more than 60% of individuals had anxiety disorders, more than 60% had depressive disorders, and more than 40% had PTSD (Rosenwohl-Mack et al., 2020).

Given these high rates of negative mental health outcomes, the minority stress model would be a useful tool to frame the psychological wellbeing of intersex women athletes. The minority stress model contextualizes mental health outcomes in terms of stressors unique to sexual minority status, coping mechanisms, and broader environmental circumstances (Meyer, 2003). While there are currently no studies that apply minority stress to intersex populations

(NASEM, 2020), the model has been adapted to transgender and gender-nonconforming populations, and some of these applications likely pertain to intersex individuals (Hendricks & Testa, 2012; NASEM, 2020). In the following section, I will attempt to employ the minority stress model to explain the potential mental health outcomes of intersex women athletes.

In the minority stress model, minority status encompasses multiple aspects of identity, like sexual orientation, race/ethnicity, and gender (Meyer 2003). An intersectional approach is necessary for framing intersex athletes who are subject to sex testing, since they occupy multiple marginalized identities. For one, they are women operating in an arena designed for men (Case, 2017). Secondly, in the modern era of sex testing, the women affected are people of color from the Global South (Winkler & Gilleri, 2021). Furthermore, they have differences of sex development. These athletes compete in an environment of cisnormativity that relies on the idea of sex as a binary, even though they exist beyond the lines of this dichotomy. The various facets of their identities interact to create their minoritized status.

Distal minority stressors, encompassing prejudice events like violence and discrimination, are environmental and independent of the individual's appraisals or perceptions (Meyer, 2003). In other words, distal stressors are those which are external to the individual. In transgender and gender-nonconforming populations, gender-based hostility has been positively associated with suicidality; victims of gender-based hostility were four times more likely to attempt suicide (Hendricks & Testa, 2012). Similarly, intersex women athletes are subject to gender-based hostility. While these athletes do not necessarily choose to present as masculine, they are frequently perceived as such, and subsequently faced with public scrutiny and humiliation (Winkler & Gilleri, 2021). In some cases, they may also face prejudice from other athletes. For instance, in 2009, Russian sprinter Mariya Savinova said "just look at her" in

reference to Caster Semenya's muscularity (Pieper, 2014). Apart from gender-based hostility, intersex athletes face discrimination from competition if they do not pharmacologically lower their natural testosterone (Adkins, 2020).

Proximal minority stressors are internal processes, including expectations of rejection, identity concealment, and internalized homophobia (Meyer, 2003). For transgender and gender-nonconforming individuals, internalized transphobia is a relevant proximal stressor, although the literature surrounding this subject is severely limited (Hendricks & Testa, 2012). For intersex populations, the dsd-LIFE study found that "self-esteem, openness, and shame" are related to mental health disparities (NASEM, 2020). Amongst intersex women athletes, the lack of choice regarding identity concealment may be worth exploring. Intersex status can go undetected, and for some athletes (i.e., Santhi Soundarajan) suspicion-based sex testing was how they gained awareness of their hyperandrogenism (Pieper, 2014). Current sex testing practices do not ensure medical privacy (Human Rights Watch, 2021), and therefore, intersex athletes may learn of their DSDs simultaneously to the public. The inability to control the spread of this information could be associated with negative mental health outcomes.

Lastly, the minority stress model includes community and social support as a stress-ameliorating factor (Meyer, 2003). The absence of such support could be associated with negative mental health outcomes. For instance, following her suicide attempt, Soundarajan mentioned that "the Athletics Federation of India did not support [her]," despite her expectations that it would (Rajan, 2009). Furthermore, while fellow athletes could serve as a source of camaraderie under normal circumstances, intersex athletes may face rejection from other competitors, as was the case for Caster Semenya (Pieper, 2014). However, other sources of support, like Athletics South Africa and the World Medical Association, may have served as

protective factors against negative mental health outcomes for Semenya (Winkler & Gilleri, 2021; Adkins, 2020). Coaches, teammates, family, media, and medical institutions could all affect psychological outcomes positively or negatively, depending on the presence or absence of their support.

Again, there is currently no formal application of minority stress to intersex populations (NASEM, 2020). More research is needed to support or disprove these speculations about how intersex athletes may fit into the minority stress model. Furthermore, more research is needed to explain the potential interactions between intersex athletes' physical and mental health. For instance, individual athletes have expressed how medically unnecessary surgeries following sex testing have affected their psychological wellbeing (Human Rights Watch, 2021). However, more data would be needed to determine if this is a population-level trend for intersex people.

Conclusion

Athletic governing bodies like the IAAF and the IOC are committed to protecting athletes from discrimination. The IOC's mission statement includes "[acting] against any form of discrimination affecting the Olympic Movement" and "[encouraging] and [supporting] the promotion of women in sport at all levels" (International Olympic Committee, n.d.). World Athletics (formerly the IAAF) claims that it recognizes that sport is "no longer just about high performance, gold medals and records, but also about 'sport for all' and about ensuring that the maximum number of citizens are able to participate" (World Athletics, n.d.). However, preventing women with naturally high testosterone from competing is a violation of these athletic governing bodies' own principles.

To defend these actions, athletic governing bodies have claimed that they are protecting the integrity of women's sport and ensuring fairness through testosterone regulations. However, there is still no substantive proof that testosterone is a reliable predictor of athletic performance (Brömdal et al., 2020; Winkler & Gilleri, 2021; Karkazis & Carpenter, 2018). If the IAAF and IOC intend to rely on the argument of "fairness," they need stronger research—free of confirmation bias—to support this claim. Furthermore, they have a responsibility to investigate other natural traits that could provide a performance advantage.

One of the dominant topics in this paper is the limitations of the binary divide in sport—that is, having dichotomous male and female categories. Even when gender is recognized as a spectrum, sex is often conceptualized as a binary. However, intersex populations demonstrate that sex also exists on a spectrum. There is an overlap between the natural testosterone levels of women and the natural testosterone levels of men, but because sports operate according to dichotomous categories, artificial lines to constrain women's testosterone are drawn.

Thus, eliminating discrimination against intersex athletes in sport will likely involve reexamining this binary divide. This could include creating a mixed category or creating numerous categories that are divided by performance-related factors, essentially functioning like weight classes in boxing. If athletic governing bodies could reliably prove that testosterone is a predictor of performance, there could be mixed categories divided by testosterone level. However, one argument against mixed categories is that they might invalidate the gender identities of intersex women. If an intersex woman is female-identifying, she ought to be eligible for the female category. According to this argument, the inclusion of intersex women should not be contingent on the creation of mixed categories, since a category for women already exists.

If athletic governing bodies were to reexamine the binary divide, an intersectional approach would be critical, as the racialized aspect of sex testing is undeniable. The only women who have been affected in the modern, testosterone-based era of sex testing are women of color from the Global South—namely African and South Asian athletes (Winkler & Gilleri, 2021). From the roots of sex testing through present day, White American/European society has enforced its definition of femininity on the international community. To mitigate these power imbalances, the IOC and World Athletics should intentionally recruit more diverse (non-Western, non-White, female-identifying, intersex) perspectives. This is particularly relevant considering that concepts of third gender or gender beyond a binary exist in other cultures—hijra in India, waria in Indonesia, and Two-Spirit for indigenous North Americans (Thomas et al., 2017). Since the dichotomous Western view came to dominate through Western colonization (Pieper, 2014), decolonizing perspectives would be useful when considering alternatives.

Lastly, although there is currently unsubstantial research to support testosterone regulations, there is also a lack of research substantiating the argument against testosterone regulations. Much of the literature condemning sex testing focuses chiefly on the ethical implications (Adkins, 2020; Gamble & Pruski, 2020; Gleaves & Lehrbach, 2016; Pieper, 2014; Cooky & Dworkin, 2013). In terms of the health effects—especially the mental health effects—on intersex women athletes, little literature exists, which is consistent with research gaps for intersex populations as a whole (NASEM, 2020). Psychological health effects may be more difficult to study as they are often less tangible than physiological health effects. Nevertheless, as demonstrated by cases like Santhi Soundarajan, the consequences can be severe. Therefore, more research should be conducted in this area.

As more transgender and nonbinary athletes begin to compete internationally, athletic governing bodies increasingly must reckon with the role of gender and sex in sport. It is unclear what the future of sex testing will look like, but some progress is being made toward its elimination. In November 2021, the IOC replaced its 2015 Consensus Statement on athlete eligibility—which included sex testing—with its *Framework on Fairness, Inclusion, and Non-Discrimination on the Basis of Gender Identity and Sex Variations* (Human Rights Watch, 2021). This framework states that "eligibility criteria should be established and implemented […] in a manner that does not systematically exclude athletes based upon their gender identity, physical appearance, and/or sex variations" (International Olympic Committee, 2021). While specific guidelines for eligibility have not yet been established, this framework is a good first step, in that it explicitly recognizes the right of intersex athletes to compete. Given the novelty of this framework and the fact that it is yet to be implemented, its effectiveness is to be determined.

However, progress toward the inclusion of intersex athletes is not straightforward. In contrast to the IOC, the IAAF has upheld its *DSD Regulations.* As recently as March 2022, the president of the IAAF (now World Athletics) has defended these regulations, citing concerns about male performance advantage after puberty (Woodyatt, 2022). Until athletic governing bodies prioritize inclusion and reconcile the place of intersex women in women's sport, discrimination against intersex women athletes will persist.

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