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Eligibility of female athletes with Differences of Sex Development to compete in international athletics

by

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"I know that the IAAF's regulations have always targeted me specifically. For a decade the IAAF has tried to slow me down, but this has actually made me stronger. The decision of the CAS will not hold me back. I will once again rise above and continue to inspire young women and athletes in South Africa and around the world."

- *Caster Semenya*

A C K N O W L E D G E M E N T S

I am so blessed to be able to thank God every day for everything I am able to achieve through the strength he gives me. You have given me the persistence to stand up to matters far greater than myself. I am truly blessed with so much more than I deserve, and for this, I thank you God.

I would like to express my sincere gratification to my advisor and Sports Law Professor, Prof Rian Cloete. Your passion for Sports Law has ignited a passion in me and helped me realize that it is possible to make my passion my career too. I am also grateful to the University of Pretoria for their unfailing support and financial assistance in awarding me with the UP Postgraduate Bursary for Masters and Doctoral students.

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To my dearest parents, saying you are my foundation to all that I am would be an understatement. There are no words to describe what a massive influence you have had on who I am today. I can only thank you for always enabling me to strive for more, push a little further and work a lot harder. You have taught me that I can move mountains, brake records and that no goal is ever too big to achieve when I put my mind to it. Your love and support have always been a pillow for me to land on whenever I made mistakes and fell to my knees. Yet, no matter how stubborn I was, you stood by my side until I reached my feet again. Thank you for all that you do and all that you are. I love you. I am also grateful to all my siblings, family members and friends who have supported and challenged me along the way.

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A B S T R A C T

After given due consideration to the need of the original hyperandrogenic regulations and the constant pressure from society upon the *International Association of Athletics Federation's*[1] (hereafter IAAF) to take action against the presumed unfair competitive edge which such an athlete posed, it cannot be said that a female athlete's natural levels of testosterone should be considered prejudicial in cases where such an excess is naturally produced within the athlete's body. Any regulation that impedes upon the rights and freedoms of an athlete must be drafted in a manner that bears the highest degree of credibility and evidence, including the support of several cross-examinations of the evidential value before the promulgation thereof. The IAAF's hyperandrogenic regulations fail to meet this extrinsic threshold and instead announces it in the absence of trailed and proven factual scientific evidence. The CAS board identified a lack of legality due to insufficient scientific evidence presented by the IAAF in order to justify

[1] International Association of Athletics Federation (hereafter 'IAAF').

the need of such regulations. This study found that Hyperandrogenic athletes faced numerous accounts of prejudice as a result of the regulations and the enforcement thereof by the IAAF. After the CAS panel established that several of the Hyperandrogenic athlete's rights were infringed upon by the regulations, in an attempt to evade legal consequences, the IAAF withdrew the hyperandrogenic regulations leading to the abolishment of all legal proceedings linked thereto. The IAAF then retaliated months later with the publication of their DSD regulations. After facing an immense amount of critique by professionals globally, a communal consensus was reached that the DSD regulation was even weaker than its pre-successor.

This study firstly investigates the scientific evidence, both in manner and in the hypothesis, presented by the IAAF in support of their DSD regulations. Secondly, it will criticise the legitimacy of the Bermon test and its publication in the *British Journal of Sport Medicine* (hereinafter the BJSM). Comparisons are made between hyperandrogenism and collateral cases involving similar medical conditions. Attention has also been drawn to the legal recourse currently available to affected athletes. Hereinafter, opinions and suggestions will be made as to an appropriate, and a law-abiding way as to how hyperandrogenism should be regulated.

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CHAPTER 1

Introduction

1.1. Introduction

Over the course of the past 89 years, males and females in the sporting world have been separated into two different categories unique to the specific physical aptitude, performance and capability levels of each gender. This separation presents itself as a straight-forward process of identification and classification based on physical attributes. Males are males, and females are females. Even so, the classification process remains one of a sensitive nature.

The International Association of Athletics Federations (IAAF) approaches this classification process by considering levels of athletic performance: "The difference in athletic performance between males and females is known to be predominantly due to higher levels of androgenic hormones in males resulting in increased strength and muscle development."[2] They do, however, recognise that in rare cases, female athletes are predominantly stronger than others due to medical conditions such as hyperandrogenism.

The International Olympic Charter expands on this concept, basing performance on androgenic hormones as they are said to have a performance enhancing effect

[2]IAAF Regulations governing eligibility of females with Hyperandrogenism to compete in women's competition, 2011, [hereafter Hyperandrogenism regulations].

relating to strength, power and speed.[3] Such enhancing effects need to be monitored as they may provide a competitive advantage in sports. But that is just it: It "may" provide a competitive advantage in sport.

In the leading judgement in *Dutee Chand v Athletics Federation of India (AFI) & The International Association of Athletes Federation (IAAF)*[4] the Court had to decide on a matter that was based on the lack of proof, even in a technologically advanced era. The court held that the onus of proof lay upon the IAAF to establish that hyperandrogenism regulations are necessary and proportionate to pursue the legitimate objective of organising competitive female athletics to ensure fairness in athletic competition.[5]

The IAAF was unable to provide "Sufficient scientific evidence about the quantities relationship between enhanced testosterone levels and improved athletic performance in hyperandrogenic athletes."[6] In the absence of such distinctive evidence, the panel was unable to conclude that hyperandrogenic athletes may enjoy such a significant performance advantage that is necessary to completely exclude them from competing in the female category.[7]

In attempting to avoid taking a legal stance in the sensitive issue of hyperandrogenism, the Court of Arbitration for Sport (CAS) panel adjudicated an "interim award" which consisted of a two-year grace period awarded to the IAAF to present newly formulated

[3] R Rheeder, 2016, Respect for Vulnerability Is a Human Right Article 8 Of the UNESCO Declaration On Bioethics And Human Rights And Senior Citizens In South Africa. *The South African Journal of Bioethics & Law,* vol.9, no.1, pp.266.
[4] CAS 2014/A/3759 Dutee Chand v Athletics Federation of India (AFI) & The International Association of Athletes Federation (IAAF) (hereafter Chand case) para 15.
[5] P Tiwari, CAS Relief for Dutee, Jolt For IAAF. 2015. [Blog] Deccan Herald. [Online]. Available from: http://www.deccanherald.com/content/491855/cas-relief-dutee-jolt-iaaf.html [Accessed 13 March 2017].
[6] Chand case (note 4 above).
[7] Chand case (note 4 above) para 15.

evidence proving that increased testosterone levels in a female does amount to an unfair advantage and that the hyperandrogenism regulations are in fact necessary. After the passing of the two-year period, and even though the CAS panel confirmed that the regulations do include a degree of infringement upon the rights of certain athletes, the panel awarded a further six-month extension based on the belief that such violation could be justified. This belief stemmed from newly filed evidence by the IAAF on 29 September 2017.[8]

The science behind the new evidence resulted from hormone and performance data collected from 1132 females and 795 males who participated in the 2011 and 2013 IAAF World Championships. The IAAF findings concluded that female hyperandrogenic athletes have an "estimated competitive benefit of 2 – 5%", thus it could be possible that they hold the capacity to gain a greater advantage due to muscle mass and strength.[9] This advantage is summarised as a gain in muscle mass, a more vibrant central nervous system, the function of aggressiveness and risk-taking and an increase in Erythropoiesis (EPO)[10] – none of which had been accurately regulated in the past. Furthermore, one of the variables used to reach this conclusion included comparing hyperandrogenic athletes' performance before and after the use of anti-androgen medications.

A vital clue pertaining to the uncertainty of the CAS panel lies in the subject matter of their judgement. The panel suggests that the extension was awarded merely on the grounds that, by filing new evidence, the IAAF complied with given directives in their

[8] Media release - The application of the IAAF hyperandrogenism regulations remain suspended. 2018. [Online]. Available from: http://www.tas-cas.org/fileadmin/user_upload/Media_Release_3759_Jan_2018.pdf [Accessed 20 February 2018].
[9] S Bermon, 2017, Androgens and athletic performance of elite female athletes. *Current Opinion in Endocrinology & Diabetes and Obesity*, vol.24, no.3, pp.246-251.
[10] Bermon (note 9 above) 248.

2015 judgement. However, a decision in terms of whether or not the new evidence carries substance in sufficiently proving that hyperandrogenic athletes have a profound sporting advantage remains unanswered.[11]

Shortly after the lapse of the extention, the IAAF elected to retract the legislation rather than file substantiating evidence thereto. In doing this, the IAAF slyly evaded the CAS panel's uncertainty by replacing the latter with the proposed draft of newly revised hyperandrogenism regulations. Conditionally, it was no surprise that the initiation of the new regulations was received with a high degree of scepticism from both experts and laypersons. The *Eligibility Regulations for the Female Classification (athletes with differences of sex development)*[12], better known as the newly revised hyperandrogenism regulations, however, presents itself as even more flawed than its predecessor. Unfortuneatly, The IAAF diminished prior hyperandrogenic activist, Dutee Chand's cause of action in excluding the track events she participated in which resulted in the termination of all proceedings and developments that Chand and her legal team have achieved up to date.

In June 2018, South African athlete Caster Semenya supported by Athletics South Africa (ASA) formally lodged her objection against the IAAF's DSD regulations at the CAS, describing the regulations as being "discriminatory, unnecessary, unreliable and disproportionate".[13] Semenya's team of experts arguing on her behalf consisted of an extensive group of medical and legal professionals, all with a single goal of relying on

[11] Media release (note 8 above).
[12] IAAF Eligibility Regulations for the Female Classification (athletes with differences of sex development), 2018, [Online], Available from: file:///C:/Users/Michael%20Kapp/Downloads/IAAF%20Eligibility%20Regulations%20for%20the%20Female%20Classification%20(Athletes%20with%20Differences%20of%20Sex%20Development)%20in%20force%20as%20from%201st%20November%202018.pdf [Accessed 1 May 2018].
[13] Media release – CAS Arbitration: Caster Semenya, Athletics South Africa (ASA) and International Association of Athletics Federations (IAAF): Decision. 2019. [Online]. Available from: https://www.tas-cas.org/fileadmin/user_upload/Media_Release_Semenya_ASA_IAAF_decision.pdf. [hereinafter referred to "the Semenya case"].

facts to invalidate the regulation in totallity. Considering the strong basis of Semenya's argument, the CAS panel's disicion on 1 May 2019 to dismissed Semenya's objection and announcing that although discriminatory, that regulations were in fact "necessary, reasonable and proportionate", came as a shock to many.[14] The finding, however, and although final, left gaping holes in its award. The 165-page award aggressively and expressly mentiontions serious concerns regarding the phyiscial application, a few of which are: the difficulties of its implementation; the difficulty to rely (or not to rely) on concrete evidene of actual athletic advantage; and the side effecs of hormonal treatment and human rights of the athlete concerned. In addition hereto, I have identified further flaws which I elaborate on during the course of my research:

1. The Eligibility Regulations merely makes provision for 5 athletic events being all track races between 400m and one mile, namely: 400m races, 400m hurdles races, 800m races, 1500m races and one mile races. This was supposedly due to the newly formulated scientific evidence (as aforementioned) which indicated that females with higher testosterone levels gain a performance advantage in specified events. The problem, however, is that the specified events included in this scientific evidence included field events Hammer Throw and Pole Vault, and does not make provision for 1500m races. Which poses the question of how, and under which pretences the regulations were formulated.
2. Is the IAAF's scientific basis, upon which the newly formulated regulations are found, sufficient to impose such harsh restrictions on hyperandrogenic

[14] Semenya case (note 13 above).

athletes?

3. If the IAAF is going to regulate hyperandrogenic athletes on their genetic make-up, should they not establish a legal standard for all biological conditions which results in the production of naturally occurring hormones in excessive measures, that may present the diagnosed athlete with a sporting advantage? In doing so, wouldn't failure to do so lead to unfairness under the Olympic Charter?
4. When will administrators be regulated in terms of establishing new regulations which have such a substantial impact on the athletes' rights? When will the IAAF face the consequences of their prejudicial actions?

1.2. Research question: Should female athletes with differences of sex development be eligible to compete in the female category of elite athletics? If so, should the legislating processes and legislators of such regulations be better regulated?

- In what manner do the new regulations differ from its predecessor, which was nullified by the IAAF on the ground of its vexatious nature?
- Can newly admitted tests successfully fill the void left by prior lab testing results?
- Identifying the faults and challenges of the Bermon hypothesis formulation.
- What does the autonomy of a successful athlete entail?
- What inference can be drawn between DSD athletes and Transgender athletes? Should such a relationship exist?
- What is the relevance of distinguishing between a female and a woman?
- Does the Therapeutic use exemption not stand in direct contrast to the

proposed regulation?

- What are the medical implications concerned with the new regulations?

1.3. Research Aim

This research aims to examine the present legal position of Hyperandrogenic female athletes and female athletes with the differences of sex development, in indicating the shortcomings in international sports law. A further aim will be to make suggestions as to how Hyperandrogenism and DSD should be legally regulated in the sporting world and how affected female athletes should be considered as a vulnerable group in society.[15] Lastly, this research serves as an aid in shedding light on the underlying administrative crises which exist in the formation of new regulations in sport.

1.4. Methodology

In conducting my research, I will be criticizing the current international sports law with regards to female athletes with Hyperandrogenism, as regulated in the International Olympic Committee Regulations[16] and the International Association of Athletes Federations Regulations[17]. Local and foreign literature dealing with female athletes with Hyperandrogenism will be evaluated. In doing so, I will give reference to the regulations themselves, showing the contradictions between the rules laid out for ordinary athletes compared to that of female athletes with Hyperandrogenism. I will substantiate this argument using International law, as stated in the Oxford journal. Special reference will be made to the ongoing Caster Semenya case. Literary sources

[15] R Rheeder (note 3 above).
[16] IOC addresses eligibility of female athletes with Hyperandrogenism. 2011. [Blog] IOC News. [Online]. Available from: https://www.olympic.org/news/ioc-addresses-eligibility-of-female-athletes-with-hyperandrogenism [Accessed 29 November 2016].
[17] IAAF Hyperandrogenism Regulations (note 2 above).

as well as the appropriate legislation and case law will also be used in further support hereto. Reference to all sources appears in the bibliography.

1.5. Delimitations

This research is conducted up until, and including, 4 June 2019.

CHAPTER 2

In what manner do the new regulations differ from its predecessors, which was nullified by the IAAF on the ground of its vexatious nature?

2.1. Introduction

In attempting to understand the monumental issue revolving around sex and gender verification, one has dated back its point of origin. Dating back to the Berlin Olympics 1936, a historic event in world athletics as female athletes were finally declared eligible for competing; the IOC unknowingly drew the first line in the sand in creating two categories for competition: male and female. Unfortunately, this division of sexes proved more complicated than was initially perceived. The IOC quickly realized that with the implication of this line, come many more loopholes and chance takers in the form of sex fraud. It was thus necessary to regulate the female category in protecting the integrity of world athletics. The predicament, however, never revolved around whether regulations were necessary, but rather how one could naturally do so when the line is drawn is evidently not one of mathematical proportion. Instead, the line is drawn in the sand with a natural status; some granules will fall on either side of the line, where others may be the granules creating the line, making the division an impossible task.

Rules and regulations took off in 1966 with the implementation of the so-called ‘naked parades’. All female participants were required to strut in front of a panel of female

medical practitioners who then decided whether the athletes conformed to the IOC's standards of 'femininity'. The biological era quickly followed in 1968 which sought for laboratory-based testing. Thus, all females were to provide Barr body cells (swab to check) for testing, to qualify for competition in the Mexico City Summer Olympic Games. Laboratory-based testing sparked the excitement of new technology which held certain advantages, including that of privacy and dignity to female athletes, even if scientists acknowledged limitations to the methodology.[18] Due to the popularity of laboratory-based tests over more invasive natural determents, in 1992 scientists attempted to further improve its sensitivity and specificity with the introduction of Polymerase Chain Reaction (PCR). PCR operates by way of extraction of DNA, which is then studied in order to identify the presence/absence of a specified gene located on the Y-chromosome. It was later revealed that some sequences were wrongly classified as male specific, while in fact female, leading to the disqualification of several female athletes due to unfortunate false positives such as athletes whose phenotype was distinctly female as having an apparently male genotype.[19] All fingers were pointed towards laboratory-based gender verification methods, making it evident that test-tube tests were simply inadequate and perhaps inferior for the task at hand as it did not account for individuals who have a 46 XY genotype.[20]

Later in the 1990s, the IAAF took a step in the right direction with the implication of mandatory, comprehensive medical assessment for male and female athletes, which up to date remains the ideal solution to the regulation of sex and gender. Unfortunately, it was discarded due to its' high cost scale and provision for such assessments was

[18] JC Reeser, 2005, Gender identity and sport: is the playing field level?. *British Journal of Sports Medicine*, vol.39, no.10, pp.695-699.
[19] As above.
[20] As above.

only to be made on an 'as needed basis' when raised by competitors, anti-doping officials or the athlete herself.[21] The IOC finally harmonized herewith the IAAF in 1999 with its adoption of the "inspect as you suspect" policy.[22] This policy was rioted in the year 2000 when 29 of the total 34 international sports federations abolished gender verification tests which became somewhat of a habit. This led to a long silent period, which led many to believe that the horrid sex verification was finally abolished. Thus, it is no wonder that the public did not take well to the IAAF 'Policy on Gender Verification Regulations' which was promulgated in 2006 and resulted in the disqualification of 800m athletes Santhi Soundarajan and Caster Semenya. Same policy, like its predecessors, was proven inadequate in that it did not conduct its medical assessments professionally nor confidentially.

The real uproar, however, was triggered by the IAAF's Hyperandrogenic Regulations which deemed female athletes with Hyperandrogenism ineligible to compete unless medical suppressants were taken to lower their levels of hormones. The onus of proof thus rested upon such an athlete to prove that she does not infer any sort of advantage from their condition. The case between IAAF and the Indian Athlete, Dutee Chand, is the reason behind the suspension of such regulations in 2015.[23] the CAS panel held that IAAF did not prove that higher testosterone levels served as an unfair advantage to a Hyperandrogenic athlete. As above mentioned, a two-year grace period was set out as the period for the IAAF to disprove the obiter dictum. No further evidence was led.

Instead, published on 23 April 2018, the IAAF announced its *Eligibility Regulations for*

[21] Michele Krech, 2016, *To Be a Woman in the World of Sport Global Regulation of the Gender Binary in Elite Athletics*. Undergrad. Institute for International Law and Justice.
[22] JC Reeser (note 18 above).
[23] Chand case (note 4 above).

the Female Classification (Athletes with Differences of Sex Development); this after the expiry of their 2 year grace period awarded to them by the Court of Arbitration to provide scientific evidence to justify their hyperandrogenism regulations and resulting in the termination of all proceedings and developments that hyperandrogenic athlete Dutee Chand and her legal team have achieved up to date. In comparing the latter to its successor, it is prominent that the key differences lie in the DSD regulation's 'divide and conquer' approach of regulated track and field events. Where the Hyperandrogenic regulations affected all track and field events, the DSD regulations specifically limit the participation of DSD and hyperandrogenic athletes in restricted events being: 400m races, 400m hurdles races, 800m races, 1500m races, one mile races, and all other Track Events over distances between 400m and one mile (inclusive), whether run alone or as part of a relay event or a Combined Event.

2.2. Can newly admitted tests successfully fill the void left by prior lab testing results?

As regulations date back to the 1960s, so does scientific research in an attempt to justify the latter. Older research projects with the subject matter being the relationship between excessive exercise and anabolic compositions in the female body include the Kraemer tests dated 1991, the Bradley tests dated 2001 and the Mosavat tests dated 2013.

The Kraemer test was executed on a much smaller scale, including merely 8 males and 8 females. While acknowledging the existence of one prior study that demonstrated the possibility of minor increases in serum T in females, they hold that their results instead supports previous investigations which were unable to find any

acute effects of serum T concentrates. Importantly, these scientists assume the perspective that other endogenous anabolic hormonal mechanisms, rather than T, may play a more prominent role in the female physiological evolution when exposed to excessive exercise.[24] Thus, where a male athlete may derive his athletic performance advantage from endogenous T, a female's advantage may lie in other endogenous anabolic hormonal mechanisms.

The Bradley tests were aimed at determining an extent to which Rate to Force Development (RFD) influenced androgen responses and total testosterone (TT) in 47 female participants when subjected to resistance exercise.[25] It was observed that significant increases in TT followed the AHRET. The conclusory inference drawn was that resistance exercise could possibly induce increases in TT and anthropometric marks of adiposity correlate with T concentrations. Therefore, "resistance exercise can induce transient increases in androgen concentrations in young, healthy women."[26]

The Mosavat tests, contrary to other tests of its kind, opted to examine the effects of excessive exercise on the female autonomy in general, not only focusing on its anabolic profile. IN understanding the results, take note that increasing cortisol, also known as an adrenalcorticol hormone which has a catabolic effect on muscle tissue, inhibits hypothalamic secretion of GnRH. Suppression of hypothalamic pulsatile enforces the release of GnRH, which inhibits the secretion of Luteinizing Hormone

[24] W Kraemer, S Gordon, S Fleck, L Marchitelli, R Mello, J Dziados, K Friedl, E Harman, C Maresh, A Fry, 1991, Endogenous Anabolic Hormonal and Growth Factor Responses to Heavy Resistance Exercise in Males and Females. *International Journal of Sports Medicine*, vol.12, no.2, pp.228-235.
[25] B Nindl, W Kraemer, L Gotshalk, J Marx, J Volek, J Bush, K Häkkinen, R Newton, S Fleck, 2001, Testosterone Responses after Resistance Exercise in Women: Influence of Regional Fat Distribution. *International Journal of Sport Nutrition and Exercise Metabolism*, vol.11, no.4, pp.451-465.
[26] S Bermon, P Garnier, 2017, Serum androgen levels and their relation to performance in track and field: mass spectrometry results from 2127 observations in male and female elite athletes. *British Journal of Sports Medicine*, vol.51, no.17, pp.1309-1314, [hereafter referred to as the 'Bermon tests'].

(LH) which plays a role in the female menstrual system and Follicle Stimulating Hormone (FSH) which is vital in puberty, from pituitary gland. This results in the diminishing of ovarian stimulation and estradiol production.[27] Results established that females with regular menstruation had lower levels of LH/FSH ration and androgen levels than females with polycystic ovary syndrome (PCOS). This means that excessive exercise does have an influence on the female menstrual cycle, which was more severely affected in female athletes who perform long term exercise at an intensity level above the lactate threshold than that of long term exercise below the threshold.[28] PCOS also made its appearance in the Bermon tests as an argument in favour of their stance that performance enhancing of T is effective in the female body. Female athletes were compared to female athletes with polycystic ovary syndrome (PCOS), who supposedly outperformed female athletes with regular menstrual cycles in terms of anabolic body composition, VO2max, and performance values in general.[39] In sum, excessive exercise prolonged over a long term and high in intensity, has a detrimental effect on female autonomy, in specific, the reproductive system.[27] On the basis of this research, one has to consider the possibility of DSD being the by-product of pro-longed excessive exercise.

A recent meta-analysis relating to the effect of resistance training in female youth in terms of muscular strength, conducted by a group of 6 experts in sports medicine, revealed the shortcomings in existing literature.[29] In terms of this study, researchers concluded that prior tests and studies often failed to conduct “separate within-study performances date for male and female youth renders many interventions findings

[27] M Mosavat, M Mohamed, M Mirsanjari, 2013, Effect of Exercise on Reproductive Hormones in Female Athletes. *International Journal of Sport and Exercise Science*, vol. 5, no.1, pp.7-12.
[28] S Bermon, P Garnier (note 26 above).
[29] W Kraemer (note 24 above).

somewhat flawed and arguably, reduces their usefulness to practitioners and sports scientists alike."[30]

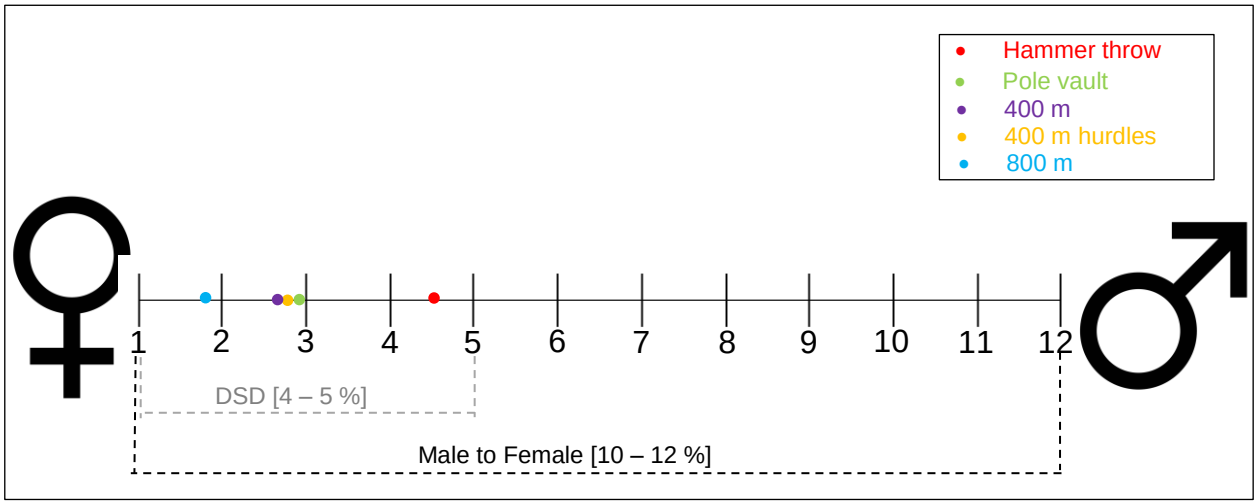
The most recent studies, however, identifies 2 main tests which lie in the hands of (1) the IAAF professional medical team[31] and (2) a Swedish based medical team including Professor Eklund[32]. Both these tests have been relied upon by the IAAF in the drafting of the newest DSD regulations. It is important to note the key differences between the Bermon tests and the Eklund tests, being that the Bermon tests were based on studies conducted in terms of female athletes over hyperandrogenic female athletes, whereas the Eklund tests were conducted in terms of female athletes over females with ordinary fitness levels.

After the CAS panel award the IAAF with a further 2-year grace period in order to prove the advantage held by hyperandrogenic athletes, the IAAF sought out to conduct extensive medical and scientific based tests to adhere to same. Amongst many world-class medical practitioners and scientists, Bermon and colleagues were instructed to do whatever necessary to obtain substantive evidence to validate their hyperandrogenic regulations. Thus, it can be assumed that the Bermon tests were conducted with a goal in mind, which to an extent, renders this test the study that is being held accountable. The test subjects were to be all athletes who competed in the IAAF 2011 World Championship and thus submitted biological samples in compliance with the rules and regulations. Participation in the tests consisted of 1332 females and

[30] W Kraemer (note 24 above).
[31] S Bermon, P Garnier (note 24 above).
[32] E Eklund, B Berglund, F Labrie, K Carlström, L Ekström, A Hirschberg, 2011, Serum androgen profile and physical performance in women Olympic athletes. *British Journal of Sports Medicine*, vol.51, no.17, pp.1301-1308, [hereafter referred to as the 'Eklund tests'].

795 males, although speculations remain as to whether prior consent was derived from such athletes.

10In the absence of prior evidence reporting the difference between male and female muscle cells in relation to their testosterone dose-response curves, Bermon speculates that it is likely that young women would, like young men, "show a dose-response relationship between the androgen levels and functional capacities as initially reported in the GDR state doping program."[33] These speculations are made despite the sensitive nature of the issue, as stressed by the IAAF on numerous accounts. In lieu, the IAAF chooses to identify this as an invitation to criticism which is open for debate as the biological parameters of sex, as a line in the sand, are not neatly divided into 2 individual categories in nature.[34] What the IAAF fails to encumber however is that, in their promulgation of gender verification regulations in the past and present, they took it upon themselves to draw such line with a sole goal of achieving clear-cut categories.



[33] M Krech (note 21 above).
[34] As above.

Figure 1: A schematic graph of the advantage results withheld in the Bermon tests in comparison to the known male to female advantage gap.

In terms of the Bermon test, female Hyperandrogenic and DSD athletes enjoy an estimated competitive advantage of '4 - 5%' over female athletes who fall within the normal female range of androgen levels.[35] These figures were established by comparing the performances of females in the lowest fT tertile to the performances of females from the highest fT tertile in their retrospective track and field events. Results showed significantly better performance in merely 5 track and field events, including 2.7% advantage in 400m; 2.8% advantage in 400m hurdles, 1.8% advantage in 800m, 4.5% advantage in hammer throw and 2.9% advantage in pole vault, respectively.[36] These results, upon which the DSD regulations are based, are not in dispute. What is disputed nonetheless, is that when correlated with the contents of the DSD regulations, the evidence presented does not adequately substantiate the legislation. In contrast to the Bermon test results, the DSD regulations specifically limit the participation of DSD and hyperandrogenic athletes in restricted events being: 400m races, 400m hurdles races, 800m races, 1500m races, one mile races, and all other Track Events over distances between 400m and one mile (inclusive), whether run alone or as part of a relay event or a Combined Event. The regulations hardly touched ground when it received its first critiques, raising questioning such as why the regulators would purposefully fail to include events that reflected such major

[35] S Bermon, E Vilain, P Fénichel, M Ritzén, 2015, Women with Hyperandrogenism in Elite Sports: Scientific and Ethical Rationales for Regulating. *The Journal of Clinical Endocrinology & Metabolism*, vol.100, no.3, pp.828-830.
[36] As above.

advantageous percentiles in the Bermon tests such as hammer throw and pole vault. Furthermore, several extra track events like 1500m races and one mile races were unexpectedly included in the list of restricted events, despite the Bermon tests placing strong evidential value on their findings that long-distance running by female athletes consistently showed lower T and DHEAS concentrations and that athletes involved in events requiring strength, power, and speed were more prone to derive an advantage.[37] This place an immense amount of pressure on the IAAF as their ideology behind the DSD regulations were substantiated due to the need thereof based on the found advantage of "4 – 5 %". It is, however, only the hammer throw (4.5%) event with such a profound percentage advantage, with the second highest percentile value being pole vault (2.9%). It must be pondered whether the exclusion of such events completely nullifies their reasoning behind the regulation, as a "4 – 5 %" advantage now becomes a much lesser "1.8 – 2.8%" proved an advantage. Additionally, is 1.8 % advantage significant enough for such an athlete to be excluded and prejudiced from competing?

Setting aside data extracted from doping programs in the former German Democratic Republic which found no clear scientific evidence proving that a relationship exists between a high level of T and female performance in sports, the Bermon test further substantiates its methodology by relying on a publication by Rickenlund *et al.* Rickenlund found that the hyperandrogenic subgroup's (T concentration 1.9 ± 0.2 nmol/L) profound advantage was based on several factors, including: "a more anabolic body composition, a higher total bone mineral density (BMD), and upper to lower fat mass ratio as well as the highest maximal oxygen uptake and performance values in

[37] S Bermon, E Vilain, P Fénichel, M Ritzén (note 35 above).

general than did oligomenorrheic or amenorrhoeic athletes with normal androgen levels"[38] Their hypothesis is based on the speculation that explosive power rendered from human muscles is dependent on muscle mass, cross-sectional muscle area, lean limb tissue, and bone-free lean mass.[39] Consequently, these indices become a prominent factor, over and above body mass, when considering functional movement performance is concerned. Furthermore, they rely on literature by Cardinale and Stone who ruminated that a positive relationship exists between T levels and explosive power in the human body, irrelevant of sexual orientation. This would support the ideology that T may play a major role in neuromuscular function. In light thereof, it can be assumed that androgenization administers a commanding advantage in its holder, substantiating the consequent gained an advantage by hyperandrogenic and DSD athletes' due to their inherited male physiology.[40] Should this ideology be supported by medical evidence, female athletes who fall within the normal T ranges are almost certain to be at a disadvantage to hyperandrogenic and DSD athletes competing in the female category. This ideology which the IAAF inherited, however, remains heavily criticised by several medical practitioners and sports scientists, such as Sonksen *et al.*, with a shared opinion that it is wrongly based on a false premise that a greater lean body mass results in higher serum testosterone. [41]

On the contrary, the Eklund tests were conducted on a much broader academic scale to establish a precedent for the serum androgen profile in all female Olympic athletes

[38] A Rickenlund, K Carlstro¨m, B Ekblom, 2003, Hyperandrogenicity is an alternative mechanism underlying oligomenorrhea and amenorrhea in female athletes and may improve physical performance. *Fertil Steril*, vol.79, pp.947–955.
[39] S Bermon, E Vilain, P Fénichel, M Ritzén, (note 35 above).
[40] M Cardinale, MH Stone, 2006, Is testosterone influencing explosive performance? *J Strength Cond Res*, vol.20, pp.103–107.
[41] P Sonksen, 2016, Determination and regulation of body composition in elite athletes. *British Journal of Sports Medicine*, vol.52, no.4, pp.219-229.

when combined with physical performance. The participants included 106 Swedish female athletes, with a further 117 females with regular fitness levels included as controls. The primary aim of their study was to establish the serum androgen profile in terms of body composition when female Olympic athletes' bodies are exposed to physical performance. The scientists explained that "in women, androgens are secreted by the ovaries and the adrenal glands, the latter being responsible for the production of precursor androgens (androstenedione (A4), dehydroepiandrosterone (DHEA) and 5-androstene-3β, 17β-diol (5-DIOL)). A larger part of active androgens (T and dihydrotestosterone (DHT)), those that are able to bind to the androgen receptor, are synthesised in peripheral tissue from DHEA by the mechanism of intracrinology, that is, the transformation of precursor androgens to active androgens within the cell. Therefore, DHEA is considered a major tissue-specific source of T and DHT in women."[42] All participants signed an indemnity form, formally consenting to the tests. Results confirmed that athletes showcased significantly higher levels of endogenous androgens, dehydroepiandrosterone (DHEA) and 5-androstene-3β, 17 β-diol (5-DIOL) and the metabolite etiocholanolone glucuronide (Etio-G), whereas levels of estrone, higher bone mineral density and more lean mass were significantly lower in the athletes.[43] Additionally, athletes showcased a higher frequency of MD, levels of DHEA that were substantially higher, significantly higher total and spinal BMD, Z score and lean mass variables, whereas body fat percentage was significantly lower in comparison to the controls. When comparing the athletes to the controls, the whole group of athletes displayed significant positive correlations were found between androgen levels and total BMD.[44] Being female specific, these results are applicable

[42] E Eklund, B Berglund, F Labrie, K Carlström, L Ekström, A Hirschberg (note 32 above).
[43] As above.
[44] As above.

to the female autonomy and are not hyperandrogenic specific. Thus, as a precedent measured on an average scale, female athletes gain higher T levels when excessive exercising is administered, and performance in sport could lead to effect higher T levels.

2.3. Identifying the faults and challenges of the Bermon hypothesis formulation

In bringing medical terminology and concepts into perspective, it became evident that when considering sport and performance a variety of factors exists that may have a normal distribution in the physiology of an athlete. This can include different medical conditions rendering a degree of advantages as per its impact on the athlete's physiology, making her prone to succeed in their sporting discipline. On the contrary, one could argue that this is merely a variation in normal physiology. It is important to note that the level of hormones in the female body's endocrinology as found in her bloodstream is merely one determinant of whether the endocrinology is disturbed or not.[45] An equivalent, or perhaps even a more significant determinant is not so much whether the A substance in the female's blood has got high concentrations, but the endocrinology in principle is that most of these are proteins that bind to receptors in end organs. Such a receptor refers to the presence of a specified chemical on the membrane of a muscle cell that binds with the A substance.[46] This binding then results in chemical changes which may or may not build up more muscle. Thus, a number of things have to happen in terms of an increased concentration that must be taken into account. Subsequent to the total ignorance given to the receptor and the number of

[45] A B Cadwallader, C S Lim, D E Rollins, F Botrè, 2011, The Androgen Receptor and Its Use in Biological Assays: Looking Toward Effect-Based Testing and Its Applications. *Journal of Analytical Toxicology*, vol.35, no.9, pp.594-607.
[46] As above.

receptors on each athlete's muscles which vary between individuals as itis genetically determined, is the sensitivity of these receptors and how receptive they are to the binding and the consequential chemical change. This is called receptor sensitivity.[47] This phenomenon leads to a "catch 22" situation in the regulation process as females can have very high levels of T, but due to their receptors not functioning in that it has receptor insensitivity, the athlete's physiology looks like, acts like and is in essence completely feminine. Such athletes respond to exercise like females with low T would as they are insensitive to the T and thus have no ability to generate an advantage from it. What the allowance of 5 T does not account for, is that a female with a reading of 5.1 would ordinarily exceed the threshold but can have a low sensitivity and will psychologically respond like females with low T. Whereas on the other hand you can have a female with a 4.8 reading, falling within the threshold, with a high sensitivity to T and they respond like women with a much higher T level. Both the latter Hyperandrogenism regulations and the current DSD regulations vaguely state that androgen receptor sensitivity must be tested yet have failed to implicate this as to date. This may be as a result of the high degree of difficulty in regulating it as an individual's receptor sensitivity is never the same at all times. Instead it is dependent on external stimuli which leads to the human body naturally upregulated and downregulated its receptor sensitivity levels in order to maintain a healthy level of substance A.[48] Thus, the only way to remain completely objective and fair, regulations need to make provision in regulating everyone, define an appropriate level of T, as well as sensitivity and the response to that which must be tracked over a period as it can vary. Only then

[47] A B Cadwallader, C S Lim, D E Rollins, F Botrè, (note 45 above).
[48] A B Cadwallader, C S Lim, D E Rollins, F Botrè, (note 45 above).

in terms thereof different categories can be established.

Further major flaws of the tests lie in the statistics and the sampling used. Each sub-group only had around 60 athletes within the group. They then divided them into tertiles (equal thirds), being: top third, middle third and bottom third.[49] They then compared their performance based on the time between only the top and bottom group. The middle group was ignored. Essentially this provides for 3 problems, namely: (1) the basis of the test was only 20 athletes compared to 20 athletes; (2) Scientists may have double counted and tested athlete samples as samples were collected over two world championships an in the absence of reporting how many of these athletes were tested twice; and (3) a cross-section study design was used to substantiate the effect that high T caused higher performance, which is a major problem because no other factors that could relate to performance were included in the statistical model.[50] Adding to the flaws, is the major upset revolving around the consent. Is endogenous T an anti-doping issue? No; the Hyperandrogenic regulations stated that it has no connotations to anti-doping – meaning they were not allowed to use the collection of blood samples, which was collected for anti-doping purposes only as that is what the athlete consented to. This has severe implications in terms of the scientific basis as the conduct by the scientific basis was unethical, rendering all findings inadmissible. Lastly and quite self-explanatory, is the found conflict of interest as the investigators performing the study, formed part of the IAAF. Thus, apart from the already established unsound scientific

[49] S Bermon, E Vilain, P Fénichel, M Ritzén (note 35 above).
[50] R Pielke, R Tucker, E Boye, 'Serious Problems Found in a Partial Replication of Bermon and Garnier (2017)', (2018), British Journal of Sport Medicine.

basis, there is a whole host of flaws in determining the 4-5% percentage.

What seems to be ignored, is the lack of diversity included within the Bermon studies, as Dr Bermon herself admits that their studies in elite female athletics did not make provision for the androgen levels in black women compared with that in Caucasian women.[51] As a matter of fact, even the Eklund studies were purely Caucasian based. The CAS panel also fails to address whether the IAAF included a diverse group of female athletes within their studies. Thus, no provision has been made for different ethnic groups, cultural backgrounds or natural surroundings. This is important as human beings adapt with their habitat, realities and unique roles played in society. Once again, a lab testing in terms of testosterone and its effect in the female body is rendered flawed and thus ineffective. Yet, bodies such as the IAAF still rely upon it, despite its claim that "there are neither available data on serum androgen levels nor reliable statistics on the so-called hyperandrogenism among a large and high-level female athletes' population".[52] Furthermore, the IAAF will have to find the means and scientific results in support and justification its regulations. This may lead to an impossible task as no female athlete has ever competed in a degree that comes close to the "10 – 12%" proved advantage required by the CAS panel.[53] After considering all the flaws in its' prior attempts, is hard to imagine that the IAAF would be able to achieve this on the balance of probabilities.

2.4. What are the medical implications concerned with the new regulations?

When evaluating the hyperandrogenic regulations, it was apparent to me that the IAAF based, what seems to be the majority of the provision and the need thereof, on the

[51] S Bermon, E Vilain, P Fénichel, M Ritzén (note 35 above).
[52] As above.
[53] Chand case (note 4 above).

welfare and best interests of the hyperandrogenic athlete. Or so it seems. The first underlying principle is made out to be the "early prevention of problems associated with hyperandrogenism"[54]; in an attempt to justify the use of compulsory medical treatments and medication that must be undergone or consumed in order for a diagnosed athlete to be eligible for competition. However, a further look into these prescribed medical treatments and medication reveals the true 'disguising' purpose of these sugar-coated words and principles. Anti-androgen medications are used as a form of a testosterone suppressant to treat hyperandrogenic athletes. However, it has the potential to do so much more than just that. With inherited names' such as androgen-deprivation therapy, chemical castration and antiandrogen pharmacotherapy, it is ostensible that the prescribed use of anti-androgen medications by the IAAF to hyperandrogenic athletes is merely a façade for being legally poisoned.[55]

For several years, anti-androgen pharmacotherapy has been offered worldwide as a treatment for sexual offenders in an attempt to prevent sexual urges and, ultimately, sexual crimes. It, however, is not a therapy that is taken lightly. In the parts of Europe, such as Austria, Canada, England, France, Germany and Wales, official provisions have been submitted into the local legal systems; stating that such a treatment may only be administered and made available to a convicted sex offender within the criminal justice system.[56] Therefore, it will be considered a crime for a practitioner to prescribe anti-androgenic medication to an individual falling outside of the above-

[54] Hyperandrogenism regulation (note 2 above).
[55] H Wolinsky, 1973, Comparative effects of Castration and Antiandrogen Treatment on the Aortas of Hypertensive and Normotensive Male Rats. *The Journal of the American Heart Association,* pp.183-189.
[56] K Harrison, 2008, Legal and Ethical Issues When Using Antiandrogenic Pharmacotherapy with Sex Offenders. *Sexual Offender Treatment*, vol.3, no.2.

mentioned spectrum. This is due to the extraordinary amount of potential side effects, including; “weight gain, hot and cold flushes, headaches, nausea, lethargy, nightmares, leg cramps, gallstones, depression including suicidal thoughts, insomnia, difficulties in breathing and fluid retention.”[57] But that is just the tip of the iceberg as more detrimental effects include; “thrombophlebitis, pulmonary embolism,”[58] “hyperglycaemia, hypertension, shrinkage of the prostate vessels, diabetes,”[59] and “gynaecomastia”[60]. With these being the short-term effects, one could only fathom what awaits on a long-term basis.

Anti-androgenic medications are also in use to treat severe cases of prostate cancer. However, without strict regulation in place, anti-androgen drugs became practitioner’s ‘go to drug’ in any case of prostate cancer. A recent study was done by academics from Stanford and the University of Pennsylvania identified that from16,888 patients with non-metastatic prostate cancer, nearly 2,400 were treated with anti-androgen therapy. Further results showed that these 2,400 patients suffered an “88% higher risk of being diagnosed with Alzheimer’s disease in the next three years than those who weren't.”[61]

An alternative, which is no more than insanity, is the removal of the gonads, which is a procedure that sterilizes the athlete; seriously impairing their quality of life. Yet, the IAAF attempts to serve these treatments as a benefit to the athlete implying that they are indirectly protecting these athletes by diagnosing them to prevent further health hazard. I propose the following, do these treatments serve to improve the quality of

[57] K Harrison, 2007, The High Risk Sex Offender Strategy in England and Wales: Is chemical castration an option?. *The Howard Journal*, vol.46, no.1, pp.16-31
[58] JW Bradford, 1983, The Hormonal Treatment of Sexual Offenders. *Bulletin of the American Academy of Psychiatry and the Law,* vol.11, pp.159-169.
[59] L Spalding, Florida's 1997 chemical castration law: a return to the dark ages. 1998. [Blog] Florida State University Law Review 25. [Online]. Available from: http://www.law.fsu.edu/journals/lawreview/frames/252/spalfram.html [Accessed 22 October 2016].
[60] J Craissati, 2004, Managing High Risk Sex Offenders in the Community. A Psychological Approach. *New York Routledge*.
[61] M Beck, 2015. Study Warns of Alzheimer’s Risk in Some Prostate-Cancer Drugs. [Blog] The Wall Street Journal. [Online] Available from: https://www.wsj.com/articles/study-warns-of-alzheimers-risk-in-some-prostate-cancer-drugs-1449527063 [Accessed 2 February 2017].

the athlete's health? Or do they merely stand as a façade to cover their actual purpose of setting the public's view of 'fairness' at ease?

2.5. World Medical Association (WMA)

Pending the CAS's decision regarding the Semenya case, the World Medicine Association (hereinafter referred to as the "WMA") released an electronic post urging physician's worldwide not to initiate the administration of the treatment withheld in the new eligibility regulations.[62] The Association advised that its council, on 25 April 2019, demanded the withdrawal of the regulations with immediate effect due to its flagrant discriminatory basis which contrasts with both international medical ethics and human rights. [63] They further expressed their concern that healthy athletes would unjustifiably be reformed to become "patients" under the administration of its physicians who merely acted per regulations. The WMA warns physicians that "it is considered as unethical for physicians to prescribe treatment for excessive endogenous testosterone if the condition is not recognised as pathological."[64] Concluding the warning, the association expresses its displeasure with the regulations due to its weak basis based on a single study which it itself disputes. This firm recommendation by the WMA to its physicians made a bold statement relating to the authenticity of the eligibility regulations. Not only did it cause frowns and further investigation into the evidential basis of the regulations by international experts and laypersons, but it also diminished the ability of DSD athletes to adhere to the regulations. Despite the WMA's attempt to invalidate the eligibility regulations, the CAS panel confirmed the regulations to be

[62] World Medical Association. 2019. WMA urges physicians not to implement IAAF rules on classifying women athletes. WMA. [Online]. Available at: https://www.wma.net/news-post/wma-urges-physicians-not-to-implement-iaaf-rules-on-classifying-women-athletes/ (accessed on 23 May 2019).
[63] As above.
[64] As above.

necessary on 1 May 2019. The award, however, is somewhat perplexing in nature. It includes serious concerns of the CAS relating to the difficulties of administering the regulations with special reference so the side effects of the suggested hormonal treatment which could lead to "the practical impossibility of compliance" thereof.[65]

The WMA retaliated against the CAS panel's award on 15 May 2019 in an official statement to its member's reaffirming its opposition against the IAAF rules. The association, in unambiguous terms, disclosed its dissatisfaction with the IAAF's expectation of having medical practitioners use their expertise for purposes other than that of providing medical assistance that is in the best interests of their patients' health and dignity.[66] They reiterate that the mere fact that an athlete is diagnosed with DSD does not constitute medical need and that "medical treatment for the sole purpose of altering the performance in sport is not permissible."[67] This decision by the WMA to counter the new eligibility regulations, regardless of the CAS panel's decision, may have a severe impact on its enforceability and ultimately may render its application to elite athletics impossible.

[65] The Semenya Case [note 13 above] 2.
[66] World Medical Association. 2019. Physician leaders reaffirm opposition to IAAF rules. WMA. [Online]. Available at: https://www.wma.net/news-post/physician-leaders-reaffirm-opposition-to-iaaf-rules/ (accessed on 23 May 2019).
[67] As above.

CHAPTER 3

Incorporation of androgen receptor sensitivity tests in regulations and classifying DSD athletes

3.1 Introduction

In attempting to understand the complexity of testing for receptor sensitivity, it is essential to understand the biology behind human androgen receptors (hAR). Current knowledge surrounding the structure function relationships within the domains of the hAR consists of the N-terminal domain (NTD), the DNA-binding domain (DBD), and a carboxy-terminal ligand-binding domain (LBD).[68] For purposes of this study, particular focus is placed on the NTD which contains two activation functions, being AF1 and AF5. As aforementioned, it is necessary for proteins to bind itself to receptors in end organs to facilitate a presumed advantage in the female's body. Where the AF1 serves as the modulatory area for expediting same protein binding (which appears to be dependent on the structure and composure of the receptor after ligand binding), the AF5 instead features in a more independent manner.[69] During ligand binding, the receptors experience a two-fold process of steroid development, where it is assorted as either an untransformed steroid receptor or, alternatively, as a transformed receptor.

Untransformed receptors are essentially inactive, meaning it cannot bind to the specific steroid, and thus associates itself with chaperone proteins in the LBD.[70]

[68] A B Cadwallader, C S Lim, D E Rollins, F Botrè, (note 45 above).
[69] As above.
[70] As above.

Chaperone proteins prevent the receptor from accessing the steroid, and therefore it is only if the receptor bears the ability to dissociate itself from these chaperone proteins that it can be classified as a transformed steroid receptor. This presents the first complication to the ideology that females gain an advantage from their high testosterone levels, as their receptors could be inactive, rendering their bodies immune from the steroid, irrespective of the concentrate level thereof.[71]

Even though heat shock protein 90 (hsp90) can be seen as a chaperone protein, it is still required in the construction of the LBD for ligand binding to take place. Once the conformation of the LBD is complete, and the ligand binding has been initiated, the transformed receptors experience a loss of hsp90 and ultimately become activated. Subsequently, the NTD's structure also changes to produce a platform of coregulator proteins, which serves as the section of the hAR responsible for the mediation of the "cell and gene specific effects of androgens."[72] As a conclusionary step to the binding process, the hAR links itself with the necessary DNA sequences responsible for

[71] A B Cadwallader, C S Lim, D E Rollins, F Botrè (note 45 above).
[72] As above.

androgen response elements (AREs).[73]

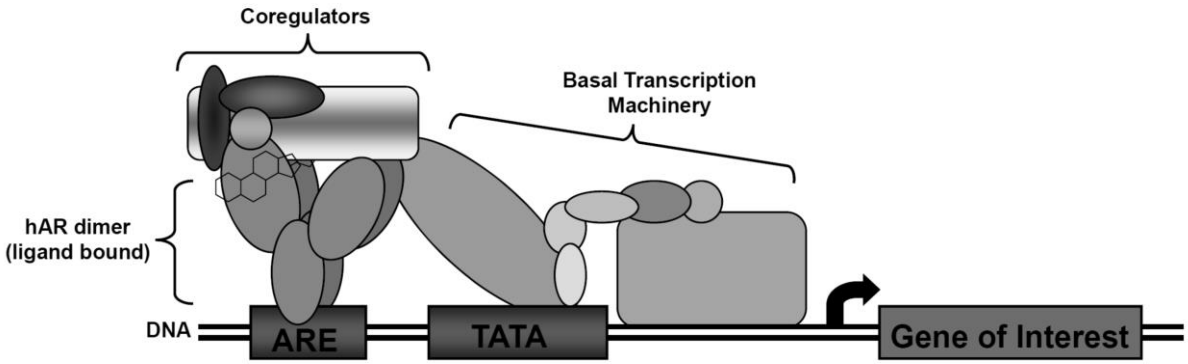


Figure 2: A diagram depicting the structure of an activated hAR dimer initiating transcription via an ARE with coregulator proteins bound, in visualizing the 'links in a chain' phenomenon. ARE, androgen response element. Modified from Nettles and Greene.[74]

In addition to human Androgen Receptors are Nuclear Receptor Coregulators or Coregulators of hAR. These coregulators are proteins induced by the hAR with the effect of either enhancing (coactivators) or reducing (corepressors) hAR mediated transactivation.[75] They further act to promote target genes in order to facilitate DNA binding, chromatin remodelling, or to novate essential transcription elements.[76] Coactivators are required for the ligand activation, which results in the escalation of free coactivators available for binding and unilaterally affects transcriptional activity of receptors. Notwithstanding, coregulators also play a great role in the activation of hAR,

[73] A B Cadwallader, C S Lim, D E Rollins, F Botrè (note 45 above).
[74] As above.
[75] As above.
[76] As above.

as they interplay with coactivators in contributing to the sensitivity of hAR activity.[77]

These extrinsic transformation and binding processes are all links in a chain that contribute to the eventual chemical reaction that facilitate the presumed gained advantage. In the event that one, alternatively several, links are missing, regardless of its placement, the process is deemed ineffective, and the steroid receptor will remain inactive. This leads to the second complication, being the complexity of the testing of receptor sensitivity. Further complicating the testing process is the possibility of semi-transformed/untransformed steroid receptors. This occurs in the absence of ligand, rendering the hAR to a cytosolic state where the steroid receptors rapidly move in and out of the nucleus.[78] In this instant, the receptors may or may not be able to facilitate the chemical reaction. One of many reasons hereto is due to several medical conditions such as an array of "cancers, cardiovascular defects, neurological conditions, immune diseases, reproductive conditions, and psychiatric disorders have been associated with hAR dysfunction."[79]

3.2. Current forms of testing

Considering the above surface-levelled explanation of the hAR function process, which can only be regarded as a simplified version of a complicated system at most, it goes without saying that an intricate form of testing is required to evaluate it. What makes the regulation process even more specific, is that the binding reaction does not merely take place in one distinguishable receptor. Instead, where Testosterone is

[77] A B Cadwallader, C S Lim, D E Rollins, F Botrè (note 45 above).
[78] As above.
[79] As above.

more likely to bind with to hAR, resulting in the cross-reaction with the progesterone receptor (PR) and the estrogen receptor (ER), DHT more predominantly binds to the hAR itself.[80]

Current forms of testing for anabolic-androgenic steroids carried out by WADA include the detection of synthetic anabolic steroids with great success, yet it still faces significant difficulties in detecting and regulating naturally occurring anabolic (endogenous) steroids.[81] In order to isolate endogenous steroids from its counter-fit analogues, doping control bodies such as WADA need to establish clear criteria of its distinguishable characteristics found in urine.[82] Such criteria have been developed for some endogenous steroids such as testosterone, whereas several other endogenous androgenic steroids which can potentially increase active androgen levels and boost performance has proved this a challengeable task. Undistinguishable endogenous steroids include the likes of 4-androstenediol and 5-androstenediol, two prohormones which remain banned even when scientists and biologists have an incomplete understanding of their metabolism.[83] This indicates the need for improved detection capabilities to detect the presence of a steroid, the identity thereof as well as its capabilities.

Current forms of testing for anabolic-androgenic steroids, such as gas chromatography (GC)–MS, depends on significant knowledge of the autonomy of the

[80] A B Cadwallader, C S Lim, D E Rollins, F Botrè (note 45 above).
[81] R Kazlauskas, G J Trout, A T Cawley, The detection and confirmation of androstenediol abuse in athletes' (Australian Sports Drug Testing Laboratory, Australia). [Blog] WADA. [Online] Available from: https://www.wada-ama.org/sites/default/files/resources/files/kazlauskas-the_detection_and_confirmation_0.pdf [Accessed 10 October 2018].
[82] As above.
[83] R Kazlauskas, G J Trout, A T Cawley (note 81 above).

steroid in order to recognise its presence in low concentrations of a known sample.[84] Due to doping control bodies inability to detect the presence of a steroid with a structure unknown to them, synthetic steroid manufacturers have started developing synthetic steroids made with the intention to evade conventional testing methods. In this manner, the manufacturers of such steroids retain the desire amongst athletes to induce anabolic activity. It is a situation of demand and supply. As athletes become more athletic and the athletic profession becomes more competitive, athletes continuously face the pressure of having to go the extra mile. Unfortunately, under the example of world champion athletes who were later exposed for their doping tendencies such as Lance Armstrong and Justin Gatlin, that extra mile comes in the form of heightened demand for newly manufactured and unidentifiable steroids. Thus the need for new testing forms is crucial in order to retain doping-free sporting practice. An attempt to research new development in unknown steroid structures have recently been prioritised, including the more "sophisticated use of MS technology, such as full-scan liquid chromatography

(LC)– and GC–electrospray ionization orthogonal acceleration time-of-flight MS, full scan LC–time-of-flight MS, and precursor ion scanning after LC–electrospray-tandem MS."[85] Although proven beneficial, these very newly administered test still has its shortfalls in identifying unknown steroid compounds.

All tests that currently exists is anti-doping based. In this regard, the purpose of such test is merely to detect the presence of a prohibited substance within the human body, without giving further consideration to the actual effect thereof as this is sufficient for

[84] A B Cadwallader, C S Lim, D E Rollins, F Botrè (note 45 above).
[85] A B Cadwallader, C S Lim, D E Rollins, F Botrè (note 45 above).

proving whether doping has taken place. In terms of DSD tests, however, an additional step is required to determine the effect of such substance in the particular individual's body, taking into consideration T levels, receptor sensitivity over a period of at least 3 months and whether a chemical reaction took place between the 2 means. The following tests approve more appropriate for purposes of same.

3.3. Newly proposed testing mechanisms

Cadwallader and others suggest that a newly developed hAR Assay may be the solution that doping control bodies have been waiting for. These Assays have been specifically formulated to analyse transactivation in the hAR subsequent to binding, in determining whether there is proper function in the receptor, as inactive receptors may lead to interference in the biological activity concerned with the steroid.[86] Where the Assay perceives a high biological activity present in the receptor, it serves as an indicator that significant levels of luciferase of the specific steroid are active and present in the hAR. Additionally, these Assays are supposedly able to ascertain between synthetic and endogenous steroids. Cadwallader further advises, even though other forms of bioactivity detective Assays are available to doping control bodies, theirs more accurately describes the activity and function known to be indigenous to the endogenous receptor. What makes their Assay even more impressive is the fact that it merely requires there to be a substance present and able to bind with the hAR, resolving the current issue of unknown structures and the possibility of subsequently overlooking substances unknown to the system. Listed by Cadwallader as the "beginning of the next generation of detection methods in the anti-

[86] A B Cadwallader, C S Lim, D E Rollins, F Botrè (note 45 above).

doping field", one must wonder, if such advanced technology is available, trialled and tested, why has it not, as per public knowledge, been utilized by the IAAF or doping control bodies such a WADA? This when a test that does not concern itself with the possible presence of prohibited substances, but rather whether the body derived a performance advantage from any prohibited substance within the body could be revolutionary in anti-doping regulations in sport.

With this test, it may be found that an athlete with normal T levels falls victim to very sensitive hAR and may derive much more of an advantage even though she falls within the allowed perimeters of T levels.

CHAPTER 4

BJSM and Precaution for Journals and Authors of False Positives

4.1. Introduction

It goes without saying that in circumstances where academic journals and its assumed proclamations are used as a basis to establish a precedent regulation, it must bear the highest degree of credibility within its field. It is thus not only of the utmost importance that the researcher cross-examines such credibility before relying thereon, but even more so that the accredited academic journals implement a strict analysis of the content of journal articles before considering publishing it.

As per the official website of the IAAF, it can be ascertained that policy legislators held the Bermon test results and findings in high regard while drafting of the new DSD regulations, if not wholly basing its contents thereon. Statistics, study designs and conclusions contained in the Bermon tests were significantly challenged by several medical practitioners and specialists in the field by way of letters to the medical journals who published this study. This includes the opinion of a group of academics, *inter alia* Silvia Camporesi, as aforementioned, who declares the Bermon tests unsubstantial, nonsensical and certainly not suitable as the basis of such a profound regulation.[87] When scrutinized on the credibility on the methodology of their tests, Bermon and Garnier merely suggested that, due to the purpose of their tests being wholly exploratory in nature, no claim is made in terms of concrete and confirmatory

[87] S Franklin, J O Betancurt, S Camporesi, 2018, The debate continues: the new IAAF Eligibility Regulations for Female Classification. *British Journal of Sports Medicine.*

results, even though they are of the opinion that the results carry strong relevance in the medical profession.[88] Camporesi and co-authors confirm the necessity of internal regulatory measures to be taken by academic journals before publication as they identify several hypothesis testing inconsistencies in the Bermon tests. They criticize that, in the absence of performing hypothesis testing corrections, the Bermon tests results remain flawed and subject to false positives, rendering them intermittent.[89] Irregularities found in the reliant five positives out of twenty-one tests becomes a severe issue in the overall test results as it creates a significant disparity in the reliability thereof. Despite the above, Bermon defends the results and advises the improbability of a 'result by chance' in even one instance, not even to mention five instances. When conducting a study of Bermon and Garnier (2017) and unilaterally controlling the discovery rate of false positives, Camporesi and co-authors exposed that testing was not done in a conservative manner in the least. These allegations go as far as suggesting that, should it be exposed to any method of false discovery available at present, none of the findings of Bermon and Garnier (2017) would survive.[90] Thus, it is fair to conclude that these results were not founded on legitimate grounds, especially when considering that it forms the backbone of profoundly consequential regulations.

In confirmation to allegations of possible false positives, another group of academics, including the likes of sports scientists Ross Tucker and Roger Pielke, concluded an independent replication of the Bermon test results. Data samples necessary for the replication were found established from the publishing by Bermon and Garnier in 2017,

[88] S Bermon, P Garnier (note 26 above).
[89] S Franklin, J O Betancurt, S Camporesi (note 87 above).
[90] As above.

as is apparent in Table 3 thereof.[91]

Table 3 from Bermon & Garnier (2017)			REPLICATION		
	N	average (SD)	N	Average	SD
100 m	112	11.88 (0.88)	112	11.88	0.88
100 m H	73	13.15 (0.48)	73	13.15	0.48
200 m	71	23.43 (0.90)	71	24.43	0.90
400 m	67	52.23 (2.56)	67	52.19	2.59
400 m H	67	56.34 (2.65)	67	56.30	2.59
800 m	64	121.80 (5.42)	64	121.80	5.42
1500 m	66	250.16 (6.42)	66	250.15	6.42
3000 m SC	56	581.61 (17.39)	56	581.61	17.39
5000 m	40	932.67 (39.73)	40	932.67	39.73
10 000 m	33	1912.6 (55.6)	33	1912.63	55.50
Marathon	92	9726.6 (790.9)	96	9726.63	790.87

Figure 3: Table showing replicated results as performed and published by Pielke, Tucker and Boye (2018) and based on data recollected from Table 3 From Bermon and Garnier (2017).[92]

Minor differences were perceived (as marked in yellow above) in their attempt to reproduce sample numbers and standard deviations as appears in Table 3 from Bermon and Garnier (2017). Even though these differences seem insignificant, they facilitated the opening of the can of worms. On account that the representative performance data in question remains inaccessible to the public, the scientists publicly called for Bermon and Garnier to furnish them with variables as used in their tests, being registered times from the 2011 Daegu World Championship and the 2013 Moscow World Championship, in order to conduct the recreation of the test itself.[93] On 6 July 2018, Dr Bermon subsequently produced this data to the scientists personally,

[91] R Pielke, R Tucker, E Boye, 2018, Serious Problems Found in a Partial Replication of Bernier and Garmin (2017). *British Journal of Sports Medicine*.
[92] R Pielke, R Tucker, E Boye (note 91 above).
[93] As above.

still withholding the associated medical data due to supposed athlete confidentiality.

When comparing the newly attained times used for testing from Dr Bermon to that of actually registered times from the 2011 and 2013 World Championships, it is evident that major anomalies were present in the generating of the results. Four events are of particular interest in promulgating underlying errors, namely: 400m sprints, 400m hurdles, 800m and 1 500m races.[94] Above and beyond the inclusion of times ran by disqualified athletes by way of doping, Pielke and co-authors identify a further three inaccuracies within the formulation of results. Firstly, in several instances and in both World championships, a single athlete's time was recorded more than once. This results in the duplication of athletes and a watered down sample pool. Secondly, on occasion, duplicate times were used in that identical times were recorded for several athletes who are very implausible on such an elite level of competition and is clearly incorrect. Lastly, even though less frequent, times were recorded for unidentifiable athletes rendering a so-called phantom time.[95] These problematic areas were summarised as follows:

EVENT	Original data points	Duplicated athletes	Athletes included who were DQ'ed for doping	Duplicated times	Phantom times	**Total problematic data points**	**Percent of total**
400m	67	6	0	5	11	**22**	**32.8%**
400mH	67	6	0	12	1	**19**	**28.4%**
800m	64	8	3	0	0	**11**	**17.2%**
1500m	66	10	2	0	3	**15**	**22.7%**

Figure 4: Table depicting the flawed areas identified in Bermon and Garnier

[94] R Pielke, R Tucker, E Boye (note 91 above).
[95] As above.

(2017) as found and published by Pielke, Tucker and Boye (2018).[96]

As can be observed from the table above, the erroneous section of the study contrives up to 33% of the framework that is declared to produce 'strong' results. [97] This percentage was calculated solely on the basis of the above four track events, leading to the drawn inference of the possibility of further misguided data amongst all other track and field events. It goes without saying that, with a problematic data fraction as high as a third, the reported results are compromised, and this has a significant effect on the evidential value of the test as a whole. Considering the relevance and revolutionary status of such a newly established data basis, it is distressing to think that the *British Journal of Sport Medicine* (hereinafter the BJSM) failed to perform an in-depth analysis before the publishing thereof. Prior independent checks on research papers submitted to be publicized are regarded as a standard practice amongst academic journals - the rationale being to protect the integrity of the profession by preventing false positives in successive research due to their interpretation of poorly generated results in a previous publicized paper. The BJSM's failure to attend to the audit of Bermon and Garnier (2017) has resulted in much more severe consequences than just causing a false conclusion in a dependent research paper or two. Instead, such shortcomings led to the rise of a series of controversial eligibility regulations in female athletics as promulgated by the IAAF. Pielke and co-authors further their concerns by exclaiming "the importance of data sharing in science as well as the role of independent checks on data with policy or regulatory significance" and encourages the BJSM to take notice hereof by adopting a more strenuous audit process on

[96] R Pielke, R Tucker, E Boye (note 91 above).
[97] As above.

research papers to be published.[98] Some academic critiques spread caution to their colleagues who have or look to interpret the results as held in Bermon and Garnier (2017) to approach their research with the discretion and knowledge of prospective false positives withheld therein.[99] Whereas others, obviously offended by the pervasiveness of the tests, call upon the BJSM to retract both Bermon and Garnier (2017) as well as its explanatory article published in 2018.[100] This lead to the BJSM, as the responsible journal for the publication of these papers, to publicly call upon Drs Bermon and Garnier to share anonymised underlying performance data. This being due to the journal being "unable to reconcile the reported methods and results of BG17 with publicly available performance data from IAAF.org and have arrived at some questions that can only be addressed with access to the original data."[101] The journal further identifies faults in the Bermon tests as:

- "BG17 reports an average 800m (for n = 64) female time of 121.80 seconds with a standard deviation of 5.42 seconds (data from BG17 Table 6, column 1);
- Given a normal distribution of times, this implies that there should be ~10 times < 116.38 (that is, <1 standard deviation below the mean, ~16% of 64);
- However, in Daegu 2011 and Moscow 2013 there are only two such times, and one of these has since been disqualified due to doping (data via IAAF.org)."[102]

The journal concludes its inquest with a statement suggesting the difficulties in trying to reconcile the reported results of the Bermon tests with that of the official IAAF data under the methods published in the paper. In short, the journal may be forced to retract

[98] R Pielke, R Tucker, E Boye (note 91 above).
[99] S Franklin, J O Betancurt, S Camporesi (note 87 above).
[100] R Pielke, R Tucker, E Boye (note 91 above).
[101] Call for Drs Bermon and Garnier to share anonymised underlying performance data. 2018. BJSM. [Online]. Available from: https://blogs.bmj.com/bjsm/2018/05/10/call-for-the-authors-of-bermon-and-garnier-to-share-the-underlying-performance-data/ [Accessed 2 August 2018].
[102] As above.

the Bermon test and journal articles from its publications in order to avoid ethical issue surrounding whether the journals and its reviewers should have published the paper in the first place.

CHAPTER 4

What does the autonomy of a successful athlete entail?

4.1. Introduction

In establishing what factors have an imminent influence on athletic performance, one must ask what makes a successful athlete. Is it a matter of psychological factors such as persistence, hard work, determination and confidence or is it something solely based on genetics? Based on popular belief, an athlete's potential to excel in their respective sporting disciplines is limited by their genetic makeup. During the publication of the Bermon tests in support of the IAAF's Hyperandrogenic regulations, Bermon averred that, "success in sport should be due to the combination of talent and dedication. These aspects are the rationale of the existing policies of the International Olympic Committee and the *International Association of Athletic Federations*. These policies concerning the eligibility of females with hyperandrogenism have been criticized by some, but no other alternative than a simple withdrawal of these rules has emerged so far. A consequence of the latter could be to rely exclusively on a simple declaration of gender, regardless of any external sexual phenotype."[39] Does this mean athletics and sport, in general, are only made for individuals of a certain Calabar? Further, do athletes suffering from hyperandrogenism and DSD not perform in terms of talent or dedication?

A recent analysis investigated whether a successful athlete is born or made, finding

that both elements are critical in the formulation of an elite athlete.[103] When comparing athletes with different somatotypes during the progression of competition, the athletes began to reflect similarities in their bone and muscle structures. It is thus established that "first the athlete is born – they must possess certain genetic characteristics and conditions – and he or she is then made during sports training."[104] In other words, even though athletic performance does require a degree of genetic excellence, without the hard work and brutal hours of dedication, even an individual with a genetically perfected profile would still fail to achieve athletic brilliance that an individual with a far lesser ideal genetic profile who trains hours on end could.

Another mitigating factor surrounds genetic mutations and conditions, such as hyperandrogenism and DSD, that could afford its holder with performance advantages. "The issue of a genetically unique individual who, by virtue of their genotype, develops attributes that permit him or her to excel at that sport. Such genetic variability is inevitable and certainly could produce an 'uber-athlete' who would naturally excel in their retrospective sport. Indeed, it could be argued that elite sport selects for physiological outliers whose genetic potential for excellence has been realised through fortuitous interaction with environmental and cultural factors."[105] In terms of reported cases, it can be assumed that such conditions occur quite infrequently, and therefore, it may be instructive for international sports federation to

[103] M Rodríguez Quijada, 2016, Is the Successful Athlete Born or Made? A Review of the Literature. *Apunts Educacion Fisica y Deportes*, vol.123, pp.7-12.
[104] M Rodríguez Quijada (note 103 above).
[105] As above.

regulate and boycott it.

4.2. The introduction of technology doping

When comparing athletic performance in a broad spectrum of sporting professions over the last decade, there is a climactic improvement transcribed between the early 20th century and the 21st century. This finding excites the sporting world, especially the likes of sports scientists who have, in no small extent, accredited the role of science in such improvement. On the contrary, a Layman would perhaps argue that Sportsmen and sportswomen have simply become better and more specialized within their sporting profession. While both these perspectives may be considered as contributory to the advancement, what is certain is that the human race has not evolved into a new species of prestigious athletic ability within a decade. Considering this, I further my research in the autonomy of a successful athlete.

In 1936, Jesse Owens earned his title of perhaps the greatest athlete that 'Track and Field' has ever seen, with his 100m record set at 10.3 seconds.[106] Yet, today we praise Usain Bolt as the 'fastest man alive' with his 2009 World record set at 9.58 seconds.[107] If not evolutionary sporting genes, what is the reason behind the staggering 0.72 second cut, which is just shy of a 7% improvement? The answer is quite simple and lies in the technologically advanced 21st century. Whereas Usain Bolt is undoubtedly the fastest man alive, Jesse Owens may remain the greatest athlete in history to run

[106] JESSE OWENS' QUEST FOR GLORY STARTED WITH 100M GOLD. 1936. [Blog] IOC News. [Online]. Available from: https://www.olympic.org/news/jesse-owens-quest-for-glory-started-with-100m-gold [Accessed on 31 October 2018].
[107] The Greatest Sprinter of All Time. [Blog] IOC. [Online] Available from: https://www.olympic.org/usain-bolt [Accessed on 29 October 2018].

on a cinders track. Cinder is a type of burnt wood surface which was compressed into a track surface. Olympic Gold Medallist Ollan Conn Cassell, who ran both on cinders and synthetic tracks, referred to cinders as “British garbage”, expressing the stress it caused to the athlete due to uneven surfaces and material clogging up the unideal long spikes required to run on cinders.[108] Adding to their burden, in 1936 the development of starting blocks was premature and consisted of holes dug in the cinders by the athletes to propel himself forward. Thus, the shift from the cinders tracks to synthetic tracks in 1968 accounts for the 0.72 second difference between Jesse Owens and Usain Bolt. Not only did Bolt have the advantage of synthetic tracks, which according to Cassel provided athletes with a better stride rhythm, more bounce from each stride and less resistance,[109] he had also benefited from running on specified starting blocks designed to give him the best possible start. A bio-mechanical analysis of the speed of Owens’ body compositions as well as the surface of the cinders tracks he ran on, revealed that cinder tracks are 1.5% slower than synthetic tracks.[110] Thus, should Owens have had the same track surface technology to his disposal, he would have merely been one stride away from Bolt.[111]

Further analysis of the development of track surface technology reveals the same conclusion in the Mile track event. In 1954, Sir Rodger Bannister achieved what no man had ever achieved before him and became the first man to run a mile under 4

[108] R Tomizawa, The Last of the Cinder Tracks. 2015. [Blog] The Olympians. [Online]. Available from: https://theolympians.co/2015/07/01/the-last-of-the-cinder-tracks/ [Accessed on 1 November 2018].
[109] R Tomizawa (note 108 above).
[110] R Tucker, The 2-hour marathon and the 4-min mile.from2014. [Blog] Sports Science. [Online]. Available from: https://sportsscientists.com/2014/12/2-hour-marathon-4-min-mile/ [Accessed on 30 October 2018].
[111] D Epstein, 2014. Are Athletes Really Getting Faster, Better, Stronger?. [Blog] TED. [Online]. Available from: https://www.ted.com/talks/david_epstein_are_athletes_really_getting_faster_better_stronger [Accessed on 30 October 2018].

minutes. He, too, ran on a cinders track. In accordance to The Sub-4 Alphabetic Register, 1 338 athletes have successfully completed a sub-4 minute mile as at 27 April 2014, mainly on synthetic surfaces.[112] Apply the afore-mentioned 1.5% advantage gained through the use of synthetic tracks, that roughly results in a remainder of 530 sub-4 minute mile achievers.[113] Regardless, 530 athletes is a massive achievement compared to the 1 athlete of 60 years ago. Sports scientists assign this incline of sub-4 athletes to the power of mindset and intelligent training.[114] In the early 20th century, a career in sport may not have been as sophisticated as it is today. Men like Sir Rodger Bannister trained 45 min on a part-time basis while pursuing a career in a more traditional line of work. Whereas today men dedicate themselves and their livelihood to such training. Following in from this, even the training programmes of athletes at a college or school level can be considered professional when compared to the training programmes followed in the 20th century.[115]

The modernisation of technology in sport is not restricted to track and field. Similar improvements due to technology can be seen in swimming. The first rapid drop in swimming times came in 1956 with the introduction of the tumble turn, where swimmers no longer had to interrupt their forward momentum by stopping and turning around. [116] Instead, a summersault like turn resulted in less resistance and stronger, faster propulsion from the wall. The next major decline in times was recorded in 1976

[112] B Phillips, 2014. The Sub-4 Alphabetic Register (1,303 athletes as at 1 October 2013) as updated by Bob Phillips on 27 April 2014. [Blog] National Union of Track Statisticians. [Online]. Available from: http://www.nuts.org.uk/sub-4/Sub%204%20Minute%20Mile%20Register%202013.pdf [Accessed on 1 November 2018].
[113] D Epstein (note 111 above).
[114] D Epstein (note 111 above).
[115] As above.
[116] As above.

by way of the introduction of gutters on the side of the pool, allowing for the reduction in waves.[117] This results in the water bouncing off the bottom and the sides of the pool rather than causing turbulence to the swimmers.[118] 1976 also marked the year where goggles were used for the first time, generating a technological combination that bore the most broken World Records.[119] The last know major influence in swimming times due to technology came in 2008 when swimsuit manufacturers designed full body, low friction swimsuits.[120] Its minimal drag and resistance traits impact was so massive that it resulted in the breaking of 25 World Records in the 2008 Beijing Olympics alone.[121] In the investigation of the high volume of newly set world records at the 2008 Beijing Olympic, it was found that all but one athlete wore Speedo's LZR Racer supersuit, also known as the 'shark skin racer'. It was only after a further 43 records were broken at the 2009 World Aquatics Championships in Rome by athletes who all wore the LZR Racer super suit, that cries of 'technology doping' threatened FINA, who then retaliated by way of the inauguration of their Requirements for Swimwear Approval Regulations in 2010.[122]

Another sport facing the scrutiny of the 21st century's developing technology is cycling as engineers became smarter and bicycles became more aerodynamic. In 1972 the record for the longest distance cycled in 1 hour was set by cycling legend Eddy Merckx

[117] D Epstein (note 111 above).
[118] What actually makes a pool fast?. 2016. [Blog] Swimswam. [Online]. Available from: https://swimswam.com/what-actually-makes-a-pool-fast/ [Accessed on 1 November 2018].
[119] S K Y Tang, The rocket swimsuit: Speedo's LZR racer. 2008. [Blog] Science in the news. [Online]. Available from: http://sitn.hms.harvard.edu/flash/2008/issue47-2/ [Accessed 1 November 2018].
[120] D Epstein (note 111 above).
[121] S K Y Tang (note 119 above).
[122] FINA Ban on Swimming Race Suits - Market Failure. 2013. OACAS Innovations. [Online]. Available from: https://oacasinnovations.weebly.com/fina-ban.html [Accessed 1 November 2018].

at 49.431 kilometers.[123] The record was unbeaten up until 1996 when newcomer Chris Boardman eradicated Merckx's record with his astonishing 56.375 kilometers. Like FINA, the International Cycling Union was confronted over the unfounded 6.944 kilometer gain, said to be predominantly as a result of Boardman's technologically advanced bicycle. In 2000, the International Cycling Union declared that in order to compete with Merckx's 1972 record, it is required that such an attempt is made using the same equipment used in 1972.[124] To the dismay of Chris Boardman, this led to the nullification of his 56.375 kilometer record. He then again attempted the on-the-hour cycle under the required parameters, achieving 49.441 kilometers. This shows the impact of technology in sport as almost the entire improvement Boardman achieved in 1996 was afforded to technology. The current record stands at 54.526 kilometers achieved by Bradley Wiggins in 2015.[125]

4.3. The Big Bang of Body Transformations

As established above, the human race has not evolved into a new species of prestigious athletic ability within a decade, but what has made a phenomenal impact on the sporting profession, and is often mistaken for evolution, is the change in gene pools in specified sports. In the early 20th century, the faces of different sports looked a whole lot more indistinguishable from one another than what we perceived today. This was due to the belief that the average body type was best suited for all athletic events. Medium height and weight were ideal, whether the athlete was to be a shot-

[123] F McKay, The First Hours - The Hour Record Before Henri Desgrange. 2018. [Blog] Podium Café. [Online]. Available from: https://www.podiumcafe.com/book-corner/2018/8/22/17767778/cycling-hour-record [Accessed 31 October 2018].
[124] As above.
[125] F McKay (note 123 above).

putter or track star. As science and technologies developed, so did the knowledge of biological sciences and the autonomy of the human body. Sports scientists started understanding the impact of the artificial selection of body types and realized that each sporting category had its own highly specialized requirements in terms of the ideal body that suited it best. This movement is referred to the Big Bang of Body Types.[126] In the words of David Epstein, "the large got larger, the small got smaller, and the weird got weirder."[127] This reflected in almost every single known sport. The 21st century shot putter is 6.35 cm taller and 61.235 kilograms heavier than his 20th century counterpart. On the contrary, the 21st century gymnast has shrunk from an average 1.62 meters to the considered normal 1.49 metres of today.[128] When referring to the 'weird', Dr Epstein gives particular interest to the bodies that are naturally considered as abnormal or out of proportion, traits that are almost laughable but yet are praised as a natural sporting ability. He depicts this idea of 'weird' through the use of Leonardo da Vinci's 'Vitruvian man' in comparing the regular male's physique to that of an NBA athlete's physiques. As seen below, in order to establish a proportionate and essentially normal physique, the average male would meet the parameters of a circle and square, whereas if an average NBA player is to be placed in similar parameters,

[126] D Epstein (note 111 above).
[127] As above.
[128] D Epstein (note 111 above).

he would require a rectangle and ellipse.[129]

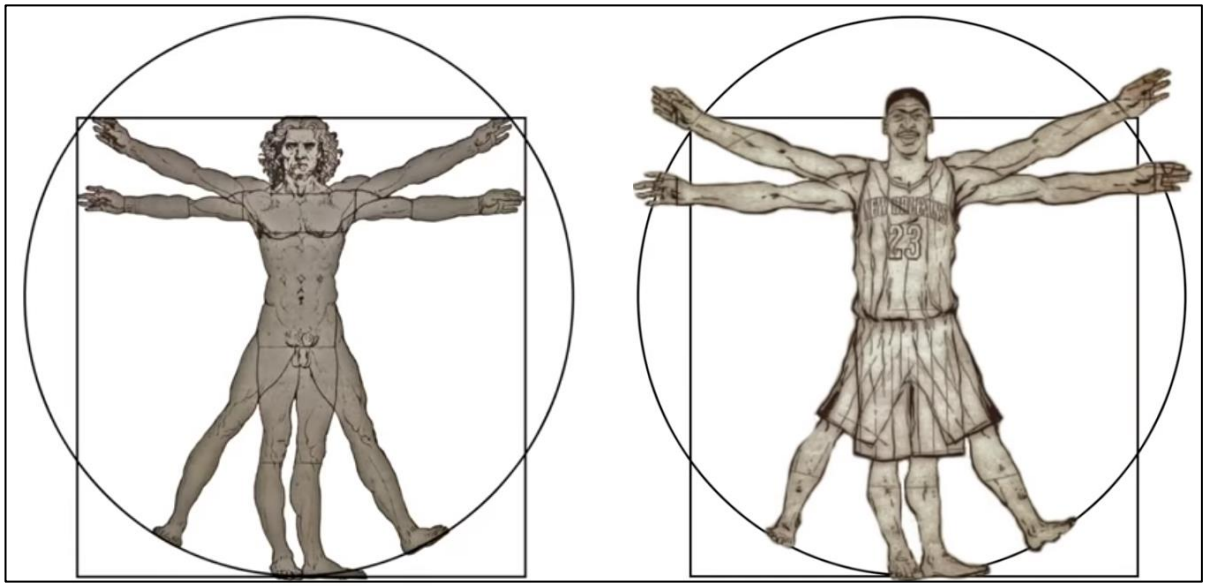


Figure 5: Diagram depicting Leonardo da Vinci's 'Vitruvian man' in comparing the regular male's physique to that of an NBA athlete's physiques as presented by David Epstein in his presentation 'Are Athletes Really Getting Faster, Better, Stronger' (2014).[130]

Similar to the average NBA player as represented above, the ideal body type of a swimmer requires a longer torso and short legs for speed. Running, on the other hand, considers the ideal body type as a short torso and long legs. David Epstein puts into perspective by comparing the physique of swimmer Michael Phelps and middle-distance runner Hicham El Guerrouj. Both athletes are holders of Olympic gold medals within their own sporting professions. Phelps stands tall at an astounding 1.95 meters, whereas Guerrouj comes in at a humble 1.79 meters; that is a 16 centimeter difference

[129] D Epstein (note 111 above).
[130] As above.

in height, yet they have the same length legs.[131]

4.4. Developing mental make-up

As sports scientists have pushed the limits of what was presupposed in the early 20th century by way of establishing a calibre of sport specific bodies, they have also defined new limitations of the human body's abilities. Dated sports science and physiology were established by listening to the body itself, giving rise to the belief that the point of physical exhaustion marked the human body's limits. This meant that once the body reached fatigue, it was unable to continue conducting physical activity until it was essentially 'recharged' with energy attained through rest and nutrition.[132] Modern sports science and physiology, however, challenged this theory, in particular, Timothy Noakes. Noakes denominates past thoughts of the body's limitations as unexplored and a scapegoat to athletes to give up. Instead, he is of the opinion that the fatigue feeling athletes experiences are the brain's way of telling the body that energy stores are rapidly depleting but, in reality, is unrelated to the muscle's workforce.[133] The modern athlete has adopted the same mindset as Noakes, setting unheard of records and pushing the boundaries of what the human body is capable of.

4.5. The introduction of new nations

Notwithstanding that the first modern Olympic games took place in 1896, it is essential

[131] D Epstein (note 111 above).
[132] C Robertson, The Science of Limits - How Far Can You Really Go?. 2014. [Blog] Willpowered Evolution. [Online] Available from: http://www.willpowered.co/learn/how-to-scientifically-push-beyond-your-limits [Accessed 2 November 2018].
[133] T Noakes, M Vlismas, 2011, Challenging Beliefs: Memoirs of a Career. *Health and Medical Publishing Group*.

to take into consideration the exclusivity of participants. Participation and dominance in the early Olympic games was not as much a celebration of individual excellence but instead showcased the winning nation's political superiority over other nations. This mainly consisted of European and American nations, with the exception of one Chilean and one Australian athlete. Jamaican athletes first participated in 1948 under the likes of the British West Indies due to colonialism. They were only formally recognized as Jamaicans upon their independence in 1962. Whereas, African nations such as Kenya and Ethiopia dominating in today's world only made their debut in 1956. This led to a whole new pool of athletes who were never recognised before.[134] New athletes, new genes and most importantly, new competition.

With specific interest to Kenyan runners, who have dominated the world of middle to long distance running over the past 50 years, several sports and medical scientist have unsuccessfully investigated the East African runner's DNA in establishing a possible 'chemical x' gene. Considering that the Kalenjin tribe of Kenya compromises merely 12% of the Kenyan population yet produced 32 athletes to run the marathon in 2 hours and 10 minutes or less in October 2013 alone, this after only 17 American men in history were successful in their attempt achieve same; the world wanted answers.[135] Global questions surrounding the presence of an advantageous genetic polymorphisms gene in the genetic systems of Kenyan runners rapidly arose, demanding answers. Recently, a group of sports scientists including Ross Tucker, conducted an evaluation of genetic studies of Kenyan endurance runners as well as Jamaican sprinters, by way of comparing "international level runners to national level

[134] D Epstein (note 111 above).
[135] As above.

runners and control individuals who showed no running prowess" but geographically represented Kenyan and Jamaican populations.[136] They seemed to side with sports scientists Wilber and Pitsiladis' review of the East African population genetic traits evidence, in their findings that the gained success was not the result of a single-gene polymorphism but rather the presence of a combination of advantageous genotypes.[137] However, due to the profound complexity of performance and what it entails, it would seem as if even scientists are divided in their beliefs and findings. On the one hand, scientists focus on the genetic make-up of the athletes, whereas on th other hand others elect to downplay the role of genetic factors due to inconsistencies faced during research, advising that no major differences in genetics could be found. The latter rather choose to accredit lifestyle factors related to performance, such as "altitude, habitual diet, cultural, training related and socioeconomic factors."[138] Surprisingly, neither of these scientists were willing to recognize the other, electing to focus on their perspective rather than taking an integrated approach in concluding that optimal genetic factors combined with an optimal training environment lead to dominating performance.[139]

Despite findings that candidate gene studies have failed to prove a difference in the genetic make-up of international-level runners, national level runners or controls in the study of Kenyan DNA, Tucker and others emphasise that concluding that East Africans' genetic make-up is not a factor to their seemingly unbeatable running success would be premature and incorrect. Instead, the fact that there is no trace of the presence of the 'chemical x' gene may indicate that advantageous polymorphisms

[136] R Tucker, M Collins, J Santos-Concejero, 2013, The genetic basis for elite running performance. *British Journal of Sport Medicine*, vol.47, pp.545-549.
[137] As Above.
[138] As above.
[139] As above.

are wider spread than initially presumed.[140] On the contrary, others attribute East African running success to their unique physiology, including long thin legs inherited from an ancestry who survived at very low latitude, a scorching and dry climate, and thus required evolutionary abdications that function as an interbody cooling system.[141]

While the exact result of performance remains premature, what can be ascertained as proclaimed by David Epstein, is that "changing technology, genes and mindsets, as well as innovation (techniques), democratization (new bodies and nations) and imagination (understanding what the body is truly capable of) are all attributed to sport performance; making today's athletes stronger, bolder and better than ever."[142]

4.6. The importance of Oscar Pistorius v the IAAF

The *Oscar Pistorius v the IAAF* case is of vital importance in my current argument as it underlines the principles of a presumed unfair advantage in the absence of a scientific basis to prove such allegations.[143] Oscar Pistorius is a double amputee Paralympian, better known as the 'blade runner'. This is due to the connotations to his prosthetic legs or 'Cheetah's' that takes the form of a 'blade', specially designed for amputees to participate in respective competitive sprinting categories. As a well accomplished Paralympian, Pistorius strived to participate in the 2008 Beijing Olympic games, which would ultimately allow him to participate as an able bodied athlete. Pistorius was celebrated in society for his bravery and his courage to raise awareness for the disabled. The IAAF, however, did not entertain this idea, banning Pistorius from

[140] R Tucker, M Collins, J Santos-Concejero, (note 136 above).
[141] D Epstein (note 111 above).
[142] As above.
[143] CAS 2008/A/1480 Pistorius v IAAF (hereafter Pistorius case).

the Olympics due to the unfair advantage he derived from his prosthetics. This ban was based solely on speculation from the IAAF, as limited and disconnected scientific proof existed at the time of the imposition thereof that could verify that the latter was true. Thus, Pistorius's legal representation instituted a claim of unfairness and possible discrimination.

The IAAF retaliated by performing several scientific tests that would justify their allegations of an unfair advantage. Upon the scientific findings, the IAAF's counter-claim was instituted at the *European Court of Sport Arbitration*, stating that the ban was proved to be just and fair.[144] The court overturned the counter-claim that the ban was justified, and Pistorius was cleared to participate in the 2008 Beijing Olympic games.

The IAAF passed regulations in 2007, banning all athletes who rely on technological aids from participating in any Olympic Games. This is due to the supposed unfair advantage which an aided athlete gained over other abled bodied athletes. This once again was placed on appeal by Pistorius' legal team.

The court held that, in accordance with the scientific tests which were performed by the IAAF, Pistorius did, in fact, gain an advantage in order to run like an able bodied athlete. The advantage allowed Pistorius to run, not worse than, but also not better than an able bodied athlete. In this regard, the advantage merely balanced out the disadvantage he inherited as per his disability. Furthermore, the regulations were inconsistent to the principles and values of the Olympic Games and thus, provided that Pistorius met the standard qualification times, he could participate in his

[144] Oscar Pistorius v the IAAF: Case study, 2010, [Blog] HLST Learning Legacies , [Online] Available from: https://www.heacademy.ac.uk/knowledge-hub/oscar-pistorius-v-iaaf-case-study [Accessed 14 October 2016].

respective athletics categories. This currently remains the respective legal position.[145]

I believe the judgement in *Oscar Pistorius v the IAAF* is correct and objective. The merits of the case are in accordance with that of the *Dutee Chand* case, and therefore a similar judgement should have been passed. The only obvious difference between the two cases would be that society approved of Pistorius heroic determination to overcome his disabilities and participate as an abled body athlete, whereas, Chand's medical disorder was frowned upon and not approved by society. I believe the grace period awarded to the IAAF to prove their statement that Hyperandrogenism stands as an unfair advantage is thus flawed and subjective.

[145] Pistorius (note 143 above) 32.

CHAPTER 6

What Inference Can Be Drawn Between DSD Athletes and Transgender Athletes? And Should Such A Relationship Exist?

6.1. Introduction

With each promulgation of a new set of regulations, followed the introduction of new terminology. What started off as a seemingly black and white gender verification between male and female, was replaced by the underdeveloped, and much greyer, term of hyperandrogenism. The latter was recently amended to read “Differences of Sex Development” or “DSD”. It is no wonder that this led to the ambiguity and an inability to develop a universal understanding of the condition at hand amongst members of the public. Thus, athletes affected by DSD are commonly, and wrongly so, mistaken for being transgender. Note that when the regulation refers to an athlete affected by DSD, it cites a female athlete born with a physical medical condition which causes a difference in their sexual development when compared to the sexual development of a considered ‘normal’ female. These athletes are to undergo medical procedures to be eligible to compete. Conversely, a transgender athlete in the female category refers to a male athlete born with a mental medical condition known as Gender Dysphoria; a diagnosis that leads to the individual’s assumption of the identity of the opposite sex than that of his birth sex. Sporting regulations, therefore, make provision for 2 types of medical conditions, (1) Cognitive and (2) Physical. A cognitive medical condition is a mental development which creates a belief in the brain. In individuals affected by Gender Dysphoria, such belief is related to their assumed

sexual orientation which contrasts with their body's physical state. Regardless hereof, a male to female transgender individual's chromosomal make-up remains male, and any medical procedure aimed at rectifying such condition is unnatural. A physical medical condition is a physical and naturally occurring disorder or defect within an individual's body. It is evident that the most imminent difference between the two conditions is that the process leading towards being transgender is unnatural, whereas DSD occurs naturally.

The history behind the regulation of transgender athletes is much briefer than that of DSD. A study conducted by the Fédération Internationale de Volleyball (FIVB), based on the athletic performance of a trans-athlete when competing in the opposite sex category, found that male to female trans-athletes derived advantages in the form of their male physical attributes such as height.[18] Thus, the FIVB established a rule stipulating that all athletes are permitted to compete in their birth sex category. This was overturned in 2004 when the IOC held that should athletes undergo sex reassignment surgery; they would be permitted to compete in their assumed sex category. Thus, even though a person may be born male, after undergoing all required medical procedures as per the IOC Transgender Guidelines which eliminates Testosterone completely, such athlete now identifies as a woman eligible to compete in the female category. As per the guidelines, the eligibility of a trans-athlete to compete was established to "maximize the overall psychological wellbeing and self-fulfilment of the transgender athlete."[146] Both conditions are required to undergo specified medical procedures. The difference between the two is that to a transgender

[146] JC Reeser (note 18 above).

athlete it would be a choice and thus consensual, whereas to an athlete affected by DSD it would be a prerequisite. Further research indicates that, due to the fully transformed transgender athlete having diminished levels of testosterone as a result of their transitioning medical procedures, regulations additionally allow for the intake of artificial testosterone in order to elevate such an athlete to a female's natural level of testosterone. Yet, the same regulators force a perfectly healthy athlete affected by DSD to take medication to lower their slightly elevated testosterone levels. This raises the question: if these regulations were applicable across the playing field, should we then allow an athlete with naturally lower testosterone levels to increase their levels to a naturally accepted level? Another dilemma arises as regulations provide for a male to female trans-athletes to compete as females while receiving oestrogen treatment; yet female to male trans-athletes are prohibited from competing in the male category while receiving exogenous testosterone, due to the WADA banned substance regulations.

Sports health physiatrist JC Reeser posed the question as to whether it is advisable or fair to permit transsexual athletes to compete. If so, should sport governing bodies, in the name of fair play, have the power to restrict the right of transsexual athletes to participate in the gender category by which society and the law accept them as human beings?[147] The short answer is yes. It is preposterous to think that the law and society are eager to accept transgender athletes in maximizing their overall psychological wellbeing and self-fulfilment[148], while athletes affected by DSD being a natural condition face constant scrutiny. We live in a society where we accept and protect

[147] JC Reeser (note 18 above).
[148] As above.

artificial sexual orientation and reject, shame and prejudice natural sexual orientation with a different development than socially understood. Only time will determine whether a correct decision was made in terms of transgender athletes while striving to instill the idea of a fair playing field within elite competition. What is certain, however, is that a significant imbalance exists when comparing Transgender rules and regulations to the DSD regulations. All sporting institutions such as the IOC and IAAF that may be of the opinion the existing DSD regulations are necessary for guaranteeing fairness and respect for all for female athletes,[149] evidently did not consider the immense effect their actions have had and will continue to have, on the lives and psychological well-being of the athletes involved, whether transsexual or not.

[149] S Bermon (note 33 above).

CHAPTER 7

What is the Relevance of Distinguishing Between a Female and a Woman?

7.1. Introduction

In the CAS ruling of the Chand case, even though the panel identified the existence of medical conditions rendering some females with elevated levels of endogenous testosterone in relation to other females, they further emphasized that such females remain female and are not eligible to compete in the male category.[150] The panel was also clear in their statement that "the Regulations do not police the male/female divide but establish a female/female divide within the female category,"[151] thus inaugurating an unambiguous definition for the female category is of utmost importance.

When differentiating between a female and a woman, one could easily pass off the one as a synonym to the other, while, each term has its own distinct definition. Where the term "female" refers to a biological sexual orientation, the term "woman" is more psychologic in statute and revolves around the manner in which an individual classifies herself. It is thus evident that the controversy revolving around gender in sport concerns the classification of a female and not a woman. This classification has proved itself to be an impossible task due to unprecedented methodologies and ideologies. Is it based on the predominant hormone or rather on your sexual organs? Even though several attempts were made by sporting institutions such as the IAAF,

[150] Chand case (note 4 above).
[151] As above.

this seems to be a question only nature can correctly answer. The CAS panel did, however, lay out guidelines for future regulators in formulating such classification when it opted to focus its investigation on whether endogenous testosterone is an appropriate means of distinguishing between female within the female category, instead of further complicating the matter by trying to classify certain females as males. The panel further averred that the latter Hyperandrogenic regulations improperly stated "that hyperandrogenic females enjoy a significant performance advantage over their non-hyperandrogenic peers, which outranks the influence of any other single genetic or biological factor, and which is of comparable significance (if not identical magnitude) to the performance advantage [of 10 to 12%] that males typically enjoy over females,"[152] as no such evidence was presented before it. Ironically, there has also never been such a substantial degree of competitive advantage enjoyed by any female as to deem her eligible and to be competition for the male category. Accordingly, the panel held that the exclusion of hyperandrogenic females from the female category is not a 'necessary and proportionate means of preserving fairness in athletics competition and/or policing the binary male/female classification.'[153]

The main problem established when reading the hyperandrogenic regulations as provided by the IAAF is the lack of regulating who, and on what grounds, may accuse an athlete of such a condition. There is a controversial nature of accusing an athlete, due to the said grounds mainly resulting from the athlete's inhabited masculine traits and prestigious athletic capacity in comparison to their fellow female competitors. In this instance, an athlete's physical appearance becomes her biggest disadvantage. Not adhering to societies opinion of what a female should act, dress or look like could

[152] Hyperandrogenism regulations (note 2 above).
[153] Chand case (note 4 above).

lead to an intensive cycle of tests and medical procedures to prove critics otherwise. It has gotten to the point that even excelling in sport seems to be a taboo. The injustice comes into display when considering an athlete's sporting excellence and abilities in the male category, compared to that of the female category. Take, for instance, sporting phenomenon Usain Bolt. Bolt has beaten world record after world record, and in return, he earned respect from billions of fans and spectators worldwide. No one would dare accuse him of having an 'unfair advantage' or having 'higher levels of testosterone' than the rest of the playing field – instead, he is worshipped in society. Adversely, as soon as a female athlete excels, such as Caster Semenya, she is immediately judged and questioned.[154]

Silvia Camporesi, a bioethicist and lecturer at King's College,[155] is but one amongst many academics who reject the IAAF's proposal that elite sporting currently maintains a level playing field. With reference to US swimmer Michael Phelps, whose prowess may have been accelerated by his double-jointedness and disproportionately long arms, she proves that female athletes often fall victim to discrimination in the classification process. In the case of *Dutee Chand*, lawyers presented an identical objection pertaining to the discrimination against women as there is no testosterone limit applicable to male athletes.[156] Male athletes with testosterone levels above what is considered to be the 'normal' range of male testosterone are permitted to compete without having to satisfy any medical criteria including undergoing any medical

[154] R Green, 2016. Suspended Hyperandrogenism Regulations Under the Spotlight At Rio Olympics. [Blog] International Bar Association. [Online] Available from: http://www.ibanet.org/Article/NewDetail.aspx?ArticleUid=4887edb3-28e2-4546-be2f-6e5f14b7e61f [Accessed 29 November 2017].
[155] S Camporesi, 2017. Hyperandrogenism explained by Dr Silvia Camporesi. [Online]. Available from: https://soundcloud.com/primediabroadcasting/hyperandrogenism-explained-by-dr-silvia-camporesi [Accessed 9 November 2016].
[156] As above.

examination or treatment as a precondition to eligibility.[157]

Furthermore, the IAAF continues to contradict itself, while maintaining that the testing related to the accusation of an athlete for the reasons of a possible presumed advantage, does not take the form of sex testing or gender verification, but merely tests testosterone levels to prevent presumed unfair advantage. However, when consulting the medical guidelines entailed in the appendices that form part of the IAAF's Hyperandrogenism Regulations, it is hard to accept that an athlete's appearance has no relevance in their supposed 'testosterone tests'. These appendices consist of a variety of tests and illustrations compiled by the IAAF in order to illustrate their perception of what femininity entails. These tests include, amongst others, an endocrine assessment, as well as a physical examination by a sports physician and gynaecologists, which will be performed by rating the female athlete's physical features in terms of a scoring sheet that would, ultimately, indicate if a diagnosis of hyperandrogenism is appropriate or not. It is apparent that the IAAF did not for one second consider the implications that these tests would have on the athlete, both physically and mentally, in allowing a stranger to explore the most private part of her essence, subject to a state of vulnerability that she would find herself in. Such tests, including physical examination and chromosomal testing, were recently deemed

[157] Chand case (note 4 above) para 6.

inappropriate by the CAS panel.[158]

As illustrated in the appendices below, for purposes of these tests, 'physical features' refer to the athlete's body build, breasts, pubic area and genitalia.

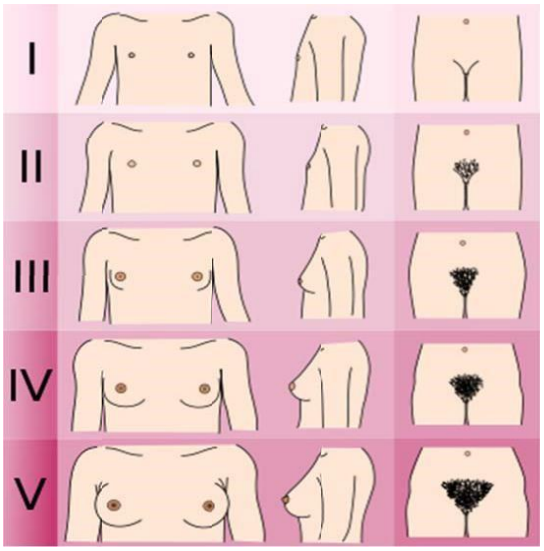


Figure 6: The Tanner-Whitehouse Scale, stipulating the 9 'clinical signs' in classifying possible signs of hyperandrogenism in female athletes. (*Source*: IAAF Hyperandrogenism

[158] Chand case (note 4 above).

Regulations, Appendices).[159]

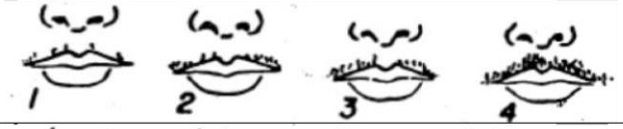
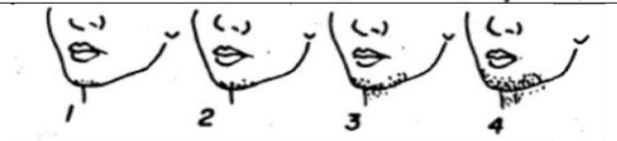
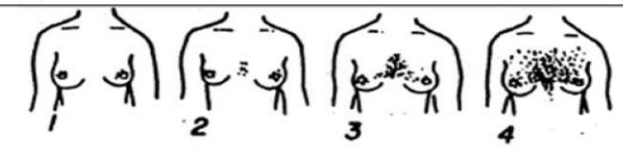
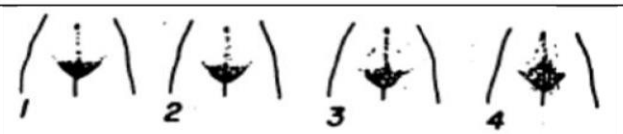
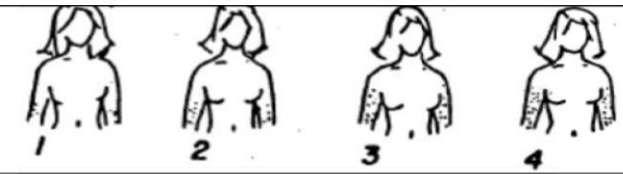
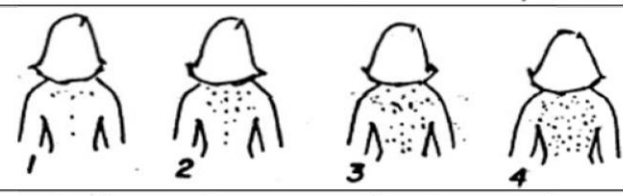
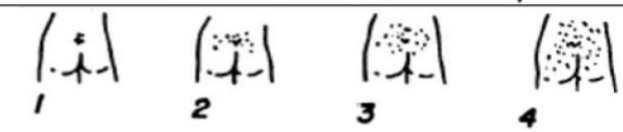
Body Area	Date of exam :		
Upper Lip		Score	
Chin		Score	
Chest		Score	
Upper Abdomen		Score	
Lower Abdomen		Score	
Arms		Score	
Thigh		Score	
Upper Back		Score	
Lower Back		Score	
	TOTAL SCORE		

Figure 7: The Hirsutism scoring sheet according to Ferriman and Gallwey, used to grade the presence of terminal hair in classifying possible signs of hyperandrogenism in female athletes. (*Source*: IAAF Hyperandrogenism

[159] IAAF Regulations governing eligibility of females with Hyperandrogenism to compete in women's competition, Appendices, 2011.

Regulations, Appendices).[160]

Katrina Karkazis (PhD, MPH, Centre for Biomedical Ethics, Stanford) raises the point that if these tests are done purely to prove testosterone levels, how could anyone single an athlete out? It is impossible to state that appearance has nothing to do with the above when it is at the center of the problem. When appealing a woman's levels of testosterone as a result of her appearance, one is simply appealing to her gender.[161]

It is hard to imagine that regulators could even fathom that such regulations would pass on a fairness scale. Although under pressure, it seems little consideration was actually given to the subject matter and the sensitivity which surrounds it. How could the regulators possibly understand when its panel is predominantly male? With a council consisting of 21 men and only 6 women, it is no wonder that regulations appear to undermine the essence of femininity and the ethical problems surrounding the legitimacy of a female to compete in the female category. The IAAF has elected a panel that is three-quarters male, to formulate a rule that is only applicable to women, and in doing so, has lost perspective of the physical and psychological well-being of the athletes affected.

7.2. The ideology behind black femininity

It is unfortunate to admit that no matter how hard women fight against the ideals of a clear-cut feminine appearance, it cannot be done away with, and contrary to popular belief, male hegemony has nothing to do with the reasoning behind this. The truth is,

[160] IAAF Appendices (note 159 above) 6.
[161] K Karkazis, 2012, Out of Bounds? A Critique of The New Policies on Hyperandrogenism in Elite Female Athletics. *The American Journal of Bioethics,* pp.410.

women devote the essence of their being to conform with the idea of appearing feminine in the eyes of society. Extensive thought, effort, and emotion are invested in the ideals of femininity; reason being that women gain power and status over and beyond ostensible superior masculinity; thus femininity is a woman's natural ability to over-power her male counterpart.[162] This natural 'superpower' that a woman holds over the heads of men is so essential in nature that even feminists struggle to relinquish the ideals of femininity due to the profound risk of potentially losing such controlling power.[163] It is the historical tale of Samson and Delilah, woven into the threads of what defines females as women, and perhaps the reason why the majority male IAAF panel could not ascertain between their 'sex testing', 'gender verification' or 'testosterone testing' regulations. This sexual power women have over men was also the reason why women were only permitted to compete in the modern Olympics as of 1900. Over and beyond the idea of women being able to compete and succeed in such a masculine sport, men were also threatened by the concept of women in shorts because that would distract men who would be too sexually charged at the thought of them. Men are all too aware of controlling power that women possess over them and have for centuries, and thus it was easier to keep them away in order to protect the integrity of men and athletics.

Modern studies surrounding the different ideologies of femininity have identified minimal variance in the beliefs and emotions associated with femininity, yet found a vast difference in how it is embodied. For the purposes of this research, I will focus on 3 isolated ideologies including: Traditional femininity ideology (TFI), Hegemonic

[162] E Cole & A Zucker, 2007, Black and white women's perspectives on femininity. *Cultural Diversity and Ethnic Minority Psychology*, vol.13, no.1, pp.1-9.
[163] As above.

femininity and Strong Black woman ideology (SBWI).

Traditional femininity ideology (TFI) can be afforded the title of the foundation of all beliefs surrounding femininity. In defining its principles, it is important to note that TFI was established as a blank canvas upon which each woman could 'fill in the blanks' in terms of her beliefs as to what is considered the appropriate role and behaviour of women in a patriarchy entrenched society.[164] Unfortunately, women have never been able to defy the ideals of femininity nor vary from the historical views on the substance of femininity, as this possibly could lead to a loss of power. Upon studying TFI, experts established a forum known as the Femininity Ideology Scale (FIS) which was founded on 5 factors. Firstly, and the factor carrying the most depth, is the stereotypical image of the women as well as the activities in which she associated herself with. This consisted of maintaining a thin and beautiful physical appearance, which was judged dependant on how attractive men found the woman. Physical appearance is then followed by dependence, purity, caretaking and emotionality.[165] For purposes of this study, the FIS factors will be integrated within two ideologies, namely: Hegemonic femininity and Strong Black Woman Ideology (SBWI).

Whereas Hegemonic femininity may just be the politically correct term for Eurocentric standards, an almost immediate replica of TFI, SBWI shows a slight deviation to the FIS directives. When considering the Strong Black Woman Ideology (SBWI), it is apparent that black women, even when striving towards the traditional standards of femininity, faced an immense amount of economic forces and oppression while black

[164] A W Davis, R F Levant, & S Pryor, 2018, Traditional Femininity Versus Strong Black Women Ideologies and Stress Among Black Women. *Journal of Black Studies*, vol.49, no.8, pp.820-841.
[165] As above.

males faced unemployment.[166] With the absence of financial security, black women were forced to adopt both feminine and masculine gender roles. This led to stereotypes of impure, "aggressive, undesirable, independent, domineering and assertive [women]."[167]

7.3. Black bodies vs White bodies

Beyond the ideologies and stereotypes, a study conducted in 1992 put forth the belief that the physical differences between black and white females may be solely based on their biological autonomy. In disproving the assumption that ethnicity has little to no influence on the determinants of the female body, this study was conducted with a hypothesis that a black female's body composition is naturally of a larger frame and stronger stature than that of a white female's body.[168] Several women of different ethnic backgrounds with matching ages, heights and weights participated in the study, minimizing any possibilities of significant outliers in the data basis. The results may have even surprised its founders. Staggering differences were logged between black bodies and white bodies. With up to 13.8% higher total body potassium (TBK) and bone minerals, 16.2% greater bone density and skeletal muscle, 2 cm longer bone lengths in both their upper and lower extremities and in the perimeter of 15% more musculoskeletal mass, black bodies present predominantly momentous over white

[166] A W Davis, R F Levant, & S Pryor (note 164 above).
[167] As above
[168] O Ortiz, M Russell, T L Daley, R N Baumgartner, M Waki, S Lichtman, J Wang, S B Heymsfield, 1992, Differences in skeletal muscle and bone mineral mass between black and white females and their relevance to estimates of body composition. *American Journal for Clinical Nutrition.*

bodies, especially in sporting events that require great stature and power.[169]

Whereas the exact mechanisms responsible for these monumental increases of musculoskeletal mass is unknown, an alternative hypothesis concludes that increased physical activity may stimulate the development of skeletal muscle and bone minerals. This alternative, however, can be discredited when dealing with athletes as, regardless of ethnicity, they all engage in elite amounts of physical activity.[170] Assuming the accuracy of this study, superior athleticism in black females could contribute to their natural ability to excel in physical activity, over and beyond that of a white female's natural ability. Any attempt to regulate such sheer natural ability would either result in racial discrimination or unfair sporting practice, and ultimately defeat the principle of Olympism and the purpose of sport in general.

[169] O Ortiz, M Russell, T L Daley, R N Baumgartner, M Waki, S Lichtman, J Wang, S B Heymsfield (note 168 above).
[170] As above.

CHAPTER 8

International legality surrounding the IAAF DSD Regulations

8.1. Comparing the IAAF DSD Regulation's morals to that of international constitutional law; including but not limited to Canadian law, Korean law, South African law and European Sports law in unison to international sports law

As a principle praised globally, human rights are essential elements in striving towards lasting world peace. The protection thereof is thus of paramount importance and the reason for the establishment of the Universal Declaration of Human Rights (hereafter referred to as UDHR). The UDHR emphasizes the international right not to be subjected to inhuman or degrading treatment and that no one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment.[171] The UDHR further proclaims that all human beings are "born free and equal in dignity and rights",[172] ultimately enforcing international protection upon all arbitrary interference against the right to privacy, attacks upon an individual's honour and reputation.[173] Even though the right to sporting practices may not be included in the UDHR itself, several international sports charters and constitutions promote sport and physical activity as an important factor in human development.[174] The development of sport specific charters ensures the protection and development of an ethical basis of sport

[171] UN General Assembly, 1948, Universal declaration of human rights, Article 5 (hereafter UDHR).
[172] Article 1 UDHR (note 171 above).
[173] Article 12 UDHR (note 171 above).
[174] Article 1 The European Sports Charter 1992, [Online] Available from: https://rm.coe.int/16804c9dbb [Accessed 24 January 2019].

that “promotes human dignity and safety of those involved in sport, by safeguarding sport, sportsmen and women from exploitation for political, commercial and financial gain and from practices that are abusive or debasing including the abuse of drugs and the sexual harassment and abuse, particularly of children, young people and women.”[175] This has led to an international standard of upholding human rights in sport, such as in the Olympic Charter and the IAAF Constitution itself. The Olympic Charter refers to the practice of sport as a human right and that “every individual must have the possibility of practising sport, without discrimination of any kind and in the Olympic spirit, which requires mutual understanding with a spirit of friendship, solidarity and fair play.”[176] Almost identically the IAAF Constitution strives to “ensure that no gender, race, religious, political or other kinds of unfair discrimination exists, continues to exist; or is allowed to develop in athletics in any form, and that all may participate in athletics regardless of their gender, race, religious or political views or any other irrelevant factor.”[177]

These international rights can be seen in several national constitutions. Canadian Constitutional law comes in the form of the Canadian Charter of Rights and Freedoms. For the purposes of this research paper, the focus is shifted to the Charter as passed by the Government of Quebec.[178] A clear fundamental right which is emphasized by way of repetition throughout the Charter is the integrity of a person. The integrity of a person refers to the humanity of a person; essentially the life of that person. Such a right cannot be renounced, varied or dictated by anyone other than the person

[175] Article 1 The European Sports Charter, 1992, [Online] Available from: https://rm.coe.int/16804c9dbb [Accessed 24 January 2019].
[176] Olympic Charter, 1983. Lausanne: Comité International Olympique 1982.
[177] International Association of Athletics Federations Constitution, 2017.
[178] The Charter of Human Rights and Freedoms, [Online] Available from: http://legisquebec.gouv.qc.ca/en/showdoc/cs/C-12?langCont=en#ga:l_ii-gb:l_i-h1 [Accessed 09 January 2019].

himself/herself. Thus, the Charter does not make provision for the specificity of a person by way of reputation, profession, medical status or sex. Therefore, regardless of the fact that an individual may classify as an elite athlete with the inherited responsibility to uphold rights of fair sporting practices, that individual's life is first and foremost safeguarded by the Charter, including the health of that individual.[179] It further stipulates that, should the exercise of such right lead to exclusion or preference, discrimination exists.[180] When considering Canada's national legislation, the Government extends this fundamental protection of the human life by way of the *Physical Activity and Sport Act*. In particular, section 4(1) of the Act emphasizes that The Government of Canada has high regard for ethical standards and values in sport and makes provision for fair participation. By establishing a regulation that makes simultaneous satisfaction of both the right to life and the right to fair participation virtually impossible, the IAAF is in direct contradiction to the Charter.

The Korean Constitution shows a high degree of commonality with the Canadian Charter in its elevation of the right to a high quality of life for all of its citizens.[181] The right to a high quality of life comes in the form of the fundamental right to happiness, which if upheld, is believed to "contribute to lasting world peace and the common prosperity of mankind and thereby to ensure security, liberty and happiness" for the posterity of all, forever.[182] It is almost impossible not to experience the Korean Constitution's purity as they reassure all citizens of their human worth and dignity by guaranteeing this right to the pursuit of happiness at the hands of the State.[183] The

[179] Section 4 of the Charter (note 178 above).
[180] Section 10 of the Charter (note 178 above).
[181] Constitution of the Republic of Korea, 12 July 1948, [Online], Available from: https://www.refworld.org/docid/3ae6b4dd14.html [Accessed 24 January 2019].
[182] Constitution of the Republic of Korea, Preamble (note 181 above).
[183] Constitution of the Republic of Korea, Article 10 (note 181 above).

high standard of happiness withheld in their Constitution is of such a nature that even if certain rights of citizens are not enumerated in the Constitution itself, that right will still not be neglected.[184] In this manner, the country takes upon itself and its government to classify and protect this fundamental right.[185] Sport has a special link to the right of happiness in that it brings enjoyment and satisfaction to those participating in it, conferring a somewhat fundamental status to freedom of sports activities.[186] The extent of freedoms such as the freedom of sports stretches so far that the Korean Constitution has rendered it immune to any form of national or international limitation.[187] In light thereof, we can assume that rights and freedoms associated with sports have a "character of civil liberties".[188]

The South African Constitution is woven with common threads to the fundamental rights as mentioned in both the Canadian Charter and the Korean Constitution. This is portrayed in the form of the right to security and control over a person's own body, as well as the right to have their dignity respected and protected, both of which have been infringed upon by the DSD regulations. [189] As one of merely two national legal systems that had primary *locus standi* against the IAAF's hyperandrogenic regulations for impeding on the rights of one of their athletes, the South African government had to make the decision whether to uphold its Constitution and stand by Olympian Caster Semenya, or shy away from the pressure and justify the breach as a fair limitation to her rights. With a lack of infrastructure to take on an international powerhouse such

[184] Constitution of the Republic of Korea, Article 37 (note 181 above).
[185] D.P Panagiotopoulos, 2013, SPORTS LAW: Structures, Practice, Justice - Sports Science and Studies. *Hellenic Center of Research on Sports Law (HCRSL).* [Online] Available from: https://www.researchgate.net/publication/276205124_Sports_Law_Structures_Practice_Justice_Sports_Science_and_Studies/citations [Accessed 12 January 2019].
[186] As above.
[187] Constitution of the Republic of Korea, Article 10 (note 181 above).
[188] D.P Panagiotopoulos (note 185 above)
[189] The Constitution of the Republic of South Africa, 1996 (hereafter The Constitution).

as the IAAF, history already proved the Indian Government unable to uphold its own Constitution, leaving Dutee Chand to fight her own battle. Fortunately, the South African government elected to support not only Semenya but DSD athletes globally, in declaring the values of the DSD regulations unconstitutional on an international scale.

8.2. Legal recourse available to aggrieved athletes and their national representatives

The CAS panel in the Dutee Chand case correctly placed emphasis on the administration processes and how it should be regulated in terms of establishing new regulations which have such a substantial impact on the athletes' rights. In doing so, the panel referred to the mechanisms of Global Administration Law (GAL), an international standard defined by its legal rules, principles, and institutional norms that must be adhered to when any administration process is undertaken. GAL is a revolutionary phenomenon as it presents a solution to the promulgation of laws and regulations that are purely intra-State based and somewhat subjective in terms of legal and political authority of legislators and regulators.[190] GAL makes provision for 3 main standards which must be met in all processes of legislating and rule-making, namely: (1) Global Administration; (2) Possible Sources of Global Administrative Law; and (3) The Emergent Content of Global Administrative Law.[191] These GAL principles are essential in the framework of sex classification regulations due to the sensitivity of the matter, making it susceptible to arbitrary decisions. To this effect, the GAL procedural limitations towards legislators offer a form of recourse to affected athletes in ensuring

[190] B Kingsbury, M Donaldson, 2011, 'Global Administrative Law' in Max Planck Encyclopaedia of International Law. *Oxford University Press*.
[191] As above.

fairness, transparency, participation and proportionality. Furthermore, GAL implements that sex classification rules and regulations must be perceived as legislation and thus its regulators are bound by the GAL processes and compliance with the GAL standards, just as legislators would.[192]

CAS serves as an essential organ to the GAL mechanisms in terms of the promulgation of global sports law. Lorenzo Casini identifies at least three overlapping functions between GAL and CAS, namely: (1) regarding the application of general principles of law to international sport institutions such as the IAAF; (2) the interpretation of sports law and its rules and regulations which has a profound influence on the rulemaking processes implemented by international sport institutions; and (3) the goal of harmonization of global sports law in providing just arbitrations and reviews thereto. In the confusion surrounding questions of whether the IAAF will face the consequences of their regulations, GAL standards go a long way in holding the IAAF and its regulators accountable.[193]

Even though the CAS panel has somewhat of a 'constitutional' status as all its decisions are considered final and binding in law, an aggrieved party does have additional means of review available to his/her disposal. Such additional means of review has the potential to further or over-rule CAS finding and may place additional pressure on the IAAF's regulatory activities. Review of CAS decisions may take place in the Swiss Federal Court due to it having jurisdiction over all review and appeals of arbitral decisions made in Switzerland and the CAS panel's location. This has the potential to correct the imbalance of power faced by athletes from their respective

[192] M Krech (note 21 above).
[193] M Krech (note 21 above).

sport regulatory bodies. Another possibility of review lies in that of regional courts, which have jurisdiction to hear matters of misconduct in sporting competition especially those sporting institutions that go beyond their own goals in promoting fair competition. Should the matter be of constitutional status, an athlete may bring his/her matter before a Regional Human Rights Court, on condition that such an athlete has exhausted all other remedies available to him/her.

CHAPTER 9

Does the Therapeutic Use Exemption (TUE) Not Stand in Direct Contrast to the Proposed Hyperandrogenic Regulation?

9.1. Introduction to TUEs

The World Anti-Doping Code International Standard for Therapeutic Use Exemptions (ISTUE) is a mandatory international standard developed as part of the World Anti-Doping Program[194] which makes provision for athletes who suffer from medical conditions and require the intake of certain medicines. This programme allows athletes to legally use such medications even if it appears on the WADA prohibited substance list. The purpose of the ISTUE is to promote the health of international athletes while enabling an athlete affected by a medical condition requiring certain medications, to compete in their retrospective sporting practices without the fear of being perceived as doping under the WADA prohibited substances. The concept of TUE establishes a threshold for all sporting rules and regulations and somewhat poses a challenge to their regulators, to elevate the rights of its athletes, over and beyond that of fair play initiatives, while maintaining the highest degree of integrity in competitive sport.

The values and principles of the TUE system faced its first significant hurdle in September 2016 when it was sanctioned to scrutiny due to a leak in the WADA

[194] World Anti-Doping Agency 'International Standard for Therapeutic Use Exemptions', 2016, [Online] Available from: https://www.wada-ama.org/sites/default/files/resources/files/wada-2016-istue-final-en_0.pdf [Accessed on 12 February 2018].

administrative data system by, said to be, Russian hacking group, Fancy Bears. Amongst the confidential records that were leaked were records pertaining to TUE grants, essentially opening the floodgates to an international audit of the TUE system. Sports scientist Yannis Pitsiladis and colleagues were the authors to have hit a soft spot in WADA's Therapeutic Use Exemption Committees (hereinafter referred to as TUECs), with their publication titled "Make Sport Great Again: The Use and Abuse of Therapeutic Use Exemptions Process"[195]. Pitsiladis et al. proclaim the lack of standardization in the TUECs criteria for diagnosis and/or treatment of medical conditions and injury, in that they are dynamic and susceptible to change.[196] Therefore, it is necessary to conduct more frequent medical assessments, rather than a 'once-off' diagnosis of the illness. This is to eliminate the possibility of misusing the TUE system as a "permissive doping passport"[197], which, according to the authors, is a current hazard to the values of the TUE system. Pitsiladis et al. conclude their research with a bold statement suggesting that the TUE process should aim at shying away from political and legal processes while shifting its focus to the protection and promotion of the health of athletes.[198] In this respect, anti-doping principles become the sole responsibility of WADA.

The detection of flaws in regulatory bodies that were originally initiated to establish a forum that both legally and ethically regulates medical conditions, such as the TUECs, provides insight into parallel forums such as the IAAF governing Hyperandrogenism. Health Scientist, Paul Dimeo and sports scientist, Verner Moller summarize the two

[195] Y Pitsiladis, G Wang, A Lacoste, C Schneider, A D Smith, A D Gianfrancesco & F Pigozzi, 2017, Make Sport Great Again: The Use and Abuse of Therapeutic Use Exemptions Process. *Current Sports Medicine Reports*, vol16.
[196] As above.
[197] As above.
[198] As above.

fundamental flaws in the TUE system as follows: Firstly, the opportunity to exploit the TUE system by either faking an illness or attaining a prescription from medical practitioners willing to bend the laws.[199] A Danish study was conducted in 2013, with the purpose of examining athletes' perceptions revolving around TUE's and the management thereof in relation to anti-doping policies.[200] The results revealed major distrust in the efficiency of the TUE system, with a staggering 51% of athletes thought to have received a TUE without the medical need for same.[201] 4 years later, Shane Sutton publicly admits that TUEs played a significant role in their "marginal goals" performance strategy. Similarly, Alberto Salazar, former coach of Olympian Mo Farah, was found to have altered his elite athlete's medical records in order to obtain TUEs.[202] Secondly, praised for uplifting athlete's health and promoting fair play in sport, the TUE system may, in fact, prove detrimental to the health of athletes. Perceived as a myth, exercising while on medication is not a good idea. Whereas broken bones or more severe illnesses such as concussions force athletes to rest, treatable medical conditions may be overcome by 'masking' medications which allow an athlete to keep pushing for the sake of athletic performance.[203] These 'masking' medications, however, each come with their own list of negative effects, which may result in both long-term and short-term health issues.

The TUECs, evidentially not impressed with Yannis Pitsiladis et al. opening their can

[199] P Dimeo & V Moller, 2017. Elite sport: time to scrap the therapeutic exemption system of banned medicines. [Blog] The Conversation. [Online]. Available from: http://theconversation.com/elite-sport-time-to-scrap-the-therapeutic-exemption-system-of-banned-medicines-89252 [Accessed on 22 January 2019].
[200] M Overbye & U Wagner, 2013, Between medical treatment and performance enhancement: An investigation of how elite athletes experience Therapeutic Use Exemptions. *International Journal of Drug Policy,* vol. 24, no.6, pp.579 – 588.
[201] As above.
[202] P Dimeo & V Moller (note 199 above).
[203] As above.

of worms, quickly fired back with a replying letter addressed to the editor of *Current Sports Medicine Reports*. In this letter, the TUECs allege that Pitsiladis et al. delivered 'inaccurate commentary' that 'impugns the process of therapeutic use exemption'.[204] They further allege that the poor understanding portrayed by Pitsiladis et al. led to the insult of the integrity of the TUE system and its members, and further substantiates the TUE initiative by boasting with its success under the scrutiny of the CAS panel. They conclude by rendering the commentary withheld in Pitsiladis et al. detrimental and unhelpful in the fight for athletes facing legitimate medical conditions.[205] This letter was later followed by a response from Yannis Pitsiladis and colleagues.[206] The response held that the original report had not been intended to impugn the TUE system, but rather to encourage suggestions for the improvement of the TUE system. They additionally indicate that their belief that reform is necessary is based on Bradley Wiggins' phenomenon in that his medical history reveals him as a three-time user of TUEs for triamcinolone, of which all three were administered before major races. The existence of TUEs currently serves as a grey area between an anti-doping system that is seemingly black and white, inviting unscrupulous athletes to exploit the loophole it leaves behind.[207]

9.2. Understanding Hyperandrogenism

When establishing the new basis of regulations for Hyperandrogenic female athletes,

[204] D Gerrard, 2017, Letter to the Editor: The Use and Abuse of Therapeutic Use Exemptions Process. *Current Sports Medicine Reports,* vol.16, no.5, pp.370.
[205] D Gerrard (note 204 above).
[206] Y Pitsiladis, G Wang, A Lacoste, C Schneider, A D Smith, A D Gianfrancesco & F Pigozzi, 2017, Response to the Letter to the Editor. *Current Sports Medicine Reports*, vol.16, no.5, pp.371-372.
[207] I Boardley 2016. Therapeutic Use Exemptions – Legalised Doping or Medical Necessity? [Blog] University of Birmingham. [Online]. Available from: https://www.birmingham.ac.uk/research/perspective/tue.aspx [Accessed 22 January 2019].

the IAAF defined Hyperandrogenism as a medical condition where a female has a higher level of naturally occurring testosterone in her body. In summarising this definition, I highlighted three main characteristics of Hyperandrogenism as stated by the IAAF themselves, this being;

I. It is a biological condition;

II. It is naturally occurring; and

III. It may present the diagnosed athlete with some sort of a sporting advantage.

These characteristics should be acknowledged in trying to establish an appropriate category for Hyperandrogenism, as they formulate the foundation of what Hyperandrogenism really is. I believe a correct procedure in attempting to classify 'Hyperandrogenism' would be to connect it with other medical conditions with the same attributes and characteristics.

9.3. A category for biological conditions with similar characteristics

Over the years, several biological conditions have presented themselves in the sporting world; none of which has been frowned upon by sporting bodies. Instead, these biological anomalies, which presented its holder with unique biological traits offering them a sporting edge, have been celebrated and envied by society and fellow competitors. Such conditions, amongst many others, include *Marfan Syndrome, Acromegaly* and *Hereditary Polycythaemia*.[208] Marfan syndrome is a biological

[208] R Pielke, 2016. *The Edge – The War Against Cheating and Corruption in the Cutthroat World of Elite Sports*. Roaring Forties Press.

condition affecting the body's connective tissues, resulting in a higher level of a naturally occurring hormone called transforming growth factor beta, or TGF-β. The syndrome is characterised by enlarged and elongated physical features, such as significant height, a large wingspan, longer fingers and toes and hyper-flexibility of joints. The result of enlarged and elongated features afforded the affected athlete with a competitive advantage over others. However, due to the side effect of an enlarged aorta, the syndrome poses a risk for fatal heart conditions. Affected athletes thus are warned against extreme physical exercise. On the contrary to Hyperandrogenic athletes, when diagnosed athletes, such as US swimmer Michael Phelps and US volleyball player Flo Hyman, excelled in their respective sporting categories, they were praised and celebrated rather than scrutinized for their gained advantage due to their biological conditions[209]. Marfan Syndrome is not considered to offer affected athletes with an unfair competitive advantage by sporting entities. Acromegaly, better known as Gigantism, is a biological disorder affecting the body's pituitary gland, causing an excessive naturally produced level of growth hormone during adulthood. The disorder results in an increased size of several physical features, including one's hands, feet, arms, legs, torso and face. Human growth hormone is enlisted on the World Anti-Doping Agency (WADA) Prohibited list of drugs[210], as an excessive amount results in the gain of an unfair advantage. Acromegaly, however, is not regulated by any sporting body as a matter of fairness, despite the presence of excessive growth hormone. Affected athletes include a substantial amount of NBA (National Basketball Association) players, including that of Romanian basketball player Gheorghe Muresan. Hereditary Polycythaemia is a biological condition that enables the body to

[209] R Pielke (note 208 above).
[210] World Anti-Doping Agency 'Prohibited List Documents' (2016) https://www.wada-ama.org/sites/default/files/resources/files/wada-2016-prohibited-list-en.pdf. (Accessed on 12 February 2017).

naturally produce a higher than average level of red blood cells.[211] This affords the affected athlete with endurance benefits, due to the excessive production of red blood cells enabling the body to produce more Erythropoietin (EPO). EPO is commonly used amongst cyclists for the purposes of doping and does form part of the WADA's prohibited list of drugs. Finnish cross-country skier Eero Antero Mantyranta's career was celebrated despite his inherited biological traits presenting him with a competitive advantage. Hereditary Polycythaemia is not regulated by sporting bodies as a matter of unfair advantage.[212]

When considering the above-mentioned conditions and their characteristics, it is noticeable that Hyperandrogenism would form part of the same category as Marfan Syndrome, Acromegaly and Hereditary Polycythaemia, if categories concerning biological conditions were to be established. This is due to the distinctive common characteristics which they all share, including:

I. They are biological conditions;

II. They result in the naturally occurring hormone in excessive measures; and

III. This excessive hormonal occurrence may present the diagnosed athlete with some sort of a sporting advantage.

In 2011 the IOC stated, with regards to the Hyperandrogenism Regulations, that, "the purpose was to guarantee the fairness and integrity of female competitions for all female athletes." The IOC Medical Commission further provided that, "today the purpose of the femininity tests carried out on women athletes taking part in the Olympic

[211] R Pielke (note 208 above).
[212] WADA (note 210 above) 3.

Games is to make sure that all female athletes compete under identical anatomical conditions." What the IOC failed to acknowledge, however, was that similar biological conditions exist that have not been regulated as a matter of fairness. In my opinion, 'fairness' refers to the impartial treatment of individuals preventing favouritism of one group of individuals in society over the another. Thus, the imposition of strict regulations with regards to hyperandrogenic female athletes, and on the contrary, celebrating athletes affected by other medical conditions with the same characteristics, the IAAF and IOC differentiate between individuals. Instead, a universal regulation should be established regulating all medical conditions of the same statute.

Pielke, "unique biological conditions have never posed itself to be problematic in competition as sporting entities never perceived them as a matter of fairness, even if they do present some sort of an advantage to the diagnosed athlete."[213] So why start now? And why start with Hyperandrogenism? Does this not constitute unfair treatment amongst athletes diagnosed with different sorts of medical conditions? These questions remain unanswered as the IAAF reach the final stretch of their two year grace period awarded to them by the court of arbitration to provide scientific evidence before the court that would justify their Hyperandrogenism regulations which have been declared unconstitutional.

9.4. TUE vs Hyperandrogenic Regulations

The Hyperandrogenic Regulations compared to TUE values can be viewed as a set of parallel lines running in opposite directions. The two regulations strive to exist in a

[213] R Pielke (note 208 above) 77.

similar manner, with what seems like the same goal: to promote the health of an athlete while upholding fair play in sport. Unfortunately, both anomalies have failed to achieve the end goal. TUE results in a potentially ill athlete being advantaged due to her illness yet resulting in a gaping loophole that allows her fellow competitors to legally dope, whereas the hyperandrogenic regulations result in the disadvantaged of a hyperandrogenic athlete at the expense of her health. Being the first of its kind, the Hyperandrogenism regulations required medical practitioners to treat athletes beyond purposes of illnesses and sickness, but merely to make them eligible for competition. This includes the prescription and administration of treatment with potential side effects and costs frankly to satisfy a regulation. When comparing same to the principles of TUE, an evident disproportion, if not a complete contrast, in the regulators and their values are experienced. The logic? Cure athletes suffering from medical conditions with prohibited substances on the WADA list, in order to have them compete safely and promote health, while concurrently medicating perfectly healthy athletes, impairing their health, to diminish naturally occurring but prohibited substances in order to uphold fair sporting practice. Are regulations endangering some to protect others? When does equality, equal treatment and fair sporting practice come into play? And if so, does it come into play for all or merely for some?

Political scientist Rodger Pielke Jr addresses the issue of regulators that are blind to the faults and flaws of their own regulations. He proposes that regulatory bodies such as WADA and the IAAF will never face defeat at their own hands as the acknowledgement of a problem in their own regulations would result in the recognition of a broader problem within their own borders.[214] Pielke refers to hyperandrogenism

[214] R Pielke (note 208 above).

and anti-doping as linked due to both being at the edge of sporting legality.[215] As regulators are forced to adopt anti-doping policies such as the TUE system which prove to be helpful only to create scandals; similarly sport's outdated approach to gender is struggling to confront modern understanding.[216] Accordingly, the two share common ground in the constant debate of what is considered normal. The inconsistency in answers to the above question suggests that no one really knows what they are looking to accomplish.[217] Pielke categorises both dilemmas under the division of 'wicked problems' as established in 1973 by design duo Rittel and Webber[218] and explains the concept in a revolutionary way:

> " 'Wicked problems' are ones that, in the words of a classic 1973 article that explained the concept, 'are ill-defined and they rely upon elusive political judgement for resolution.' Such problems are 'resolved,' not solved. They are called 'wicked' because they are 'malignant' (in contrast to 'benign'), or 'vicious' (like a circle), or 'tricky' (like a leprechaun), or 'aggressive' (like a lion, in contrast to the docility of a lamb). By definition, we can never really solve a wicked problem; we can only do better or worse at trying to manage it. And better or worse depends on what we think is a problem in the first place, or whether we think that there even is a problem requiring action. Wicked problems can be addressed only through negotiation, and negotiation can't solve the problem. An oft-cited example of a problem of this sort is crime, which is never solved completely; we just do better or worse at tackling it, depending on the

[215] R Pielke (note 208 above).
[216] As above.
[217] F McKay, The Edge, by Roger Pielke Jr. 2017. [Blog] Podium Café. [Online] Available from: https://www.podiumcafe.com/book-corner/2017/11/27/16704754/the-edge-by-roger-pielke-jr [Accessed on 22 January 2019].
[218] H W J Rittel & M M Webber, 1973, Dilemmas in a General Theory of Planning. *Elsevier Scientific Publishing Company, p*p.155-169.

responses that we put in place through our political and social systems."[219]

In accordance to this, Pielke advises that the only way to deal with sports problems requires regulatory bodies such as WADA and the IAAF to change their thought process, electing to move away from the '19th century principle' façade they have been hiding behind for years.[220] Let Paralympians compete with able bodied athletes. Cease from selecting to merely celebrate certain genetically gifted athletes while incarcerating the ones thought of as genetically 'cursed'. Do not allow concepts such as 'purity' and 'fair sporting practices' to overpower the protection of athletes against dangerous products and practices in trying to achieve anti-doping goals.[221]

[219] R Pielke (note 208 above).
[220] F McKay (note 217 above).
[221] F McKay (note 217 above).

CHAPTER 10

The Decision, Conclusion and Recommendations – Establishing Appropriate Rules and Regulations in Approaching Hyperandrogenism

10.1. The CAS decision of 1 May 2019 in a nutshell

As the legislating body holding the power to finally put an end the generational battle of the sexes, the CAS had a hard decision at their doorstep. In an opening statement, the CAS panel concluded that, whereas the regulations are *prima facie* discriminatory, such discrimination is in fact necessary in order to maintain the distinctive male-female competition categories.[222] CAS confirms that sex is determined by human biology and not legal status nor gender identification, which is determined on a basis of whether or not the physical traits which identifies male from female are present or not. Such distinction is decided to be necessary in order to separate the insuperable advantages between sexes.[223] Based on the evidence presented by the IAAF (Bermon tests), the CAS panel decided that "endogenous testosterone is the primary driver of the sex difference in sports performance between males and females"[224] and thus the regulations are indeed necessary. Special emphasis is given to the fact that the regulations do not force athletes to have surgery in that testosterone levels an be controlled effectively by use of conventional oral contraceptives.[225] This decision is

[222] Media release – Executive summary. 2019. [Online]. Available from: https://www.tas-cas.org/fileadmin/user_upload/CAS_Executive_Summary__5794_.pdf [Accessed 04 June 2019].
[223] As above
[224] As above.
[225] As above.

followed by a list of concerns CAS finds in the application of the regulations.

Currently, this decision has been appealed and regulations set aside by the Swiss Federal Tribunal until such time where a final judgement is deliverable.

10.2. Conclusion

This dissertation has examined whether female athletes with differences in sexual development should be allowed to compete in the female category of elite athletics, with due consideration given to their natural levels and the impact thereof in the sporting industry. As part of this examination, I have argued against the legality of the IAAF's DSD regulations and the legitimacy of the manner in which it was promulgated.

Whereas Honourable Justice Annabelle Claire Bennett, President of the CAS Panel, concluded that the hyperandrogenic regulations do in fact infringe upon the rights of certain athletes and whereas the CAS panel found such an infringement justifiable under the principles of fair play, the IAAF still decided to withdraw such regulations which were to face a second interim period.[226] Months later, the IAAF announced the introduction of the DSD regulations, which in fact is a watered-down regulation of its predecessor, and in reality, contains severer outcomes to those affected. The withdrawal of regulations that seemed to have won their first fight, however, gave rise to several other problematic areas with regards to the IAAF and IOC's approaches regarding the management of athletes in both the international, as well as national spheres of athletics. The second fight won by the IAAF was a successful defence of their regulations in front of the CAS on 1 May 2019, however once again suspended

[226] Dutee Chand (note 4 above) 56.

by the Swiss Federal Tribunal. It is disconcerting that the CAS overlooked so many flaws in the IAAF's defence in reaching their decision to uphold the DSD regulations, a few of which could potentially set female athletics back to the times of physical examinations of a female body to ensure that all the "physical traits" are present as suggested by "human biology". The CAS panel also failed to acknowledge the poor quality of the medical tests relied on by the IAAF (Bermon tests) which forms the basis of the DSD regulations. Instead, the CAS elected to use its power to affirm that, on the basis of pure speculation that no other known factor contributes to the advantage gap between male and female, that "endogenous testosterone is the primary driver of the sex difference in sports performance between males and females".[227] No scientific evidence exists that such statement is true and correct. Thus, for purposes of this dissertation, this decision can be summarised as a lack of a neutral consideration given to fundamental fairness, poorly researched medical data, outdated testing techniques and irregular judgements made revolving collateral case law.

The primary conclusion that can be drawn from this examination is that both the IAAF's Hyperandrogenic regulations and DSD regulations indefinitely breach upon the higher values and morals of international athletics, as well as, an infringement of DSD athletes' fundamental rights conferred on them by both national constitutionalism and the UDHR. Such infringements should not be justifiable by an illusion of *bona fide* conduct that was aimed at reaching a constricted level of fairness and should preferably be considered as a mitigating factor that would accordingly result in the

[227] Media release – Executive summary (note 222 above).

nullification of the DSD regulations and/or any regulations to follow in its footsteps.

10.3. Recommendations

In reaching a conclusion to this sensitive archaic topic, I tend to share the opinion of Pielke. First distinguished as a 'problem' in the 19th century, hyperandrogenism and similar intersex medical conditions have since only been designated with resolutions that are specific to that era, regardless of the changes in time. In order to accurately deal with this problem, regulatory bodies such as WADA and the IAAF will have to change their thought processes and move away from the '19th century principle' façade they have been hiding behind for years.[228] By definition, it can be said to be a 'wicked problem', one that does not necessarily have a solution. Essentially, an ethical duty falls upon both WADA and the IAAF to ensure that positive political and social systems are in place in order to progress in the management thereof, rather than deteriorate any advancement achieved up to date.

In striving to better the current management of hyperandrogenism and DSD, I propose that the current DSD regulations be nullified. Concurrent to its nullification, all regulatory bodies, no matter its power or status, should subsequently be barred from promulgating successive regulations relating to hyperandrogenism until such time where conclusive scientific evidence can be provided that proves the existence of a profound sporting advantage held by hyperandrogenic athletes. With reference to the Canadian Charter, athletes are first and foremost human beings and should be treated accordingly. In the event that a scientific basis is established to justify such regulation, the application of such regulation must be done on a unilateral basis where all females

[228] F McKay (note 217 above).

are tested and not on the 'suspicion' basis that currently exists. Should this present itself as too costly, a similar approach of random selection for testing, as used by WADA for anti-doping purposes, should be administered.

The law should encourage Paralympians compete with able bodied athletes, cease from constituting and enforcing the term 'genetically cursed', and most importantly, prohibit concepts such as 'purity' and 'fair sporting practices' to overpower the protection of athletes against dangerous products and practices in trying to achieve anti-doping goals.[229]

[229] F McKay (note 217 above).

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List of Legal Abbreviations

BJSM – British Journal of Sport Medicine

CAS – Court of Arbitration in Sport

DSD – Differences of Sex Development

GAL – Global Administrative Law

IAAF – International Association of Athletics Federations

IOC – International Olympic Charter

ISTUE – International Standard for Therapeutic Use Exemption

TUE – Therapeutic Use Exemption

UDHR – Universal Declaration of Human Rights

WADA – World Anti-Doping Agency

List of Medical Abbreviations

5-DIOL – 17 β-diol

ARE - Androgen response elements

A4 – Androstenedione

BMD – Bone Mineral Density

DNA – Deoxyribonucleic acid

DHEA – Dehydroepiandrosterone

DHT – Dihydrotestosterone

Etio-G – Etiocholanolone glucuronide

hAR – Human Androgen Receptors

LBD – Ligand-binding domain

NTD – N-terminal domain

PCOS – Polycystic ovary syndrome

PCR – Polymerase Chain Reaction

T – Testosterone

TT – Total testosterone

D e c l a r a t i o n

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