12-2-2020 2:30 PM

Science and Sex Testing: The Beginnings of a Female Testing Discourse

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A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Kinesiology

Abstract

In the 1960s, the International Olympic Committee (IOC) sanctioned testing to verify the sex of elite female athletes. Sex tests, as they were called, did not extend to male athletes, and they have tended to rely on appearance and performance alone. Now measuring testosterone levels, the Eligibility Regulations for the Female Classification scrutinizes female athletes far more than male athletes. This dissertation contributes to the sex testing literature by investigating three under-explored avenues: the history of the sex testing sports medical literature, a medical discourse analysis of IOC documents based on the implementation of sex testing, and a critical feminist analysis of the 2019 hearing of runner Mokgadi Caster Semenya.

Data collection comes from a range of sources, including the IOC's archives, medical journals, IOC Medical Committee correspondence from 1950-1999, current regulations for hyperandrogenism in the IAAF, and the Court of Arbitration of Sport (CAS) hearing *Mokgadi Caster Semenya & ASA v IAAF* (2019). This dissertation introduces a discourse called 'female testing,' highlighting the IOC's continued history of testing only female athletes for sex. This critical feminist analysis questions the role of the IOC and the IOC medical commission's science in determining sex-based testing. This dissertation recommends more critical oversight into the relationship between sport science and ethics, and a more pragmatic approach to addressing female testing. Female tests in sport go far beyond what ordinary people are familiar with regarding their biological makeup. The tests currently in place leave some athletes in the women's category at a disadvantage, including women, women of colour, trans folks, queer-identifying folks, and women from non-Western nations.

Keywords

Sex Testing; Female Athletes; Olympics; Discourse Analysis; Sports Medicine.

Summary for Lay Audience

Since 1967, the International Olympic Committee (IOC) has sanctioned testing females to protect the female category in sport. Initially a genetic test called 'sex testing,' these regulations attempted to monitor 'fair play' in the female category by ensuring that males do not attempt to participate in the female category and gain an unfair physiological advantage. Testing helped to discern several sex types in addition to the standard male/female binary. Sex types may present with aspects of male and female characteristics, referred to as intersex, or individuals with Differences of Sex Development (DSD). Intersex individuals might appear androgynous (containing features of both male and female characteristics), but otherwise, there might not be any indication that an individual was intersex.

By sanctioning the testing of female athletes to make sure that they are female, the IOC and supporting sport governing bodies are sending several messages: i) females require testing or verification for protection against male athlete intruders; ii) males absolutely have a significant sporting advantage over females; iii) *only* male and female categories should exist in sport; and iv) medical science is the most appropriate way to ensure regulatory compliance for gender categories in sport. Some scholars support sex tests to protect 'true' females participating in the female category. Others believe that testing females is harmful since the tests maintain the gender binary. Both sides agree that the tests are harmful to those who are exposed as intersex. This dissertation adds to this discussion by presenting 'fair play' as defined through the sports medicine literature, historical archives, the current regulations for sex testing, and pragmatic analysis of a recent court case in the international sport's court, the Court of Arbitration for Sport (CAS). This dissertation suggests reconsidering sex testing regulations since society does not regularly track biological makeup. Females can, therefore, only comply with sex testing regulations after being tested.

Co-Authorship Statement

There was no co-authorship contribution other than supportive input by colleagues, advisors, and my supervisor.

Acknowledgments

The road to completing this Ph.D. began about a decade ago. It is surprising to think of all the lives who have encouraged me in pursuit of this degree.

I first want to acknowledge the financial support received while in my doctorate program and in conducting the research presented herein. My studies were supported by Western University's Graduate Student Funding Program, several positions as a Graduate Teaching Assistant, and two Social Sciences and Humanities Research Council (SSHRC) supported positions as a Graduate Research Assistant. Data collection was funded by the IOC's Ph.D. Students and Early Career Academics Research Grant Programme. Travel for presenting at conferences was supported by the Western University Kinesiology Department's Travel Award, the Travel Award from the Department of Health Sciences at Western University, the Roberta Park fund through North American Society for Sport History (NASSH), and the International Association for the Philosophy of Sport (IAPS) Student Travel Award.

Everyone who has supported my research, been a friend, colleague, or confidant, I thank you. Like many students before me, my family continued to support me in completing this program. As an avid sports fan, I truly enjoyed long talks with my brother Alex and his wife, Julie. Alex, thanks for always being there and for your vivacity for life. My parents, Steve and Lana—thank you for always being there for me. You were available by phone call or Facetime at any time. Even outside of school, you have always rooted for my happiness and encouraged me to shoot for the stars. I am forever grateful.

I must thank my high school English teacher Miriam Heinicke. I value not only our shared interests but also your zeal for life. I must also acknowledge my good friend Katherine Crosmer, who was taken from this earth too soon. The memory of her intellect, creative pursuits, and excitement for life encourage me daily.

Many thanks go out to the Kinesiology crew at Cal State University, Fullerton, including my colleagues/support squad Tanya Jones and Paulina Rodríguez. Dr. Jared Coburn, Dr. Bill Beam, Dr. Daniela Rubin, Dr. Alison Wrynn, Dr. John Gleaves, Dr. Matthew

Llewellyn, and Dr. Toby Rider—you all supported my career and research, which meant a lot to someone who had little confidence navigating academia. The utmost thanks to my master's advisor Dr. Kathleen Wilson-Thomas, for guiding me through my master's research. My master's thesis was my first step in learning about gender inequalities and applying my knowledge in useful ways. You encouraged me and showed me that my research questions were valid, and I am forever grateful for that support.

To those at Western that helped my assimilation to Canada, I cherish those moments and appreciate the help immensely. My Ph.D. supervisor Dr. Angela Schneider has been ever so patient with all my questions. Angela, you are genuine and empathetic; your patience, kindness, and understanding have truly changed my worldview, and without your willingness and support, I would not be where I am now.

Finally, thank you, Mick. Only someone who has lived with a Ph.D. student can know what the day-to-day is like. Thank you for kindness and unconditional support.

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Abbreviations

ACSM	American College of Sports Medicine
AFI	Athletics Federation India
ASA	Athletics South Africa
CAS	Court of Arbitration for Sport
CHSTM	Consortium for History of Science, Technology and Medicine
CMAJ	Canadian Medical Association Journal
CSSR	Czechoslavak Socialist Republic
DHT	Dihydrotestosterone
DNA	Deoxyribonucleic Acid
DSD	Differences of Sex Development
EPOR	Erythropoietin Receptor Gene
EU	European Union
FDA	Food and Drug Administration
FIMS	Fédération Internationale de Medicine Sportive
FINA	Fédération Internationale de Natation
FP	Fair Play (referring to types of fair play infractions classified by Ioan-Radu Motoarca)
IAAF	International Association of Athletics Federation (known as World Athletics after October 2019)
IAPS	The International Association for the Philosophy of Sport
IF	International Federation
IOC	International Olympic Committee
IQ	Intelligence Quota
JAMA	Journal of the American Medical Association
NASSH	North American Association for Sport History
NIH	National Institute of Health
NOC	National Organising Committee
OC	Oral Contraception
OSC	Olympic Studies Centre
PCOS	Polycystic Ovarian Syndrome
PFCO	Primary Familial and Congenital Polycythemia
PCR	Polymerase Chain Reaction
RNA	Ribonucleic Acid
SHBG	Sex Hormone-Binding Globulin
SSHRC	Social Sciences and Humanities Research Council
US	United States
UCI	Union Cycliste Internationale
USSR	Soviet Union
UEFA	Union of European Football Association
WADA	World Anti-Doping Agency
WHO	World Health Organization

Chapter 1

1 Introduction

In the landmark case, *Dutee Chand against the Athletics Federation of India (AFI) and the International Association of Athletics Federations (IAAF),* Indian sprinter Dutee Chand successfully won an Interim Award to suspend female eligibility regulations. The "IAAF Regulation Governing Eligibility of Females with Hyperandrogenism to Compete in Women's Competition" was suspended until the AFI and IAAF provided evidence that hyperandrogenism grants an unfair advantage in the women's category. Among her claims were that the regulations discriminated against athletes with specific natural physical characteristics, and were based on inaccurate and potentially biased knowledge of the relationship between testosterone and athletic performance, thus constituting a form of doping control.[1] Chand's case highlights the potential of hegemonic masculinity in sport, which suggests that the 'muscular female' is somehow incompatible with sports competition.[2] Chand's case might come as a surprise to some, but the regulation of participation in women's sport by defining and examining female bodies has occurred in Olympic sport since the 1930s.[3] Chand's success marks a significant shift in ideologies around sex and gender that has plagued sport since the inception of the modern Olympics in 1894.

Chand's case successfully halted the regulations "IAAF Regulation Governing Eligibility of Females with Hyperandrogenism to Compete in Women's Competition" and forced IAAF officials to adjust the regulations to be more appropriately based on scientific

[1] Dutee Chand v. Athletics Federation of India (AFI) and International Association of Athletics Federations (IAAF), 2014/a/3759 (CAS, 2015) 1, 3.

[2] As Cahn (2015: 54) denotes, women's sports inherently contested this idea, "Symbolically, women's sport stood for female advancement and shrinking male hegemony." See Susan K. Cahn, *Coming on Strong: Gender and Sexuality in Women's Sport* (Cambridge: Harvard University Press, 2015), 54.

[3] Myron Genel, Joe L. Simpson, and Albert de la Chapelle, "The Olympic Games and Athletic Sex Assignment," *JAMA: Journal of The American Medical Association* 316, no. 13 (Oct 4 2016): 1359-60, https://doi.org/10.1001/jama.2016.11850.

evidence. While improved upon, regulations to manage eligibility requirements remain controversial.

In 2018, Semenya and Athletics South Africa submitted a formal dispute against the IAAF: *CAS2018/O/5794 Mokgadi Caster Semenya v. International Association of Athletics Federations* and *CAS 2018/O/5798 Athletics South Africa v International Association of Athletics Federations* (herein referred to as *Mokgadi Caster Semenya & ASA v IAAF*). Semenya and the ASA's primary claims were that the IAAF's "Eligibility Regulations for Female Classification (Athlete with Differences of Sexual Development)" (herein referred to as the IAAF's 2018 Eligibility Regulations for the Female Classification) discriminated against athletes based on their sex or gender. As the Arbitral Award details: "[these Regulations] only apply i) to female athletes; and ii) to female athletes having certain physiological traits."[4] During the hearing, which Semenya ended up losing, both parties presented evidence to support either the claims of discrimination or the claims in support of the regulations. Such evidence presented included the decision of Chand's case wherein the Court of Arbitration for Sport (CAS) delivered an Interim Award that upheld Chand's appeal and suspended the regulations (at the time referred to as Hyperandrogenism Regulations) for up to two years.[5]

The regulations in question for the Semenya case govern eligibility for females with differences of sex development (DSDs) when participating in the women's events. This regulation requires testing for a level of endogenous testosterone above 5nmol/L to

[4] Mokgadi Caster Semenya and Athletics South Africa (ASI) v. International Association of Athletics Federations (IAAF) 2018/O/5798 and 5794 (CAS, 2018), 1. An important distinction should be made between the terminology 'female' and 'women.' Females refer to the biological sex of individuals with female reproductive properties, and in the sporting context, this is the aspect being regulated at this moment. Women, on the hand, refers to a gender-identity. While it is commonly associated with those individuals who have female reproductive parts, this is not always the case. While the IOC recognizes these distinctions, sports categories separate based on 'men' and 'women,' looking to legal sex and testosterone levels to judge who is who. Because sport still uses the term women to classify the sport category, there is often confusion of the use of these terms. This dissertation refers to both when appropriate; female to refer to the biological sex of athletes and women to refer to the either the gender-identity or the gender-category in sport.

[5] *Dutee Chand v. AFI & IAAF*, 2014a/3759 (CAS, 2015) 1, 3. Since this decision, the IAAF's 2018 Eligibility Regulations for the Female Classification and replaced it with new regulations, which are now the regulations under consideration for Semenya's case. This terminated the Chand case as the regulations did not apply to Chand.

participate in eight events in international athletics competitions.[6] If an athlete fails this test, and has a DSD, they must regulate the endogenous production of testosterone using medication or they are no longer able to participate in the women's classification.[7] Also significant is that throughout the hearing, the IAAF issued a late modification of the IAAF's 2018 Eligibility Regulations for the Female Classification and Semenya could not prepare for the hearing with the amended items under consideration and was unable to procure expert testimony. Semenya claimed that this late addition violated her right to procedural and substantive fairness, among other things.[8]

While news of testing elite female athletes might be surprising to those who are unfamiliar with its occurrence, female Olympic and elite athletes have been subjected to biological, genetic and social distinction since the 1930s and even earlier, considering that females were not allowed to participate in the inaugural year of the modern Olympic revival. Since the modern Olympic revival, Olympic sports have been segregated by gender; the women's category has been regulated on an informal basis since the 1930s. By the 1960s, elite sport's governing bodies issued formal sex tests, as they have been called by the International Olympic Committee (IOC) and in the literature, as a way to *confirm* a woman's biological or genetic sex through an examination of genitals and later a genetic test by issue of a buccal swab.[9] Sex tests were ordered as a form of protection, as the IOC states, to protect

[6] The use of the phrase used by CAS is significant as they state that the DSD regulations "establish new mandatory requirements governing the eligibility of women with certain differences of sex development ("DSD")…" *Dutee Chand v. AFI & IAAF*, 2014/a/3759 (CAS, 2015) 1.

[7] There is also some controversy around this requirement of the regulation as it was initially the case in the Hyperandrogenism Regulations that women were to obtain surgery. This has been removed as a violation of medical ethics. And the requirement that individuals are to not participate is part-and-parcel to the complaint at hand as other than taking medication in order to lower the endogenous testosterone levels, there is no other avenue that allow athletes with DSDs to participate in the eight sports in question in Athletics.

[8] *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018), 1, 8. Semenya also submitted complaints against the amended items themselves, in particular evidence against the use of oral contraception (OC) for testosterone management.

[9] Otherwise known as the Barr Body test. See: Albert de la Chapelle, "The Use and Misuse of Sex Chromatin Screening For "Gender Identification" of Female Athletes," *JAMA: Journal of the American Medical Association* 256, no. 14 (1986):1920-1923; Lindsay P. Pieper, *Sex Testing: Gender Policing in Women's Sports* (Chicago: University of Illinois, 2016), 61; James L. Rupert, "Genitals to Genes: The History and Biology of Gender Verification in the Olympics," *Canadian Bulletin of Medical History* 28, no. 2 (2011): 339-65.

the female classification in sport against those who might compete unfairly if they are not scientifically classified as women, but as men or intersex individuals.[10]

Cases of gender verification that exist outside of sport are typically reserved for individuals born with obvious intersex conditions or for individuals who seek gender-confirming surgery. The motivation to confirm the sex of athletes in the female category implies at least two things: i) that some athletes might be disqualified from the women's competition for their biological sex when this is not the case for athletes competing in the male category; and ii) that biological or genetic sex can be confirmed, and it can determine who plays in women's sport. The IAAF's 2018 Eligibility Regulations for the Female Classification seeks to move away from this confusion. Testing for genetic markers ended in 1996. The IAAF's 2018 Eligibility Regulations for the Female Classification was reissued as *ad hoc* testing that measured testosterone levels. Some scholars argue that this is too reminiscent of sex testing; in that, while the tests are for a different function, the tests are still targeting the female classification.[11] Male athletes are not (and have never been) tested for sex characteristics like gynecological, phenotypical, genetic, or sex markers under the intention that their sex needs to be verified.[12] While males have been subjected to doping tests since dope tests were introduced, the need to "verify" sex is a profoundly different manner. Dope tests at present might test similar markers compared to the hyperandrogenism tests, but the need to introduce the distinction of hyperandrogenism from doping is significant and should not be overlooked. Doping tests are also a test for maleness; females also submit to doping tests, and dope tests test for exogenous (externally produced and then consumed) performance enhancers. This differs from hyperandrogenism, which is an endogenous

[10] Pieper, *Sex Testing*, 61; de la Chapelle, "Use and Misuse," 1920-1923.

Although there is no strong evidence to suggest that genetic males were competing in the women's category.

[11] Paul Davis and Lisa Edwards, "The New IOC and IAAF Policies on Female Eligibility: Old Emperor, New Clothes?" *Sport, Ethics and Philosophy* 8, no. 1 (2014): 54, https://doi.org/10.1080/17511321.2014.899613; Genel, Simpson, and de la Chapelle, "Olympic Games," 1359.

[12] Sheri L. Dworkin and Cheryl Cooky, "Sport, Sex Segregation, and Sex Testing: Critical Reflections on This Unjust Marriage," *American Journal of Bioethics* 12, no. 7 (2012): 21-3, https://doi.org/10.1080/15265161.2012.680545.

performance enhancer.[13] The need to confirm a given sex or sex markers like testosterone in sport also grants a false belief that the IAAF is the representing body that can make these very personal decisions.

Through its Medical Commission and by sanctioning scientific sex tests, the IOC was attempting to determine what it means to be female for sports competition and has chosen to use its authority to scientifically enforce sex segregation in sports competition through medical examinations and scientific testing.[14] The IOC's moral justification was twofold: i) the importance of fair play in the *Olympic Charter*; and ii) the concerns raised by many women athletes who were, or who had, competed at the Olympic Games.[15] Testing sex in sport has been labelled by some authors as inhumane and criticized for being based on lingering (Victorian) assumptions of discriminating sex differences.[16] Those in support of the newest eligibility requirements, the IAAF's 2018 Eligibility Regulations for the Female Classification, claim that it promotes a test that will protect female athletes against female athletes who have androgenizing physiological effects and therefore might benefit from sporting advantages that are like the physiological advantages associated with testosterone.[17] Therefore, this dissertation aims to contribute to this discussion with

[13] There is also significance in the fact that other genetic performance enhancers exist, but they are not being tested for. Somehow the sex-based endogenous performance enhancers (those that are dependent on sex chromosomes) are the ones that matter.

[14] Kathryn E Henne, *Testing for Athlete Citizenship: Regulating Doping and Sex in Sport* (New Jersey: Rutgers University Press, 2015); Dworkin and Cooky, "Unjust Marriage," 21; Sarah Teetzel and Cesar R. Torres, "Drug Testing, Sex Verification, and the 1967 Pan-American Games," *The International Journal of the History of Sport* 33, no. 1-2 (2016), https://doi.org/10.1080/09523367.2015.1134499.

[15] IOC, "IOC Consensus Meeting on Sex Reassignment and Hyperandrogenism november 2015," (2015).

[16] Katrina Karkazis et al., "Out of Bounds? A Critique of the New Policies on Hyperandrogenism in Elite Female Athletes," *American Journal of Bioethics* 12, no. 7 (2012), https://doi.org/10.1080/15265161.2012.680533; Kathryn Henne, "The "Science" of Fair Play in Sport: Gender and the Politics of Testing," *Signs: Journal of Women in Culture and Society* 39, no. 3 (2014). Jaime Schultz, "Caster Semenya and the "Question of Too": Sex Testing in Elite Women's Sport and the Issue of Advantage," *Quest* 63, no. 2 (2011), https://doi.org/10.1080/00336297.2011.10483678. Professor Doriane Lambelet Coleman, expert witness and former elite 800 meter runner, testimony at Swiss Supreme Court. Source: New York Times, author: Jere Longman, date: Sept. 8, 2020.

[17] Martin Ritzén et al., "The Regulations About Eligibility for Women with Hyperandrogenism to Compete in Women's Category are Well Founded. A Rebuttal to the Conclusions by Healy et al," *Clinical Endocrinolgy* 82, no. 2 (Feb 2015): 307-8. https://doi.org/10.1111/cen.12531.

an analysis of the IOC's use, role, and function of sports medical science in the development of sex testing historically and in IAAF's 2018 Eligibility Regulations for the Female Classification. While the IAAF's 2018 Eligibility Regulations for the Female Classification is administered by the IAAF, a sport governing body in its own right, their powers to allow competition within Olympic sport are regulated by the IOC, and therefore the extension to the eligibility regulations can be analyzed from the lens of the IOC.

1.1 Purpose

This dissertation primarily analyzed the IOC's use of sports medical science to implement sex testing in the past and support testing for the IAAF's 2018 Eligibility Regulations for the Female Classification. This research argues that the historical practice of sex testing and continued practice of testing for hyperandrogenism (through the IAAF's 2018 Eligibility Regulations for the Female Classification) contributes to a discourse that targets female elite athletes, known as female testing. A critical feminist analysis and archival data contributed to an interpretation of female testing discourse, focusing on the IOC's use of medical science to determine sex-based eligibility. Part of the analysis included in this dissertation assesses whether or not the science used was based on biological or genetic determinism, or the belief that human physiology directly influences or controls human behaviour. The concept of biological determinism was a thought child of feminist critiques of science from the 1980s. [18] This discourse was traced through three avenues, starting with the history of the sports medical literature as it relates to sex testing, a critical feminist analysis of the 2019 hearing of middle-distance runner Semenya (i.e., *Mokgadi Caster Semenya & ASA v IAAF*), and a discourse analysis of the IOC's implementation of sex testing through archival material.

At the outset, the primary research question was: *Can the current science on the female athlete explain medical (e.g., physiological, hormonal, or genetic) reasons to require sex*

[18] Notable scholars include Anne Fausto-Sterling, *Sexing the Body: Gender Politics and the Construction of Sexuality* (New York: Basic Books, 2000); Kathleen Okruhlik, "Gender and the Biological Sciences," *Canadian Journal of Philosophy* 21 (1994); and Sandra G. Harding, *The Science Question in Feminism* (Milton Keynes: Open University Press, 1986).

testing for fair play in elite sports competitions such as the Olympic Games? Secondary questions were: How are women being protected by these sex tests? Is this protection necessary? However, the research question was modified during the initial data collection phase. The research question was adjusted for historical methods and because initial data collection showed a dearth of data (i.e., scientific research explaining sex testing). To better ascertain the role of the IOC in determining the sex testing science, the primary research question was: *In what ways (i.e., scientific, social, assumptive) do IOC members justify (if at all) sex testing in Olympic competitions?* The primary lens in data collection and analysis was to determine the role and relationship of the science used. Therefore, secondary questions included: *What types of scientific knowledge is used to support sex testing? How is the science or scientific knowledge applied?* These questions aim to identify how the IOC interacted with the relevant science and applied scientific knowledge to sporting females.

Data was collected from the IOC's archival material (i.e., Olympic Studies Centre [OSC] archives), university libraries, and online academic libraries. Historical data collection centred on the formal period that the IOC officially implemented sex testing since archival material at the OSC was limited to a 25-year embargo. This period ranged roughly from 1950 to 1999.

1.2 Sex/gender and masculinity/femininity

Distinctions between sex/gender and femininity/masculinity are necessary for this discussion. Concepts of sex/gender, femininity/masculinity are debated in the feminist literature and cannot be taken up as the focus of this dissertation.[19] However, distinctions between sex/gender and femininity/masculinity need to be considered as they reside at the core of discussions of sex testing in sport. Sex and gender are distinctly different. Sex refers to a person's biology and is predicated mainly on reproductive anatomy functions, among other things. (Attempts to change sex can be made through gender-confirming surgery; however, this dissertation does not address individuals with gender-confirming

[19] Judith Butler. *Undoing Gender.* (East Sussex; Psychology Press, 2004). My perspectives on this topic come from Anne Fausto-Sterling, Judith Butler, Betty Freidan and Simone de Beauvoir.

surgery as its primary focus). Gender, on the other hand, is a social marker for a person. Many people confuse sex and gender as being the same thing, but they are not. Gender is individually chosen (i.e., gender identity). Femininity and masculinity also refer to social characteristics and are stereotypically related to gender distinctions. For example, to be feminine might represent social assumptions around behaviour, the clothes one wears, the types of hobbies and interests one has.

In an editorial for *The Exchange*, long time academic editor and scholar in scientific communication Geoff Hart provided two explanations for why an unimpeded reliance on binary thinking is problematic:

> The first is simply reality: far more of the universe is made up of things that are continuous in nature, with no neat distinctions and many intermediate values between any two points, than is made up of things with discrete, binary characteristics… The second and more serious problem is that… binary thinking divides the universe into us and them, opposing camps who can only agree on the need to fight until one camp declares victory. [20]

When discussing sex/gender and femininity/masculinity within the IOC context, there has been confusion in the past. The IOC recognizes these distinctions and does not discriminate based on one's gender identity or social distinctions. When discussing these distinctions, sex refers to a person's biological sex composition (e.g., male, female, and intersex), gender refers to a person's gender identity (e.g., man, woman, queer, and nonbinary), and femininity/masculinity refers to common gender-based stereotypes associated with genders. There is a separate testing regulation for athletes who have undergone gender-confirming surgery. Separate scientific tests are applied to individuals who have undergone male-to-female gender-confirming surgery primarily but not to those who have undergone female-to-male gender-confirming surgery. Regardless, the terminology for addressing the gender-confirming surgery regulations is different from the language for testing female athletes.

[20] Geoff Hart, "Editorial: Binary Thinking," *The Exchange*, 2005, 9.

1.3 Justification

Pieper argued that the increase in overly muscular females during the Cold War sparked public fear that males were competing in the women's category.[21] Informal testing had occurred unofficially as reported in newspapers in the 1930s when Missouri runner Helen Stephens blew past her opponents in the 100-metre finals of the 1936 Berlin Summer Olympics.[22] Controversial in its own right, reports suggested that the sex of Helen Stephens and her competitor, Polish-American track and field athlete Stanisława Walasiewicz, were questioned because they were too good at their sport of choice.[23] The Cold War Olympic sports era was considered a period filled with political tensions since the sporting successes also spoke to the successes outside of sport and the 1960s. When the Soviet Union and the United States emerged as antithesis superpowers, Soviet track and field athletes and sisters Irina and Tamara Press gained notoriety for being suspiciously 'abnormal' in athletic prowess (i.e., strength, speed, or another performance characteristic).[24] The IOC responded to newspaper reports by implementing a female testing procedure to ensure suspicious female athletes like the Press sisters were medically classified as females.[25]

History of sport scholars have documented histories of sex testing. What is lacking is a connection between the implementation of sex testing and the IOC's related use of science to support sex testing. While the approach in this research is centred on the current practice of testing female athletes for hyperandrogenism, continued research into the history of sex testing can speak to how sex testing in sport regulated women athlete's

[21] Pieper. *Sex* Testing, 36.

[22] Pieper, *Sex Testing*, 11; Vanessa Heggie, "Testing Sex and Gender in Sports; Reinventing, Reimagining and Reconstructing Histories," *Endeavour* 34, no. 4 (Dec 2010), https://doi.org/10.1016/j.endeavour.2010.09.005.

[23] Pieper, *Sex Testing*, 11.

[24] Pieper, *Sex Testing*, 54-5.

[25] "IOC Medical Commission Fonds," (Lausanne, Switzerland: Olympic Studies Centre Archives, 1967-1996). IOC. "IOC Consensus Meeting on Sex Reassignment and Hyperandrogenism November 2015." 2015.

bodies. Therefore, there is a need to draw different connections between the IOC and historically administering sex testing.

The IOC has continually claimed, through their *Charter*,[26] that the tests are required in order to ensure that there is fair play in sport. Fair play, also referred to as levelling the playing field, refers to a good value upheld by sport, specifically promoted as inherent in the Olympic sport's ideology known as Olympism. The fair play literature in the philosophy of sport is vast, and this dissertation does not aim to directly argue for or against any current debates on this topic.

Throughout time, Olympic eligibility requirements for testing female athletes have evolved to test for markers of excess testosterone production; and the IAAF's 2018 Eligibility Regulations for the Female Classification does not test females for genetic markers of sex like the policy before 1996. Instead, the eligibility requirements require that female athletes be tested in an *ad hoc* manner to check if they have higher androgen levels and if their body is receptive to those androgens. More specifically, the IAAF's 2018 Eligibility Regulations for the Female Classification aims to verify whether female athletes have a condition known as hyperandrogenism. Hyperandrogenism is an endocrine disorder that can occur in women of reproductive age, and the majority of individuals who have hyperandrogenism will have polycystic ovary syndrome (PCOS).[27]

[26] IOC, *Olympic Charter*, (2015).

[27] Hyperandrogenism is genetically understood to be a DSD (i.e., differences of sex development) due to the genetic presence of an XY gene; the individual usually exhibits common traits for females but also generates high levels of androgens which create and regulate testosterone output in the body. Polycystic ovarian syndrome (PCOS) is a condition not always linked to DSDs and might affect 5% of the female population. Characteristics of PCOS are long times between periods (or not periods), period irregularity, fluid-filled sacs (called follicles) on the ovaries, and inhibited androgen receptivity. Héctor F. Escobar-Morreale, Manuel Luque-Ramírez, and José L. San Millán, "The Molecular-Genetic Basis of Functional Hyperandrogenism and the Polycystic Ovary Syndrome," *Endocrine Reviews* 26, no. 2 (2005); Bulent O Yildiz, "Diagnosis of Hyperandrogenism: Clinical Criteria," *Best Practice and Research Clinical Endocrinology and Metabolism* 20, no. 2 (2006); Ricardo Azziz and Howard A. Zacur, "21-Hydroxylase Deficiency in Female Hyperandrogenism: Screening and Diagnosis," *The Journal Of Clinical Endocrinology and Metabolism* 69, no. 3 (1989).

One avenue within the female testing literature that is underdeveloped is the role of science in female testing.[28] Current scientific literature states that certain physical traits are directly caused by the hormone testosterone, a significant biological marker for the male sex. With it comes significant physical advantages (e.g., increased strength, power, muscle mass, and stature) that can be advantageous in select sports.[29] However, the scientific tests are not meant to reduce athletes only to their biological makeup, but instead, provide a more significant biological or genetic understanding of the advantages that might be conferred upon female athletes.[30]

This dissertation does not suggest that the science in support of female testing is wrong. This dissertation calls for more oversight on the use of medical literature in the public realm. Science is about finding truth and evolving when new truths emerge. The empirical sciences utilize a highly rigorous paradigm of experimentation typically shaped by a commonly agreed upon epistemology that enables scientists to communicate and interpret new information. While much time is spent developing scientific frameworks, South African sports medical scientist Tim Noakes argues that these frameworks can become comfortable, and a failure to evolve paradigms can result in missed academic opportunities.[31] Therefore, this dissertation urges more scholars to assess the ways that medical science has been used, for instance, to control one aspect of sport and social life.

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[28] Henne, "Science of Fair Play."

[29] Katrina Karkazis and Rebecca M. Jordan-Young, "The Powers of Testosterone: Obscuring Race and Regional Bias in the Regulation of Women Athletes," *Feminist Formations* 30, no. 2 (2018); Barry D. Dickinson et al., "Gender Verification of Female Olympic Athletes," *Medicine and Science in Sports and Exercise* 34, no. 10 (Oct 2002), https://doi.org/10.1249/01.MSS.0000030845.73118.79; IOC, "Consensus Meeting on Sex Reassignment."

[30] One of the important issues at stake in understanding the scientific and moral dilemma is the core structure for understanding the lines on which our knowledge about sex differences stand. As argued by Viennese philosopher Karl Popper in *Science as Falsification*, one of the most forgotten principles of empiricism is that truth claims must be falsifiable, or the Falsification Principle. See Tim Noakes, "How Does a Foundational Myth Become Sacred Scientific Dogma?" *Philosophy and the Sciences of Exercise, Health and Sport* (2004); Karl R Popper, "Science as Falsification," *Conjectures and Refutations* 1 (1963); Also refer to Arthur L. Caplan, "Fairer Sex: The Ethics of Determining Gender for Athletic Eligibility: Commentary on "Beyond the Caster Semenya Controversy: The Case of the Use of Genetics for Gender Testing in Sport,"" *Journal of Genetic Counseling* 19, no. 6 (Dec 2010): 549-50, https://doi.org/10.1007/s10897-010-9322-0.

[31] Noakes, "Foundational Myth" (2004).

The IOC's use of science to uphold fair play, sex segregation and sex differences should not be overlooked. The claims that females need protection from males and that these divisions by sex must occur in sport must stand up to scientific and ethical scrutiny.[32] Since female testing's moral impetus is for fairness and protection, then sport ethics literature should consider the ways that sports science is applied.

1.4 Author's standpoint and reflexivity

In particular, female testing has contributed to a discussion on what it means to be a woman or female, and through the IOC's research has led an advancing medico-technological industry. This dissertation is urging for caution when using new science in sport. Moreover, while the IOC has changed the language around testing to reflect hyperandrogenism, some scholars believe that the IAAF's 2018 Eligibility Regulations for the Female Classification still reflects dated notions about femaleness (and femininity).[33] Therefore, this research suggests caution when females are the only group tested for sex-based distinctions.

I believe that science is a way of viewing the natural world around us, and perhaps one way humans can understand their place in the world. As presented by feminist historian Donna Haraway in "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," science is still a form of rhetoric, or "a series of efforts to persuade relevant social actors that one's manufactured knowledge is a route to a desired form of very objective power."[34] Even in its mathematical formulas, science is still a manufactured product of humankind and subject to conflicting cultural influences. According to Haraway, the problem occurs when these influences are left untended.[35]

[32] The IOC uses the word 'protection' in regard to sex testing, a word that is controversial in its use.

[33] Davis and Edwards, "Old Emperor, New Clothes," 53.

[34] Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (1988): 577.

[35] Haraway, "Situated Knowledges," 577.

Additionally, if sport's governing bodies continue to use science to support female testing, then we must collectively reevaluate our core beliefs about sex differences and the sex category. With the understanding that sex and gender are not analogous, and neither are dimorphic (i.e., sex is more than just male versus female and gender is more than just man versus woman), the reevaluation of how we conduct and interpret science might involve more research on intersex individuals within a supportive framework and applied queer theories. Reevaluation can help recognize research founded on principles of dimorphic sex and that fails to encompass the full and more modern understanding of sex/gender.[36] This dissertation contributes to the discussion on female testing in sports competitions to move towards progression that allows all humans to express themselves through sport and personal expression.

This standpoint of female testing is inherently critical. Female testing may be necessary, but the IOC should be cautious due to the history of treatment women have endured in the biomedical space. Challenging a topic like sex testing is extremely difficult; continual reflexive checks during research collection, analysis and presentation were required to present the findings in an accurate way, rather than in the way that fit the beliefs of myself, the researcher.[37] In reading this topic, readers must also suspend assumptions and beliefs about sex/gender. Heated discussions about sex/gender and discrimination against women, women of colour, and other marginalized groups can be difficult to navigate. Therefore, when approaching the topic of female testing, recognize that there may be some biases that readers may need to reconsider. In doing so, scholars can enter into more comprehensive discussions about research methods.

The formal name for Sex Testing has changed throughout the years of testing, starting in 1968 in Grenoble as Sex Verification, and then changing to Women's Medical

[36] This is a suggestion that science account for all sexes and genders in research and moves away from a bipolar view of male/female, man/woman. This includes intersex, non-binary, and trans experiences and research.

[37] Reflexive checks through the research period included critical reflecting on personal biases and beliefs, re-thinking, journaling, discussions questions with colleague, re-reading, re-analyzing, and cross analyzing. Other non-reflexive checks included reading academic articles, media articles, and social media accounts of the issue.

Examination in Mexico City of the same year.[38] These names can be exceptionally bothersome and confusing. For accuracy, this dissertation refers to female testing. This name does not entirely capture the testing procedure, as the tests discriminated against females with masculine physique or males participating in the female category, which would potentially suggest transgender athletes at that time. Instead, it reflects that the tests aimed to identify a finding for female biology.

1.5 Method

This research sourced relevant historical data to identify a medical discourse analysis of sex testing female athletes. Methods include Kuhnian discourse analysis (through a form of genealogical tracing). This multi-layered research genealogical discourse analysis aimed to identify knowledge and knowledge contributors relevant to sex testing historically. Kuhnian discourse analysis works by identifying focal knowledge (i.e., the primary knowledge) for sex testing and then analyzing it through a subject-object filter. Philosopher Thomas Kuhn identifies ruptures as fundamental shifts when a scientific paradigm evolves and changes to a new set of beliefs. Kuhn's genealogical analysis is used in the philosophy of sciences to track historical changes, relationships, and events within a scientific paradigm. Kuhn has yet been used in the history of sports medicine.

Therefore, the Kuhnian genealogical method identified the knowledge that wields power in a given situation (i.e., the relevant knowledge and knowledge contributors).[39] Common language and key identifiers are recognized, and then crucial ruptures (i.e., focal knowledge) are then classified. The relevant knowledge then presented in this chapter mapped out into a trend called a discourse. This dissertation defines discourse as a set of beliefs, assumptions, or norms perpetuated through social interactions, personal

[38] They have also been referred to as 'Sex Check,' 'Sex Control,' 'Femininity Testing,' 'Femininity Test,' 'Gender Verification,' 'Gender Control,' and 'Gender Test[ing].' See Lindsay Parks Pieper, "Sex Testing and the Maintenance of Western Femininity in International Sport," *The International Journal of the History of Sport* 31, no. 13 (2014); Pieper, *Sex Testing*, 3.

[39] Michel Foucault, *Archaeology of Knowledge* (New York: Vintage Books, 2013); Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 2012).

behaviour, and cultural and societal reinforcement.[40] Discourse appears paradigmatically in the chosen and omitted language, the chosen structure for arguments, and research designs and aims. Discourse is a powerful prevalent of ideologies within and across nations, races, sexes, classes, identities, and consciousness.[41]

Data collection was required first to assess the connection between the IOC and their use of science. Primary research was conducted at the Olympic Studies Centre (OSC) archives in Lausanne, Switzerland. The IOC granted access in support of the 2019 IOC Ph.D. Students and Early Career Academics Research Programme.[42] Details of fonds were provided by the OSC librarians in conjunction with the research proposal. Since there is no public, published account of the science the IOC used, much of the data included referential research from Medical Commission members and catalogues within the OSC.[43] Sources like the IOC's *Encyclopaedia of Sports Medicine*, *Women in Sport* provided useful overviews by leading researchers in areas deemed necessary to the IOC and elite sport.[44] This encyclopedia was useful because it is solely concerned with women's physiological, anatomical and psychological adaptations or responses to sport dating back to 1985.

A genealogical data collection occurred within OSC archives. The time range was between 1950 – 1999 due to the IOC's 25-year embargo, the availability of the research at the OSC archives, and because this period encompasses the formal period when the IOC required sex testing competition. This genealogical tracing identified links between

[40] Derived from Foucault, *Archaeology of Knowledge*, 80-1.

[41] Foucault, *Archaeology of Knowledge*, 109-111.

[42] The research was supported by this grant programme from 2019-2020 but research was conducted solely by me and no bias cannot be stated based on receiving this funding. Research was conducted within one week while on-site in Lausanne, Switzerland in the Spring of 2019.

[43] OSC files detailed included those categorized under the IOC Medical Commission (with reference code B-ID04-MEDIC/001-040), the IAAF (with reference code D-RM02-ATHLETE/001-031), some related to United States National Organizing Committees (D-RM01-ETATU/001-092, although only files from D-RM01-ETATU/003-004 were inspected and the information was deemed irrelevant).

[44] Arne Ljungqvist, "Gender Verification," *The Olympic Encyclopaedia in Sports Medicine* 8 (2000). While this resource is 20 years, it is still a highly-cited resources. This is most likely because Ljungqvist was one of the leading contributors to the implementation of sex testing as an Olympic member.

IOC members, Medical Commission members and other stakeholders and medical science support for sex testing. While semi-arbitrary, this time frame is significant because it centres on the decades where the debate about sex testing was most prominent and mostly formally reinforced.[45] Sources like Eileen O'Connor and Patricia Vertinsky's "Towards a Discernable History of Sports Medicine"[46] helped track which contributors, journals, articles, and books have added to sports medicine historically. Methodological tracing was supported by Thomas Kuhn's *The Structure of Scientific Revolutions*.[47] Kuhn's methodology can work in reverse (i.e., from now moving through history) so it can trace lines of thought through history, actors, and method changes. What emerges is a potential history of a thought or discourse. Since female testing is does not exist within one discipline or body of knowledge, Kuhn helps piece together a history of female testing.

A pragmatic analysis of *Mokgadi Caster Semenya & ASA v IAAF* was conducted. The procedure and findings of Semenya's CAS case are directly relevant to the IOC's use of fair play. Pragmatism extrapolated the overlapping legal issues involved in the cases of *Mokgadi Caster Semenya & ASA v IAAF*.[48] Pragmatism offers a unique set of attributes for scholars attempting to make sense of the many confounding issues of intersexuality in sport. This chapter draws heavily from philosopher Richard Posner's (1990) article "What Has Pragmatism to Offer Law" as it creates a useful bridge between the core concepts of pragmatism, its history, its effectiveness in challenging a particular issue, and its relevance

[45] The IOC's Medical Commission was created in 1967, and testing was implemented by the IAAF in 1966 and formally for the IOC in 1969. Testing was suspending in 1992 and abandoned in 1996. Arne Ljungqvist, Correspondence Regarding the Working Group for Sex Testing, Mar 18, 1988, B-ID04-MEDIC, IOC Medical Commission, 036/SD2: Olympic Studies Centre Archives, Lausanne, Switzerland.

[46] Eileen O'Connor and Patricia A. Vertinsky, "Towards a Discernable History of Sports Medicine," *Canadian Bulletin of Medical History* 28, no. 2 (2011).

[47] Kuhn, *Scientific Revolutions*, 12-3.

[48] *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018).

The usefulness of pragmatism in Semenya's case was highlighted by philosopher Dr. Alun Hardman address at the International Association for the Philosophy of Sport conference in Kyoto, Japan, in September of 2019. Now published, Tim L. Elcombe and Alun R. Hardman, "Pragmatic Conventionalism and Sport Normativity in the Face of Intractable Dilemmas," *Journal of the Philosophy of Sport* 47, no. 1 (2020).

to the philosophy of sport.[49] The role and relationships between lex sportiva (sports law) and fair play specific to the case of South African middle-distance runner Semenya was analyzed. Semenya's eligibility rests on several values within sport, namely fair play and the right to participate, which was analyzed through philosopher Ioan-Radu Motoarca's case study of known versus unknown violations of fair play in sport.

The genealogy is taken back up through a technical weaving of the history of genetics and history of endocrinology as it correlates with the historical development of female testing. In considering relationships with fair play, the genealogy, discourse analysis, and critical history of the science related to sex testing is brought to the forefront.

The dissertation concludes with a presentation of fair play and female testing. The literature on fair play (also referred to as the level playing field) in sports competitions is comprehensive, and this dissertation contributes to an understanding of fair play and sex testing.[50] Additionally, the specific topic of gender categories (and the definition of woman within the sport context) and sex testing in sport is also addressed in the sport ethics literature.[51]

1.6 Research contribution

Critical sociological, philosophical and historical research on female testing has explored the role of science in determining female testing regulations.[52] Therefore, this scholarship aims to expand the current understandings of the role of science in sex testing. Since

[49] Richard A Posner, "What Has Pragmatism to Offer Law," *Southern California Law Review* 63 (1990).

[50] Sigmund Loland, *Fair Play in Sport: A Moral Norm System* (London: Routledge, 2013); Angela Schneider and Robert Butcher, "Pre-Lusory Games for Goals: A Gambit Declined," (1997); Robert L Simon, *Fair Play: The Ethics of Sport* (London: Routledge, 2018).

[51] Torbjörn Tännsjö and Claudio M. Tamburrini, *Values in Sport: Elitism, Nationalism, Gender Equality, and the Scientific Manufacturing of Winners* (Taylor and Francis, 2000); Angela Schneider and Mikael Gonsalves, "The Role and Relationship of Science and Ethics in the Evaluation of Fairness in Sport," *Sport in Society* 22, no. 9 (2018); Pam Sailors, Sarah Teetzel, and Charlene Weaving, "The Complexities of Sport, Gender, and Drug Testing," *American Journal of Bioethics* 12, no. 7 (2012).

[52] Alison Wrynn, "The Human Factor: Science, Medicine and the International Olympic Committee, 1900–70," *Sport in Society* 7, no. 2 (2004), https://doi.org/10.1080/1461098042000222270; Schneider and Gonsalves, "Science, Ethics, and Fairness."

sports science and sports medicine history is sparse, this research adds to a history around sex testing and highlights truth-claims prioritized over others regarding elite women's sport. This research should also be extended to the critical analysis of science within sport.[53]

The history of sports medicine is sparse, with much of the research being conducted as a facet of sports medicine discipline or sport history. Therefore, this research is the first to use this methodology to history of sport studies, especially for tracking the relationship between sports medicine and a private organization like the IOC. Minimal research has been conducted on sports medicine history and the development of endocrinology or genetics through a sports lens. In conjunction with endocrinologist Alan Rogol, sport historian Lindsay Parks Pieper has begun to research this line of work, and this research can contribute to this understanding.[54]

1.7 Delimitations

This study reviewed documents from actors who contributed to the scientific literature and created and implemented sex testing eligibility regulations historically to determine if the choices made were arbitrary and, in some way, affected by personal biases. Scrutinizing all the political actions regarding female testing within the sport's governing organizations and the scientific research groups would be beyond this paper's scope. The use of relevant and available meeting minutes from the IOC (and related committees) and communications between IOC members were only supplementary sources to determine the science prioritized when creating eligibility requirements.

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[53] Haraway, "Situated Knowledges;" Ruth Hubbard, Mary Sue Henifin, and Barbara Fried. *Biological Woman-the Convenient Myth: A Collection of Feminist Essays and a Comprehensive Bibliography*. (Cambridge, MA: Schenkman Pub. Co., 1982); Fausto-Sterling, *Sexing the Body*; Helen Longino and Ruth Doell, "Body, Bias, and Behavior: A Comparative Analysis of Reasoning in Two Areas of Biological Science," in *Sex and Scientific Inquiry*, ed. Sandra Harding and Jean F. O'Bare (Chicago: The University of Chicago Press, 1987); Okruhlik, "Gender and the Biological Sciences;" Nelly Oudshoorn. *Beyond the Natural Body: An Archaeology of Sex Hormones*. (Routledge, 2003).

[54] Rogol, Alan D., and Lindsay P. Pieper (2018). "The Interconnected Histories of Endocrinology and Eligibility in Women's Sport." Hormone Research in Paediatrics, 90(4), 213-20.

A sociological literature review project was also beyond the scope of this study. Ethnic, cultural, racial, national and class-based biases should not be disregarded. Much of deconstructive sport historical research acknowledges these social and cultural interactions, but this research did not thoroughly analyze them. Noticeably absent from this dissertation is the introduction of the athlete's view of female testing. This is due to the minimal scholarly material around the athlete's perception. This dissertation does not wish to disregard the athlete's voice and instead urges more scholars to consider this line of inquiry.[55]

The use of the phrase sports medical sciences is a blanket term. The use of the phrase sports science does not mean a review of all such topics in this study as the focus is on the justification of testing. Relevant to female testing is genetics and endocrinology.

1.8 Limitations

Some of the history and philosophy of the relevant biological and sport exercise sciences helped trace the questions in this study to identify historical points of time in sports medicine and how scientists and philosophers addressed philosophical and moral issues. The restrictive time frame is not arbitrary and was most difficult to pin down since, generally speaking, sports medicine is a derivative of medicine and anatomy and physiology (and biology, and the life sciences in general). Some of the relevant studies about physical activity and sport history were included as supplementary to the research question.

This dissertation's data collection was also limited by the IOC's embargo, which restricts publicizing all IOC meeting minutes, communications, reports, and other materials issued to the archive. Therefore, no direct connections could be addressed in more recent years.

[55] The current political climate also suggests that many athletes are fearful for speaking up about female testing due to being labelled as anti-human rights. Karkazis, Jordan-Young, Davis, and Camporesi, "Out of bounds," 8; Francisco J. Sánchez, María José Martínez-Patiño, and Eric Vilain, "The new policy on hyperandrogenism in elite female athletes is not about "sex testing,""*Journal of Sex Research* 50, no. 2 (2013): 112-5.

1.9 Dissertation breakdown

This dissertation is an integrated article study. Chapters 3-6 contribute equally to the dissertation and can stand alone as its own article. Chapters 3-6 are supported by an introduction chapter (chapter 1), a review of the literature (chapter 2) and a conclusion chapter (chapter 7). With an integrated article format, there are some repetitions required so that the reader can fully understand the issue if coming to each chapter individually. Additionally, while each chapter brings a unique perspective to the research, they each speak to the complex and sometimes contradictory nature of female tests to i) bring to light more of the science used in justifying female tests, ii) call attention to the stakeholders who are involved in this knowledge production, and iii) encourage a pragmatic view that considers that the tests might not be the best for the athletes' health.

First, this dissertation presents a background of the current scholarship around female testing in chapter two. This chapter begins with common discussions on female testing; this includes those sociologists, sport historians, sports philosophers and some sports medical contributions (among others) who discuss why female testing is controversial (p. 22-48). Many of these authors draw from various backgrounds, including ethics, cultural studies, feminism and queer studies, using methods for analyzing media and communications, discourse analysis, and medical analysis. A brief overview of the history of sex testing, the rationales used for female testing (i.e., fair play and medical discourse), and the concept of fair play follow.

Chapter three continues the discussion of relevant literature to draw in the medical science on hyperandrogenism, sex trait differences and biological and genetic sex differences as espoused in the historical literature (p. 49-75) and bring in the data collected under this study. It must be mentioned that this chapter, nor the dissertation itself, did not focus on how the current IOC applied medical science through their use of the eligibility requirements. Instead, this research used the IAAF's 2018 Eligibility Regulations for the Female Classification to trace the discourse around intersex bodies through the history of the science around hyperandrogenism and genetic sex differences. A Kuhnian genealogical analysis was conducted as the starting point for this research. Data for this chapter was collected at the OSC archives.

Chapter four then provides a critique of Semenya's CAS hearing (p. 76-110). The use of pragmatism and the philosophical critique in the area of law was used because Semenya's case is at the crux of the female testing debate. In considering that Semenya has become a significant role-player in the contemporary debate around female testing, the court still found that the regulations of hyperandrogenism, as it were in 2016, were to be upheld, using the basis of scientific justification even though the humanity of Semenya was acknowledged. The purpose of this analysis is twofold: i) to introduce a pragmatic legal analysis of scientific use in CAS, and ii) return arguments of fairness within a legal framework. This analysis also brings in scholarship around transgender athletes, as discriminations for both intersex athletes and transgender athletes could be related to judgements around physique and fair play etiquette. The dissertation contribution for this chapter reasserts the way that sports authorities prioritize science to deem fairness requirements necessary discrimination.

Chapter five brings together the elements of the data uncovered as they relate to medical decision-making for fair sport. The data is then analyzed from a critical feminist lens (p. 111-146). Chapter six draws together the findings throughout the other chapters to suggest what the tests mean for female athletes (p. 147-159). Finally, a concluding chapter (chapter 7, p. 160-170) summarizes the dissertation's overall findings.

Chapter 2

2 A review of the critical scholarship around female testing

Ever since the cultural turn in sport scholarship, women's sport historians and sport philosophers have brought female athletes' experiences to light.[1] In more recent years, as eligibility requirements governing female testing in elite sport has shifted, critiques of eligibility requirements have documented the discriminatory nature of the tests, as well as the debate over issues like sex segregation in sport, fair play regarding sex, and the history of women's inclusion in sport.[2]

The body of literature that encapsulates female testing is broad, and it covers several academic and human rights issues.[3] There are four main arguments against female testing, each of which question: i) the perpetuation of female testing through sex-segregated sport; ii) discrimination of the female tests to be based on biological reductionist and deterministic reasoning; iii) the notion of fair play, and iv) the human rights of the athletes being sex tested.

This literature review will review the relevant, critical scholarship on female testing. This chapter highlights some of the authors and articles that have contributed to this topic. This chapter also aims to bring in feminist critiques against science to show its relevance to the female testing scientific literature. Scholarship around women's role in sport, women's bodies in sport, transgender athletes, sport and privacy, race, and fair play contribute to this

[1] This is not to say that the history of women's lack of parity in sport does not play a vital role in the unraveling of the story in this research project, and respective women's athletic histories are accounted for in the final account of this research. According to Bandy (2016: 726), "With their increased participation in sport, women challenged the patriarchal ideology upon which sport was based, provoked questions about ideas concerning femininity and masculinity and eventually raised questions about the basic nature and purpose of modern sport." See Susan J. Bandy, "Gender and the 'Cultural Turn' in the Study of Sport and Physical Cultures," *Sport in Society* 19, no. 5 (2016): 726-735.

[2]

[3] Scholars that have written on sex testing have written in the areas of history of sport, philosophy of sport, sports medicine, genetics, endocrinology, medical ethics and ethics in genetics and endocrinology, anthropology, sociology, law and sports law, communications, gender studies, feminism, race studies, queer studies, and transgender studies.

complex discussion. A historical overview of female testing throughout Olympic sport history is first presented, followed by an overview of key concepts concerning the issues and some of the current literature's recommendations.[4] Critical science historians and philosophers introduce how ideologies within science can be misconstrued as a scientific finding and indoctrinated as fact. This chapter does not go into the history of barriers female athletes have faced.[5] Methodologies used are provided in each chapter.

2.1 Women's bodies and sports

Historically, women have struggled to gain entrance, respect, and parity in elite athletics since the origin of the modern Olympic Games.[6] Modern founder Pierre de Coubertin did not allow women to participate in Athens's first Olympic Games in 1896.[7] Twenty-two women competed in the second Olympiad in 1900 in Paris, France, thanks to local organizers' efforts, not the IOC.[8]

Furthermore, Teetzel's thorough examination of the rules and eligibility requirements that differ between the genders describes how gender discrimination occurs through convention

[4] Heather Sheridan, "Conceptualizing 'Fair Play': A Review of the Literature," *European Physical Education Review* 9, no. 2 (2003); Nathan Q. Ha et al., "Hurdling over Sex? Sport, Science, and Equity," *Archives of Sex Behavior* 43, no. 6 (Aug 2014), https://doi.org/10.1007/s10508-014-0332-0.

[5] Other scholars have already done this. See: Patricia A. Vertinsky, *The Eternally Wounded Woman: Women, Doctors and Exercise in the Late Nineteenth Century* (Manchester: Manchester University Press, 1990); Allen Guttman, *Women's Sports: A History* (New York City: Columbia University Press, 1992); Cahn, *Coming on Strong*; Schneider and Gonsalves, "Science, Ethics, and Fairness."

[6] Guttman, *Women's Sports: A History*; Jane English, "Sex Equality in Sports," *Philosophy and Public Affairs* (1978); Paul Atkinson, "The Feminist Physique: Physical Education and the Medicalization of Women's Education," in *From 'Fair Sex' to Feminism: Sport and the Socialization of Women in the Industrial and Post-Industrial Eras 1987*, ed. James A. Mangan and Roberta J. Park (London: Routledge, 2013), 39; Elizabeth Fee, "Nineteenth-Century Craniology: The Study of the Female Skull," *Bulletin of The History of Medicine* 53, no. 3 (1979); Vertinsky, *The Eternally Wounded Woman*; Angela Schneider, "The Ideal Olympic Athlete: Some Thoughts and Reflections on Gender Differences," *Olympika* (2001); Gertrud Pfister, "The Medical Discourse on Female Physical Culture in Germany in the 19th and Early 20th Centuries," *Journal of Sport History* 17, no. 2 (1990).

[7] Gertrud Pfister, "Women in Sport–Gender Relations and Future Perspectives," *Sport in Society* 13, no. 2 (2010).

[8] Guttman, *Women's Sports*.

and language use.[9] In collection with Teetzel's other essays that aim to consolidate the rules and regulations athletes must follow, this essay highlights how the Olympic Games have historically alienated women and continue to do so with unequal events and gender-exclusive language. Since evidence provided shows how founder Pierre de Coubertin did not want women to participate in sport, it becomes apparent that the minor 'discrepancies' such as inaccurate pronoun use can perpetuate an Olympism based on a biased founder.

The following literature presentation reviews the varying facets that apply to the conversation around sex segregation in sport.

2.1.1 Women's sporting bodies and female testing

Sports sociologists Shari L. Dworkin and Cheryl Cooky argue that the legitimacy of the current tests for hyperandrogenism practice cannot be separated from sex segregation in sport and that female testing maintains segregation and reinforces gender/sex discrimination.[10] The authors assert that sex segregation in sport has historically been reinforced whenever a female outperformed a male. One example the authors provide is when Jackie Mitchell, the first woman to sign a professional baseball contract, struck out Babe Ruth and Lou Gehrig.[11] Women have been banned from professional league baseball ever since. Women also cannot participate alongside men (say in a marathon) because males' influence would alter their times and provide an unfair advantage.[12] The necessity of sex segregation sits as the core principle at stake in this debate because it reinforces biological differences between sexes and is reinforced by science.

While some argue that sex segregation is adequate and boosts female visibility, the inability of women to succeed at the same level as male athletes hinder their cultural and political

[9] Sarah Teetzel, "On Transgendered Athletes, Fairness and Doping: An International Challenge," *Sport in Society* 9, no. 2 (2006), https://doi.org/10.1080/17430430500491280.

[10] Dworkin and Cooky, "Unjust Marriage," 21.

[11] Ruth and Gehrig were struck out in an exhibition game in 1931; see Marilyn Cohen, *No Girls in the Clubhouse: The Exclusion of Women from Baseball* (Jefferson: McFarland, 2009), 39; Tony Horowitz, "The Woman Who (Maybe) Struck Out Babe Ruth And Lou Gehrig," *Smithsonian Magazine*, 2013, 31-34.

[12] Dworkin and Cooky, "Unjust Marriage," 21.

growth as a group because they do not receive as much of both the "basic" and "scarce benefits" of sport. Philosopher Jane English's 1978 article on equal access in sport is a landmark essay in philosophical studies of sport that raised inequality for women in sport. Here English explains the "basic benefits" and "scarce benefits" of sport:

> Sports offer what I will call basic benefits to which it seems everyone has an equal right: health, the self-respect to be gained by doing one's best, the cooperation to be learned from working with teammates and the incentive gained from having opponents, the "character" of learning to be a good loser and a good winner, the chance to improve one's skills and learn to accept criticism – and just plain fun… Beyond the basic benefits of sport, some athletes reap the further benefits of fame and fortune. I shall call these the scarce benefits of sport. The term is not meant to imply that they are kept artificially scarce, but that it is simply not possible for prizes and publicity to be attained equally be everyone at once.[13]

In addition to missing out on these benefits, some authors argue that this separation sends the message that women are weak.[14] Historically, men and women have participated in mixed competition sports such as sailing and equestrian, but some argue that offering more or solely mixed-gender competitions would reduce visibility and reinforce female inferiority.[15] Unfortunately, no discussion constitutes a choice an athlete can make. There is no option to participate with females only or males only, or in mixed-gender competition, leading to missed opportunities.

The assumption of natural, biological sex differences neglects areas where skills overlap between the sexes. Swedish philosopher Torbjörn Tännsjö argued this back in 2000 as one of the first sport ethicists to address the nuances of sex differences in sport and the lack of deep analytic thought around the issue.[16] Health communication scholar Claire Sullivan wrote an article, one of the most widely cited articles concerning gender verification, which sought to outline the history of gender verification and sex testing in sport by critically

[13] English, "Sex Equality in Sports," 270-1.

[14] Sailors, Teetzel, and Weaving, "Complexities of Sport."

[15] Angela Schneider, "On the Definition of 'Woman' in the Sporting Context," in *Philosophical Perspectives on Gender in Sport and Physical Activity*, ed. Paul Davis and Charlene Weaving (Routledge, 2009).

[16] Tännsjö and Tamburrini, *Values in Sport*.

examining how this process upholds the notion of fair play. Sullivan refers to the advantage thesis, a concept promoted by queer and transgender scholars Sheila Cavanaugh and Heather Sykes, which states that males have a significant physical advantage over females.[17] This discourse is prevalent in sports and gender/sex discussions since it assumes the normative dimorphic concept of gender/sex as man/male and woman/female. According to Sullivan, "Sports governing bodies are dealing with society's basic categorization of humans and thus are entangled in attempts to scientifically and medically define what it means to be 'male' and what it means to be 'female' for sport competition."[18] Sullivan argues that because sports are segregated by sex, and the IOC employs these sex verifications, as they claim, to level the playing field, but, since there are no universally agreed-upon definitions of male and female, the IOC policies are designed to manage the gender binary rather than creating a climate of fair play.[19]

Scientists and critics have come out against the IAAF's 2018 Eligibility Regulations for the Female Classification and sex testing historically as it upholds a mythical, and primarily Western, binary divide through invasive scientific techniques.[20] Feminist communications scholars Sarah Blithe and Jane Hanchey argue that female testing performs a type of discrimination that is gendered and physiological. They state, "Although this form of physiological discrimination intersects with sexism, patriarchy, racism, and imperialism, it operates within a new field of power that primarily discriminates against non-normative

[17] Claire F. Sullivan, "Gender Verification and Gender Policies in Elite Sport," *Journal of Sport and Social Issues* 35, no. 4 (2011), https://doi.org/10.1177/0193723511426293: 401.

[18] Sullivan, "Gender Verification," 402.

[19] Sullivan, "Gender Verification," 402.

[20] Sarah Jane Blithe and Jenna N. Hanchey, "The Discursive Emergence of Gendered Physiological Discrimination in Sex Verification Testing," *Women's Studies in Communication* 38, no. 4 (2015): 489, https://doi.org/10.1080/07491409.2015.1085474; Cheryl Cooky and Shari L. Dworkin, "Policing the Boundaries of Sex: A Critical Examination of Gender Verification and the Caster Semenya Controversy," *The Journal of Sex Research* 50, no. 2 (2013): 103, https://doi.org/10.1080/00224499.2012.725488; Pam R. Sailors, "Mixed Competition and Mixed Messages," *Journal of the Philosophy of Sport* 41, no. 1 (2013), https://doi.org/10.1080/00948705.2013.858398.

bodily processes."[21] This line of argument suggests that female testing might determine what is normal versus abnormal when it comes to biological processes.

Authors have also warned against female testing's ethical ramifications since the practices have resulted in public humiliations and athletes attempting suicide.[22] Sport philosophers Pam Sailors, Sarah Teetzel and Charlene Weaving advocate for sports regulating bodies and critiques to continue to examine the ethical indictment of female testing in sport to understand how this affects females directly. They suggest that both a fair playing field and treating individuals fairly cannot exist in sport. Of particular scholars analyzed the IAAF's 2015 Eligibility Regulations for the Female Classification, which risked targeting women of colour who presented hyper-muscular, which suggested that those who do not present as stereotypically Western feminine are targeted.[23] In this discussion, Western' femininity' is distinctly different from being a female biologically. In Sailors, Teetzel, and Weaving refer to femininity as, more so, the expectations that exist around a woman's physique, mannerisms, and social expectations, like the idea that all women must get pregnant and have a child simply because they bear the ability to do so. Common characteristics of Western femininity would suggest that a woman should marry a male and reproduce, carry their body in a way that is appealing sexually, wear makeup, and wear feminine clothing. While these characteristics are loosening, these characteristics are still well-known in society and sometimes, when a woman lacks these characteristics, they are criticized.[24]

The IAAF's 2018 Eligibility Regulations for the Female Classification is invasive not only on ethical grounds but it also reinforces beliefs of hegemonic masculinity that is often

[21] Blithe and Hanchey, "Discursive Emergence," 489.

[22] C. Wiesemann, "Is There a Right Not to Know One's Sex? The Ethics of 'Gender Verification' in Women's Sports Competition," *Journal of Medical Ethics* 37, no. 4 (Apr 2011), https://doi.org/10.1136/jme.2010.039081; Albert de la Chapelle, "Use and Misuse;" Malcolm A. Ferguson-Smith, "Gender Verification and the Place of XY Females in Sport," *Oxford Textbook Of Sports Medicine* 2 (1998).

[23] Sailors, Teetzel, and Weaving, "Complexities of Sport."

[24] Becky Francis et al., "Femininity, Science, and the Denigration of the Girly Girl," *British Journal of Sociology of Education* 38, no. 8 (2017). Pieper, "Western Femininity in Sport."

celebrated in sport.[25] Sport is a masculine domain at its origin, women's intrusion as athletes deem female athletes as pathological.[26] The female athlete in sport challenges the "heterosexual matrix," or the "tacit ontological aggregation of sex, gender, heterosexual femininity, and appearance."[27] This is a popular form of discourse that sport sociologists and historians have demarcated as inherent in sport. Scholars argue that the female athlete is at odds with traditional ideals of women in ancient times.[28] The more muscular and less feminine a female athlete performs, the less authentically 'woman' they become. According to Henne, aesthetic judgements remain the facet on which sex testing lies.[29] This idea of a woman is reinforced through science that strives to uphold ancient and mythical notions of womanhood as feminine.

Sport-governing bodies advocate that sex testing is necessary based on fair play ideologies and in support of the female binary. Males are not tested for sex, but they are tested for exogenous supplementation, such as doping or taking drugs to improve sport performance. Many genetic and biological variations give males (and potentially all athletes) unfair advantages, but they are overlooked in regulations. For example, endurance skier Eero Mantyranta has a condition that causes high hemoglobin and oxygen capacity due to a mutation in the erythropoietin receptor gene (EPOR), called primary familial and congenital polycythemia (PFCO).[30] Cooky and Dworkin argued this notion:

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[25] Masculine hegemony is based on the Gramscian concept of hegemony. As defined by Hargreaves (1993, 22), hegemony is "a form of control which is *persuasive*, rather than coercive. It is understood to be the result of people's positive reactions to values and beliefs, which, in specific social and historical situations, support established social relations and structures of power." Male hegemony is not simply described to be male versus female but instead represents a general pressure or oppression of male-dominated views to prescribe behaviors that support males over females, Jennifer Hargreaves. *Sporting Females: Critical Issues in the History and Sociology of Women's Sports*. (London: Routledge, 1993), 26.

[26] Schneider, "Ideal Olympic Athlete," 317.

[27] Heather Sykes, "Transsexual and transgender policies in sport," *Women in Sport & Physical Activity Journal 15*, no. 1 (2006): 3.

[28] Schneider, "Ideal Olympic Athlete," 317-8.

[29] Henne, "Science of Fair Play."

[30] Cooky and Dworkin, "Policing the Boundaries," 110; Genel, Simpson, and de la Chapelle, "The Olympic Games," 1360.

> Part of the reason why only athletes in women's sport competitions are tested for sex and why sex is the only "naturally occurring advantage" that is tested is this: for sport-governing bodies, sex testing is necessary because of the underlying belief that all biological males are stronger, bigger, faster, and thus superior athletes when compared to all biological women competing in the same sport. Hence, sex testing legitimates sex segregation as necessary to "ensure a level playing field" in sport...[31]

The central role of biology and genetics in sport is to support fair play and ensure that no inherent variations confer physical advantages, but the IOC continues to only test females for these physical advantages.

Teetzel, Sailors, and Weaving's work "The complexities of sport, gender, and drug testing"[32] highlights some of the critical ethical issues in sex verification discourse as presented by anthropologist Katrina Karkazis, feminist scientist Rebecca Jordan-Young, feminist scientist Georgiann Davis, and medical ethics scholar Silvia Camporesi, and extends support that the authors examine how the IAAF and IOC sex verification requirements are flawed. Sailors, Teetzel and Weaving call attention to the complexities of fairness, the social construction of sport, and the dangers of conflating drug testing issues with sex verification. In some of the authors' recommendations, Sailors, Teetzel and Weaving suggest that the recurring problem in sport – that the fair playing field and treating individuals fairly cannot exist in sport – be examined more thoroughly. In general, this article, and others[33], directed toward sport medicine ethicists, advocates for sports regulating bodies and critiques to continue to examine the ethical indictment of female testing in sport to understand how this affects the females directly.

Scholars argue that the adoption of female testing and continued survival was believed to be predicated on the "advantage thesis," the concept that males have a significant physical

[31] Cooky and Dworkin, "Policing the Boundaries," 108.

[32] Sailors, Teetzel, and Weaving, "Complexities of Sport."

[33] Sailors, Pam R., Sarah Teetzel, and Charlene Weaving, "Prescription for "sports medicine and ethics,"" *The American Journal of Bioethics* 13, no. 10 (2013): 22-24.

and physiological advantage over females.[34] This discourse is prevalent in sport concerning gender/sex since it assumes the normative dimorphic idea of gender/sex as man/male and woman/female. Sports are segregated by sex, and the IOC regulates these classifications through eligibility requirements on claims to level the playing field. However, since there are no universally agreed-upon definitions of male and female, the IOC policies are being designed to manage the gender binary rather than creating a climate of fair play.[35]

In all, some authors have suggested more refined eligibility requirements, granting that the newest version has moved away from sex verification practice and that it ensures that the women participating are doing so within 'natural' means. Women found to have a DSD that may provide a sporting advantage, and elevated T-levels might not participate in the women's category. Ethically, the IOC and sport's governing bodies are advised to provide the female athletes with more knowledge of the situation, clearly articulate the informed consent, and ensure privacy in these sensitive situations.

2.1.2 Philosophical perspectives of women sporting bodies

A growing body of literature alone, sport philosophy takes on the philosophical arguments within sport.[36]

Sport philosopher Angela Schneider's article "On the Definition Of 'Woman' in The Sport Context" has been cited in philosophical sport literature as it brings up the crucial task of defining what it means to be a woman in sport.[37] Schneider main argument defines the moral issues that women experience in the elite level sport. Schneider starts by contrasting

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[34] Sheila L. Cavanaugh, and Heather Sykes, "Transsexual Bodies at the Olympics: The International Olympic Committee's Policy on Transsexual Athletes at the 2004 Athens Summer Games," *Body and Society* 12, no. 3 (2006): 75-102; Sullivan, "Gender Verification," 402. The advantage thesis derives originally from Porter's 1992 theory of strategic economics, an influential and widely used economics theory.

[35] Sullivan, "Gender Verification," 402.

[36] Paul Davis and Charlene Weaving, *Philosophical Perspectives on Gender in Sport and Physical Activity*. (London: Routledge, 2009); Charlene Weaving, "Unraveling the Ideological Concept of the Female Athlete: A Connection between Sex and Sport," in *Philosophical Perspectives on Gender in Sport and Physical Activity*, ed. Paul Davis and Charlene Weaving (London: Routledge, 2009); Schneider, "Ideal Olympic Athlete," 318.

[37] Schneider, "Definition of 'Woman'."

the ideal woman and the female athlete.[38] In presenting Aristotle's version of the woman as beholding feminine qualities, the contrast between the athletic woman and ideal femininity becomes antagonistic. Much of the conflict at the elite sporting level arises from paternalism (the longstanding belief that females need protection from males). Paternalism is one of the main limitations of a masculinist sport institution. For example, paternalism might suggest a need to protect the female athlete from harm (i.e., eating disorders, mental strain, or female athlete triad) or to protect female athletes from masculinity (i.e., social repercussions). Gender verification was introduced in elite non-Olympic sport after the appearance of tennis player Renée Richards, known as Renée Clark before gender-confirming surgery, challenged the United States Tennis Association when asked to compete in the U.S. Open in 1976 even though Richards had transitioned from a male to a female.[39] As a male-to-female transitioned athlete, Richards called into question what makes a woman a woman. Schneider's recommendation is a three-pronged, bioethics methodological approach to address this issue, which involves asking the gender-biased question, asking for consciousness-raising, and, finally, a moralist approach of proper communication, listening, and collaboration.[40]

Carolyn McLeod's contribution to this literature is as a feminist theorist. Critics of female testing opt for feminist theories to help articulate the issues around women athletes. "Mere and Partial Means: The Full Range of the Objectification of Women" discusses how sport can operate to treat people not as human but as mere means, or as means only.[41] This is to treat people as objects for pure use instead of honouring them as subjects and honouring their full experiences. The subject/object debate may be considered one of the strongest

[38] This draws from her conception of the 'ideal Olympic athlete' published in another article; Schneider, "Ideal Olympic Athlete," 314-323.

[39] Susan Birrell and Cheryl L. Cole, "Double Fault: Renee Richards and the Construction and Naturalization of Difference," *Sociology of Sport Journal* 7, no. 1 (1990).

[40] Rosemarie Tong, "Feminine and Feminist Ethics," *Social Philosophy Today* 10 (1995).

[41] Carolyn MacLeod, "Mere and Partial Means: The Full Range of the Objectification of Women," in *Philosophical Perspectives on Gender in Sport and Physical Activity*, ed. Paul Davis and Weaving Charlene (Routledge, 2009). Original thoughts were derived from Kant, through the lecture notes of his students in Immanuel Kant and Jerome B Schneewind. *Groundwork for the Metaphysics of Morals*. (Yale University Press, 2002).

arguments for feminism; this debate highlights that women are mostly considered only for their bodies, looks, and sexual appeal, rather than being appreciated for their intellect, experiences, and emotions.[42] Throughout this piece, McLeod continues to highlight how problematic objectification is.[43]

Sport philosopher Paul Davis presents a detailed analysis of this topic related to objectification and sexuality in sport in 2010 in his chapter on "Sexualization and Sexuality in Sport."[44] Similar to Davis, McLeod brings up the subject/object argument because most feminist theorists see objectification as being entirely relinquished as a subject and, in some way, transforms a woman into *only* an object. Nevertheless, can't women in sport be both? Through a personal narrative, MacLeod argues that one can (superficially) embody an objectifying gaze without internalizing it. Here McLeod states, "the relation of objectification that constitutes gender requires both attitude and act. Gender is a distinction of power that is *read* into and imposed *upon* women."[45] McLeod's elaboration of the degrees that an objectified person can be objectified is essential when considering that partial objectification does impact a subject, whether it is embodied or not.[46]

2.1.3 Science and women's bodies

Trailblazers in their own right, feminist critiques of science have called attention to the incompatibility of science in the lives of women and their bodies. As highlighted by Haraway, "Science becomes the myth, not of what escapes human agency and

[42] Sandra G. Harding, *Science and Social Inequality: Feminist and Postcolonial Issues* (Urbana: University of Illinois Press, 2006).

[43] In the article, McLeod used Feminists Martha Nussbaum and Sandra Lee Bartky to broaden the definition by adding in "benign" and "malign" aspects of objectivity, since not all objectivity should be considered bad and objectification can be liberating depending on the context. This also denounced the idea that sexual objectivity is absolute (see Dworkin, Pornography: Men Possessing Women (New York: Perigee Books, 1981), 128; MacKinnon, Feminism Unmodified: Discourses on Life and Law (Cambridge, Mass: Harvard University Press, 1987), 119), "Mere and Partial Means," 9.

[44] Davis and Weaving, *Philosophical Perspectives*.

[45] MacLeod, "Mere and Partial Means." See also Sally Haslanger, Nancy Tuana, and Peg O'Connor, "Topics in Feminism," (2003).

[46] MacLeod, "Mere and Partial Means."

responsibility in a realm above the fray, but, rather, of accountability and responsibility for translations and solidarities linking the cacophonous visions and visionary voices that characterize the knowledges of the subjugated."[47] Haraway's work has consistently argued against the position of science as a penultimate and objective endeavour, in particular, because science is conducted and interpreted by humans. In Haraway's 1981 work titled "In the Beginning was the Word: The Genesis of Biological Theory," Haraway interrogated the narrative of biology as god-like through a critiquing analysis of four books, which contain works from sociobiologists David Barash and Edward Osborne Wilson (E.O. Wilson), scientist George Wald, sociologist Susan Leigh Star, and female biologist Ruth Hubbard. All-in-all, while extremely useful, Haraway's critiques are usually anti-science in the way that science cannot be objective and that it continues to situate females and people of colour as categorically and undeniably separate from the white, biological male.

Feminist historians and critics of science provide an avenue for feminist and women sports historians to look more closely at the scientific constructs which bind female bodies.[48] In her 2010 article "Sexes, Species, And Genomes: Why Male and Females are Not Like Humans and Chimpanzees," historian of science and professor of gender studies Sarah Richardson critiques the segregation of 'male' and 'female' genomes that exist within current genome research. Richardson states, "In the present context [in genetic research], then, to say that males and females have different genomes is to say that the sexes are, in important ways, like species. More specifically, it gives a certain ontological parity to sexes and species. It also strongly asserts that ontological primacy of sex to genetic and genomic reasoning, and biological and evolutionary reasoning more generally."[49] Richardson draws distinct comparisons to the treatment of races within scientific research. Richardson argues

[47] Haraway, "Situated Knowledges," 590.

[48] Henne, "Science of Fair Play," 789; Barbara Laslett et al. *Gender and Scientific Authority*. (Chicago: University of Chicago Press, 1996); Roberta J. Park, James A. Mangan, and Patricia A. Vertinsky, *Gender, Sport, Science: Selected Writings of Roberta J. Park* (London: Routledge, 2009); Schneider and Gonsalves, "Science, Ethics, and Fairness;" Oudshoorn, *Beyond the Natural Body*; Patricia A. Vertinsky, "Old Age, Gender and Physical Activity: The Biomedicalization of Aging," *Journal of Sport History* 18, no. 1 (1991); Wrynn, "The Human Factor," 212.

[49] Sarah S. Richardson, "Sexes, Species, and Genomes: Why Males and Females Are Not Lke Humans and Chimpanzees," *Biology And Philosophy* 25, no. 5 (2010): 831.

that because sexual reproduction and, therefore, the continuation of the human race cannot exist on one sex alone, it is improper to distinguish genes through class-based differences in the same way that populations or species might be differentiated.[50]

Often restricted by definitions and modes of science, historian and philosopher of science Kathleen Okruhlik's work questions assumptions in biological sciences that have been applied by Schneider to sports science and the limited understandings of the female athletes.[51] The opportunity to produce perhaps controversial science has opened doors for female athletes who were once ineligible to participate in long-distance runs like marathons. Okruhlik's pressure on the biological sciences has contributed to general reform that has later impacted sports medicine and physiological sciences, all of which promotes more gender-based research. For example, before 1985, much of the United States' (U.S.) physiological research pertained only to men. Feminist critics of science in Canada and the U.S. placed an extreme amount of political pressure on governing health bodies demanding that these officials include women as research subjects.[52]

Influential sport historian and scholar in the body/society paradigm Patricia Vertinsky's work leads to the growing collection of women's voices in the history of science and medical discourse to draw a correlation between how women's bodies were viewed, discussed and corralled during the nineteenth century, which was a crucial period for bio-medicalization and the use of scientific knowledge to employ power over minority groups.[53] Vertinsky's intersection with exercise aided the newly blooming discipline of women's history in sport and understandings of how the woman's physical and active body has pervaded history in different ways. In *The Eternally Wounded Woman*, Vertinsky uses

[50] Richardson, "Sexes, Species, Genomes," 836. A notion that was first articulated by Keller (1992) in claiming that population geneticists seemed to think of sexes as separable classes. See Evelyn Fox Keller. *The Mirage of a Space Between Nature and Nurture*. (Duke University Press, 2010).

[51] Schneider and Gonsalves, "Science, Ethics, and Fairness."

[52] Okruhlik, "Gender and the Biological Sciences." Elizabeth D. Harvey and Kathleen Okruhlik. Women and Reason. (Ann Arbor: University of Michigan Press, 1992). Much of Okruhlik's work, including the article "Gender and the Biological Sciences" and the editorial Women and Reason, calls into question biological deterministic and biological reductionistic biases that justify female inferiority.

[53] Vertinsky, *Eternally Wounded Woman*.

nineteenth-century medical reports and literary debates on women's bodies as primary resources.[54] While the scientific practice has historically been inundated (and controlled) by the white, Western male, the late nineteenth period stressed a bio-politics, in the Foucauldian sense, that placed the upkeep of health on the individual and simultaneously on the state. Thus, medicine was called upon to define and regulate various diseases, social irregularities, and bodies to support political reach and legislation (i.e., science replaced the Church as the new dogma). In order to illustrate this, Vertinsky highlights three crucial discourses: man's definition of woman over time; female physicians who breached the medical profession; and the dichotomy of the totalitarian male, through the work of G. Stanley Hall, and the emancipatory female, through the work of Charlotte Perkins Gilman. This book is one of the first to draw in medical discourse and emancipatory politics for females through exercise.

Scholars in sports technology and ethics have also asked what rights, especially privacy rights, that athletes have. In "Respecting Privacy In Detecting Illegitimate Enhancements In Athletes," Teetzel discusses the ethical ramifications of the invasion of personal privacy that is 'inherent' in sports' increasing desire to track and stop doping in sport.[55] Teetzel highlights that the invasion of privacy not only occurs when an athlete is required to provide biological samples. Due to much advancement in genetic testing technologies, scientists from the WADA can access an athlete's biological passport and genetic code. Teetzel found it problematic that providing consent to doping is enforced and that not consenting to this measure discredits an athlete as already guilty. While WADA states that athletes can waive their right to consent, Teetzel argues that the athlete does not retain much autonomy because to waive that right means that they can no longer play under the Olympic umbrella, a point originally presented by Schneider.[56] Thus, they do not indeed have the autonomy to play and withhold some of their genetic or biological privacy.[57] This

[54] Vertinsky, *Eternally Wounded Woman*.

[55] Sarah Teetzel, "Respecting Privacy in Detecting Illegitimate Enhancements in Athletes," *Sport, Ethics and Philosophy* 1, no. 2 (2007), https://doi.org/10.1080/17511320701425371.

[56] Angela Schneider, "Drugs in Sport, the Straight Dope: A Philosophical Analysis of the Justification for Banning Performance-Enhancing Substances and Practices in the Olympic Games," (1993).

[57] Schneider, "Drugs in Sport."

type of invasiveness, while fruitful in conducting tests, can proceed down the ethical rabbit hole. Manipulation of genomes for sports performance or, generally, infiltrating the body to such a high degree has forced scholars to raise moral implications of knowing one's (let alone another's) genetic code.[58]

As science historian Londa Schiebinger documents, "Science is a product of society. The goal of uncovering how gender influences the structure and polity of science extends the process of critique that persuades us to affirm certain knowledge and practices over others by rendering conscious the unconscious in our assumptions, priorities, and methods."[59] While speaking to the role of gender in sciences, Schiebinger's historical article on the emergence of plants' taxonomy called out glaring political, cultural, and historical practices that resulted in a biased science. Schiebinger's work *Nature's Body: Gender in the Making of Modern Sciences* in particular highlights how Carl Linnaeus', most known for his taxonomy of plants, as well as fellow taxonomists of that era, used gendered and racialized language and beliefs to describe plants, which was in turn taken up by literary novelists and poetics and dispersed among the populace. Schiebinger's analyses show evidence that sciences like taxonomy throughout the seventeenth century were biased toward cultural notions that the upper-class, white man carried into their research. For example, with men promoting their and their peers research as the authority and disseminators of knowledge, women and men of colour could not introduce different questions into research.[60] Primarily, while Schiebinger's research was focused on gender, much of the decisions interior to the science production were race-based and focused on ways of scientifically proving race-based inferiority.

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[58] Angela Schneider, "Privacy, Confidentiality and Human Rights in Sport," *Sport in Society* 7, no. 3 (2004), https://doi.org/10.1080/1743043042000291721; Wiesemann, "Right Not to Know."

[59] Londa L. Schiebinger, *Nature's Body: Gender in the Making of Modern Science* (New Brunswick: Rutgers University Press, 2004): 7.

[60] Lacking were questions that did not place people of color and women as inferior or incapable of doing science. Schiebinger's studies also suggest that woman gained entry into medicine and sciences at a time when there were larger scientific and political transformation in flux. And their entrance was conflicted with the idea that women were non-scientific. This was an attempt of medical men to ground the exclusion of men of color from sciences. See Schiebinger, *Nature's Body*, 142.

The scholarship on the history of science and the philosophy of science has not been applied to understandings of sport in general. Since critical feminist analysis have successfully encouraged reform in scientific paradigms, their tools can be of use in analyzing sports medicine research and female testing.

2.2 The historical emergence of sex testing in Olympic sport

From 1968 to 1999, the IOC sought to quell fears that males were participating in the women's category, and they attempted to do this by implementing medical tests that verified female athletes' sex. American sport historian Lindsay Pieper claims that this was heightened by the tensions of the Cold War, as well as the publication that two female competitors had turned out to be 'male.'[61] Since at least the late 1970s, women's sport historians and sport philosophers have brought the experiences of female athletes to light.[62] In more recent years, eligibility requirements governing female testing in elite sport have shifted, critiques of the IAAF's 2018 Eligibility Regulations for the Female Classification have documented the tests' discriminatory nature.[63] The debates in the relevant literature have focused on contentious issues like sex segregation in sport,[64] fair play in sex or gender,[65] and the history of women's inclusion in sport.[66]

[61] Correspondence between Avery Brundage and Count Baillet-Latour, Letter Regarding a Female American Athlete, June 23, 1936, B-ID04/MEDIC, IOC Medical Commission, 035-SD1: Olympic Studies Center Archives, Lausanne, Switzerland; Pieper, *Sex Testing*, 47.

[62] English, "Sex Equality in Sports;" Park, Mangan, and Vertinsky, *Gender, Sport, Science*.

[63] Karkazis et al., "Out of Bounds." P. N. Sperryn, "Sex Testing in Sport Can Ruin Lives," *British Medical Journal* 348 (May 28 2014), https://doi.org/10.1136/bmj.g3468.

[64] Dworkin and Cooky, "Unjust Marriage;" Roslyn Kerr and C. Obel, "Reassembling Sex Reconsidering Sex Segregation Policies in Sport," *International Journal of Sport Policy and Politics*, 10 no. 2 (2018): 305-320.

[65] Henne, "Science of Fair Play," 788; Ioan-Radu Motoarca, "Kinds of Fair Play and Regulation Enforcement: Toward a Better Sports Ethic," *Journal of the Philosophy of Sport* 42, no. 1 (2015).

[66] Guttman, *Women's Sports*; Ann M. Hall. *The Girl and the Game: A History of Women's Sport in Canada*. (Toronto: University of Toronto Press, 2016).

The history of sex testing has been documented by sport historians, philosophers of sport, and sport scientists. British sports medicine historian Vanessa Heggie's historiography aims to correct many misleading stories surrounding the history and rationale for sex testing.[67] Meanings within sport took on a political nature during war times, acting as sublimated war during the World Wars, and doping and gender fraud became a more central topic in the 1950s and 1960s. Part of Heggie's study highlighted misinformation about: i) those who were accused of being gender frauds when their exposure happened, as well as the narrative in place that harmed athletes from non-democratic regimes; and ii) what was the justification for the sex testing.

Claims that the media and political tensions heightened the spectacularizing of female bodies during the Cold War period are not unfounded.[68] Pieper's historical analysis, which utilized historical archives, newspaper articles, and texts, argued that "…the IAAF's and IOC's repeated insistence on the need for sex/gender verification illustrates the anxieties sparked by non-feminine, non-Western, non-white women. The organizations may have claimed that fairness was at stake; however, concerns about athletes' appearances led the campaign."[69] The history of sex testing shows women's inferior position in the Olympic movement and demonstrated a secondary status in the sport, a claim supported by fellow historians and sports philosophers.[70]

The fixation on female athletic bodies did not begin in the 1960s. In 1936, Avery Brundage, the president of the American Olympic Committee (AOC), first wrote about the verification of women's sex in communicating with the IOC president, Count Henri de Baillet-Latour.[71] In the correspondence, Brundage recounts a letter he received around the peculiarity of an elite American athlete. He states,

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[67] Heggie, "Reconstructing Histories."

[68] Pieper, *Sex Testing*, 36-8.

[69] Pieper, *Sex Testing*, 185-6.

[70] MacLeod, "Mere and Partial Means;" Pieper, *Sex Testing*, 186; Schneider, "Ideal Olympic Athlete," 320.

[71] Baillet-Latour, Letter Regarding a Female American Athlete.

> I don't know whether hermaphrodites are as common today as they evidently were two thousand years ago judging from the many statues which appear in museums of classical art, but I do know that the question of the eligibility of various female (?) athletes in several sports has been raised because of apparent characteristics of the opposite sex. Recently considerable publicity was given in the American press to the case of an English athlete who after several years of competition as a girl announced herself (?) a boy. Perhaps some action has already been taken on this subject; if not, it might be well to insist on a medical examination before participation in the Olympic Games.[72]

Furthermore, several sources claim that women were subjected to gynecological examinations at random times from the 1930s to 1960s until gender verification was enforced in 1966.[73] Systematic and scientific testing was introduced at events in the 1960s, first in the IAAF and then formally in the IOC because, before that point, team and family doctors issued femininity certificates could falsify certifications.[74] The necessity for these tests was further exacerbated by the successes of Soviet female athletes, Irina (1939-2004) and Tamara (b. 1937) Press, who were Ukrainian sisters who competed in the hurdles and pentathlon, and shot put and discus, respectively. Their muscular build and athletic success sparked fear that the women were somehow males biologically, and these stories dominated the media during the Cold War period. According to Pieper, this is just one example of how non-normative notions of femininity dominated the athletic narrative of the time.[75]

Testing began in 1966 at the European Track and Field Championships in Budapest, at the Commonwealth Games in Kingston, Jamaica, and in Winnipeg's 1967 Pan American Games.[76] In these situations, a gynecological exam was conducted; in Budapest, women were inspected in the nude by a panel of female physicians. However, officials had received complaints of the tests, and the testing was replaced with lab testing through chromatin

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[72] Brundage Correspondence, 1936, 1-2.

[73] Myron Genel and Arne Ljungqvist, "Essay: Gender Verification of Female Athletes," *The Lancet* 366 (2005); Sullivan, "Gender Verification," 401-2.

[74] Louis J. Elsas et al., "Gender Verification of Female Athletes," *Genetics In Medicine Review* (2000).

[75] Pieper, *Sex Testing*, 46; Elsas et al., "Gender Verification," 250-1.

[76] Elsas et al., "Gender Verification," 250.

testing of buccal cells for the inactive X chromosome, also referred to as the Barr Body. The test was considered to be "simpler, objective and more dignified."[77] The validation of these tests only related to the effectiveness of the tests in disqualifying athletes, and not necessarily about the findings. At the European Cup, the buccal smear revealed that Polish sprinter Ewa Klobukoska had an extra chromosome and "internal, male-like characteristics." Klobukoska was disqualified.[78]

Barr Bodies are artifacts that are easily stained and viewed under a microscope and indicate (for sex testing purposes) the presence of an inactive X chromosome. Athletes provide a cheek swab to ensure that the extra chromosome (of the XX complement) has folded in on itself to form a dense chromatin body. Unfortunately, this test only maps the chromatin body's presence and does not account for physiological or phenotype sex. Critics have expressed that using the Barr Body test for sex testing purposes is unreliable, as many genetic variations can be present in athletes (including XXY and XO), and discriminatory.[79]

The IAAF initially dropped chromosomal testing in 1988 in favour of a team doctor's visual health check but abandoned all forms of testing in 1992. Since doping regulations were so scrupulous, the IAAF deemed all forms of visual testing unnecessary (based on the requirement to pass urine in front of a witness), and that modern sportswear deemed males masquerading around as females unfeasible.[80] The IOC instead modified their chromosome test in 1992 by introducing a genetic test that identified a specific region of code found on the Y chromosome known as the "sex-determining region Y," or SRY

[77] See Eduardo Hay, "Sex Determination in Putative Female Athletes," *JAMA: Journal of the American Medical Association*, 4 (1972): 39-41; Elsas et al., "Gender Verification," 250-1; Pieper, *Sex Testing*, 55.

[78] Elsas et al., "Gender Verification," 250; Larned D. ,"The Femininity Test: A Woman's First Hurdle." *Womansport*, (July 1976): 9-11; Pieper, *Sex Testing*, 55.

[79] Jill L. Brodsky and Myron Genel, "The 2015 Pediatric Endocrine Society Ethics Symposium: Controversies Regarding 'Gender Verification' of Elite Female Athletes - Sex Testing to Hyperandrogenism," *Hormone Research in Paediatrics* 85, no. 4 (2016): 273-7, https://doi.org/10.1159/000444170; Cooky and Dworkin, "Policing the Boundaries," 110.

[80] Heggie, "Reconstructing Histories."

gene.[81] The absence or presence of this gene affects the expression of a gene that codes vital testicular formation, and in turn, this was deemed a better marker of gender.[82] By 1999, however, the IOC removed genetic sex testing by the 2000 Sydney Games unless competitors challenge an athlete.

Currently, there are different eligibility requirements for athletes with hyperandrogenism and transgender athletes.[83] The IAAF's 2018 Eligibility Regulations for the Female Classification, which regulates athletes with DSD, lists that athletes must test under the high threshold of 10 nmol/L of testosterone to compete in the women's category. If an athlete has a T-level over 10 nmol/L in conjunction with a disorder of sex development (DSD) that can receive the androgens, they may incur a physical advantage.[84] Individuals with congenital adrenal hyperplasia, for example, have higher levels of androgens and may be receptive to those androgens.

2.3 Overview of fair play in sport

One of the core moral concepts that play a critical role in this debate is the idea of fair play in sport competitions, which is also referred to as keeping a level playing field in sport. In support of fair play, the Olympic movement attempts to diminish cheating like doping and sex fraud to provide equal opportunities in sport. The literature on this topic is comprehensive and is an essential contribution to understanding of why the issue of female testing in sport competition has been defended by sport administrators and many athletes, whose primary motive is not to violate human rights but rather, to defend the critical concept and practice of fair play.[85]

[81] Elsas et al., "Gender Verification."

[82] Heggie, "Reconstructing Histories."

[83] IAAF, "Eligibility Requirements for the Female Classification," 2018.

[84] IAAF, "Eligibility Requirements."

[85] Some of the authors who have made significant contributions to this sport ethics literature on fair play are Robert Simon, Robert Butcher and Angela Schneider, and Sigmund Loland.

The concept of fair play may be a modern one, but it is argued to have been embodied by athletes in ancient Olympia and based on an honourable and just behaviour deemed acceptable before the gods. The most prominent rise of fair play, however, is linked to the Muscular Christianity movement in nineteenth-century British public schools and universities.[86] The Muscular Christianity movement inspired modern Olympic Games' founder Pierre de Coubertin, which could be to blame for why definitions of fair play remain deontologically elusive.[87] Henne believes fair play is laden with a problematic past. In the book *Testing for Athlete Citizenship: Regulating Doping and Sex in Sport*, Henne stated,

> Fair play, especially as taken up by the nineteenth-century Muscular Christianity movement that promoted religious piety through physical activity, has a decidedly colonial past, as its incorporation through sport was considered a method of strengthening empire and civilizing colonialized peoples. Accordingly, scholars have argued that campaigns for fair play (as doping-free) in sport negate the influence of gendered, national, or socio-economic inequalities that shape the fields on which athletes play and the resources to which they have access.[88]

Contrary to this, Loland proposed that fair play is centred around the equal opportunity to perform sport, which ultimately rejects essential inequalities that individuals cannot control.[89] Many simply know it as the good value upheld by sport, promoted explicitly as a value inherent in Olympic sport's ideology of Olympism. There is no clear definition of a level playing field or what fair play means in sport other than the IOC uses in Olympic policy and definitions presented in the fair play literature.

Modern notions of fair play in sport equate fair play to ideals of morality and virtuosity towards one another and practice sport in an idealistic and respectable manner. Sport

[86] Nick Watson, Stuart Weir, and Stephen Friend, "The Development of Muscular Christianity in Victorian Britain and Beyond," *Journal of Religion and Society* 7 (2005).

[87] Ian Ritchie, "Pierre De Coubertin, Doped 'Amateurs' and the 'Spirit of Sport': The Role of Mythology in Olympic Anti-Doping Policies," *The International Journal of the History of Sport* 31, no. 8 (2014), https://doi.org/10.1080/09523367.2014.883500.

[88] Henne, *Testing Athlete Citizenship,* 22.

[89] Loland, *Fair Play in Sport*. Variation in training, such as access to technology, science, facilities, coaches, and variation in the athlete's biology can significantly alter an athlete's success.

philosopher Mike McNamee's inquiry into the moral content of Olympism highlights just how difficult it is to pinpoint a universal, underlying moral harmony that the Olympic Games try to portray.[90] One of the most supported claims of fair play is that each sport contains an 'ethos' that is a mutually and oft unspoken agreement between players, officials, and fans within that particular sport, an argument documented by sport philosopher Heather Sheridan.[91] Additionally, sport philosopher Fred D'Agostino defines ethos as a set of "conventions determining how the formal rules of that game are applied in concrete circumstances… [the] unofficial, implicit, empirically determinable conventions which govern official interpretations of the formal rules of a game."[92] Originating from the Greek *ēthos* meaning "nature, disposition," or "customs" in the plural form, a more recent definition is: "the distinguishing character, sentiment, moral nature, or guiding beliefs of a person, group, or institution."[93]

Ethos is never firm, and they fluctuate based on historical, social, and intra-personal factors. An ethos in a given sport is unique to that sport and determined partly through a historical convention that is carried through by those respectful of the traditions,[94] partly determined by a convention of *mutatio* (or change) that occurs naturally in a given sport (i.e., such as incoming technologies, athletes, controversies, policies, or remarkable feats that might change an idea about the sport), and partly determined by raw, human, sociological factors within sport.[95]

Elementary to sport ethos are extending branches of fair play definitions, which will not be discussed comprehensively in this thesis. The most prominent defining branch of fair play is based on formalism, and it consists of the adherence to formal rules to guide sport and

[90] Mike McNamee, "Olympism, Eurocentricity, and Transcultural Virtues," *Journal of the Philosophy of Sport* 33, no. 2 (2006), https://doi.org/10.1080/00948705.2006.9714700.

[91] Sheridan, "Conceptualizing Fair Play;" Loland, *Fair Play in Sport*; McNamee, "Olympism, Eurocentricity, Transcultural Virtues."

[92] Fred d'Agostino, "The Ethos of Games," *Journal of the Philosophy of Sport* 8, no. 1 (1981).

[93] Merriam-Webster, 2018.

[94] Such as those traditions carried over from the Ancient Olympiad.

[95] This could be social, political, and emotional and originate from competitors, athletes, coaches, officials or the public/outsiders.

elevate games to sports.[96] Simon describes formalism as a "family of positions" used to characterized games.[97] These include the central tenets of games, such as winning, losing, acceptable moves within the game, and aspects of the primary structures and constitutive rules. constitutive, regulative rules and perhaps even auxiliary rules. Broadly, formalism acknowledges that games can be defined in reference to a games' constitutive rules.[98] Constitutive rules are those official rules like what determines a point, a win, or a foul; regulative rules might be more concerned with the official attire to be worn by a team or the ball's inflation pressure auxiliary rules are more concerned with eligibility and safety.[99] Contra to Loland's argument that the ethos is hierarchical to even regulating rules, without the consideration (as opposed to the assumption) for fair play to be structured within formal rules, sport is merely games.

Fair play in sport cannot exist without play's moral nature, as scholars argue within sport literature.[100] Theories of play offer insight into the value of games and games as sport, as well as the appeal that "sport is at its best when realized as play."[101] Health researchers and sport psychologists Jeanne Nakamura and Mihaly Csikszentmihalyi's thesis of experiencing deep flow states in play is still a highly regarded theory in sport's psychology as a positive model for the progressive and meditative benefits associated with play and

[96] d'Agostino, "The Ethos of Games;" Meier, K. 1985, "Restless Sport," *Journal of Philosophy of Sport* 12, 64-77; Meier, K. 1988. "Triad Trickery: Playing with Sport and Games." *Journal of Philosophy of Sport*. 15, 11-30; Morgan, W. and Meier, K. (eds) Champaign: Human Kinetics Pub. 39-48; Suits, B. 1989.,"The Trick of the Disappearing Goal," *Journal of Philosophy of Sport*. 16. 1-12; Suits, B. 1988a. "Tricky Triad: Games, Play, and Sport." *Journal of Philosophy of Sport*. 15. 1-9; Suits, B. 1988b. "The Elements of Sport." *Philosophic Inquiry in Sport*.

[97] Simon, *Fair Play*, 46-7.

[98] Angela Schneider, "Girls Will Be Girls, in a League of Their Own–The Rules for Women's Sport as a Protected Category in the Olympic Games and the Question of 'Doping Down,'" *Sport, Ethics and Philosophy*, 14, no. 4 (2020): 478-495; Simon, *Fair Play*, 46-7.

[99] Simon, *Fair Play*, 18.

[100] Jeanne Nakamura and Mihaly Csikszentmihalyi, "The Concept of Flow," in *Flow and the Foundations of Positive Psychology* (Springer, 2014); Klaus V. Meier, "An Affair of Flutes: An Appreciation of Play," *Journal of the Philosophy of Sport* 7, no. 1 (1980); Bernard Suits. *The Grasshopper: Games, Life and Utopia*. (Broadview Press, 2014); James W. Keating, "Random Thoughts on the Nature and Significance of Play," *Listening* 16, no. 1 (1981); Johan Huizinga. *Homo Ludens: A Study of the Play-Element in Our Culture*. (Routledge and Kegan Paul, 1949).

[101] Sheridan, "Conceptualizing Fair Play," 167.

movement.[102] Sport as play theories experience discontent against hegemony sport theorists and others who contend that sport is work because sport is a socially constructed, historically grounded practice where people continue to remake themselves and make sense of their world. However, I disagree with hegemony sport theorists in that the work ethic found in sport and embodied by those who push sport to its apex (i.e., high-income earners and dopers who push the boundary of sport towards work) can completely eradicate the playfulness that continually inspires sport.

Concepts of sport character as virtuous offer a valiant notion of fair play in that they generally support a conception of ethics that develops a virtuous character instead of being guided by abstract universal obligations. Loland's proposal of a moral norm system taps into a beautiful quality found in sport, in that athletes all over the globe can somehow relate to each other in a simple and intelligible way.[103] He suggests then there must be a proverbial consensus on fundamental, intuitive sporting ideals. Loland's moral norm system considers aspects of formalism and ethos proposed by D'Agostino. In these understandings of sport character, human flourishing can be found in a good person's character, not in actions regulated by rules established on righteous beliefs.

So long as an ethos fits into certain ethical principles, then good sports competition can prevail. However, aspects of nobility only attribute fair play with an individual character and their willingness to be righteous within the sports context. In that sense, how does it differ from a basic understanding of virtue but applied to the context of sport? Sheridan's critique of the moral norm system and virtue theories offers relief to these theories, which are admirable and important, but not all-encompassing. Additionally, fair play as a social contract has offered an expression of ethos as morality in sport. Approaching sport as a social contract means we "join others in acting in ways that each, together with others, can reasonably and freely subscribe to as a common moral standard."[104] However, this idea

[102] Nakamura and Csikszentmihalyi, "The Concept of Flow."

[103] Loland, *Fair Play in Sport*.

[104] See Sheridan, "Conceptualizing Fair Play."

neglects individual variations along with the moral standard and does not account for the pressure to conform to expected standards that come with professional sports.

Along these lines, sport philosophers Robert Butcher and Angela Schneider's 1998 account of fair play as respect for the game argues that sports are practices that form a cooperative activity in which goods internal to the activity are realized in the pursuit of the sport-specific established standards of excellence and thus can have interests that transform from the game to the athlete.[105] The article focuses on the moral ideal of fair play in competitive sports. It identifies five different conceptions of fair play in sport: *viz*. fair play as a bag of virtues; fair play as play; fair play as a fair contest; fair play as respect for the rules; and fair play as contract or agreement. Butcher and Schneider find all of these concepts unsatisfactory, and they propose the concept of "fair play as respect for the game," which they argue can overcome the shortcomings of the previous conceptions. Fair play as respect for the game creates certain behavioural consequences in competition as the athlete who respects the game expect enters in the' practice' and thus accepts the established standards of excellence and to is judged by them and also accepts a duty to criticize so that evolution is possible from within the community of practitioners. It follows from this position that: athletes play their best and strive for excellence with those doing the same; athletes and teams are fairly matched, or it is not a good victory. Opponents perform to the best of their abilities, allowing every opportunity to play their best. Fair play as respect for the game moves away from traditional understandings and definitions of fair play as 'respect' is not just then a lack of disobedience but is honouring or holding in high regard, thereby giving a positive definition for athletes to compete to the best of their ability.

Furthermore, sport philosopher Robert Simon's notion of fair play, as documented in his *Fair Play: The Ethics of Sport,* must be included in any fair play overview. Concerning gender equity in athletic competition, Simon argues that "…it is not that women's sports are inferior, but rather that more of us need to make the effort to appreciate the diverse

[105] Kant, 1948: 32; see Robert Butcher and Angela Schneider, "Fair Play as Respect for the Game," *Ethics in Sport* 25, no. 1 (1998): 1-22.

qualities that are exhibited in athletic competition."[106] So while Simon's arguments around fair play in sport generally are noble, his attribution of fair play within women's sport is notably different for a number of reasons. To start, women's sports within his argument deserves its own set of categorical thinking as "women's sports can be just as interesting and competitive as the men's version."[107] Moreover, he gives credit to the fact that men's and women's programs where physiological disadvantages are present were not morally suspect or illegitimate.

Fair play, as interpreted in this research, is understood to be an ethos in sport as argued by Sheridan.[108] This research utilizes a comprehensive understanding of fair play in sport, which considers all of these definitions embodied within an ethos. Within the ethos, athletes approach the formal rules, the informal rules, each other, themselves, all within a social contract to play respectfully and ethically in this shared experience. The commonality in experiencing deep flow and respect of the game is about shared fair play qualities. It is also about finding balance in physical, personal, and social qualities within sport.

2.4 Conclusion

This chapter provided a concise overview of the comprehensive literature that pertains to the female testing scholarship, including an overview of important historical emergences that determined the necessity of female testing to initially emerge in sport. This chapter brought together current scholarship on female testing. Scholarship on women's role in sport, women's bodies in sport, transgender athletes, sport and privacy, race, and fair play contribute to this complex discussion.

Subsequently, the historical overview of the emergence of female testing in Olympic sport introduced key concepts and highlighted the scholars who have significantly contributed

[106] Simon, *Fair Play*.

[107] Simon, *Fair Play*.

[108] Sheridan, "Conceptualizing Fair Play."

to this research area.[109] To review, there are three main arguments against female testing that this dissertation aims to address: i) the perpetuation of female testing through sex-segregated sport; ii) discrimination based on biological reductionist and deterministic reasoning; and iii) the notion of fair play. The following chapter presents the data collected for this research, which drew from recent scientific articles on female testing and IOC position statements to provide genealogical tracking to identify the female testing discourse throughout the history of the female tests' scientific development.

[109] Sheridan, "Conceptualizing Fair Play;" Ha et al., "Hurdling Over Sex."

Chapter 3

3 Mapping female testing in Olympic archives

Female tests' original and dominant rationale was based on IOC evidence that males might want to participate in the female category in sport.[1] In a letter to Dr. Elizabeth Ferris, Vice Chairman of the IOC Medical Commission and Chief of Gender Verification Testing Dr. Hay asserts that, "The I.O.C. Medical Commission makes the examinations mandatory in order to eliminate any advantages a masculine type of athlete might have in a competition with female athletes …the I.O.C. must continue to eliminate from the competitions athletes who exhibit problems in the area of sexual differentiation and thus have physical advantage."[2] While there have been critical ethical arguments that the IAAF's 2018 Eligibility Regulations for the Female Classification is inhumane, it remains that female testing continues even if on a more informal basis. Through an extensive review of the female testing literature and discourse analysis, this dissertation addresses the utility of female testing to justify sex segregation in sport, the discrimination of female tests based on biological reductionist claims and biological deterministic reasoning, and the rationale that these tests are required for fair play in sport. Therefore, this chapter presents the data collection conducted for this research, which drew from the IAAF's 2018 Eligibility Regulations for the Female and historical data from the IOC archives. A genealogical tracking identified a female testing discourse throughout the history of the female tests' scientific development.

[1] Eduardo Hay. Letter from Dr. Eduardo Hay in response to Dr. Elizabeth Ferris, (Feb 22, 1981), B-ID04/MEDIC, IOC Medical Commission, 035-SD4: Olympic Studies Center Archives, Lausanne, Switzerland; Hay, "Sex Determination," 39-41; For additional commentary, see Pieper, *Sex Testing,* 1; Caplan, "Fairer Sex," 549. Female testing is a term that brings together the names of tests used to test female athletes. When discussing distinctions between sex/gender and femininity/masculinity, sex refers to the biology of a person (e.g., male, female, intersex, and hyperandrogenic), gender refers to a person's gender identity (e.g., man, woman, queer, and nonbinary), and femininity/masculinity refers to social stereotypes associated with men and women.

[2] Hay, Letter to Dr. Elizabeth Ferris, Feb 22, 1981: 2.

3.1 Purpose

This chapter aims to present a history of relationships between the Olympic movement female testing. To do so, this research used source files at the Olympic Studies Centre (OSC) and subsequent research at the Toronto Gerstein Library databases to map a connected history of female testing.[3]

Since this dissertation uses historical data to support a current critical analysis, Foucault's genealogy was deemed useful for this research since it aims to track, define and draft paradigms.[4] This research hypothesizes that female testing exists as a discourse that travels through several different scientific paradigms, time periods, and institutions. Female testing knowledge is required from multiple scientific disciplines, and it cannot operate as its own scientific paradigm. Instead, it relies on multiple scientific paradigms, such as endocrinology and genetics, to exist. Multiple actors, including IOC actors and members of the scientific community, continue to uphold female testing through shared research efforts, continued testing, shifts in testing methods, and governance, like working groups and commissions, that support female test's function.

This chapter's main goal was to identify the IOC's role in female testing discourse and relationships that the IOC had with other parties or disciplines. In particular, female testing has highlighted specific empirical (i.e., biological, endocrinological, genetic, social) definitions that are external to sport for what it means to be a woman when competing in sport. This conveys the definitions of womanhood that the IOC values, which are rooted in scientific praxis. The decision to test females, historically and currently, prioritizes certain body-knowledges over others, even if IOC members were not actively involved in the perpetuation of any kind of discourse. This prioritization has a direct effect: a structural imbalance between the athletic categories. This imbalance can have residual effects in popular belief systems and applying science.

[3] IOC Medical Commission Fonds.

[4] More on this in the following section; Foucault, *Archaeology of Knowledge.*

3.2 Methodology

This research method was a multi-layered genealogical analysis, which aimed to identify knowledge and knowledge contributors relevant to the female test, the focal knowledge (i.e., the primary knowledge) for female testing.[5] This chapter identified key stakeholders of the female testing discourse. In this sense, stakeholders do not refer to those individuals as stakeholders for promoting/dissuading a discourse. Instead, stakeholders here refer to critical proponents of the discourse. Stakeholders are not always people, but they may also be the particular language chosen or set of methodology used. Examples of stakeholders are objects of scientific inquiry, strategic linear language, and tacit assumptions about gender, sex, race, and nation. Therefore, this means that the research had to identify main contributors to that discourse, such as those involved in the decision-making process, ways knowledge was disseminated or promoted, and how knowledge was interpreted. This chapter presents data collected and the relevance of the data in identifying a discourse.

Data was then analyzed through a Kuhnian subject-object filter. Kuhn's mapping of a paradigm uses genealogical analysis to identify knowledge that holds power in a given situation (i.e., the relevant knowledge and knowledge contributors).[6] In this research, the knowledge-power is the IOC as they control the mechanisms (i.e., rules and regulations) for competing in sport. Kuhn's definition of paradigms largely stemmed, according to Kuhn, from a necessity for consensus within the scientific research community. Therefore, a clear consensus for a type of scientific research would signify directionality and agreement. Shifting the consensus indicated changes, shifts, and ultimately ruptures. Sociologists Brad Way also cites that it was also encouraged when working with social scientists. Wray states, "Kuhn was struck by the differences between the natural sciences and the social sciences. In the former, there is broad agreement about the fundamentals of

[5] Kuhn, *Scientific Revolutions*.

[6] Genealogy methodology is largely attributed to Foucault through examinations of his works: Wendy Bastalich, "Reading Foucault: Genealogy and Social Science Research Methodology and Ethics," *Sociological Research Online* 14, no. 2 (2009): 81-90; Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (New York: Random House, 1973); Michel Foucault, *The History of Sexuality Volume 1: An Introduction* (London: Penguin, 1976); Michel Foucault, *Discipline and Punish: The Birth of The Prison* (London: Penguin, 1977). Kuhn utilizes this method to map scientific revolutions within specific paradigms; see Kuhn, *Scientific Revolutions*.

the field, whereas in the latter there is often significant disagreement about fundamentals."[7] For sociological research, Kuhn's definition of paradigm is a useful mediator for comparing female testing discourse with how a scientific enterprise operates.

Once common language and critical identifiers are recognized, fundamental ruptures (i.e., focal knowledge) can be classified. Philosopher Thomas Kuhn identifies ruptures as fundamental shifts when a scientific paradigm evolves and changes to a new set of beliefs. In his work *The Structure of Scientific Revolutions*, he diligently maps out the behaviours that can contribute to or signify a paradigm shift and how that can happen.[8] Foucault also describes the ruptures as such, "Making historical analysis the discourse of the continuous and making human consciousness the original subject of all historical development and all action are the two sides of the same system of thought. In this system, time is conceived in terms of totalization, and revolutions are never more than moments of consciousness."[9] Therefore, in mapping discourses, ruptures in paradigmatic behaviour signify important characteristics around a piece of knowledge and tell us what was believed before the rupture and what emerged after the rupture. The literature that emerges within the ruptures analyzed with applied critical gazes (i.e., analysis of focal knowledge through the subject-object filter).

The relevant knowledge presented in this chapter mapped out into a trend called a discourse, defined as a set of beliefs, assumptions, or norms perpetuated through social interactions, personal behaviour, and cultural and societal reinforcement.[10] Discourse appears in the chosen and omitted language, the chosen structure for arguments, and research designs and aims. Discourse is a powerful prevalent of ideologies within and across nations, races, sexes, classes, identities, and consciousness.[11] Foucault believes that

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[7] Brad Wray, K., "Kuhn and the Discovery of Paradigms," *Philosophy of the Social Sciences 41*, no. 3 (2011): 380-397; Gopesh Anand, Eric C. Larson, and Joseph T. Mahoney, "Thomas Kuhn on Paradigms," *Production and Operations Management* (2020). https://doi.org/https://doi.org/10.1111/poms.13188.

[8] Kuhn, *Scientific Revolutions*.

[9] Foucault, *Archaeology of Knowledge*, 12

[10] Derived from Foucault, *Archaeology of Knowledge*.

[11] Foucault, *Archaeology of Knowledge*.

thorugh a social constructivists view, knwoeldge is an outcome, which might emerge randomly based on interrelated historical practices. These random outcomes might in turn produce the discourse and actors of a discourse itself, rather than the actors being consciously aware of the production of that discourse. Therefore, the results presented conform to this belief as a way of identifying the root strucutres of the female testing discourse.[12]

3.2.1 Relevant knowledge and knowledge contributors

The origination of the initial phase for this research begins with obvious knowledge of female testing, the IAAF's 2018 Eligibility Regulations for the Female Classification.[13] As these regulations are currently in place and they represent the crux of the debate on female testing, it allows researchers to get on the same footing and for tracing to be tied to this document. From there, genealogical tracing identifies where the knowledge comes from. Since female testing exists outside of a singular discipline, Kuhnian paradigm mapping draws connections between the discourse and those involved in discourse production.

With this framing in mind, we can look to the IAAF's 2018 Eligibility Regulations for the Female Classification and other sex testing requirements that were implemented to support the discourse's history.[14] In identifying the focal knowledge as it relates to the discourse are female testing, this research asks: What is the preferred knowledge that the IAAF or IOC wants to use in order to define femaleness? Are they attempted to define femaleness at all?

[12] Bastalich, "Reading Foucault," 81-90; Foucault, *Order of Things*; Michel Foucault, *Sexuality Volume 1*; Foucault, *Discipline and Punish*.

[13] IAAF, "Eligibility Requirements for the Female Classification."

[14] PCR testing refers to a type of genetic testing measure that rapidly makes billions of copies of a specific DNA sample so that scientists can take very small samples of DNA and replicated into a large enough volume for laboratory use. Espy, J. R. et al., "Real-Time PCR in Clinical Microbiology: Applications for Routine Laboratory Testing," *Clinical microbiology reviews* 19, no. 1 (2006), https://doi.org/10.1128/CMR.19.1.165-256.2006.

3.2.2 Identification of the focal knowledge

Focal knowledge refers to the knowledge that is being directly focused on. In this case, female testing's focal knowledge would be the knowledge that defines the test, test requirements, and test purposes.[15] Focal knowledge for female testing are the known or obvious forms of science used in this discourse and identify the methods being used to conduct female testing (e.g., buccal smears and polymerase chain reaction [PCR] gene testing).[16]

Since the focal knowledge of testing to prove femaleness sits in the discipline of science, then you must look at science critically. Philosophers of science have been doing this for centuries now. Philosophy of science began as thinkers asking questions about one's work and holding up thought to scrutiny. With the expansion of academic and intellectual thought, an independent body can scrutinize this work in more nuanced and unique ways, both within and outside of the scientific discipline, which confers both advantages and disadvantages to the practice. The assessment of the focal knowledge through the lens of philosophy of science is a methodological layer not yet introduced in the initial application, but it is a lens that needs to be applied.[17]

3.2.3 Analysis of the focal knowledge through a subject-object filter

Once the focal knowledge is identified, the job of analyzing this knowledge becomes clearer. The primary literature is read through race-and-woman-centred analytics, asking

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[15] Catriona Macleod and Kevin Durrheim, "Foucauldian Feminism: The Implications of Governmentality," *Journal for the Theory of Social Behaviour* 32, no. 1 (2002).

[16] See note 14.

[17] Caplan, "Fairer Sex," 549. The philosophy and the history around the science of sex testing, its reliability, and its explicit purposes have been undocumented, or at the very least, hard to find. It is not that researchers have not looked at the science around testing to prove femaleness from outside – as there are a variety of critical scholars who have been engaging with this topic since its emergence in 1967 – but there is not yet a broader presentation of it in the way in which philosophy of science can understand. Additionally, those who have looked at this phenomenon have looked at it from within science (i.e., ethics of genetics, endocrinology), from within the Olympic paradigm (i.e., *Olympic Review*, IOC Medical Commission), or have looked at it from a strictly biomedical ethical standpoint. This information is neither organized nor established.

essential questions around the biases that can be identified through language use, research design, and doing so in a way that does not take knowledge sets for granted. For example, specific knowledge can be applied within a research design and a study is carried out. Once the findings are reported, it can provide evidence of a given knowledge used in a research design. The implications of this are threefold: i) the use of the knowledge might be wrongfully conferred; so the design of the study is based on faulty, biased, problematic knowledge, and its use of the study is then perpetuated as a useful and reliable source of knowledge; ii) the research design is often replicated as in scientific practice is the standard; a particular research group could research one topic or line of thought for years, and if the original thought was never questioned, then there is a whole body of research that is supporting wrongful thinking through scientific documentation; and iii) there are real-world ramifications around this; this is the most problematic of all three implications. Real-world ramifications might manifest themselves as a medical, political or social intervention for specific groups of people, damaging or tailored behaviour around a specific group of people, and death around action or inaction tailored to a specific thought.

As in the sciences, scientific thought is prioritized to be right over other forms of thought, and this is where the real-world ramifications are problematic. One example of this was the progenerating of the hereditarian theory of intelligence quota (IQ) through R.M. Yerkes's Army Mental Tests.[18] Yerkes' Army Mental Tests were a set of newly developed intellect tests funded by the American government to be tested on military personnel and military recruits. When Gould analyzed Yerkes' work, he found that much of the test assumed Western normative to be the primary basis for IQ. From knowing what a turntable was to standard nomenclature (and the ability to speak and understand English), the test would rank someone who was essentially more familiar with Western culture as higher on the intelligence quotient than those who were less familiar with something like tennis or bowling.[19] While this brief account does not do justice to Gould's work, it highlights how

[18] Stephen Jay Gould and Steven James Gold, *The Mismeasure of Man* (New York City: W. W. Norton and Company, 1996).

[19] Gould and Gold, *The Mismeasure of Man*. The ideal outcome for Yerkes' tests revolved around measuring intellectual innateness. The aftermath of this test is still known today – that intelligence can be measured, which it cannot, and that a person's race and nationality play a significant role in intellectual

critical analysis from the philosophy of sciences disciplines can contribute to this discussion and attempt to break down common and misrepresented conceptions of what knowledge is depicted as.

3.3 Methods

Data collection was focused on one primary collection and two supplemental collections. The main collection consisted of the Olympic Studies Centre (OSC) archives. Supplemental collections included those through the Consortium for the History of Science, Technology and Medicine (CHSTM), located in North America's Northeast corner. Sources pulled from CHSTM members included the University of Toronto library (i.e., Robarts Library and Gerstein library) and the Wellcome Library's online database, also a member of CHSTM.[20]

The timeframe for data collection (1950-1999) was constructed around the formal implementation of female testing, which began officially in 1967 and ended in 1999. Data was expanded to 1950 to account for any data that might be recovered at the OSC archives. Some data existed as early as 1938, but it was only one document. Data from the FIMS fonds, located in the OSC archives, existed before 1967, with a few documents from the 1950s. The timeline after 1999 was left intact for the initial phase.

This research delimits this timeline for several reasons. First, the IOC holds an embargo on the information and documents that can be accessed by researchers. Therefore, documents newer than 25 years old are unable to be accessed. Research design began in 2018 and was conducted in 2019. Therefore, 1994 was the latest that the research in the archives could go. Since chromosome testing ended after the 1996 Atlanta Games, this data collection

aptitude, which it does not. Yerkes, and those involved with the test development, wrongfully administered this test to measure military aptitude. They also wanted to find innate reasons for race-based differences in intelligence.

[20] The database collected from the Wellcome Library was not limited by the timeframe and consisted of the entire collection of the Ferguson-Smith Archives. Forty-one files (multiple scans compiled into a single digital source) were available in this online database, and consisted of correspondence, material for illustrative slides, reports, press-clippings, seminar details and articles all between 1967 and 2001.

period's limitation was acceptable. Therefore, data collection focused primarily on chromosome testing to contribute to discussions of ethical hormonal testing used currently.

Data, such as correspondence preparing for the 1996 Atlanta Olympics, was collected through the OSC. Fifty-seven digital archive files (multiple scans compiled into a single digital source) were downloaded and taken home from the OSC in Lausanne, Switzerland. Four files were ostensible in French, while a portion of the files (approximately 30%) consisted of French documents. OSC archives consisted of correspondence, scholarly articles, meeting minutes, material for illustrative slides, internal and press release reports, press-clippings, conference programs, training materials from 1938 to 1996. Fonds accessed at the OSC archives included IOC Medical Commission fonds concerning International Association of Athletics Federations (IAAF) relations, Gender Verification at the Olympic Games, and fonds concerning the Fédération International Medical Sportive (FIMS).

Thirty-three articles and ten books were either electronically downloaded or scanned on-site, and other photographs were taken of bibliographies for those recent items at the OSC. The most frequently accessed material was the archive scans; the other resources pulled from these archives were used for fidelity once research has been conducted comprehensively. Data collection occurred in April 2019 over five consecutive days.

Literature collected at the University of Toronto consisted of two main subsections. The research was conducted on-site, and sources were taken home for further study. On-site sources consisted of scans or online copies of 21 book materials in partial and full formatting. An additional 92 articles were also downloaded. The sources taken home consisted of 32 books or manuscripts. The research was conducted initially in September 2019. Take-home resources were accessed from September to December 2019 and compiled into, and importance was determined based on author, topic, and dates.

3.4 Results

The results section focuses on essential data uncovered. These include primary data from the OSC archives and supporting data from the University of Toronto. Details include the

descriptions of the OSC archives, including the IOC Medical Commission fonds, correspondence and meeting minutes between the IAAF and FIMS with the IOC Medical Commission, and an introduction to sports medicine knowledge, genetics and endocrinology during the period in question.

3.4.1 IOC Medical Commission fonds

The IOC Medical Commission fonds files overlap with several of the fonds files in a variety of ways. Most of the discussion around female testing (commonly referred to as "gender verification" in the OSC archives) went through the IOC Medical Commission as they were the primary point of contact and authority for female testing. The IAAF was also a central point of contact, but since the OSC does not provide archival information for the IAAF, and only correspondences between IOC and IAAF members, fonds stemming from the IAAF was limited. Unfortunately, I do not have access to the IAAF archives to confirm this information or find origin source files. However, the IOC Medical Commission worked with the IAAF and other International Federations (IFs) through regular meetings and circulatory letters. The Medical Commission also collaborated with the IAAF Medical Commission when needed. Access was granted to the IAAF correspondence fonds but determined to be too large in scope. Not enough time was allotted to researching all of the data correlated to the IAAF members. Therefore, it was left out. This choice does not suggest that the data is not related to this research, and analysis of it might suggest additional findings for the discourse presented.

Members of the IOC Medical Commission might also be involved in some other sports governance level, such as with the IOC Executive, representing a country, IF, or sport, or participating in the FIMS and medical research component. The Medical Commission was also involved in each Olympic Games. So, their presence is also established with Organising Committees. Documents connected to Medical Commission members are also traced through Medical Commissions of Organising Committees, although complete files for Organising Committees were not of concern for this research.[21]

[21] Albert Dirix and Xavier Sturbois, *The First Thirty Years of the International Olympic Committee Medical Commission: 1967-1997*, ed by IOC Olympic Study Centre (Lausanne, 1998).

3.4.1.1 Notable research

The main priority of assessing the IOC Medical Commission fonds was to establish those involved in the female testing discourse's germination and identify which knowledge sources were of primary concern. Discernment could not be made as to the priority or hierarchy of stakeholders. However, what we start to see throughout the IOC Medical Commission fonds data is that Medical Commission members and others involved with the day-to-day of the female testing discourse were involved with the production of literature and scientific knowledge. However, a large majority of this knowledge production was i) produced during the periods of female testing and therefore not preceding the institution of female testing, but somewhat residual (and potentially causal); and ii) it emerged mostly due to the controversial nature of female testing and therefore can be filtered as somewhat unreliable as to the authenticity of research.

Elsas states that founders of "IOC's gender verification model" were Prince Alexandre de Merode as Chairman of the IOC Medical Commission, and Dr. Eduardo Hay, Vice Chairman of the IOC Medical Commission and Chief of Gender Verification Testing.[22] According to the archives within this period, those IOC members who published on the topic were: Dr. Eduardo Hay, Dr. Arne Ljungqvist and Dr. Albert Dirix. Other notable members were published on the topic included Professor Albert de la Chapelle of Finland, Dr. Joe Leigh Simpson of the United States, Dr. Elizabeth Ferris of Great Britain, Professor Ferguson-Smith of Great Britain.[23]

3.4.1.2 Notable correspondence

Data presented in this section consists of correspondences between Medical Commission members and medical experts in the 1980s. This is because the 1980s marked a time when medical experts discussed the ethical ramifications of gender verification with the Medical Commission in more earnest than previous years. Additionally, this section reads like a narrative as it was presented in part at the North American Association for Sport History

[22] Elsas et al., "Gender Verification," 251.

[23] Dirix and Sturbois, *The First Thirty Years*.

(NASSH) conference in May of 2019. Feedback was received on the following excerpt and edited appropriately.

Advancements in scientific research and medical technology in the 1950s and 1960s allowed athletes to do more and train more efficiently. The IOC was already having nuanced discussions about the implications of these newfound technologies, but the Executive Committee could not address these issues alone. Issues of a medical nature required much more deliberation and research. So, in response, the IOC brought together a group of international doctors and scientists dedicated to discussing athletes' health; the Medical Commission was organized at the 1964 IOC Meeting in Tokyo, and it oversaw all medical matters in Olympic sport.

As an active member of the IOC Medical Commission since its inception, Dr. Eduardo Hay was a significant player in the debate on female testing during the 1980s, through correspondence with medical inquiries, being active on commissions and generating documents related to female testing. Dr. Hay was a Professor of Gynaecology and Obstetrics at the National University of Mexico City and held medical appointments throughout Mexico City. He was the most qualified and available to address female testing within the IOC Medical Commission.

Most of the Commission consisted of doctors and physicians who were not previously IOC members but often involved in related Olympic endeavours and represented a wide range of scientific expertise. This small committee consisted of only men, and they provided counsel and support to the IOC Executive on sports issues of the scientific nature. Their primary role was to administer and organize doping controls. However, they also contributed to the verification of femaleness in female sport and the physiology of altitude training and later organized physiological research aspects that were important to the IOC program.

In addition to Dr. Hay (who was also a member of the Mexico Olympic Committee and representative at the Organising Committee for the Mexico Games), members included: Dr. Albert Dirix, vice president of the Belgian Olympic Committee; Professor Arnold Becket of Great Britain and Head of the Department of Pharmacy at the Chelsea College

of Science and Technology in London; Giuseppe La Cava of Italy, who was the Secretary General of the FIMS and Professor at Rome University; Dr. Roger Genin of France and vice president of the Organising Committee for the Grenoble Games; Professor Ludwig Prokop of Austria, President of the Australian Federation of Sports Medicine and professor at Vienna University; Arpad Csanadi of Hungary, and vice president of the Commission and member of the IOC; and Pieter Van Dijk of the Netherlands, president of the Medical Commission of the International Cycling Union.[24]

Most of the Medical Commission was of clinical background, except for Arpad Csanadi of Hungary and Prince Alexandre de Merode. De Merode, who was a prominent Belgian dignitary and resided as Chairman since the formation of the Commission until he died in 2002, was part of a few scandals throughout the years, but he drew criticism mainly by being Chairman to a Medical Commission and was not practiced or educated in the field of medicine.[25]

Regarding testing females, the IOC Medical Commission was to advise the IOC Executive in "eliminate[ing] any advantages a masculine type of athlete – might have in a competition with female athletes."[26] To do so, members would refer to knowledge within their respective fields. Overall, the Medical Commission did not consider themselves an investigative team or a research institute.[27] Furthermore, the IOC Medical Commission consulted with FIMS delegates and FIMS members were represented on the council and many IOC Medical Commission attended FIMS Congresses. Much of the IOC Medical Commission's day-to-day tasks were dedicated to logistics around doping control and female testing, such as ensuring the tests were delivered appropriately and timely, and that repeat tests were either deemed needed unnecessary and to disseminate necessary

[24] J. W. Westerhoff, Letter to the Members of the Medical Commission, "Correspondence," 1967, B-ID04-MEDIC, IOC Medical Commission, 001: SD2: Olympic Studies Centre Archives, Mon Repos, Lausanne, Switzerland.

[25] Westerhoff, Letter to Medical Cmmission.

[26] Prince Alexandre de Merode to Professor Albert de la Chapelle, Letter from Prince Alexandre De Merode to Professor Albert de la Chapelle, July 14, 1987, B-ID04-MEDIC, IOC Medical Commission, 035/SD1: Olympic Studies Centre Archives, Lausanne, Switzerland.

[27] Hay, Letter to Dr. Elizabeth Ferris.

information to the relevant IFs. Overall, the IOC Medical Commission sought counsel from FIMS and thought that the tests were "effective in providing a practical and accurate means of detecting the genetic abnormalities which interfere with the conduct of the competitions under the present regulations."[28]

Female testing was said to be a relatively simple procedure, but it required a hefty financial budget and some collaboration with the National Organizing Committees (NOCs). At most major international sporting events throughout the 1980s, female athletes were directed to the Olympic laboratory, typically in the Olympic village, so that medical associates could take three buccal swabs from their inner cheek. The cheek swab would allow researchers to look for genetic markers for female sex and male sex, a test known as karyotyping. Karyotyping could identify the chromosomal makeup by looking at the number and appearance of a cell's chromosomes. Moreover, of interest to sporting officials was locating an individual's sex chromatin, a type of nucleus unique to the female and labelled the Barr Body. If this test were inconclusive or presented markers for genetic disorders, a blood-hormone analysis and gynecological exam would be required.

The IOC did not want to cause any undue stress for the female athlete in stressful or arduous testing. While imperfect, Medical Commission members considered the sex chromatin method decent enough; it was simple, economical, and could detect genetic abnormalities that might 'interfere' with their gender rules. However, there were cases where female athletes were told that they could not participate in sport, that they were most likely genetically male, which caused irreparable harm. In one situation, a woman was told this very thing and left the sporting competition and could not compete. When the IOC had followed up with the athlete three months later to inform them of the blood analysis follow-up results, IOC officials were able to convey the 'happy' news that the athlete was indeed one of these anomaly cases, but the athlete and family had already undergone three months of psychiatric help due to the original news.

The misdiagnosis of the intersex athlete was what concerned a lot of medical experts. Since there were more ways to determine sex other than genetics, science established that

[28] Hay, Letter to Dr. Elizabeth Ferris.

chromosomal sex, gonadal sex, secondary sex characteristics, and gender identity must align to represent either male or female. It seems that a large portion of those who spoke out against tests did so with the support of Professor Albert de la Chapelle. While some scientists did not want to get caught up in the debate, de la Chapelle was provocative; he repeatedly asked direct questions of Dr. Hay and Prince de Merode and applied an immense amount of pressure on Medical Commission members to reconsider their methods and at least sit down to discuss more appropriate testing measures. His persistence played a role in organizing a special working group organized by Dr. Ljungqvist and included Dr. Simpson.

Additionally, scientific societies like The Endocrine Society, The American Academy of Pediatrics, and The American Society of Human Genetics, to name a few, issued memorandums against the use of sex chromatin testing, with detailed reports arguing the same ethical litigations as Dr. Wong and Dr. de la Chapelle.[29] The IOC Medical Commission was concerned that these genetic anomalies were being systematically recruited and their physical advantages exacerbated.

Throughout the files, several correspondences request clarification on the purpose of the tests. The pinnacle of this emerged between 1983 and 1987. Just before the 12th South East Asia Games in 1983, Dr. Giam and renowned geneticist Dr. Wong Hock Boom – who is known as the Father of Paedeatrics in Singapore – wrote to the Medical Commission to express their concern that the sex chromatin tests were at worst damaging to those females wrongly accused and ineffective at best.[30] Both these men were part of the Medical

[29] Correspondence between the Danish Olympic Committee and the International Olympic Committee, A Memorandum on the Use of the Sex Chromatin Investigation of Competitiors in Women's Division of the Olympic Games, February 16th, 1972, B-ID04-MEDIC, IOC Medical Commission, 035-SD2: Olympic Studies Centre Archives; The Endocrine Society, Letter from the Endocrine Society to IOC President Juan Antonio Samaranch, Aug 10, 1987, B-ID04-MEDIC, IOC Medical Commission, 036/SD2: Olympic Studies Centre Archives, Lausanne, Switzerland; Albert de la Chapelle, Letter from Dr. Albert de la Chapelle to the IOC Medical Commission Including a Resolution on Gender Verification of Female Athletes from the American Society of Human Genetics, Nov 24, 1987, B-ID04-MEDIC, IOC Medical Commission, 035-SD1: Olympic Studies Centre Archives, Lausanne, Switzerland.

[30] Correspondence between the Organizing Committee of the 12th South East Asian Games 1983 and Dr. Eduardo Hay, Femininity Controls in Sport, October 5 – November 10, 1982, B-ID04/MEDIC, IOC Medical Commission, 035-SD2: Olympic Studies Centre Archives, Lausanne, Switzerland.

Commission for the South East Asia Games' Organising Committee. Dr. Wong wrote a report that highlighted the various ways in which the testing was problematic. In Dr. Wong's letter, he said, "The reason for separating sports events for men and women is the recognition that physical prowess of the male exceeds that of the female by virtue of his greater production of androgenic hormones. These hormones provide an advantage in sports because: - 1) of protein anabolism and hence greater muscle mass and power and 2) of greater physical motivation brought on by both foetal [*sic*] and post-natal androgenic hormone activity – brain imprinting and ongoing brain motivation."[31] [emphasis added] And then he says, "The above being the purpose, then the purpose will be defeated if women participants possess androgenic hormones beyond the norm seen in the average woman competitor."[32]

Dr. Wong was a geneticist, so he was familiar with the type of genetic disorders that might present themselves from a karyotyping test. The Barr body screening was only useful in catching a few genetic "gender frauds," as they were called, and not all of them presented relevant physical advantages in sport. The good news was that it was effective in at least catching the "deliberate masquerading of males as females in order to cheat."[33] Unfortunately, these tests were missing out on quite a few genetic anomalies, and this included individuals with congenital adrenal hyperplasia, pure gonadal dysgenesis, real hermaphrodites, and 46XX males. Furthermore, this was a problem because essentially, in the eyes of genetics, the screening was not that effective, and there was a more straightforward and kinder test that could be used to detect males masquerading as females – if that was the goal.

Therefore, throughout the 1970s, 1980s and 1990s, geneticists implored that the sex chromatin tests did not truly differentiate the "bona fide" and the "non-bona fide" females. To an extent, they understood what the IOC was trying to do with these tests and the type of athlete that the IOC wanted to weed out. Dr. Hay did end up responding to Drs. Giam

[31] Hay, "Femininity Controls in Sport."

[32] Hay, "Femininity."

[33] Hay, "Femininity."

and Wong conceding that the test was not perfect, but it was capable of catching a female who should be considered female by genetic and physical standards, and one who does not have the physical advantages that were associated with males. Dr. Hay reasoned that it was vital, from a medical viewpoint, to classify this genetic anomaly even further based on the anatomical, physiological, and psychosocial parameters, even though this was not something the IOC could take on. It was not necessarily that the tests were catching all the cases of gender fraud, but it was believed that the test was deterring women from participating in some instances. Moreover, to them, that was a sign that the tests were effective.

On July 14th, 1987, Prince de Merode replied to one of the many letters from Professor Albert de la Chapelle's. In it, he stated, "It is not our aim to issue decisions 'ex cathedra' concerning the masculinity or femininity of persons participating in the Olympic Games. When we carried out the first tests in 1968, we simply wished to put a stop to the development of a particularly immoral form of cheating which had been spreading insidiously within high-level competition sport." He continued, "In fact, incessant denunciations having their origin in the Olympic village, accompanied by persistent rumors widely echoed by the media, were besmirching sport and the reputation of the persons concerned. Without the least proof, serious accusations were made concerning human beings whose fundamental rights were made a mockery of." [34] Prince de Merode's response to Professor Albert de la Chapelle on July 14th, 1987, was one of the first times an IOC member explicitly stated why the controls around the female classification in sport existed.

While this narrative provides a small glimpse into the IOC Medical Commission's data, it also provides readers with the essentials of who was involved and the types of discussions that IOC Medical Commission members were involved in.

3.4.2 Fédération International Medical Sportive (FIMS) fonds

The meetings for the FIMS or the International Federation for Sports Medicine began as early as 1928. This organization consisted of those team doctors and physicians affiliated

[34] De Merode to de la Chapelle.

with the IOC through their respective IFs and regional medical communities. Although interrupted by the World Wars, FIMS continued to meet every four years at Sports Medical Congresses. These congresses centred around the Olympic Games' quadrennial and provided a space for team doctors, physicians, researchers, and sports governance members to convene, learn, and share on sports medicine issues.

The primary purpose of the FIMS association was not necessarily tied to female testing. According to their handbook, the second edition published in 1988, their purposes include:

a) *To promote the study and development of sports medicine throughout the world.*
b) *To preserve and improve the moral and physical wellbeing of mankind through physical fitness and sports participation.*
c) *To study scientifically the natural and pathological implications for physical training and sports participation.*
d) *To organise and/or sponsor internationally sports medicine scientific meetings, courses, congress and exhibitions.*
e) *To establish and maintain contact with organisations in sports medicine and related fields.*
f) *To publish scientific information in sports medicine and related subjects.*
g) *To take all other such steps, either alone or in cooperation with any appropriate individual or organisation, as shall from time to time by calculated to further the purposes above listed and to promote the study and development of sports medicine throughout the world.* [35]

The data from FIMS is limited. Before that publication, FIMS held congresses. Those in attendance were IOC Medical Commission members, FIMS and FIMS Executive members, and team doctors. Additionally, correspondence with Skip Knuttgen was established to identify more of sports medicine history and his involvement in the American College of Sports Medicine (ACSM). Lastly, the FIMS Congresses are interesting because they provide a glimpse of the science that researchers were concerned with. What is significant about this data is that they were not concerned with female competitors' medical aspects, let alone female testing. During the period in question (primarily the 1960s-1970s), FIMS was still trying to be established as a primary liaison

[35] FIMS, Correspondence, 1988, E-RE02-FIMS, 003/SD4: Olympic Studies Centre Archives, Lausanne, Switzerland.

with the IOC Medical Commission and Executive. The group was finally recognized in the *Olympic Book of Sports Medicine* (1988), even though this process led to ups and downs around communication and recognition with FIMS. This process was led by Professor Skip Knuttgen of Harvard and Professor Kurt Tittel, who were co-chairman of the FIMS Scientific Commission, co-editors of the book, and notable members within the ACSM community.

3.4.2.1 Olympic Congresses for sports medicine

Not all the Olympic congresses were preserved in the OSC archives. Regardless, the topics, lecturers and meeting details were of extreme importance to this research's nature. The first congress preserved in the OSC archives was the International Conference on Sport and Health, conducted in Oslo, Norway, from February 25-26, 1952. The congress denotes an apparent alliance with the World Health Organization (WHO), as Dr. Milton I. Roemer of the WHO had presented a clear representation of how sport contributes to positive global health.[36]

The next notable congress preserved was the XVI World Congress for Sports Medicine (XVI^{e} Congres Mondial de Medicine Sportive) in Hanover, 1966. A brief content analysis was performed on this program. This program was published in English, French, German and Spanish. The following countries were represented at the Congress: Finland, US, Denmark, Germany, Norway, Japan, Soviet Union [USSR] largely represented, Czechoslovak Socialist Republic [CSSR], Canada, Israel, Poland, Eastern Germany, Italy, Turkey, Spain, Yugoslavia, Austria, and Romania.

Topics discussed include physiology, lipid metabolism, the effect of sport on the nervous system, motor function, environmental conditions and cardiac rhythm, total serum cholesterol, respiratory and circulatory effects of isometric muscle contractions, blood redistribution, hypoxia, cardiac function, physical fitness and training methods, and more. Specifically, topics related to women athletes were located in physical fitness and training

[36] International Conference on Sport and Health, Oslo 25-26 Fevirer 1952: Programme, Discourse, Correspondance, 1952, E-RE02-FIMS, FIMS Fonds, 004/SD2: Olympic Studies Centre Archives, Lausanne, Switzerland.

methods. These topics were acknowledged through with keyword identification, such as "hormone" or "hormonal," which were then weeded out or included as concerning the female hormonal profile, as well as "woman," "feminine," "female," "femmes," anything related to the breast or uterus, and more. There were four topics out of the 240 that discussed female-specific terms. Two were related to the exercise-induced physiological response in women, another addressed women with mastectomia, and another addressed the woman diver. Three of these four specialized in women, whereas the fourth studied both men and women.

There is also the concern of the gender expression of grammar, which was taken into account when searching through the non-English text. In the instances where something like die person (la personne in French or die Person in German) would place a feminine gender on the word, the use of the gender was ignored for purposes of this research as it was to identify if women as a person were included as a specific area of study. Other than typical expressions of gender in French from la and el, there was no indication that women or femme was used in the French text.

Anything related to sex or sexuality (French: sexe/sexualité; German: ibid/sexualität) or any reference to hermaphrodite or intersexual (which presents as phonetically in other languages) were also searched for. The most reliable was English text.

Other program congresses included in the fonds was the program for the Convention and Symposium of physicians of International Sports Federations, which was held in Rome, Italy on October 24-27, 1981. The meeting notes from the FIMS group at the XXIInd World Congress on Sports Medicine held in Vienna, Austria, 1982 were also preserved in the archives. In addition to the congresses, the OSC archives preserved communications between FIMS members and the IOC Executive and the IOC Medical Commission of the IOC. Additionally, media, relations and documents related to the Olympic Medical Archives were considered very relevant to this research's nature.

3.5 Sports medicine and physiological differences

An effective way to understand scientific knowledge and scientific discourse is by historically tracing it to its origins.[37] This is outside of this research scope; however, a presentation of current sports medical knowledge is crucial to this discussion and can aid researchers in identifying histories of female testing medical knowledge. Current understandings of the science supporting female testing can be applied to historical data around sex testing justifications.

Current research associated with female testing is easily identified as it directly attributes elite female athletes, hyperandrogenism, and endocrinology profiles as the study's focus. One avenue into this research is through molecular genetics and biochemistry of 5a-reductase deficiency in sports medicine research. In a cohort of 25 individuals, Thigpen, Davis, Milatovich and colleagues, this disordered derived from mutations in the type 2 gene account, confirming previously observed genetic heterogeneity. Over 40% of the affected individuals were classified with compound heterozygotes, and this suggested that an individual with 5a-reductase 2 mutations might be higher in the population than previous estimates.[38]

Fénichel, Paris, Philibert, and colleagues' molecular assay of four female athletes with 5a-reductase (based on the SRD5A2 gene) deficiency showed a positive potential that females might be affected by the deficiency. Due to SRD5A2 mutations, the body lacks 5a-reductase (responsible for a chemical reaction that converts testosterone into androgen and dihydrotestosterone) and cannot convert testosterone into reproductive tissue, therefore disrupting the formation of external genital before birth. These individuals are considered genetically male (with one X chromosome and one Y chromosome in each

[37] Articles that contributed to this included Stephane Bermon et al., "Serum Androgen Levels in Elite Female Athletes," *Journal of Clinical Endocrinology Metabolism* 99, no. 11 (Nov 2014), https://doi.org/10.1210/jc.2014-1391; Mary-Louise Healy et al., "Endocrine Profiles in 693 Elite Athletes in the Postcompetition Setting," *Clinical Endocrinology* 81, no. 2 (Aug 2014), https://doi.org/10.1111/cen.12445; Martin Ritzén et al., "A Rebuttal," 307.

[38] Thigpen, Anice E., Daphne L. Davis, Athena Milatovich, Berenice B. Mendonca, Julianne Imperato-McGinley, J. E. Griffin, Uta Francke, Jean D. Wilson, and David W. Russell, "Molecular Genetics of Steroid 5 Alpha-Reductase 2 Deficiency," *The Journal of Clinical Investigation* 90, no. 3 (1992): 799-809.

cell), but their external genitalia might look predominantly female or ambiguous. The authors recommended that screening for SRD5A2 be completed for female athletes with primary amenorrhea and hyperandrogenism "to protect their health and privacy and ensure fairness in female competition."[39] These females were 46, XX DSD with female phenotype and high plasma testosterone, with a lack of breast development (which suggested SRD5A2) and dihydrotestosterone (DHT) remaining. More research must be done to identify the molecular markers.[40]

This genetic mutation is better understood now but does not show up the historical literature. The data suggest that markers for male physiology, as the mutation suggests, were noticeable; this is based on the claims of male intruders participating in the female category.[41] Officials were unable to communicate genetic differences, hormonal mutations, or technical, physiological advantages. Identifying the female athletes' condition, in general, went undetected for so long; while understandable, due to the natural progressions in science, there is an issue with this. Fénichel, Paris, and Philipert and colleagues also explain delayed diagnoses even in current diagnoses, since genetic malformation needs to be observed at birth based and this observation is minimal. It may also be associated with a rise of testosterone levels and 5a-reductase type 1 enzyme at puberty; since the only indication at birth is genitalia malformation, which is only slightly observable at birth, correction or education might not be provided by the doctors at that time. A post-puberty checkup is unlikely to happen, especially by the same doctor, and the condition has a chance of persisting without apparent indicators.[42]

Unfortunately, historical research around the SRD5A2 mutation, such as one conducted by Imperato-McGinley colleagues in 1976, attempted to determine the contribution that

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[39] Fénichel, "Molecular diagnosis of 5alpha-reductase deficiency in 4 elite young female athletes through hormonal screening for hyperandrogenism," (2013): E1058.

[40] Fénichel, "5alpha-reductase deficiency," E1055–E1059.

[41] Heggie, "Reconstructing histories; Pieper, *Sex Testing*, 16.

[42] Imperato-McGinley, Julianne, Ralph E. Peterson, Teofilo Gautier, and Erasmo Sturla, "Androgens and the Evolution of Male-Gender Identity Among Male Pseudohermaphrodites with 5α-Reductase Deficiency," *New England Journal of Medicine* 300, no. 22 (1979): 1233-37: 771.

androgens have for male-gender identity formation. In a critique from Dr. John Money, Money pointed out many errors with this research, such as theories of male/female, masculinity/femininity that originated with the *a priori* belief that gender-identity could be described through biological determinants contaminated by the legacy of Descartes. He stated, "Thus the biologic or organic as a determinant in matters of gender and sexuality is juxtaposed against the nonbiologic - which is usually undefined, but is assumed to be the psychologic, acquired or learned."[43] As Money explains, their mistake rested in the unsubstantiated claim that those with 5a-reductase are, in addition to being hermaphrodites who eventually changed to live as men, were reared as unambiguously female. Based on the medical practice and knowledge at the time of birth, their genitalia did look like female genitalia, so there can be no way of rearing them any other way than merely female.[44] Money advises against a dogmatic approach that assumed a biological determinant and has the potential of ruining lives.[45]

Dr. Money goes on to say that the findings only confirmed (and not add): "what has long been known about the importance of hormonal determinants in prenatal life, plus the importance of surgically resolving genital ambiguity in infancy… and of preventing hormonal dissonance at puberty…" [46] Although Money is critiquing Imperato-McGinley and colleagues for conducting their research with an *a priori* assumption of biological determinants, Money alludes to the preferred treatments of properly aligning hormones with sex and preventing hormonal dissonance during puberty.[47]

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[43] Imperato-McGinley et al., "Androgens and Male-Gender Identity," 770.

[44] Fénichel, "5alpha-reductase deficiency," E1055–E1059.

[45] Imperato-McGinley et al., "Androgens," 770.

[46] Imperato-McGinley et al., "Androgens," 771.

[47] Mooney's use of the term hormonal dissonance is not defined in the text, but it might relate to a conflict of hormones comparative to other sex-based markers of hormones, such as phenotypic characteristics. It ocuild be related to cognitive dissonance (at the core understanding of conflict) and relate to conflict between the hormones in the body and the gender identity or gender expression visible.

Money's critiques, unfortunately, rest on the exact claims he is arguing against. The recognition of hormonal determinants in prenatal life and surgical correction assumes normative prioritizing in empiricism that genitalia *should* look a certain way and be corrected if it does not. Hormonal markers before birth should also be identified to determine the *proper* sex of the baby. His use of the phrase "hormonal dissonance" is even more ambiguous in meaning: what is the proper balance of hormones that a baby is supposed to have? Are any identified norms specific to social preferences, or are they necessary for healthy function? Money does comment on some cultural differences—for example, the Dominican Republic did not do the preferred corrective methods—and addresses the author's lack of continuity with the local philosophy. However, his assumptions of the preferred medical treatments also disregard any cultural tradition in the Dominican Republic. If the Dominican Republic knew of such methods, how can researchers suggest that they would have performed Money's preferred method of hormonal balance or corrective surgery? His critique becomes furthermore value-laden as it perpetuates a Western scientism dogma that values normative structures (such as correction physique for gender) over any kind of cultural nuances.

Other current research on androgen levels in elite female athletes stems from the Athletic Biological Passport. Prominent sports doctor and director of the Department of Science and Health of the IAAF, Stéphane Bermon and colleagues Garnier, Hirschberg (and more) provided supposedly normative serum androgen values in elite female athletes, taking into account menstrual status, oral contraceptive (OC) use, type of athletic event, and ethnicity. In their study, 849 elite female athletes were tested for serum T (testosterone level), dehydroepiandrosterone sulphate, androstenedione, sex hormone-binding globulin (SHBG), and gonadotrophins. It is of interest to note that the research aimed to identify normative T values for the Athletic Biological Passport to establish the levels of females that might be "normal" or possibly take exogenous steroids. The authors stated, "Androgens (in particular T) show ergogenic effects in both genders, but one could expect that these performance-enhancing effects are more spectacular when these

molecules are given (or produced) to (by) female athletes."[48] Sampling hour, age, and type of event had a small influence on serum T concentration, but ethnicity did not. Of the 85.5% not on OCs, 168 of 717 were oligo- or amenorrheic. OC use showed the lowest serum androgen and gonadotropin and highest SHBG concentrations. After removing five doped and five DSD women, median and free T values were close to the reported by sedentary young women (99th percentile = 3.08 nmol/L).[49] While useful, this research was the first to represent a somewhat larger sample of the target group of elite female athletes with hyperandrogenism. As the authors stated, "Unfortunately, and to the best of our knowledge, 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. This lack of information should be overcome, should the scientific and sports governing bodies want to develop, validate, and implement a blood steroidal module of the [Athlete Biological Passport] in the future."[50]

While interesting research, there remain scholars who are critical over the methodological approaches. Xavier and McGill suggest that new policies give endocrinologists a prominent role in evaluating and treating elite female athletes. Care to test details, treatment decisions, individualized approaches, safe and practical approaches, different opinions over treatment, and potentially debilitating side effects of anti-androgen treatment (such as excessive thirst, electrolyte imbalances, liver toxicity, headache, fatigue, and insulin resistance), in practice. The authors suggest that "[a]lthough reducing excessive androgen levels in women with hyperandrogenism is considered the standard of care, treating an elite athlete who may have additional motives for needing treatment

[48] This claim was taken from the "only available source of documentation" from W.W. Franke and B. Berendonk, "Hormonal Doping And Androgenization Of Athletes: A Secret Program Of The German Democratic Republic Government," *Clinical Chemistry*. 43 (1997): 1262–1279.

[49] Bermon et al., "Serum Androgen Levels."

[50] Bermon, Stéphane, Martin Ritzén, Angelica Lindén Hirschberg, and Thomas H. Murray, "Are the new policies on hyperandrogenism in elite female athletes really out of bounds? Response to "Out of bounds? A critique of the new policies on hyperandrogenism in elite female athletes,"" *The American Journal of Bioethics* 13, no. 5 (2013): 63-65.

or limiting treatment will add a new dimension to decision making."[51] In asking these questions, the researchers are imploring those involved to consider both the short-term and long-term effects of treatment not only from the sports perspective but also from a lifelong and ethical perspective.

3.6 Conclusion

This research identified main contributors to a female testing discourse, such as those involved in the decision-making process, how the knowledge was disseminated or promoted, and how it was interpreted. What is presented here is a detailed description of the data collected, the relevance of the data in identifying the discourse and some discourse analysis. This research utilized Kuhn's genealogical analysis methodology to trace female testing discourse through medical literature in three resource hubs. Data collection was focused on one primary collection and two supplemental collections. The main collection consisted of the OSC archives located in Lausanne, Switzerland. Supplemental collections included the University of Toronto.

This process established who was involved in the germination of a female testing discourse and identified which knowledge sources were of primary concern. There were a few individuals and sources established to be preferred. Throughout the discourse, we begin to see that Medical Commission members and others involved with the day-to-day of the female testing discourse were the ones who eventually became involved with the production of literature and scientific knowledge. However, a large majority of this knowledge production was i) produced during the periods of female testing and therefore not preceding female testing, but somewhat residual (and potentially causal); and ii) it emerged primarily due to the controversial nature of female testing and therefore can be filtered as somewhat unreliable as to the authenticity of research.

In mapping the discourse of female testing, key stakeholders identified were scientific inquiry, such as endocrinology and genetics, as well as the use of the IOC Medical

[51] Xavier, Neena A., and Janet B. McGill, "Hyperandrogenism and Intersex controversies in Women's Olympics," *The Journal of Clinical Endocrinology and Metabolism* 97, no. 11 (2012): 3907.

Commission and potential the FIMS group for networking. Strategic linear language and tacit assumptions about gender, sex, race, and nation also played a role in decision making for implementing the tests and in scientific findings on individuals with 5a-reductase.

Chapter 4

4 Repositioning fairness through pragmatism

Since 1967 formally, the IOC has required females to undergo scientific testing to determine that they are not male. While these tests, otherwise known as sex testing or gender verification, have been contentious. In the past, the Court of Arbitration of Sport (CAS) has even ruled the regulations to be unfounded. CAS ruled in May of 2019 that the tests and segregating sport based on sex, regarding the case filed by Semenya, to be a necessary form of discrimination to ensure the vitality and safety of women athletes.[1] Based on this assertion and what is known about the history of sex testing, it is essential to critically examine the role that CAS has in determining fair play in sport related to science as a tool to reinforce femaleness and sex differences.

There are many claims of social justice issues involved in testing female athletes for sex, which is a problem that scholars are faced with when attempting to dissect this quandary. Some of these issues include medical ethics, the fair play system in sport, athlete's rights, human rights, issues of informed consent, the scientific debate on sex-determination, and many more. In many ways, the breadth of knowledge required to properly dissect female testing's moral permissibility and approaching common ground on agreed-upon definitions of sex has also provided conditions for a naturally occurring interdisciplinary field to exist in broader society.[2] To add to this discussion, this chapter addresses the legal complexity

[1] Semenya and the Athletics South Africa (ASA) requested that the DSD Regulations issued by the International Athletics Federation (IAAF), titled "IAAF Eligibility Regulations for Female Classification (Athletes with Differences of Sex Development)" be declared invalid and voided immediately due to an infringement by the IAAF on athlete's human rights. Two requests for arbitration were dismissed as of May, but Semenya's cohort has since appealed and the IAAF's request to re-impose regulations (since they are lifted temporarily due to the appeal) was rejected only recently. *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018), 1; British Broadcasting Corporation (BBC), "Caster Semenya: Swiss Court Rejects IAAF Request to Re-Impose Testosterone Rules," 2019, https://www.bbc.com/sport/athletics/48630087.

[2] 'Female testing' is a term to bring together the names of tests used to test female athletes. Distinctions also should be made between sex/gender and femininity/masculinity. When discussing these distinctions, sex refers to the biology of a person (e.g., male, female, intersex, and hyperandrogenic), gender refers to a person's gender identity (e.g., man, woman, queer, and nonbinary), and femininity/masculinity refers to social stereotypes associated with men and women.

of Semenya's case and analyze it through the lens of pragmatism by applying the concepts of the fair play principle and lex sportiva.

4.1 Purpose

Philosophers of sport have often theorized on aspects of law that carry over into sport through jurisprudence, lex sportiva, or as a means of understanding the interpersonal relationships in sports. Throughout these discussions, we have learned that law intersects with sport in the court sector, in issues of human rights, privacy and athlete control (in the case of doping), and within-sport jurisdiction (and understanding the role of rules in sport-playing). One case that has highlighted the complexity of lex sportiva is South African middle-distance runner Mokgadi Caster Semenya. Her case is not necessarily unique, but Semenya's publicity has highlighted how regulating the female classification in sport overlaps with various social constructs, social issues, and legal issues.

The justification for the requirements that regulate the female category in sport has called upon fair play and scientific justifications. Therefore, it is necessary to amalgamate those arguments through a philosophical analysis of the relevant literature and an analysis of the legal findings concerning one of the most well-known and most current cases against testing for female eligibility: the case of *Caster Semenya and ASA against the IAAF*.[3] The purpose of this analysis is twofold: i) to introduce a pragmatic legal analysis of scientific use in CAS, and ii) return arguments of fairness within a legal framework. This analysis also brings in scholarship around transgender athletes, as discriminations for both intersex athletes and transgender athletes could be related to judgements around physique and fair play etiquette. The dissertation contribution for this chapter reasserts the way that sports authorities prioritize science to deem fairness requirements necessary discrimination.

[3] The group submitted a name change from the IAAF to World Athletics in October of 2019.

4.2 Method and methodology

Semenya's and the ASA's 2008 CAS cases findings are directly relevant to the IOC's use of fair play and the power granted to science in determining fair play. Therefore, this chapter analyzed Semenya's and the ASA's CAS case, *CAS2018/O/5794 Mokgadi Caster Semenya v. International Association of Athletics Federations* and *CAS 2018/O/5798 Athletics South Africa v International Association of Athletics Federations* (herein referred to as *Mokgadi Caster Semenya & ASA v IAAF*). Pragmatism introduced by Posner provided a filter for understanding the issues of fairness surrounding Semenya.[4] Posner's interpretation of pragmatism for law creates a useful bridge between the core concepts of pragmatism, its history, its effectiveness in challenging a particular issue, and its relevance to the philosophy of sport.[5] The issue of Semenya eligibility rests on several values within sport, namely fair play and the right to participate. Therefore, the role and relationships between lex sportiva (sports law) and fair play specific to Semenya was analyzed through philosopher Ioan-Radu Motoarca's case study of known versus unknown violations of fair play in sport. The analysis then turns on the head of fairness to interrogate not only sport fairness but also legal procedural fairness, repositioning the gaze to determine whether Semenya was treated fairly or not.

Pragmatism offers a unique set of attributes for scholars attempting to make sense of the treatment of intersexual athlete. Pragmatism is a helpful tool for filtering claims in Semenya's case. Semenya's case has become so widely popularized that even lay-people feel comfortable debating Semenya's physiology and genetic makeup even having never met Semenya. Because Semenya's story has been so popularized, people have lost sight of the real issue at hand—that Semenya is actively living through this issue and it embodies Semenya's unique lived experiences. Therefore, by introducing Posner's pragmatism

[4] *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018). The usefulness of pragmatism in Semenya's case was highlighted by philosopher Dr. Alun Hardman address at the International Association for the Philosophy of Sport conference in Kyoto, Japan, in September of 2019. Elcombe and Hardman, "Pragmatic Conventionalism."

[5] Posner, "What Has Pragmatism to Offer Law." The study of the role and reach of sports law is well established in its discipline, so this chapter does not attempt any notable contributions to the debates around sports law's role on a broader scale.

application, scholars can practice sweep aside monstrous narratives that circulate around Semenya. More importantly, Posner's pragmatism is, as he argues, a pragmatism that is fit for law, insofar as it can be used to identify proper roles of law. These proper roles beset the law as being useful in the way that society finds it to be useful, rather than in the strict sense of when the law was written or in the sense of moulding one's life to fit into the law. Instead, pragmatic law views law as always adapting, malleable, and applicable to an impossible number of scenarios that cannot exist in a fixed function.[6]

Lex sportive can be a useful navigational tool within CAS and sports law. [7] Because Semenya has already agreed to participate in the IAAF and within the IAAF and IOC regulations, Semenya is bound contractually in that any disputes that arise between Semenya and her governing body must go through the CAS. While justified because of the unique nature of sport, it also confines the dispute to be biased within the CAS and ultimately the sporting bodies involved.[8] Therefore, the introduction of sports law literature through lex sportiva is useful at understanding the complexity of the legal parameters that support the eligibility requirements. Through philosopher Ioan-Radu Motoarca's three types of fair play principles in sport, this chapter interprets the way that fair play is used.

This chapter is not meant to reflect any type of sensationalism of the Semenya case. It is meant to diminish the sensationalism by situating Semenya as a teacher or promoter of knowledge of her experiences within the female testing paradigm. The Semenya case is extremely well-known and the data is extremely accessible; there is also widespread use of Semenya's case in recent news articles. Presenting Semenya's case is relavent and familiar, and Semenya has been a notable figure in the female testing debate.

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[6] Benjamin N. Cardozo, *The Nature of the Judicial Process (1921)* (New Haven: Yale, 1976).

[7] See the Sports Lawyers Association, the International Sport Lawyers Association, the Canadian Sports Law and Governance Association, and the International Association of Sports Law, among others. Lex sportiva can help scholars navigating tricky legal conundrums.

[8] That sports disputes can only be heard in the CAS has been an issue in past human rights cases, notably the case of Canadian cyclist Kristen Worley. See Lori Ewing, "Canadian Cyclist Kristen Worley Blazes Own Trail as Voice for Gender Diversity in Sport," *The Globe and Mail*, April 19, 2019.

4.3 Pragmatism, lex sportiva, and fair play

In recognizing that all three concepts presented in the following section (that of pragmatism, lex sportiva (sports law), and fair play) have been elusive of an agreed-upon definition or usefulness, this section contributes useful insight to the ways that each of these conceptual terms can be applied within scholarly research as it relates to sports, discrimination, and sports law.

The following section provides an overview of the key terms, and their application in this chapter.

4.3.1 On pragmatism

Pragmatism within an understanding of justice and law has been heavily criticized as a model that does not provide adequate tools to be used within a normative practice. Historic legal theory has long been entranced by the debate of legal realism versus pragmatism.[9] My entrance into this topic is relatively nascent, so any pragmatism application here cannot consider decades of thoughtful debate. However, pragmatism has not been dismissed, and it instead can show usefulness through creative philosophical inquiry.

Before the benefits of pragmatism to law can be identified, it is crucial to establish what pragmatism means in this chapter. It is also worth noting that there are numerous types of pragmatism. American jurist, economist, and previous United States (U.S.) Circuit Jaw Richard Posner's representation of pragmatism can be applied to law for sweeping away unnecessary narratives.[10] Not only that, but it also requires that certain propositions be continually tested, and it judges issues by their social needs rather than criteria that are considered to be objective or impersonal.[11] In his article "What Has Pragmatism to Offer Law," Posner offers two definitions of the term. The first is that of R.W. Sleeper that

[9] Posner, "Pragmatism." Many within this discipline would argue that the debate has been settled; however, pragmatism has been taken back up to be used in other contexts. Its usefulness for Semenya has been highlighted by sport philosophers recently. See Elcombe and Hardman, "Pragmatic Conventionalism."

[10] Posner, "Pragmatism," 1662.

[11] Posner, "Pragmatism," 1661-2.

pragmatism is "…a philosophy rooted in common sense and dedicated to the transformation of culture, to the resolution of the conflicts that divide us," and that of Cornel West, that pragmatism is a "common denominator" and is "a future-oriented instrumentalism that tries to deploy thought as a weapon to enable more effective action."[12] From Posner's presentation of pragmatism, this chapter uses pragmatism as a philosophy of common sense.[13]

Of course, this simplified view of pragmatism might not mean much. Instead, to turn to Posner's penultimate question: what does pragmatism have that would benefit law? Posner's article was presented during a distinct shift in pragmatism when it was tried yet again to gain traction within legal theory.[14] He argues that his proposition of pragmatism "stands for more emphatic rejection of Enlightenment dualisms such as subject and object, mind and body, perception and reality, form and substances; these dualism being regarded as the props of a conservative social, political, and legal order."[15] He suggests that pragmatism moves to understand life in more realistic, and therefore fluid terms.[16] To Posner, all humans had a level of creativity that was useful in various ways, but useful to solve the problems that come up during life.[17] Not surprisingly, to the pragmatist thought, seeking definitions of any sort, let alone necessary definitions such as "truth" and

[12] Posner, "Pragmatism," 1661; See: Sleeper, *The Necessity of Pragmatism: Dewey, Conception of Philosophy*.

[13] Posner, "Pragmatism," 1661.

[14] Posner is an expert source on pragmatism as someone who is familiar with the legal theory's history, it's natural shifts to and from legal realism and logical positivism, and as a contributor during its revitalization in the 1980s.

[15] Posner, "Pragmatism," 1654

[16] In his eyes, the idea that the universe was less structured, and more fluid fit in with the viewpoint of the Romantic poets and Romantic philosophers, which at the time challenged the rigidity posed by science, particularly in the era of the Romantics which experienced scientific fluctuations like Newtonian physics. The viewpoints of the Romantic poets, that of Blake, Woodsworth, Pierce, and Holmes was that human exertion could not be considered a merely objective reality.

[17] In either way perceived, whether the world is of a natural order or of a social attraction, humans beset a level of creativity in which, in the social realm of it, humans must creativity adapt to solve very human problems.

"objectivity," become impossible to define under these standards. Something like truth can only be represented by the individual observer and cannot represent a fixed reality.

As a welcome contributor to Posner's dialogue on pragmatism, Posner invites American lawyer Benjamin Cardozo's contribution to legal pragmatism as espoused in his 1921 book *The Nature of the Judicial Process*.[18] Cardozo's arguments for legal pragmatism are essentially grounded in human beliefs about goodness. Therefore, a law governing moral matters cannot exist in the space of its own, but there must be an agreed-upon level of understanding between how the law is written and how it is applied to the society and situation. Posner quotes the following excerpt, "In such matters, the thing that counts is not what I believe to be right. It is what I may reasonably believe that some other man of normal intellect and conscience might reasonably look upon as right."[19] Cardozo's line of thinking further argues for an instrumentalist viewpoint when considering law pragmatically, which mean that no laws can be considered "so well established that they may not be called upon any day to justify their existence"[20] as law is always adapting, malleable, and applicable to an impossible number of scenarios that it cannot exist in a fixed function.

Cardozo's and Posner's main argument against the formalist line of thought is that a law cannot prove to exist based on an originating authoritative source, which is what formalist thinking argues for. Instead, Cardozo argues that the path to where it will lead, where the decision for something to be right, wrong, or unrelated, cannot be contrived in a source, but it must be to look to the future, to establishing social homeostasis and it must consider this balance as its primary goal rather than considering the source.

[18] Cardozo, *Judicial Process*, 66.

[19] Cardozo, *Judicial*, 88-89.

[20] Cardozo, *Judicial*, 98-99.

Posner, Cardozo, and eventually new-age theorists, including Elcombe, Hardman, and others,[21] propose that the legal pragmatist is entirely *humanist in its construction*, so much so that law cannot be considered be fundamentally latched onto a particular point in time and instead must remain in flux. These laws are always in flux simply because they can be applied to various contexts, contexts that evolve by nature. Since an omnipotent law cannot naturally exist, all laws are open to interpretation when it comes time for the law to apply to a given situation. A judge's decision rests on an interpretation of the law, which ultimately is creative freedom within legal bounds or the bounds of the applicable law's limitations.

This revitalized form of legal pragmatism (which Posner refers to as neo-pragmatism applied to the law) requires three common elements to be considered pragmatic: i) distrust of metaphysical entities as certitudes in philosophical thought; such metaphysical entities refer to concepts like reality, truth, and nature; ii) the insistence that a proposition must be tested by its actions, by the effect they have, or if they make no difference then they must be set aside;[22] and iii) the assertion for the law to judge, whether it be a scientific, legal, political or ethical problem, by their ability to "conformity to social or other human needs rather than to 'objective,' 'impersonal' criteria."[23] When we consider this nature of laws, pragmatism can offer a more fluid reality than a fixed reality. This chapter brings in pragmatism to simplify the complexity of female testing in sport and show its usefulness.

4.3.2 Lex sportiva

Lex sportiva has been a topic of discussion in sports law for some time now, and this is primarily due to its power as a potentially all-encompassing definition of sports law since sports has become increasingly international and profoundly influenced by

[21] My guidance around this third wave of pragmatism is arising solely from Hardman's studies, which was later published with Tim Elcombe as leading contributor in the 47th volume of the Journal of the Philosophy of Sport. Elcombe and Hardman, "Pragmatic Conventionalism;" Colin Koopman, "Genealogical Pragmatism: How History Matters for Foucault and Dewey," *Journal of the Philosophy of History* 5, no. 3 (2011); Gregory Fernando Pappas, "Empirical Approaches to Problems of Injustice," *Pragmatism and Justice* (2017); Richard J Bernstein, *The Pragmatic Turn* (Boston: Polity, 2010).

[22] Posner, "Pragmatism," 1660.

[23] Posner, "Pragmatism," 1660-1.

commercialism.[24] In essence, lex sportiva is an attempt of sports lawyers and sports law scholars at providing a understandable definition of what sports law is, what it can and cannot influence, and its role in various international conflicts.

Unfortunately, lex sportiva does not have an agreed-upon definition, but some agreed-upon description of the term and its uses. Sports law scholar Klaus Vieweg describes it as a "basis for decisions" in legal academic articles and seems to think that lex sportiva can represent "the rules and regulations that the stakeholders in the realm of sport create in order to create a global, uniform sports law, independent of nationality and detached from the states themselves."[25] Vieweg uses the term lex sportiva as an encompassing, self-enacted, non-state law of international sport, specifically those rules and regulations enacted by national and international sports federations and legal principles that stem from the CAS. While his use of lex sportiva is a bit grandiose (he argues that it can be useful in *dissolving* tensions between the various conflict resolution on national and international levels), his exploration of the term regarding the fairness principle in law and fair play in sport is entirely relatable and worthy of consideration.[26]

In contrast, sports lawyer Alfonso Valero argues that the 2014 definition of lex sportiva cannot stand because it is based on self-referential means through the CAS. While lex sportiva had been used in CAS courts and then again referenced by other cases and academics, the definitions around lex sportiva in place cannot replace any comprehensive definition for the state of sports law. In these instances, lex sportiva can only be defined by the limited cases in which it was successfully used. The definition sought by Valero that lex sportiva is a set of "general principles of the regulations of sport shared by the sports community," he argues, speaks to the two main aspects that lex sportiva is used for: respect

[24] Alfonso Valero, "In Search of a Working Notion of Lex Sportiva," *The International Sports Law Journal* 14, no. 1-2 (2014).

[25] Klaus Vieweg, "Lex Sportiva and the Fairness Principle," *International Sports Law Review Pandektis* 10 (2014). 384.

[26] Vieweg, "Fairness Principle," 385.

for self-regulation in conjunction with mandatory but selective law oversight, as well as a conceptual tool that can define the elements unique to the sport.[27]

Valero suggests that the definition is still too ambiguous since its components are waived around when the CAS seeks outside support from the governments when desired but is also used as a separation tactic by the CAS to restrict this same government oversight during sensitive moments. He cites several instances where the court has manipulated lex sportiva based on these bounds, which draws significant attention to the potential of misuse that a lacking definition in lex sportiva can convey.[28]

To Valero, lex sportiva is *granted recognition over individual national legal norms by state laws*. For example, in article 12 (1) of the Charter of Fundamental Rights of the European Union, autonomy is granted to the individual sports federations in enforcing their own rules and regulations. The authority to exact law ultimately derives from state laws.[29] Individual sports federations cannot create their own lex sportiva, and if there is conflict, then the European Union (EU) can supersede lex sportiva.[30] There is serious doubt about whether a uniform, international law can effectively navigate the multitude of intersecting social, moral, national, and international conflicts that arise in sport. This is by and far the most significant critique of lex sportiva; even so, lex sportive has been used for decisions in past CAS cases so it therefore exists in some capacity regardless even if the use of lex sportive as a "uniform, international law" is inaccurate.

[27] Valero, "Lex Sportiva," 4.

[28] Valero, "Lex Sportiva," 4. In many cases, the court sites the necessary reason for why government should not intersect with sport. One example is this statement that was issued in the US court case Nabozny v Barnhill, "This court believes that the law should not place unreasonable burdens on the free and vigorous participation in sports by our youth. However, we also believe that organized, athletic competition does not exist in a vacuum. Rather, some of the restraints of civilization must accompany every athlete on to the playing field." See: Nabozny v Barnhill, 334 N.E. 2d 258 (1975).

[29] European Parliament, *Charter of Fundamental Rights of the European Union* (Luxembourg: Office for Official Publications of the European Communities, 2000).

[30] Valero, "Lex Sportiva," 5.

As argued by Vieweg, that although "lex sportiva is by no means a cure-all, it does offer participants in the realm of sport the 'chance to self-regulation.'"[31] Lex sportiva is subject to strong influences by the national and state law considering that the state allows the existence of a lex sportiva, and by doing so, the state also has ultimate power in regulating decisions within lex sportiva. This becomes a mutual relationship then; when CAS decisions are based on lex sportiva, these decisions can be recognized in national courts. However, these decisions are restricted in that they cannot violate the principle of *the odre public*, which means that the decision cannot violate mandatory international norms to be internationally recognized. Therefore, the CAS must regard international moral norms to inform a properly enforced decision outside its court. Moreover, in applying national law to sports cases (where, for example, the Court of the EU must step in), the Court of Justice of the European Union would classify characteristics of sports federations' rules and regulations as confirming to EU law not to erode the unique features of sport and to recognize the necessary organization of sport.[32] Lex sportive can step in when decisions made by the sporting world might be considered immoral compared to international norms.

4.3.3 Fair play principle in sport

Motoarca's essay around the enforcement of fair play through institutional penalties is an excellent entrance into the enforcement of the fair play principle in sport generally. Some scholars argued that Fair play is considered a moral norm system that has evolved in sport to consider something as simple as 'you do not check a player from behind' to something as overt as 'do not dope.'[33] These types of assertions around fair play can be arguably traced back to the development of sport and sporting culture around amateurism and sportspersonship, and for the reasons that sport has piqued the interest of so many worldwide, small and large acts of fair play have remained central to many games in both international, professional, and amateur sport.

[31] Notably the Swiss Federal Court of Justice, 2018; Vieweg, "Fairness Principle," 387-8.

[32] Valero, "Lex Sportiva," 5; Vieweg, "Fairness Principle," 387.

[33] Loland, *Fair Play in Sport*; Motoarca, "Kinds of Fair Play," 125.

The common understanding with fair play infractions is that they violate something about the sport agreed upon while it might not necessarily have been written in stone. To each degree, examples of fair play infractions are only brought up as commonly understood to be breaching fair play in sport because, generally, the instance occurred and altered the game's effects. In many of these instances, those fair play infractions that are the most contentious seem to exist as a cheater who got away. Where the large majority recognize that the fair play infraction exists, the play was still made (concerning Maradona's hand goal, for example), and in this way, the player in the very least knew that they were cheating and let the play happen regardless.[34] Whether the officials in question were duped or not is not necessarily the point, although the officials do bear much of the brunt of the responsibility at the moment. However, the player in question is considered to be at that moment teetering on edge in the sporting world where, if it were up to, say, the fans, he would have been kicked out of the game right then and there.

To articulate his point, Motoarca brings up Adriano's situation, a Shakhtar forward who committed a 'fair play infraction' during a Champions League match.[35] Motoarca's aim in addressing this incident is essential because although the infraction was an unspoken rule, the player was penalized by use Union of European Football Association's (UEFA)

[34] Maradona's hand goal is a very famous fair play infraction done by Argentine footballer Diego Maradona. The incident is also referred to as the hand of God, since Maradona stuck his hand out in an attempt for his team to score a goal in the quarter-final match between Argentine and England as part of the 1986 FIFA World Cup. The goal stood and remains to be controversial largely because video footage shows clearly that the hand contact was made, and the incident stands as an example of a fair play infraction largely because the call was not changed, even by Maradona himself. It also serves as a useful example of regulating constitutive rules. See Nicholas Dixon, "On Winning and Athletic Superiority," *Journal of the Philosophy of Sport* 26, no. 1 (1999).

[35] While tangential to the discussion of the chapter, it might be helpful to articulate at least some of Motoarca's example. He brings up the fair play infraction of the footballer Adriano Leite Ribeiro who, in a game of FC Nordsjaelland versus FC Shakhtar Donetsk, changed the trajectory of the game by not following a fair play principle commonly followed in football. Play was stopped due to the injury of a Nordsjaelland player. This meant that the play was stopped while the Danish were in possession of the ball. Upon resuming the game, possession automatically goes to Shakhtar, and common courtesy states that the ball would be returned to the team who had possession before the injured stoppage, which in this case was the Danish. So, while one of Shakhtar's players kicked the ball to the Danish, Adriano (who is on Shakhtar) swoops in to take possession of the soccer ball and ended up scoring. Shakhtar of the Ukraine ended up winning over Nordsjaelland of Denmark 5-2. What makes the win of Shaktar so remarkable is the fair game infraction that drastically affected the outcome of the game.)

Control, Ethics and Disciplinary Body with a full game suspension and community hours.[36] Regardless of whether or not the player knew they were potentially cheating the fair play rules of soccer, and regardless of if they intended to take advantage of an otherwise unclear inbound kick, the rules of the Disciplinary Regulations were vague but still able to encapsulate the broad range of sporting conduct behaviour that could be violated.

Motoarca articulates that at least specific to soccer; there are three types of fair play principles: rules required to play the game that is also considered fair play (sport-specific; which he labels FP-1), rules related to good sportspersonship that are not written rules (which generally are intended to provide respect in sport and might be applied to a variety of sports; FP-2), and other forms of fair play principles that would fall under the term etiquette (sport-specific; FP-3).[37] Therefore, his distinction between fair play types is an essential aspect of fair play regulatory behaviour, particularly when considering violations around participating in sex categories. While tangential, it is important to clarify, at least to some extent, what Motoarca means by these three types of fair play principles.

FP-1 fair play principles that are constitutive to a given game are specific to the game played in that the principle might be included in the rule book, and in some sense, the withdrawal of that rule from the official rule book would change the nature of the game. These rules are not intended to invoke metaphysical harm as in the good versus evil sense, but they are, by all intents and purposes, required as we have defined the sport to exist as it does today. It is also important to note that his use of a required principle is constitutive

[36] A decision was made after the game by the UEFA's Control and Disciplinary Body to penalize Adriano because he infracted an unspoken rule (that the ball would go back to the Danish) with a next game suspension and a day of community football service. Article 5 of the Disciplinary Regulations of the UEFA was invoked, where Article 5 and Article 10 clearly demonstrate that anyone "who behaves in an unsporting manner to gain advantage" (from the former) can be suspended for one game (from the latter). See Motoarca, "Kinds of Fair Play." News outlets deemed the infraction "hugely controversial"; see Press Association, "Shakhtar's Luiz Adriano Banned One Game for Goal against Nordsjaelland," *The Guardian* 2012, https://www.theguardian.com/football/2012/nov/27/shakhtar-luiz-adriano-banned-one-game.

[37] Motoarca's extensive argument is that while it is clear that the player's behavior was considered unsporting, the rules had not been applied in this manner before. He furthermore notates similar behaviors of unsporting behavior, which to a lesser degree might not have been considered as blatant or significant, could also be interpreted from the same UEFA rule, but they are not. His argument seeks to draw a line where violations of the fair play principle, in soccer specifically, can incite the UEFA's regulations and when it is an abuse of the Disciplinary Regulations. Motoarca's description of fair play rules are similar to that of Suits',

in the enlarged sense. Therefore, the rules are not necessarily constitutive (or regulatory) in nature, but they are considered a requirement of the game regardless of how the rule is classified. His general example is that of regulating a foul. While some may consider this to be a regulatory rule, it could also very well be classified as a constitutive rule because it is in place to enforce a safety requirement that would allow the game to get out of hand if it were not in place.

The secondary form of a fair play principle (FP-2) is not directly tied to a game structure. However, its "…purpose is to promote an atmosphere of cordiality, respect and equal opportunity on the pitch (and sometimes outside of it)."[38] Motoarca classifies this fair play principle as tied to social, behavioural aspects not tied to a specific game but regulated by broader, social governing of behaviour within a given culture. For example, there are general rules around behavioural expectations and rules around racist remarks while in play (under proper sporting conduct), but these types of fair play principles are still invoked even outside and outside of the intimate actors in a sport. These types of fair play principles are usually based around generally agreed-upon societal morals and loosely around a process of ethical enforcement at a given time and are considered external to a sport, even if written into some type of formal organizational rules. These are more fluid but can also be tied to legal jurisdiction outside of sport.

The third form of fair play principles (FP-3) is tied to a game and reflect proper social behaviours concerning etiquette. An etiquette related fair play principle is not be fundamentally tied to a game's structure, but it would cause an effect in the game environment if the rule were violated in some way. A simple example of this is when hockey players shake the opposing team's hands at the end of a game. Hockey is one of the only sports that has carried on the tradition of shaking hands even though it is not a rule *per se,* and being a part of this procession is a form of etiquette. Pittsburgh Penguins' star Sidney Crosby was criticized for failing to shake hands after winning the Detroit Red Wings to win the 2009 Stanley Cup. This fair play infraction is still cited in popular news stories, even though the post-game experience on the ice after the Penguins' Stanley Cup

[38] Motoarca, "Kinds of Fair Play," 126.

win might be considered an environment that is not normal.[39] Therefore, signs of etiquette are tied to a sport and generally offer a level of respect for when an otherwise good physical behaviour is considered out of hand.[40] According to Motoarca, other examples are apologizing for when a ball hits the net and goes on the other side in tennis, helping a player up in contact sports, and pre-game rituals of good sportspersonship.

In each of these fair play types, the distinction that Motoarca is making is around the *severity* of the moral or fair play infraction, whether this infraction should be regarded as a form of social infringement, and whether or not the rules of etiquette could be so forcibly applied. This chapter takes on all three of Motoarca's fair play rules (FP-1, FP-2, and FP-3).

4.4 Mokgadi Caster Semenya & ASA v IAAF

The case in question consists of two claimants, South African middle-distance runner Caster Semenya and Athletics South Africa, who submitted a formal dispute against the Constitution of the IAAF: *CAS2018/O/5794 Mokgadi Caster Semenya v. International Association of Athletics Federations* and *CAS 2018/O/5798 Athletics South Africa v International Association of Athletics Federations*.

Their primary claims are that the IAAF's DSD Regulations, which are loosely considered to be the revitalized testing regulations known colloquially as sex testing, discriminate[d] against athletes based on their sex or gender. As the Arbitral Award details: "[the DSD Regulations] only apply (i) to female athletes; and (ii) to female athletes having certain

[39] Even in a situation when excitement is high, hockey players are still expected to join the procession. Another example of this type of infraction is at the 2020 World Juniors. Team Canada captain Barrett Hayton forgot to remove his helmet during the Russian national anthem, and in turn was criticized for a lack of class. Directly after the anthems, when the players were supposed to shake hands, several Russian players intentionally averted shaking his hand and passing comments to him to let him know that the move on Hayton's part was a sign of disrespect.

[40] There has been the suggestion that the fair play rules around etiquette are an extension of the rules around cordiality. And to an extent I would agree, but I also agree with Motoarca around leaving the distinction between etiquette and the rules of the game. Partly so because this brings in the degree of the "spirit of the game", which, while a crucial aspect of sports conduct and game-playing, in the simplest sense, overcomplicates otherwise simple matters

physiological traits."[41] During the hearing, both parties presented evidence to support either the claims of discrimination or the claims in support of the regulations. Such evidence presented included the decision of Chand's case wherein the CAS delivered an Interim Award that upheld Chand's appeal and suspended the regulations (at the time referred to as Hyperandrogenism Regulations) for up to two years.[42]

The regulations in question for the Semenya case govern women's eligibility with differences of sex development (DSDs) by testing for a level of endogenous testosterone above 5nmol/L to participate in eight events in international athletics competitions.[43] If an athlete fails this test, they must regulate the endogenous production of testosterone through medication or are no longer able to participate.[44] Also significant to this chapter is an occurrence that happened within the hearings, which was the late modification of the DSD Regulations by the IAAF insofar as Semenya could not prepare for the hearing the amended items under consideration as well as unable to procedure expert testimony. She claimed that this late addition violated her right to procedural and substantive fairness, among other things.[45]

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[41] *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018), 1, 2.

[42] *Dutee Chand v. AFI & IAAF*, 2014/a/3759 (CAS, 2015) 1. Since this decision, the IAAF withdrew the Hyperandrogenism Regulations and replaced it with new regulations, which are now the regulations under consideration for Semenya's case. This terminated the *Chand* case as the regulations did not apply to Chand.

[43] The use of the phrase used by the CAS is significant here as they state that the DSD regulations "establish new mandatory requirements governing the eligibility of women with certain differences of sex development ("DSD")" *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018), 1, 3.

[44] There is also some controversy around this requirement of the regulation as it was initially the case in the Hyperandrogenism Regulations that women were to obtain surgery. This has been removed as a violation of medical ethics. And the requirement that individuals are to not participate is part-and-parcel to the complaint at hand as other than taking medication in order to lower the endogenous testosterone levels, there is no other avenue that allow athletes with DSDs to participate in the eight sports in question in Athletics.

[45] *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018), 1, 8. Semenya also submitted complaints against the amended items themselves, submitting the evidence against the use of oral contraception for testosterone management.

The application of the three concepts presented above is useful based on the complexity of the Semenya case. In many ways, Semenya's case highlights how fair play is used as a strategical tool in determining the sex and gender divide and natural sex is being used against her right to compete. However, to establish this, it is important to look at each of the concepts they apply to Semenya's hearing. The concepts are presented against the Executive Summary decision issued on April 30th, 2019, instead of the redacted Arbitral Award.[46]

4.4.1 The application of legal pragmatism to Semenya's case

In his 2019 IAPS Presidential Address, Hardman attempted to revitalize philosophical pragmatism within the realm of sports law and related explicitly to Semenya's case. While not derived from Posner, his approach to pragmatism was developed from a type of third-wave of pragmatism, and it begins to account for some of the glaring holes that pragmatism has been criticized against similarly along the lines that Posner developed.[47] Furthermore, his analysis suggests pragmatism as a useful analytical tool for scholars who aim to research Semenya's case.

Situated within Elcombe and Hardman's definition of pragmatism is the notion that *justice exists within an ever-improving cultural framework* that seeks to define morally normative practices along a fixed exponential timeline. Philosopher Tim Elcombe and Hardman draw from pragmatist Colin Koopman's basis of *Pragmatism as Transition*, which asserts that social practices are transitional and that when certain customs are in transition, it can be labelled as a form of "meliorative cultural criticism[s],"[48] or otherwise known as

[46] The choice to analyze the Executive Summary over the Arbitral Award is largely due to accessibility; at the time of this study, the Arbitral Award was not available, and it is now only available in redacted form. The Executive Summary suffices in the instances described.

[47] In his address Hardman credits third-wave pragmatism to authors such as Pappas and Koopman. It should be noted that the address was eventually published with Tim Elcombe as the primary author. Nonetheless, the introduction of this topic by both authors is noted for bringing a useful but previously unrecognized analytical tool into a very relevant area of sports studies. Pappas, "Empirical Approaches to Problems of Injustice." Koopman, "Genealogical Pragmatism." The presidential address was published in conjunction with author Tim Elcombe in the 47th volume of the Journal of the Philosophy of Sport. See Elcombe and Hardman, "Pragmatic Conventionalism."

[48] Elcombe and Hardman, "Pragmatic Conventionalism," 2.

transitional norms of justice. At its core, Koopman's ideals of pragmatism are similar to Posner's articulation. Koopman's ideals of pragmatism are based on addressing current and vital social issues on normative moral ethics, which speaks to who we are and aims to be a society. Koopman's pragmatism is human-centric, similar to Posner's. Furthermore, in both matters of thinking, pragmatism exists to account for the emotional fluctuations of the human enterprise in ways that a fixated legal, medical, or otherwise linguistic point of view of our society cannot fully account for.[49]

Of relevance to Semenya's case, Elcombe and Hardman's takes on some of Koopman's core beliefs to position Semenya's issue in terms of a neo-pragmatic viewpoint. In other words, they ask, 'how can philosophers in legal and sports theories conceptualize the dilemmas that Semenya is facing within this objectivistic framework?' Elcome and Hardman seek to use pragmatism philosophy within the objectivity of legal framework. Moreover, to answer these questions, they first identify philosopher Nancy Fraser's use of "normal justice" and "abnormal justice."[50] In Fraser's point of view, "abnormal justice" marks a period when these core components of "normal justice" (the what of justice, the who, and the how of the justice being served) are absent. According to Fraser, "normal justice" exists where there is: i) a shared assumption (social and theoretical) around what justice is; ii) shared ontological assumptions about who is entitled to make claims about/against/toward whom; and iii) *stable* assumptions around the scope of justice so that delimitations around how justice can be carried out are clear.

On taking Fraser's perspective around normal justice, the relationship between pragmatism and Semenya might be more apparent. As Elcombe and Hardman assert, the who, what, and how of the justice being served in the Semenya case is lacking. Among other ways, practicing legal pragmatists might address the scholarship of medical ethics and gender

[49] Koopman, "Genealogical Pragmatism;" Elcombe and Hardman, "Pragmatic Conventionalism;" Posner, "Pragmatism."

[50] Nancy Fraser, "Abnormal Justice," *Critical Inquiry* 34, no. 3 (2008); Nancy Fraser. *Scales of Justice: Reimagining Political Space in a Globalizing World*. Vol. 31 (Columbia University Press, 2009).

ethics.[51] Scholars anthropologist Katrina Karkazis, feminist Rebecca Jordan-Young, and bioethicists Arthur Caplan have called into question the nature of the tests regulating the women's category under various grounds, including medicine or science play in determining womanhood and in regulating the gender category in sport. If these tests are based on a scientific understanding of sex/gender, they should be upheld by the same rigour in which science is upheld.

In this way, the role of the history and philosophy of science as it applies to sport could bridge concerns of ethicists and lay-people and scientific justifications. On the one hand, of concern for Semenya's case, pragmatist thinking should be, and it seems it is ultimately tied to, scientific and medical ethics in that Semenya is bound to the roles that genetic and endocrinological research play in determining her corporeal reality. Therefore, as prescribed by Posner, a pragmatist viewpoint of female testing in sport resides on realistic expectations of human nature, in flux understandings of human knowledge and personal experiences, and fluidity within strict legal frameworks.[52]

Another strong rationale for the use of pragmatism within Semenya's case is that Cardozo's *The Nature of the Judicial Process* stems from John Dewey, a leading philosopher on pragmatism at the time of its publication. Posner posits that new ideas in pragmatism were not emerging; the area of philosophy, namely logical positivism, was benefiting from

[51] Anthropologist Katrina Karkazis' work has been a major proponent for combatting the use of sex testing in terms of medical ethics around intersex and testosterone. See Karkazis et al., "Out of Bound;" Karkazis and Jordan-Young, "Powers of Testosterone." Katrina Karkazis, *Fixing Sex: Intersex, Medical Authority, and Lived Experience* (Duke University Press, 2008); Other scholars include Caplan, "Fairer Sex," 549; Silvia Camporesi and Paolo Maugeri, "Caster Semenya: Sport, Categories and the Creative Role of Ethics," *Journal of Medical Ethics* 36, no. 6 (Jun 2010): 378-9, https://doi.org/10.1136/jme.2010.035634.

[52] Of concern for the case of Caster Semenya, pragmatist thinking should be, and it seems it is ultimately tied to, scientific and medical ethics in that regularly these practices need to be reassessed to ensure that while the end goal for the enterprise, for example science, is to observe nature through as normal processes as possible, there is the understanding that the role of science still files under the application of the pragmatist viewpoint. Science is still created by and large with human tools, and there is no one way to perform science. Posner suggestion of a pragmatist point of view for the philosopher of science could contraindicate the philosopher of science's enterprise since it rests on a detrimental (through the downfall of either pragmatism or science itself) form of anti-materialism and anti-positivism. Posner states that the shift in direction of the pragmatist thought poses a direct challenge to positivism: "But it shifts the emphasis in philosophy of science from the discover of nature's laws by observation to the formulation of theories about nature that are motivated by the desire of human beings to predict and control their environment." Posner, "Pragmatism," 1656.

pragmatic ideals. He states, "Logical positivism itself, with its emphasis on verifiability and its consequent hostility to metaphysics, is pragmatic in demanding that theory make a difference in the world of fact, the empirical world. Popper's falsificationist [*sic*] philosophy of science is close to Pierce's philosophy of science; in both, doubt is the engine of progress and truth an ever-receding goal, rather than an attainment."[53] Therefore, he argues, the fact that Dewey and other prominent pragmatists can be seen streaming through analytic philosophy and political philosophy,[54] and disciplines outside of philosophy, such as anthropology,[55] and academic lawyers, is significant and it shows that the use of pragmatism should not go overlooked.[56]

4.4.2 The application of lex sportiva to Semenya's case

Vieweg considers lex sportiva to be "encompassing the self-enacted, non-state law of international sport,"[57] which is an appropriate use of the term lex sportiva in current literature and for this chapter. He also considers lex sportiva to be a recognizable concept demonstrated by the CAS regardless of its definitional ambiguity. Therefore, recognizing that lex sportiva exists allows the CAS and the sports federations a degree of autonomy that grants unique aspects of sport to be permissible and understandable within the multi-various levels of international and national laws could play a role in the development of sports law.

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[53] Posner, "Pragmatism," 1659.

[54] Posner, "Pragmatism," 1659.

[55] Philosophers of sports science are all too familiar with Geertz, Clifford, "Deep play: Notes on the Balinese cockfight," In *Culture and Politics*, 175-201. (New York: Palgrave Macmillan, 2000).

[56] Posner's footnote on academic, legal pragmatists is quite long. However, I would recommend Farber's *Legal Pragmatism and the Constitution*, Grey's *Holmes and Legal Pragmatism,* and pretty much anything by Rorty. Notwithstanding, Posner's correlation here on all the veritable forms of pragmatism that are still alive today, thirty years after they were supposedly discontinued, speaks volumes then to the usefulness of aspects of pragmatism over a variety of channels. He cites that the strengths of pragmatism are better appreciated today are "…due in part to the apparent failure of alternative philosophies such as logical positivism, but more to a growing recognition that the strengths of such alternatives lie in features shared with pragmatism, such as hostility to metaphysics and sympathy with the *methods* of science as distinct from faith in the power of science to deliver final truths;" Posner, "Pragmatism," 1653.

[57] Vieweg, "Fairness Principle," 385.

Vieweg also finds that through procedural aspects, the CAS adheres to and requires that the fairness principle is honoured through all levels of governances and within the procedural aspects of hearings. The area within legal theory in which this resides is the right to a fair hearing recognized by the CAS.[58] Vieweg also recognizes the use of the fairness principle in regards to interpersonal relationships within sports, as well as the fairness principle being of substantive content by the CAS, "as a general legal principle and the court also expressly relies on the principle in applying federation rules and regulations and filling lacunae when reaching its own decisions."[59] The fairness principle can also be a useful principle when a rule requires a certain degree of interpretation from its formal roots. Furthermore, according to Vieweg, the fairness principle is exerted only when applied to other athletes in comparable situations.

In a few examples, Vieweg cites the terms in which the fairness principle has been called upon in CAS. Examples include the ability for participant concerns to be heard fairly, the necessary assertion for clarity (for example, if a time limit was not evident in a given event), and that "[a]ny sanction imposed on an athlete must be comparable to sanctions imposed on other athletes in similar cases in order to ensure that the fairness principle is observed."[60] Based on the application of the fairness principle in lex sportiva, specifically, it could be argued that the fairness principle on legal grounds has been violated since the regulations on DSD can only apply to female athletes. This raises the question whether a comparable situation means that the situation must limit itself to the gender category in question? It might be suggested that if a comparable situation existed for all athletes, then all athletes must be able to be subjected to a relatively similar scenario. More analysis is needed here to better understand the applicability of an eligibility regulation like sex/gender testing.

Another area that is not clear is whether the fairness principle could be invoked when a case would extend beyond applying the federation rules and regulations as a form of lex sportiva. It was not clear if the principle could "…limit the authority of sports associations

[58] Vieweg, "Fairness," 389; see footnotes, for example: CGF v EGA, CAS 2010/A/2275.

[59] Vieweg, "Fairness," 389.

[60] Vieweg, "Fairness," 390.

and federations to enact their own rules and regulations and whether the CAS can… quash federation rules and regulations if they are found to be in violation of the fairness principle."[61] If this is the case, then the usefulness of lex sportiva can be used to invoke that a type of procedural unfairness has been committed in the *Mokgadi Caster Semenya & ASA v IAAF* case. The decision to determine eligibility based on sex/gender invokes transnational and transcultural belief systems about sex/gender; however, forcing Semenya to be judged based only on the belief systems of CAS is extremely limiting and not accurate. Lex sportive is useful in this regard; because of the many differing global understandings of sex/gender, lex sportive argues that this hearing should be considered within more contexts than simply CAS.

Lastly, Vieweg invites the general legal principles of equal treatment and proportionality to be significant to sports federations' rules and regulations. In the award of *Mokgadi Caster Semenya & ASA v IAAF*,[62] the Panel does speak to the level of discrimination, necessity and proportionality involved in this case as the basis for allowing the rule to remain legitimate, citing that it is considered standard for a rule to impose treatment that can be defined as discriminatory (by being differential) based on specific criteria or characteristic if it is deemed "a necessary, reasonable and proportionate means of attaining a legitimate objective."[63] Therefore in this situation, the proportionally and necessary requirement for discriminatory rules to exist in athletics is to allow for other athletes a chance at winning and to ostracize an athlete who performs too well.[64]

What cannot be overlooked in *Mokgadi Caster Semenya & ASA v IAAF* is the justification that the necessity of the eligibility requirements is based on a reasonable and proportionate means for obtaining an objective (i.e., separating sport for fairness). Although segregating

[61] Vieweg, "Fairness," 391.

[62] *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018), 1.

[63] *Dutee Chand v. AFI & IAAF*, 2014/a/3759 (CAS, 2015) 1.

[64] Silvia Camporesi's recent 2019 publication addresses the balance between unfairness on the nuanced level within a medical ethics discipline. Silvia Camporesi, "When Does an Advantage Become Unfair? Empirical and Normative Concerns in Semenya's Case," *Journal of Medical Ethics* 45, no. 11 (2019): 700-4.

the sexes and maintaining this divide is reasonable, so is the necessary ostracism of a woman who is told that they cannot compete. While the test's usefulness might be shown in court, CAS fails in providing adequate recommendations for continued play.[65]

4.4.3 The application of the fair play principle to Semenya's case

According to the Executive Summary for the April 30th, 2019 decision for *Mokgadi Caster Semenya & ASA v IAAF*,[66] the DSD Regulations were the regulations called into question, not the sex binary in sport. Furthermore, the regulations were deemed a necessary form of discrimination. The differences between the fairness of allowing Semenya to participate regarding Semenya's rights and the rights of the other athletes presented an ultimately difficult case for the CAS Panel. Semenya in this case is determined to be violating rules of eligibility and CAS must decide between the rights of the few (i.e., Semenya and athletes who violate eligibility requirements) or the many (i.e., athletes who do not violate eligibility requirements).

Additionally, the Panel specifically stated that while Semenya was the main informant involved in the case, in no way is the hearing a case over cheating. The Executive Summary state that

> while much of the argument in this proceeding has centred around the "fairness" of permitting Ms. Semenya to compete against other female athletes, there can be no suggestion that Ms. Semenya (or any other female athletes in the same position as Ms. Semenya) has done anything wrong. This is not a case about cheating or wrongdoing of any sort. *Ms. Semenya is not accused of breaching any rule.* Her participation and success in elite female athletes is entirely beyond reproach and she has done nothing whatsoever to warrant any personal criticism. (6, emphasis added)

For Semenya's most recent case, consider the following findings: the DSD Regulations are the only regulations that are being called into question, not the regulation around the sex binary in sport; the IAAF has proved to the CAS that the regulations governing female

[65] In 2007 it was reported that Indian sprinter Sanathi Soundarajan attempted to commit suicide after failing a gender following her silver medal win at the Doha Asian Games. See "Athlete Santhi Soundarajan Attempts Suicide," *Hindustan Times* 2007. "Athlete Santhi Soundarajan Attempts Suicide," 2007.

[66] *Mokgadi Caster Semenya v. International Association of Athletics Federations*, O.

athletes with 46XY DSD must remain intact due to ethical concerns around fairness and the right for other female athletes to participate; Semenya has not violated a fair play principle, knowingly or unknowingly, nor is Semenya being accused of such behaviour, as stated by CAS;[67] Semenya is not being charged as violating a fair play principle in any case even though her eligibility stands to rest on IAAF's adoption of the fair play as a primary principle in athletics; Semenya is being subjected to medical and public scrutiny even though she has not violated the fair play principle, or knowingly cheating, but was instead forced into a situation and must challenge the regulations that are seeking to limit professional athletics career. What could also be analyzed is if sport is reasonably voluntary at this stage whether and the implications of testing Semenya at this stage in her career.

Based on the CAS decision, it would seem that standard understandings around regulating fair play do not apply to the unique situation of Semenya's eligibility. For one, as clearly established by the CAS and as commonsensical as it is, it is impossible to ask that a female athlete be responsible and aware of her genetic makeup in order to comply with this regulation around DSDs. However, it is unnecessary to consider Semenya an athlete who violates the legal fair play principle as she is not being accused of this.

There is also the question of the role that sporting fair play has in this. As Motoarca describes it, Fair play, as fundamental to the sport, is the rule that applies, but the interpretation of this rule is murky. In some ways, the two behaviour-type rules might also apply. To consider the fair play principle as an external social rule, that of FP-2, regulating sex for physical reasons might be regulated within mandated courts (so outside of CAS regulation) in the instance of domestic abuse. Physical parameters might be considered when an agreed-upon situation is mediated through physical requirements, such as physical forcefulness (within or outside of a relationship). However, there is no instance where sex

[67] *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018), 1, 6. See quotations in previous paragraph.

regulation is invoked in broader, socio-legal understandings. The only area in which sex regulation is invoked is Western medicine as a proactive form of social regulation.[68]

4.5 Fair play etiquette and judgements of physique

Fair play as etiquette also plays a factor as it would not be proper for an athlete born male to walk over to the starting blocks of the athletics event. Knowing or unknowingly violating this rule, to a degree, labels the person in question to be in clear violation of social etiquette (in the broad sense) and sporting etiquette. Officials governing the Olympic Games, including the IAAF, repeatedly expressed concern that a man would find himself walking up to the starting line and attempt to win the gold medal at the women's event of his choice. However, this type of suggestion indicates a difference between knowingly and unknowingly breaking the rules of eligibility.

The issues of hyperandrogenism and athletes who have undergone gender-conforming surgery are inextricably related in this sense. Transgender athletes, who complete male-to-female or female-to-male gender-confirming surgery, are also discussed in the literature as athletes who cross the sex/gender divide in sport.[69] Their eligibility issues are similar to those that emerge in discussions of female testing. The IOC has a separate set of regulations that define how transgender bodies are regulated; however, scholars also suggest that these regulations are harmful rather than helpful.[70] Some scholars argue that the tests uphold the gender binary, or the classification of gender between men and women.[71] According to Cavanaugh and Sykes, "… the policy functions to manage a categorical gender binary in the face of social, medical and legal uncertainty; gender identifications, anatomical, genital and chromosomal variations that aren't intelligible to

[68] Where an infant would display sometime of disorder of sex development, doctors have historically rectified this through medical interventions, such as hormone, surgical modifications and psychiatric development. This practice has been recommended to be discontinued, but doctors are still medically obliged to label sex upon delivery of a baby. See Karkazis, *Fixing Sex*.

[69] Ljungqvist and Genel, "Essay;" Cavanagh and Sykes, "Transsexual Bodies."

[70] IOC, "Stockholm Consensus," 2004.

[71] On both the sex testing policies and policies for transgender athletes: Sullivan, "Gender Verification," 402; on the Stockholm Consensus (transgender athletes): Cavanaugh and Sykes, "Transsexual Bodies," 77.

those committed to a bio-centric two sex model; so-called gender 'purity' in women's sport; and to mask a fetishistic engagement with athletic bodies – as media spectacles – that are hyper-muscular, sculpted, highly toned, enervated, streamlined, and appear to be death defying."[72]

Discussions on the regulation regulations for transgender athletes are often connected to the regulations against hyperandrogenism. Debates around transgender athletes and hyperandrogenism in sport are predicated on the separation and regulation of the sex categories. To maintain a fair playing field, the IOC subscribes to sex as a binary and segregates sports based on male and female sexes. While considered outdated and will never result in purely equal opportunities for women and transgender women, this model stems from fears that physiological advantages will cause irreparable harm to the sex categories in sport. The discrimination of transgender athletes in sport is based on this and the notion that transitioning from one sex to another could transmute the same advantages procured by using substances banned under the WADA.

Semenya's physique plays a part in this discussion as well. Historically, officials concerned with sex testing in the 1960s-1980s used language of this sort; sex testing was deemed necessary because hyper-muscular athletes competed in the 800-metre event.[73] These athletes were believed to be purposely cheating the rules around sex-segregated sport, rather than the case of being more muscular than other competitors. Hyper-muscular women who participated in the sport of track and field, for example, were believed to be Amazonian and called a "muscle moll."[74] These transgressions of normative heterosexuality and femininity are shown in the muscular female athlete and the female athlete who dopes. They challenge the hegemonic gender order and disrupt everyday societal beliefs of gender: "Doping poses a threat to the heterosexual matrix… [t]he dislike

[72] Cavanaugh and Sykes, *Transsexual Bodies*, 77.

[73] Pieper points out that fears of "inauthentic women, male imposters, and female dopers," and an increase in "unprecedented victories and muscular physiques" of USSR female athletes, sparked the introduction of testing by the IAAF; see Pieper, *Sex Testing*, 59.

[74] Characterized by the "muscle moll" athletic female, Olympic officials had discussions in the 1950s that women's track-and-field events should be removed because the athletes were "not truly feminine;" see Cahn, *Coming on Strong,* 111.

of doping is constituted by a dislike of what it produces—the non-heterosexually feminine woman." This is most obvious in media depictions, where muscular women of colour are considered to breach normative notions of heterosexuality, femininity, and gender norms and were forced into stigmatization.

Speaking on an early IOC statement on transgender athletes, sport ethicist Sarah Teetzel's ethics-based discussion on the implications surrounding the eligibility of transgender athletes reveals that this discussion is complicated for a few reasons. For example, researchers have nascent knowledge of the transitioning process, and sports officials do not know if transitioning is a form of doping that confers a significant physiological advantage over other women who have not transitioned. Primarily when it comes to transgender athletes, sports officials are concerned with physiological differences and the increased size in stature and body types that might have occurred when exposed to androgens as males, and in which specific enhancements can carry an advantage in a given sport (e.g., feet size for swimmers, height advantages in basketball and volleyball). One aspect that Teetzel highlights is that similar types of sex differences are built into the sporting eligibility requirements, and in this way, the sport might inherently limit female potential from the start. Additionally, the introduction of the 2004 Stockholm Consensus that regulated transgender athletes highlights more complex and controversial sporting requirements for transgender athletes. Since studies of transgender athletes are not wholly conclusive (nor exhaustive), Teetzel concludes that the eligibility requirements must remain cautious in their eligibility requirements to allow for fair play in the chance that transgender athletes might confer a deleterious advantage.

Many scholars agree and urge more research into these aspects; Pitsidalis and colleagues suggest that "[g]iven the paucity of relevant research and the likely impact of decisions relating to transgender and intersex athletes, there is now an urgent need to determine not only what physical advantages transgender women carry after [gender-conforming surgery] but also what effect these advantages may have on transgender women competing

against cisgender women in a variety of different sports."[75] Unfortunately, it is still uncertain how many intersex athletes participate in each level of sport and the number of transgender athletes who wish to compete but are barred due to eligibility requirements or a lack of technological advancements.[76] Additionally, we have also not knowingly seen sex variations race against each other, nor has it been confirmed that male and female athletes *do not* want to compete together, that males would win in all competitions, or that females will be discouraged.[77]

One recent study suggests that men competing in cricket, golf and tennis have a greater performance advantaged over women, especially compared to sports like swimming and running. In identifying performance enhancements of transgender athletes, this research found that testosterone blockers taken by transgender women reduce biological advantage only slightly. The findings suggest that elite men are 10-13% faster in swimming and running than elite women. A performance gap exists in cricket (bowling cricket balls), golf (hitting long drives), and weightlifting (i.e., 29% and 52% of a gap) since these sports rely on muscle mass and explosive strength. Transgender women retain a 12% performance edge two years after completing gender-confirmation surgery. The study stated, "Performance differences larger than 20% are generally present when considering sports and activities that involve extensive upper body contributions… The gap between fastest recorded tennis serve is 20%, while the gaps between fastest recorded baseball pitches and field hockey drag flicks exceed 50%." When transgender women suppress testosterone for at least 12 months, they reported a 5% loss of muscle area, lean body mass, and strength. They suggested that the transgender woman's muscular advantage is only suppressed

[75] Pitsiladis, Y., Harper, J., Betancurt, J. O., Martinez-Patino, M. J., Parisi, A., Wang, G., & Pigozzi, F., "Beyond Fairness: The Biology of Inclusion for Transgender And Intersex Athletes," *Current sports medicine reports*, *15* no. 6 (2016): 387.

[76] Shea M. Balish et al., "Sex Differences in Sport Remain When Accounting for Countries' Gender Inequality," *Cross-Cultural Research* 50, no. 5 (2016), https://doi.org/10.1177/1069397116665815.

[77] These three suggestions are based on current justifications of non-mixed sport competition. Athlete voice suppression contributes to the first assumption and the third assumption. That males would win in all competitions is false since each sport competitions convey their own physical skill advantages. See women in shooting events, 1992 Olympics.

minimally with testosterone, and testosterone did not remove anthropometric advantages, muscle mass and strength.[78]

Individuals ousted by tests are being misconstrued as a certain type of male athletes, those born as a physiological male and male gender and aiming to cheat the category. The only case of a male competing in the Olympics under the guise of a female was Heinrich or Dora Ratjen.[79] However, Ratjen's sex and intention for competing under the female class is still uncertain. Other resources cite female Olympics who have gone on to have sex changes.[80] Unfortunately, none of these cases constitute that a man was deliberately participating as a woman in the Olympics or that the individuals had higher than normal levels of androgens when participating.[81] We cannot infer that these tests are catching physiological males because that would mean that those who have been or are being caught identify as men at the time of participation and have the same physiology of athletes participating in the male category.[82] What stands to rest is that socially, these individuals pass as female.[83] Since the tests cannot identify who is a *man* and a *woman*, and since the tests are finding individuals with physiological intersex conditions, past cases of individual gender fraud cannot be classified as men, nor should they ever be. The necessary upholding of the regulations also cannot assert this distinction.

[78] Hilton, E. N., and Lundberg, T. R., "Transgender Women in the Female Category of Sport: Perspectives on Testosterone Suppression and Performance Advantage," *Sports Medicine*, (2020): 1-16.

[79] Baillet-Latour, Letter Regarding a Female American Athlete; Heggie, "Reconstructing Histories." Pieper, *Sex Testing*, 26-8; Elsas et al., "Gender Verification of Female Athletes," 250-1.

[80] Elsas et al., "Gender Verification of Female Athletes," 250; Pieper, *Sex Testing*, 29.

[81] Notwithstanding these claims, to call a transgender male who transitioned after sport competition a man prior to their surgery is inaccurate and potentially offensive. And the use of a transgender male being a bonafide example of a male participating in sport is utterly wrong! These insinuations suggest a strong insensitivity around sex/gender as well as the experiences of transgender people.

[82] This is not what is happening, even though in some instances, women do develop with the ability to produce sperm.

[83] This is also not about gender identity or legal sex, as the CAS Executive Document infers. It means that by 'passing' as women, they have grown up and lived their lives as women. A biological assertion cannot change their historical lived experience.

4.6 Mapping *Mokgadi Caster Semenya & ASA v IAAF*

In their decision, the CAS determined that the male-female divide in sport does not have anything to do with recognizing legal sex or gender identity. Instead:

> the purpose of the male-female divide in competitive athletic… is to protect individuals whose bodies have developed in a certain way following puberty from having to compete against individuals who, by virtue of their bodies having developed in a different way following puberty, possess certain physical traits that create such a significant performance advantage that fair competition between the two groups is not possible… Natural human biology does not map perfectly onto legal status and gender identity. The imperfect alignment between nature, law and identity is what gives rise to the conundrum at the heart of this case.[84]

The CAS stipulated that sex segregation in sport was necessary to "protect one group of individuals against having to compete against individuals who possess certain insuperable performance advantages derived from biology rather than legal status, it follows that it may be legitimate to regulate the right to participate in the female category by reference to those biological factors rather than legal status alone."[85] Therefore, the case was pragmatically aligned in materiality that genetic males are predisposed to higher levels of testosterone and therefore higher levels: "On the basis of the scientific evidence presented by the parties, the Panel unanimously finds that endogenous testosterone is the primary driver of the sex difference in sports performance between males and females."[86]

Unfortunately, as demonstrated earlier, the hearing for Semenya was not about males versus females. A common misunderstanding with the evidence around sex differences is that there is evidence sufficient to delineate male versus female in the biological sense, that

[84] *Mokgadi Caster Semenya and ASI v. IAAF,* 2018/O/5798 and 5794 (CAS, 2018), 1. See the Executive Summary, 4.

[85] The Executive Summary, 4-5.

[86] Executive Summary, 4. Even though studies suggest there is no evidence showing that successful athletes have higher testosterone levels determine a more or less successful athlete. Instead, this is an assumption based on studies that have confirmed that testosterone helps individuals to increase their muscle size, strength, and endurance, and there advocate that it is logical to then infer that a person with more testosterone has a greater athletic advantage than one with less testosterone. See Karkazis et al., "Out of Bounds."2012).

this science is exact in sports medicine. The evidence presented is the necessary underlying factor for differences in sports performance. As stated, again, in the Executive Summary:

> The IAAF submitted that all but one of the many different factors that contribute to sport performance - including training, coaching, nutrition and medical support, as well as many genetic variations - are equally available to men and women. The only factor that is available only to men is exposure to adult male testosterone levels. The IAAF submitted that if the purpose of the female category is to prevent athletes who lack that testosterone-derived advantage from having to compete against athletes who possess that testosterone-derived advantage, then it is necessarily "category defeating" to permit any individuals who possess that testosterone-derived advantage to compete in that category. The majority of the Panel accepts the logic of the IAAF's submission. [87]

There is currently only logic being used to determine differences in sport performance between an athlete who has an intersex condition does not equate to differences in sport performance between males and females.[88] What needs to be reassessed is the scientific uniqueness of the intersex athlete, within respectful terms, if (and so it seems) an appropriate amount of distinction of physical advantage is needed to enforce fair play in sport through medical intervention.

4.7 Using philosophy of sports medicine as a navigation tool

One of the glaring holes in the debate around female testing in sport is that the literature around the subject is prescriptive, with descriptive inputs limited to medical experts. Scholars from outside of the scientific realm cannot dedicate time to handling the breadth of knowledge around female testing without dropping all of their other projects. The level of intimacy in which a scholar needs to be familiar with the female testing literature is

[87] The Executive Summary, 4-5.

[88] This is similar to arguments that were being made about the ethics of transgender participation in sport. There is not science that verifiably addresses the sport performance of transgender athletes, of intersex athletes and true disadvantages or advantages. There is a large amount of data being drawn from the endocrine profiles of 454 men and 239 women from within IAAF competition sample to assess endocrinological profiles. What is cited here is only a small sample. Bermon et al., "Serum Androgen Levels in Elite Female Athletes;" Healy et al., "Endocrine Profiles;" A letter requested that the study from Healy and colleagues be redacted for inaccuracies: Ritzén et al., "A Rebuttal," 307.

immense. Those involved in this debate require a vast array of inputs. These inputs are not altogether linear, and the wide range means the literature is fragmented.

Bioethicists, geneticists, specialized endocrinologists, and somehow the international sporting administration, Olympic team doctors, sport philosophers, sport historians, feminists, theorists, lawyers in international law and sports law, sociologist, and athletes have contributed to this growing foundry. Those who have space to or those already experienced in the science of sex-determination research have contributed to discussions of sex-differentiation in sport. Additionally, having or not having experience in scientific research limits those who can and cannot contribute to the discussion.

What is needed is a cohesion of the literature required to tackle this topic. What is also proposed here is that international oversight on international law should be required to take over. We have seen this type of reach through international and national legal systems in Canadian cyclist Kristen Worley who successfully won her trial against the Union Cycliste Internationale (UCI) and IOC around discriminatory practices regulating hormone levels for transgender athletes. Worley's case was unique in that she never signed the affidavit that legally bound her from seeking outside action. Therefore, Worley was able to pursue remuneration through the Human Rights Council in Toronto, Canada.[89]

Scholarship that supports inclusive and equal sport should begin with a pragmatic approach to the issue. This methodology is beneficial, considering that there have been limited resolutions throughout the length of this research. Most of the arguments reside on the notion that Semenya is fast and that her ineligibility is apparent. This is not something that should be so easily swept aside or suggested so lightly. By using pragmatism to approach and clear this web of social, moral and legal issues, we can see the direction that we need to go, the moral ambiguity present, and the lack of definitive answers presented regarding solving this matter. Therefore, the use of pragmatism here effectively draws a clear line as to i) how testing for the female sex demonstrates fair play in action and ii) the roles that lex sportiva is being used and for what means.

[89] Ewing, "Kristen Worley."

However, what keeps arising are discussions around sex-determination: i) the evidence is limited to scientific preference, and ii) the evidence used cannot be directly applied to the unique situation that the court case presents. The scientific evidence presented in the case for justifying female testing is evidence to support the sex binary or the sex divide in sport, which is not what was being called into question as stated by the CAS. Instead, what is being called into question is the relationship of intersex athletes with the female and male categories in sport. What could be analyzed is not the stats that determine male and female performance, but the stats that determine intersex performance. Eliminating the top runners does not necessarily mean that the sport is made fairer. Endogenous fairness seems to revolve around a notion of fairness that reflects fairness for the common good rather than all. The increased acceptable levels of social negativity towards Semenya and the IAAF's acceptability of the publicity around Semenya ineligibility allows for the prevalence of herd mentality and recognition of those athletes that sport culture upholds.

Discussions of Semenya's eligibility sit closely to transgender eligibility and discriminations of hyper muscular body types. By interrogating the sex binary distinction in sport, scholars can recognize the unique attributes that Semenya, intersex athletes, and transgender athletes bring to the table. Unique attributes might be appreciated in a third category. While something that the IAAF might initially oppose, an open or third category with limited sex/gender regulatory oversight might be worthwhile to consider not only to provide an avenue for athletes like Semenya but also to understand the advantages or disadvantages that are present between intersex, transgender, male, and female athletes. A third category might change how a sport is played, and it would also draw a significant comparison from the other gender categories. It would primarily allow for a degree of freedom the athletes are not allowed to participate in. It could also open up areas for creative exploration in which many of the issues that athletes are experiencing, things like overtraining or psychological fatigue, could be remediated.

Because of the case's complexity, there is a solid argument that Semenya was not allowed a fair trial. Evidence used to support the findings were based on the scientific understanding that Semenya is a male when she is not. Additionally, there is no plausible reality where Semenya would be able to participate in the men's category. Therefore, while the fairness

principle in the sporting sense exists to benefit the many instead of the few, the ruling to uphold the regulation is effectively kicking Semenya out of the sport and not allowing her the fair opportunity to compete against like-bodied individuals. While the scope of issues related to Semenya's case can quite quickly get out of hand, failing to recognize all these overlapping issues would not be accurate. Pragmatism is a useful analytical tool in this regard as it can sweep clear the confounding narratives around the issue and to present the necessary "what," "who," and "how" of the issue. It also recognizes that, especially when considering the legal case of individuals who dispute a female testing result, rules should be considered fluidly within the changing or transitional nature of societal norms, as the sex/gender distinction in particular. It is necessary to analyze at least on a fundamental level all the constituents of this issue to grasp the complexity at hand. Since sex segregation and female regulation are still ongoing, it is hopeful that this research can be applied to finding constructive ways to navigate this phenomenon.

Lastly, in recognizing the words of sociologist Magubane, this research recognizes Semenya's experiences as an educational tool. Semenya was subjected to public scrutiny without her consent, and her name has been blatantly represented and misrepresented as a name that signifies many things, including man, intersex, and derogatory terms. Semenya never asked for this, and by reasserting her as a teacher, she is given respect. While this chapter does not use Semenya's word as a point of departure for educating the scholarship around her issue, it attempts to place Semenya as the primary concern of the debate within female testing, rather than by using Semenya as a tool to understand a broader issue.

4.8 Conclusion

The decision ruled in *Mokgadi Caster Semenya & ASA v IAAF* represents a broader misunderstanding of the fair play principles that Semenya's situation resides on. Knowing or unknowingly violating this rule, to a degree, labels the person in question to be in clear violation of social etiquette (in the broad sense) and sporting etiquette. Semenya's physique plays a part in this discussion as well. Historically, officials concerned with sex testing in the 1960s-1980s used language of this sort; sex testing was deemed necessary because hyper-muscular athletes competed in the 800-metre event. Scholars need to consider the unique language surrounding intersex, hyper-muscular, and transgender athletes.

The decision ruled in *Mokgadi Caster Semenya & ASA v IAAF* conflates the regulations' need to regulate the women's category with the regulation of the sex binary. The application of lex sportiva could favour Semenya by claiming that the procedure through the CAS violates the principles of a fair trial and, by proxy, the principles of the *odre public*. Additionally, through Motoarca's case study of known versus unknown violations of fair play in sport, it is clear that Semenya has never knowingly violated the fair play principle regarding sex regulation in sports.

Endogenous fairness seems to revolve around a notion of fairness that reflects fairness for the common good rather than all. The IAAF, does not provide an avenue for Semenya to continue to run in IAAF competitions, particularly considering that running in the men's category is not an option. This suggests that the eligibility requirements have no adequate solution. Without an adequate option for competing, the IAAF is affectively kicking Semenya out of competition. What needs to be reassessed is the scientific uniqueness of the intersex athlete, within respectful terms, if (and so it seems) an appropriate amount of distinction of physical advantage is needed to enforce fair play in sport through medical intervention.

Chapter 5

5 Mapping ‘female testing’ discourse in sports medicine

From the 1950s to 1981, the field of Sports Medicine went through rapid and unprecedented growth. The American College of Sports Medicine (ACSM) had grown to about 9,000 members in 1981, with about 1,250 of its population consisting of physicians. At this time, there was also a debate around how the college would be organized. The ACSM was following the path of the British situation, where once family physicians were able to be trained for expertise in sports medicine, many physicians jumped ship. This shift occurred alongside the growth of The Orthopaedic Society for Sports Medicine, a specialized subset of Sports Medicine that focused on new approaches to long-term injury management.[1]

Some old school sport historians might disagree that sport history grew out of sports medicine’s rise. Sport history has existed, after all, in some formal capacity since 1937 when Seward Staley’s sport history class for Physical Education Majors took place at the University of Illinois. Nancy Struna has taught us that Seward Staley pioneered this discipline in the American education system.[2] In her 2008 article titled, “Sharing, Arguing, and Seeking Recognition: International Congresses, Meetings, and Physical Education, 1867-1915,” Robbie Park also identified that the history of sport and physical culture did not necessarily start when we entered into it, but rather through the emergence of international congresses, such as the international world’s fairs, the growth of modern research universities, learned progressions and professional organizations served as an area in which the growth of academic disciplines could flourish.[3]

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[1] P. N. Sperryn, “Interview with Dr. Allan Ryan,” *British Journal of Sports Medicine* 15, no. 3 (1981).

[2] Nancy L Struna, “Reframing the Direction of Change in the History of Sport,” *The International Journal of the History of Sport* 18, no. 4 (2001).

[3] Roberta J. Park, “Sharing, Arguing, and Seeking Recognition: International Congresses, Meetings, and Physical Education, 1867–1915,” *The International Journal of the History of Sport* 25, no. 5 (2008), https://doi.org/10.1080/09523360701875517.

As contemporary historians of sport are housed in various Kinesiology departments, Physical Education and Exercise Science, hearing about sports medical conferences and the Sports Medicine discipline's growth is old news. As Physical Education departments have grown, we have been part of this rise, expanded, and facilitated sports medicine's growth inherently in its teachings. Even though our departments are linked, the relationship between sport and sports medicine is underdeveloped. Underlies this research is sports medicine's growth as a highly regarded profession and a necessity within professional sport. By looking at the International Olympic Committee (IOC) role in using sports medicine to benefit elite sport and examining this relationship in isolation from other Olympic practices, science's relationship to determine femaleness can become more evident. There are no other avenues in society where testing for genetic or endocrinological markers is okay, but somehow the IOC and the relevant scientific disciplines have done so for nearly 53 years.

5.1 Purpose

The debate around female testing is centred around two central bodies of knowledge: one that grapples with the female athlete rights and one concerned with medical ethics.[4] Critical sociological, philosophical and historical research on female testing has only briefly explored the *role* of science in determining female testing regulations. What is missing is an integrated view of female athletes and medical ethics. This chapter presents an integrated perspective of the two sides of the female testing debate by bringing together current understandings of the role of science in female testing through a female testing discourse.

This chapter drew from the previous dissertation chapters. The historical data presented in this chapter aims to clarify that the debate surrounding female testing is not about males

[4] The distinction can also be made that one side of the debate looks at the human experience of the female athlete and the other side looks to the objectivity of science. This chapter refers to female testing as a term to brings together the names of tests used to test female athletes and to refer to a discourse of testing female athletes in elite sport competition. The distinction also should be made between sex/gender and femininity/masculinity. When discussing these distinctions, sex refers to the biology of a person (e.g., male, female, intersex, and hyperandrogenic), gender refers to a person's gender identity (e.g., man, woman, queer, and nonbinary), and femininity/masculinity refers to social stereotypes associated with men and women.

trying to compete in the female category but instead reflects a systematic use of science to reinforce sex-based discrimination. This chapter presents a cohesive understanding of the medicalized female body supported by the IOC's necessary female athlete verifications and overarching histories of the sciences related to female testing. The sciences related to female testing was reflected in endocrinology and genetic sources. These overarching histories are presented through Kuhnian discourse analysis's methodological lens and presented in a chronological manner that coincides with the IOC's introduction of the sex tests formally.

5.2 Methodology

This chapter's methodology emerged from the data in chapter three and the reflections in chapter four around pragmatics and female athlete testing. Discourse mapping is structured around key ruptures (i.e., focal knowledge) from the scientific literature. Ruptures are used here in the Kuhnian sense, where philosopher Kuhn identifies ruptures as fundamental shifts that signify that a scientific paradigm evolves and changes over to a new set of beliefs. In his work *The Structure of Scientific Revolutions*, Kuhn suggests that a paradigm shift might occur out of a response to a crisis.[5] Furthermore, he describes the paradigm shift's evolution in these terms:

> The transition from a paradigm in crisis to one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of an old paradigm. Rather it is a reconstruction of the field's most elementary theoretical generalizations as well as many of the paradigm's methods and applications. During this transition period there will be a large but never complete overlap between problems that can be solved by the old and by the new paradigm. But there will also be a decisive difference in the modes of solution. When the transition is complete, the profession will have changed its view of the field, its methods, and its goals. [6]

In a broader sense, paradigm shifts are also described by Foucault; however, he uses the term rupture to describe significant paradigm changes, "Making historical analysis the

[5] Kuhn states, "Often a new paradigm emerges, at least in embryo, before a crisis has developed far or been explicitly recognized." Kuhn, *The Structure of Scientific Revolutions*, 86.

[6] Kuhn, *The Structure of Scientific Revolutions*, 8.

discourse of the continuous and making human consciousness the original subject of all historical development and all action are the two sides of the same system of thought. In this system, time is conceived in terms of totalization and revolutions are never more than moments of consciousness."[7] Therefore, in mapping discourses both in the Kuhnian sense and in the broad Foucauldian sense, it is vital to look for behaviour in the history of the scientific paradigm that suggests that methodological changes are occurring, as well as changes or significant shifts in consciousness. The paradigm shift becomes clear through discourse analysis as it suggests a disruption of old methods and suggests shifting into new methods and new findings.

Therefore, to bring these methods to the relevant literature presented here, this chapter documents historical findings of the paradigm shift in endocrinology and genetics, the two major sciences that the IOC relied on throughout the 1960s into the 1990s for sex verification. While the discourse is not mapped in entirety, and instead the chapter highlights key aspects of the female testing discourse; the history presented here is meant to provide a clearer glimpse into the field's growth when its methods and utility was considered extremely important. In this sense, discourse is defined as beliefs, assumptions, or norms perpetuated through social interactions, personal behaviour, and cultural and societal reinforcement.[8] Discourse appears paradigmatically in the chosen and omitted language, the chosen structure for arguments, and research designs and aims. Discourse is a powerful prevalent of ideologies within and across nations, races, sexes, classes, identities, and consciousness.[9]

The sources presented in this chapter are primary to female testing discourse and considered secondary sources in terms of the field's history (i.e., endocrinology and genetics). However, in some cases, the sources are considered primarily, especially when considering the evolution of the paradigm shift in genetics. Sources were identified through primary sources found through archival research, database searches and search strategies.

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[7] Foucault, *Archaeology of Knowledge*, 12

[8] Derived from Foucault, *Archaeology of Knowledge*.

[9] Foucault, *Archaeology of Knowledge*, 12.

Based on the findings in previous research (see chapter three), the science used for female testing during the 1950s-1990s suggested two research areas, which included trends related to genetic research and endocrinology research. Specific database searches for genetic research included searches for the "Barr Body" (in its various forms), such as the "Barr Body method" and "Barr 1949 genetics." These searchers were able to be extremely pinpointed because the IOC was clear about using the Barr Body method for determining sex differences. The literature around the Barr Body method was supported by findings from database searches related to 'chromatin,' 'sex chromosome.' Once the primary sources were obtained through the Olympic Studies Centre (OSC) archive, this chapter's research was conducted at the University of Toronto and its databases.[10]

There were several subjects investigated, and those include sports medicine, endocrinology and genetics, generally. Each field was limited to leading monographs or edited volumes dedicated to that topic during the period analyzed, and the chapters were identified as relevant to the research objective. While the most relevant to sports science studies, sports medicine was limited in terms of scientific knowledge related to female testing. The most significant source of information came from the disciplines of genetics and endocrinology.

Finally, one interesting aspect of this data collection was the ambiguous nature of "sports medicine" as a discipline played. The study of the "sports medical literature" has repeatedly been espoused as the necessary information in which knowledge around female testing would be housed. This makes sense – as this is medical literature related to sporting endeavours. However, a survey into the sports medical literature shows that the scientific knowledge consulted to properly assess female testing was not a part of the sports medicine literature. This means that while articles were being produced examining "sex testing" and 'sex verification,' some specific to sports and athletes, none of the articles fell within the sports medicine literature umbrella. These academic articles were primarily housed in journals related to endocrinology, genetics, and ethics.

[10] See chapter 3. Gerstein Library and Robarts Library. Notably, the libraries at the University of Toronto organize their stacks based on topic, so many of the topical searches led to key findings simply based on this unusual categorizing method. Research was conducted at the Olympic Studies Centre (OSC) located in Lausanne, Switzerland based on the 2019 IOC PhD Students and Early Career Academics Research Grant Programme. Methods pertaining to these sources can be found in chapter three.

5.3 Justification

Much like some of the other spaces that the woman occupies in society, the woman's body as a terrain in the sport is contested. From the scholarly perspective, the body of the woman who engages in sport is dissected and reconstructed in a far more gruesome way than male bodies. By withstanding this scrutiny, the woman's mere existence in the sporting world can also act as a form of defiance and strategy. As feminist sports scholar Weaving highlights, since females are deemed passive and docile or eligible to be harmed, then the athletic women in sport does not make sense.[11] Women are not to be competitors within the sport, but rather must be conquered like the mountain and aggressively controlled based on the aggressive qualities found in sport. Testing to ensure that a woman is scientifically verified and not doing the same to the men's category is not only highly unethical, but it simultaneously does at least three things: it systematically forces women to know and manage their physiology, it supports racist and sexist discrimination especially within the scientific paradigm, and it justifies racist and sexist discrimination in society using science through the trope of a fair playing field in sport.

Testing female athletes categorically is continually justified based on key, inherent physiological differences between males and females and is touted as necessary in order to protect the female category from the mass losing against males even though these claims are unfounded and based on few experiences of individuals who exhibited male characteristics when competing in the Olympics or who happened to change their sex from female-to-male sometime after competing.[12] Unfortunately, none of these cases, nor any other cases, signify that the women's category in elite sport is under direct threat of males competing in their category. Nor is there any factual evidence available to suggest that males will win every round of an event if they compete with females.

[11] Weaving, "Unraveling."

[12] Caplan, "Fairer Sex."

5.4 Key scientific developments of female testing

There has been a long-standing debate in sport history and sport ethics on the role and ramifications of female testing or the verification of the female athlete in Olympic and elite sport. Since 1967, the International Association of Athletics Federation (IAAF) and the IOC have endorsed formal eligibility requirements (i.e., IAAF's 2018 Eligibility Regulations for the Female Classification) for the scientific testing of female athletes to ensure that female participants in elite sport adhere to gender eligibility rules. This decision was intended to keep the playing field fair in sport to provide meaningful and genuine athletic interactions since it was believed that males might masquerade as female athletes to gain an athletic advantage.[13] Since sport is inherently physiological, it assumes that managing sport based on physiological factors is only fair. Sport has a powerful effect, and since the implementation of these tests, the sports medicine literature has provided many scientific data on variations of sex through biological, genetic, and endocrinological permutations.

Feminists and advocates for human equity have tried to negotiate science's role in determining traits, advantages/disadvantages, behaviours and more, all related to differences and similarities in the human body.[14] While some idealize science as society's official knowledge producer, and therefore the act of using science to understand female bodies as useful,[15] the choice to test only females in sport has produced a discourse that continues to hierarchically determine gender roles based on biology and outdated medical beliefs about the female body. This hierarchy can also be understood as a form of biological determinism.

[13] Sánchez, et al., "The New Policy."

[14] Bordo, Susan, *Unbearable Weight: Feminism, Western Culture, and the Body (*Berkeley: University of California Press, 1993); Haraway, Donna, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (1988): 575-99; Laslett, Barbara, Sally Gregory Kohlstedt, Helen Longino, and Evelynn Hammonds. *Gender and Scientific Authority.* (Chicago: University of Chicago Press, 1996).

[15] Dickinson et al., "Gender Verification."

5.4.1 Genetics and female testing: The Barr Body method

Ultimately tied to the history of sex testing is genetic testing for recognizing the X or Y chromosome characteristics present in humans. Notable in the history of sex testing is the evolution of the genetic discipline. Genetics was still a growing field of research throughout the early twentieth century. This field was generally still in development, compared to studies in physiology and anatomy, for example, through much of the late 1900s until the 1950s. It is generally agreed upon that Mendel's discovery of the laws governing inheritable traits was the first introduction of Genetics, and genetics was first coined in 1905 by English biologist William Bateson, the man who found and published Mendel's work on inheritable traits. Therefore, it is easy to see how nascent the topic of genetics is.

However, scientists consider the emergence of the Barr Body in 1949 to be a breakthrough in the stale area of intersex studies and sex research and genetics. While Dr. Murray Barr was ultimately against the use of the methods in identifying femaleness in sport (as he argued in a letter to the IOC Medical Commission),[16] another colleague in the field and involved with Barr Body research, Dr. Keith Moore, was happy to hear that their medical advancement was being put to use.[17]

The scientific knowledge data collected for understanding the genetic leaders and primary thought was limited to the 1950s, which marks one of the first congresses that the OSC preserved in their archives. Sex testing was not formally conducted by at least one of the governing sports bodies until 1967, even though reports mentioned some kind of testing as early as the 1930s.[18] However, the primary source of genetic knowledge was, naturally,

[16] Murray L. Barr, Letter from Dr. Murray Barr to Canadian Olympic Association President Dr. Roger Jackson, June 2, 1987, B-ID04-MEDIC, IOC Medical Commission, Olympic Studies Centre Archive.

[17] Keith L. Moore, "My 60 Years as a Clinical Anatomist," *International Journal of Anatomical Variations* 5, no. 1 (2012).

[18] Pieper, *Sex Testing*, 29. Pieper cites an instance concerning the Czechoslovakian athlete Zdenka Koubkova, who warranted an investigation in 1935 due to "appearance-based suspicions." Pieper cites that the results were inconclusive and the athlete was stripped of medals by the Federation Sportiva Feminine Internationale. Heggie (2010, 159), cites a similar instance. The original source provides insight, but details remain vague. Unfortunately, it is not clear the type of investigation, who is conducting it, if it was

not discovered in the 1950s. Therefore, some references are made to texts from before this period.

The discovery of the sex chromatin has been heralded by an editorial in the Canadian Medical Association Journal (CMAJ) as "the most important Canadian contribution to fundamental medical science since Banting discovered insulin in 1921."[19] This discovery was also a testament to Cajal's aphorism that in looking at research from a different perspective, a phenomenon could be discovered which had not been discovered before. This assertion is also one that Thomas Kuhn remarks as a significant milestone for scientific resolution. To progress in a field, one must approach a concept from within a different worldview, as a way to speak and to try to understand how a traditional way of thinking might be altered.[20]

The discovery of the sex chromatin was just this. The sex chromatin was not noted as significantly different before Barr's contribution. It was instead referred to as a 'paranucleolus.' In 1949, Barr and his graduate student Bertram were the first to relate this object to sex. The discovery of the sex-related characteristic emerged when animals whose hypoglossal nerve was excited but failed to show a nucleolar satellite. The animals' cells were tested for a variety of factors, including a staining technique failure, differences in fixation, experimental conditions, age and sex. Sex, primarily being that the animals with the nucleolar satellites were female, became a significant finding and was isolated so that more details could be experimented with.[21]

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conducted at a sporting event. See: Donald Furthman Wickets, "Can Sex in Humans be Changed?" *Physical Culture* 77, no. 1 (January 1937): 16-17; "Change of Sex," *Time* (Aug 24, 1936); *Time* (Aug 10, 1936, 40) also reports investigations of U.S. runner Helen Stephens conducted before the run at the 1936 Berlin Olympics, see "Olympic Games," *Time*, Aug 10, 1936; both *Time* articles are available via http://www.time.com/time/magazine [accessed December 23, 2020].

[19] Keith L. Moore, *The Sex Chromatin* (Philadelphia: W. B. Saunders Company, 1966).

[20] Moore, *The Sex Chromatin*, 143; Kuhn, *The Structure of Scientific Revolutions*.

[21] Murray L. Barr and Ewart G. Bertram, "A Morphological Distinction between Neurones of the Male and Female, and the Behaviour of the Nucleolar Satellite During Accelerated Nucleoprotein Synthesis," in *Problems of Birth Defects* (New York: Springer, 1949).

In 1967, the sex chromatin could be loosely defined as "a characteristic mass of chromatin within nuclei of somatic cells of normal females of many animals, including man."[22] It was conceptually derived from the nucleolar satellite but was renamed to be the 'sex chromatin' since it was sex-specific, and the term 'nucleolar satellite' was no longer an appropriate name. This is particularly so because the sex chromatin was not a satellite like the nucleolar satellite was, and it instead rests along the inner surface of the nuclear membrane. The usefulness of the sex chromatin was to identify potential sex differentiating characteristics.[23] Outside of the logistical details for analyzing sex chromatin, Moore's volume also detailed the sex chromatin tests as a useful diagnostic tool in identifying certain genetic disorders and other quandies in health and medicine. It was useful in calculating the sex ratio in pre-birth embryos[24] in identifying sex chromosomal anomalies (e.g., Klinefelter's syndrome, mental deficiency, and gonadal dysgenesis)[25] and for mapping genetically linked sex chromosomal traces.[26] Other areas include hermaphroditism, tumours, and postmortem studies.

From its emergence until about 1970, the name of this chromatin was under debate. Dr. Murray Barr rejected the name 'the Barr Body' initially, even though we know that that name was popular well into the 1970s and 1980s. The term 'X-Chromatin' was preferred since the term 'sex chromatin' seemed to instigate fear-mongering associated with sex development abnormalities in any capacity, and the researchers did not wish to raise any alarms. Additionally, the use of the name 'female sex chromatin' was highly denounced as poor terminology. This is because the naming would imply that the sex chromatin was only present in females, when "fairly normal-appearing males have sex chromatin similar in all

[22] Moore, *The Sex Chromatin*, 160.

[23] See later chapters in Moore, *The Sex Chromatin*, 316; as well as the following: Hans Zellweger and Jane Simpson. *Chromosomes of Man*, (Hoboken: Wiley-Blackwell, 1977); Andre Glucksmann, *Sexual Dimorphism in Human and Mammalian Biology and Pathology* (Cambridge: Academic press, 1981); Gunnar Hambert. *Psychiatric Study Seventy-Five Cases: Males with Positive Sex Chromatin*. (Akademiförlaget, 1966).

[24] Moore, *The Sex Chromatin*, 316.

[25] Moore, *The Sex Chromatin*, 316; Zellweger and Simpson, *Chromosomes of Man*.

[26] Moore, *The Sex Chromatin*, 316.

respects to that seen in females."[27] It was also cautioned that the use of the 'sex chromatin' was a good guide to chromosomal sex in people with ambiguous sex development but that it does not indicate a person's appropriate sex.[28]

As with any history of scientific discovery, the progress is hardly ever linear or straightforward. The chromosome dates evolution as early as the 1840s from the Swiss botanists Nägeli, who had initially called them 'transitory cytoblasts.'[29] Waldeyer coined the term 'chromosome' in 1888, but considerations for the biological function of chromosomes were beyond research capabilities.[30] The revival of Mendelian laws in application to biology was a remarkable shift for this discipline. With Mendel's theory and improved staining techniques, cytogenetics was born. Sex chromatin testing was initially referred to as 'nuclear sexing' and 'sex tests,' but should be appropriately referred to as 'tests of chromosomal sex' or 'tests of chromatin sex.'[31] The use of the term 'sex tests' was denounced as an inappropriate name due to the confusion of the purposes of the test, for they were not able to indicate a person's social or clinical sex; instead, the tests "gives a clue to the make-up of the sex chromosome complex in a person's cell.[32] Even so, the sex chromosome's compliment may be different from a person's anatomical appearance, psychosexual orientation, or sex of rearing and role in society."[33]

Interestingly, Zellweger credits the findings of an extra chromosome in patients with Down syndrome[34] with the discovery that the chromosomal aberrations can cause disease in humans. Zellweger also links the Barr Body testing method as a more effective method for

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[27] Moore, *The Sex Chromatin*, 317.

[28] Moore, *The Sex Chromatin*, 4, see chapters 22 and 24.

[29] Zellweger and Simpson, *Chromosomes of Man*.

[30] Moore, *The Sex Chromatin*.

[31] Moore, *The Sex Chromatin*, 4; Hambert, *Males with Positive Sex Chromatin*.

[32] See chapter 7: Moore, *The Sex Chromatin*.

[33] Moore, *The Sex Chromatin*, 4

[34] See Lejeuen et al., 1959; France and Jacobs et al., 1959 in Zellweger and Simpson, *Chromosomes of Man*.

testing for chromosome than chromosome analysis.[35] The significant distinction between Zellweger's concerns and those of the Barr Body was that the Barr Body provided information on the number of X chromosomes and not any other (i.e., Y or O or additional chromosomes)[36] that were presented in the various other syndromes related to chromosomal aberrations (i.e., XXY Klinefelter, XXYY syndrome, XXX syndrome, 46/47 +C mosaic, Mosaic Down's syndrome, and more).[37]

In 1966, Keith L. Moore, Professor of Anatomy and Head of the Department at the University of Manitoba, published an edited volume titled *The Sex Chromatin*. There were 22 contributors and roughly 27 chapters in this volume. Topics ranged from the history of the discovery of the sex chromatin to sex chromatin patterns, sexual dimorphism, staining techniques, and the sex chromatin behaviour in various forms of morphogenesis or disorder. Keith L. Moore was a leading scientist studying genetics and wrote several chapters in the book. Moore was also a student and student researcher under Dr. Murray Barr at the time of the Barr Body discovery. He is considered a primary contributor to the finding of the sex chromatin and developed the skin biopsy and cheek swab methods for testing sex chromatin.[38] Other notable works from Moore included "The Sexual Identity of Athletes" published in the Journal of the American Medical Association (JAMA) in

[35] Zellweger's text is concerned with 'abnormal chromosomes' and not sex differentiation necessarily. However, the distinction that he uses (between chromosome analysis and the Barr Body method) is an interesting one considering that he goes through the history of the emergence of cytogenetics and fails to document Murray Barr and colleague's contribution as directly significant to the work of cytogenetics.

[36] XO also known as Turner's Syndrome; refers to an individual born with one X and O chromosome and lacking a Y chromosome, who would be born genetically male according to the sex-determination system.

[37] 46/47 +C mosaic refers to a rare genetic condition where an individual is born with 46, XXY and 46, XX; XXY Klinefelter syndrome (KS) or 47, XXY, refers to an individual born with two or more X chromosomes and one Y chromosome, who would be born genetically male with underdeveloped testes or infertility according to the sex-determination system; XXYY syndrome refers to an individual born with two X and two Y chromosomes, who would be born genetically male according to the sex-determination system; XXX syndrome known as trisomy X and 47, XXX, referring to an individual born with three X chromosomes, who would be born genetically female with an extra X chromosome in each female cell according to the sex-determination system. These syndromes are all based on the XX chromosome makeup for genetic females and XY for genetic males, and they also represent an abnormal number of chromosomes that is not 46 total.

[38] Moore, "60 Years."

1968,[39] "Sex Determination, Sexual Differentiation and Intersex Development" published in the *Canadian Medical Association Journal* in 1967,[40] and "Sex Determination: Normal and Abnormal Sexual Development" published in the *Journal of Obstetric, Gynecologic, & Neonatal Nursing* in 1974.[41]

Other contributors worth mentioning include Dr. Malcolm Ferguson-Smith, who was a senior lecturer in Medical Genetics at the University of Glasgow, and Dr. John Money, associate professor of Medical Psychology and Pediatrics at that time, at Johns Hopkins. Money is a well-known name in controversial sex-based science, and his studies revolved around psychiatric behaviours of gender identity and individuals with intersex. Contributors for *The Sex Chromatin* came from the following departments: embryology, anatomy, ophthalmology, general medicine and general pathology, anatomy, cytogenetics, hematology, medical/cytogenetics, obstetrics/gynecology, radiobiology, psychology, pediatrics, and biology.

According to this volume, chromatin was particles derived from chromosomes, and they appeared in cells during interphase, and only specific chromosomes or chromatins were stainable or visible during the interphase period. A chromosome might have many stainable parts, in which case the nucleus would be open-faced or vesicular. Oral epithelial cells contain the most visible nuclei. There are cases where little chromatin parts are stainable/visible.[42]

Most chromatin comes from autosomes or body chromosomes, which are any chromosome other than sex chromatin. The X chromosome leaves a characteristics remnant, the sex chromatin, a larger chromatin mass that appears planoconvex and adjacent to the inner

[39] Keith L. Moore, "The Sexual Identity of Athletes," *JAMA: The Journal of the American Medical Association* 205, no. 11 (1968).

[40] Keith L. Moore, "Sex Determination, Sexual Differentiation and Intersex Development," *Canadian Medical Association Journal* 97, no. 6 (1967).

[41] Keith L. Moore, "Sex Determination: Normal and Abnormal Sexual Development," *Journal of Obstetric, Gynecologic, and Neonatal Nursing* 3, no. 1 (1974).

[42] Moore, *The Sex Chromatin*.

surface of the nuclear membrane. There are cases when the sex chromatin is easier to see, and these are the cases of most neurons where another chromatin is absent or when they appear finely as in oral epithelial cells. However, sometimes the autosomal chromatin is coarse, and it can be challenging to differentiate chromocenters from autosomes or impossible (i.e., sex-determination is not possible). In these cases, the chromatin is more condensed or dense and found in human renal convoluted tubules or hepatic plates. In other cases, no nuclear detail can be distinguishable at all.

Sex chromatin is rarely recognizable *with certainty* in the nuclei of males, which indicates that it can and does exist in male nuclei. However, the distinguishing characteristic of the sex chromatin between sexes is that the mass becomes more and more distinguishable once there is an abnormal sex chromosome complex or if the nuclei are female.[43] Identifying a mass as one that is sex chromatin is observed less than 10 percent in male nuclei. Oral epithelial cells of males rarely contain a mass of chromatin large enough to be considered sex chromatin. It was significant clinically that there is a "broad range between the upper figures recorded for males and the lower figures recorded for females."[44]

Lastly, the sex difference in chromatin patterns of interphase nuclei is related to the heteropyknotic or stainability behaviour of the sex chromosomes, notably the X chromosome, in somatic cells.[45] This means that they "stain deeply" compared to another chromatin. Sex differences are also related to chromatin patterns in cells and are recognizable when the chromatin derived from the autosomes is not too coarse or dense. This is the basis of sex chromatin tests and identifying anomalies.

Of importance to the usefulness of the sex chromatin was how to identify this in a laboratory setting correctly. There were various ways in which the sex chromatin could be identified, and it would also behave differently in different settings. The cytological testing of sex chromatin is usually based on leukocyte nuclei's sexual dimorphism; this differs

[43] Moore, *The Sex Chromatin*, 21; Chapter 7 and 18.

[44] Moore, *The Sex Chromatin*, 21.

[45] Moore, *The Sex Chromatin*, Chapter 6.

from sex chromatin in other cells because a drumstick-like nuclei appendage, with its head attached to the nucleus by a thread-like neck. This new cytological approach was a helpful relief in the stagnant field of intersexuality, which had reached an impasse. Previously applications to sex difference testing in chromatin patterns occurred in clinical tests of chromosomal sex and aided in diagnosing abnormalities in sex development. These tests were also used to screen a larger population to study abnormalities involving sex chromosomes. At the time, there was still a hypothesis on how the sex chromosome contributed to sex-determination and differentiation.

In a standard setting, the sex chromatin was observable in interphase cells and sometimes during the early prophase of mitosis. It represents a single X chromosome. It is said to be exhibiting positive heteropyknosis when the area of the chromosome stains densely. X chromosomes stain intensely with nuclear stains, whereas other chromosomes are more or less unstained and represent negative heteropyknosis. The sex chromosome is observed next to the nucleolus in some cells, particularly neurons or free in the nucleoplasm. When viewed in a prophase nucleus, the sex chromatin is typically distinguishable from the other chromosomes. Other chromosomes are longer in shape and look more like a thick squiggly line, whereas the sex chromatin appears to be a mass and circular structure.

Additionally, a distinctive chromocenter or sex chromatin in interphase nuclei is considered a cytological characteristic of the female in humans and other mammals. This is because the “chromatin-like chromocenter” is rarely visible in nuclei of normal males. In a buccal smear of an oral epithelial cell of a nucleus in the interphase of a human female, the sex chromatin is visible as a dark black spot, typically along the inner surface of the nuclear membrane. It is planoconvex in size and shape and represents a single condensed X chromosome.

The drumstick’s morphological characteristics are a round, oval head with an average diameter between 1.4u and 1.6u (referring to the haplogroup U in DNA mitochondria). It is attached to the rest of the nucleus by a fine thread-like neck. Its chromosome particles or chromatin is as dense as the rest of the nucleus and arranged in clumps. There is usually a 0.2u diameter spacing. It might lie near the base of the nodule, and it has the appearance

of a stoma when along the base. The differences between the regular and irregular drumstick appear to be relatively minute.[46] However, they would be accepted as drumsticks if they were in females or might be considered an aspect of mosaicism in males. The frequency of drumstick appearances is hard to nail down and ranges from 1 in 5 to 1 in over 300. There also seems to be variation depending on where the sample was taken from, the physical forces during the spreading of the film, or even aspects of physio-hormonal changes such as menstruation. Age also appears to be a factor, with more drumsticks appearing at birth, particularly in premature infants. At this early stage, differentiating sex differentiation was still in development and procedural error could mean the wrong sex was identified.

Outside of Moore's volume, several texts were dedicated to understanding and researching the sex chromatin. While the documenting of scientific findings, laboratory technique and nuances within these fields are outside the scope of this research, several of these references are useful bibliography for understanding where large amounts of knowledge can be located for newcomers to sex chromatin research. Two of the texts listed here were dedicated to the abnormal chromosomes' delimitations: Zellweger's *Chromosomes of Man*[47] and Glucksmann's *Sexual Dimorphism in Human and Mammalian Biology and Pathology.*[48] Techniques on handling chromosomes were documented in *Modern Aspects of Cytogenetics,*[49] the updated edition of *The Handling of Chromosomes,*[50] and the Nobel Symposium for *Chromosome Identification: Technique and Applications in Biology and*

[46] It might rarely be altered. Figure 3-2 of the text (in Moore, copyright could not be obtained) shows examples of regular and irregular drumstick. However, they are distinguishable. For example, if you look to D and F, note that the arrow is pointing to two drumsticks, but they are actually a rare drumstick in the male. While it does not come out in the picture, these drumsticks are paler than others. Moore, *The Sex Chromatin*, Chapter 6.

[47] Zellweger and Simpson, *Chromosomes of Man*.

[48] Glucksmann, *Sexual Dimorphism*.

[49] Rudolf A. Pfeiffer, "Modern Aspects of Cytogenetics: Constitutive Heterochromatin in Man," (paper presented at the Symposia Medlea Hoechst, 1972).

[50] Cyril D. Darlington and Leonard F. La Cour, *The Handling of Chromosomes* (Sydney: George Allen and Unwin., 1976).

Medicine.[51] A recent and comprehensive guide (within the research period) can be found in *Chromatin Structure and Gene Expression.*[52]

5.4.1.1 Theories of genetic sex development

There were leading theoretical contributions to understanding why biological sex and other sex traits were present in humans during the development of genetic testing and genetic identification. Most of the smaller theories relied on a form of Darwinism, one of which investigated genetically driven natural selection. These other theories typically looked at the sex ratio. The sex ratio could be applied generally to various areas, such as mathematical Darwinism and evolutionary genetics. However, it generally referred to the potential scientific reasons for a relatively balanced number of males and females in bipedal or upright mammals.[53] Popular theories that studied the sex ratio included the sex allocation theory,[54] the popular theories of James Maynard Smith around evolution, sex and game theory,[55] mathematic biology,[56] and evolutionary development in behavioural biology.[57]

James Maynard Smith was a theoretical and mathematical evolutionary biologist and geneticist. Maynard Smith was a primary proponent of the development of game theory within theories of evolution. He studied the evolution of sex as well as signalling theory.

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[51] A. Gropp and Lore Zech, "Identification of Metacentric Marker Chromosomes in the Mouse by Use of Banding Techniques" (paper presented at the *Chromosome Identification: Technique And Applications In Biology And Medicine: Proceedings of The Twenty-Third Nobel Symposium Held September 25-27, 1972 at The Royal Swedish Academy of Sciences*, Stockholm, 1973.

[52] Iain L. Cartwright et al., "Chromatin Structure and Gene Activity: The Role of Nonhistone Chromosomal Protein," *Critical Reviews in Biochemistry* 13, no. 1 (1982).

[53] Moore, *The Sex Chromatin*.

[54] Eric L. Charnov, *The Theory of Sex Allocation*. Vol. 18, (Princeton: Princeton University Press, 1982).

[55] See John Maynard-Smith, *The Evolution of Sex*, Vol. 4 (Cambridge University Press: Cambridge, 1978); John Maynard-Smith, *Games, Sex and Evolution* (New York: Harvester-Wheatsheaf, 1988); John Maynard-Smith and Eors Szathmary, *The Major Transitions in Evolution* (Oxford University Press, 1997).

[56] Gregory Chaitin, *Proving Darwin: Making Biology Mathematical* (New York: Vintage, 2012).

[57] Perry J. Gustafson, Ledyard G. Stebbins, and Francisco J. Ayala, *Genetics, Development, and Evolution: 17th Stadler Genetics Symposium* (London: Springer Science and Business Media, 2013).

Although the work of Maynard Smith could not be studied comprehensively in this portion of these studies, it is important to regard his work as being highly influential within genetic and evolutionary theories and as having contributed to understandings of sex development at his time. Some essential texts include *The Evolution of Sex,*[58] *The Major Transitions in Evolution,*[59] and his collection of reviews and critical essay on *Games, Sex and Evolution.*[60]

Maynard Smith also worked with Eric Charnov, an American evolutionary ecologist known for his work on foraging, marginal value theorem and life history theory. One significant work in life history theory was the theory of sex allocation and scaling/allometric rules.[61] Charnov was also a notable contributor to evolutionary ecology, or population genetics, and evolutionary game theory. Three of his papers are Science Citation Classics. In his 1982 text *The Theory of Sex Allocation*, Charnov attempted to articulate a means of applying Darwin's theory of natural selection to the biological problem of sex allocation. He used selective thinking and population genetics to explain why 'sex resources,' or the genetic and biological means to reproduce either by oneself (i.e., hermaphroditic) and needing another to reproduce (i.e., dioecious). Gametically, hermaphroditic organisms produce large and small gametes in a lifetime, whereas dioecious organisms produce separate male and female gametes.[62] However, since scientists had a limited understanding of why a certain number of male or female gametes were produced, Charnov wanted to understand the ways that natural selection contributed to this 'sex ratio.'[63] His use of Maynard Smith's theory of genetic equilibrium in a population to work through this problem shows the two theorists' close working relationship.

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[58] Maynard-Smith, *Evolution of Sex*.

[59] Maynard-Smith and Szathmary, *Major Transitions*.

[60] Maynard-Smith, *Games, Sex and Evolution*.

[61] Charnov, *Sex Allocation*.

[62] A gamete is the mature haploid male and female germ cell and is the cell that is able to unite with another of the opposite sex.

[63] Charnov, *Sex Allocation*.

Analyzing Charnov's questions for accuracy is beyond the scope of this research. Notable for this research is chapters nine and fourteen in his monograph, where Charnov addresses favourability. Favourability in sex theory refers to when dioecy is favoured over hermaphroditism or vice versa. Branching off evolution theorist Michael Ghiselin's 1969 theory that natural selection favours changing one's sex (via hermaphroditism) over dioecy when an individual's reproductive success is closely related to age or size, Charnov applies the theory of 'sex reversal'[64] and his theory of hermaphroditism.[65] Sex change, sex reversal and hermaphroditism would not benefit the dioecy organisms' survival due to various reasons, the leading proponent being anatomical restrictions. The allocation of sexes into male and female in dioecious and hermaphroditic organisms, according to Charnov, were divided based on the function and form of the life structure. The allocation of sex resources within both organism groups lay in the reproduction of male or female offspring in the former instance and the decision into what sex to change into and why in the latter instance.

It is worth noting that while theories of sex development are still circulating today, much of evolutionary biology has transitioned to a more sophisticated approach as in biological (and in turn evolutionary) theory. Biologist Alessandro Minelli and immunology Thomas Pradeu's recent work *Towards a Theory of Development* is doing just this.[66] Drawing from biology, evolution theory, evolutionary genetics, and philosophy of science, Minelli, Pradeu and others set out to define the boundaries for developmental biology theories. However, Maynard Smith is still a very well-known name regarding this theory of the evolution of sexes and game theory application models. For example, in 2019, a paper on "Sex Ratios in The Haplodiploid Herbivores, Aleyrodidae and Thysanoptera: A Review and Tools for Study"[67] utilized the theory of sex allocation to understand adaptive predictions and biological control agents in population dynamics of insects. A chapter was

[64] Charnov, *Sex Allocation,* 132.

[65] Charnov, *Sex Allocation*, 219.

[66] Alessandro Minelli and Thomas Pradeu, "Theories of Development in Biology–Problems and Perspectives," *Towards a Theory of Development* (2014): 1-14.

[67] Elizabeth Canlas Bondy and Martha S. Hunter, "Sex Ratios in the Haplodiploid Herbivores, Aleyrodidae and Thysanoptera: A Review and Tools for Study," *Advances In Insect Physiology* 56 (2019): 251.

completed in 2017 that addressed the evolutionary basis for sex allocation and unbiased sex ratios.[68]

Developmental biology is worth noting briefly in this research, even though it cannot be explored fully. Developmental biology "offers descriptions and explanations of the processes involved in the development of living entities,"[69] and it does so from a seemingly molecular level. Developmental biology transitioned from embryology after principles from development genetics strongly influenced the discipline. By doing so, embryology was able to take on aspects of plant development in the life sciences, and it was able to express the life sciences on a more nuanced or molecular level. Theories of development relate to theories of sex development insofar as developmental biology has been "framed in terms of genes, genetic 'blueprint,' and genetic program, with the implicit idea that the final form of the organism is 'already there' in the instructions contained in its genome as early as the egg stage."[70] Developmental biology takes on differentiation and morphogenesis, questions of reproduction, regeneration, evolution and more.[71] The newly modified theory needs to come to terms with agreed-upon principles. However, it is generally agreed that differential gene expression[72] plays a significant role in understanding heterogeneity and how the body can reproduce itself down to the number of cell chromosomes. Developmental biology theory(ies) play(s) a crucial role as a theory that has emerged from theories of natural selection, evolution and sex development.[73]

For understanding its application to this research, theories of developmental biology affect theories of sex and ultimately female testing. If theories of sex development were based on sex being pre-determined by genetics, then it could force athletes into certain ways of being

[68] Ian C. W. Hardy and Rebecca A. Boulton, "Sex Allocation, Sex Ratios and Reproduction," *Elsevier*, (2019).

[69] Minelli and Pradeu, "Theories of Development," 15.

[70] Minelli and Pradeu, "Theories," 4.

[71] Minelli and Pradeu, "Theories," 41-2.

[72] Minelli and Pradeu, "Theories," 42.

[73] Minelli and Pradeu, "Theories," 155.

that they do not agree with. The IOC's reliance of science prioritizes the knowledges of genetics, in this case, and forces onto athletes the understanding of their genetic makeup and pre-determined sex roles.

5.4.2 Endocrinology and female testing: Sex hormones at work

The role of endocrinology in the development of female tests in Olympic sports is at least twofold. Firstly, endocrinology did not play a primary role in sex-differentiation until more recently, where it was brought into the spotlight when Semenya's eligibility was brought into question in 2008. However, its role in Semenya's case was still based on a determination of sex through genetic analysis. Secondly, throughout the history of female testing, endocrinology played a supporting role for genetic tests. This might have been due to a genetic test's availability, but there was never a jump to endocrinology to *determine* sex because there was no endocrine test available to determine sex. Endocrinological analyzes were consistently vital in identifying the roles and functions of the gonadal function in athletes. While a gonadal misfunction might have caused a rise in androgen production, any tests conducted to identify that rise were still considered a prerequisite to genetic testing.

Sex-differentiation mechanisms have strongly influenced endocrinology since its inception, and the discipline has been arguably created in modern empirical realms due to initial observations on reproductive-endocrinological function. In Western and Eastern-Asian ancient society, thinkers were fundamentally concerned with the observable effects surrounding the endocrine function; these effects related to fertility and castration and ultimately the community's survival.[74] Aristotle observed endocrinological function when he castrated a hog. He also observed the ovaries of sea urchins that fluctuated with the lunar cycle.[75]

[74] Victor Cornelius Medvei, *The History of Clinical Endocrinology: A Comprehensive Account of Endocrinology from Earliest Times to the Present Day* (CRC Press, 1993).

[75] Samuel M. McCann, *Endocrinology: People and Ideas* (Springer, 2013).

Knowledge around endocrine function had been in circulation since pre-history (dubbed proto-endocrinology in medieval China, circa 1600 BC),[76] but the first evidence of experimentation with endocrine function did not occur until recently, around 1849. As with much of the ancient knowledge around endocrine function, the first evidence related to sex. In 1849, German physiologists Arnold Berthold became the first to keep a record of endocrine experiments when he castrated the rooster's comb and accurately identified that the comb was androgen-dependent, and removing the comb led to a reduction in androgen-typical behaviours such as aggressiveness and interest in hens along with atrophy of the comb. He then transplanted a form of testes into the castrated rooster and observed the resumed functions such as comb size, crowing and other masculine-typical behaviours. Berthold's observations were considered a fundamental advancement and led to subsequent testing, such as in females.[77]

One of the most famous forms of modern endocrine experimentation was that of Charles-Edouard Brown-Sequard. Although a pioneer in experimental and clinical neurology and a growing interest in adrenal glands' function, Brown-Sequard is most famous for his presentation in 1889. He reported injecting himself with testicular blood, seminal fluid and testicular extract of guinea pigs and dogs. He reported feeling younger, stronger, working longer hours and being more physically active. Even though his methods and findings received much criticism, and his work was never able to be replicated, Brown-Sequard's findings were popularized.

Endocrinology was also considered a discipline based on "quackery" until the remarkable discovery of insulin to remedy diabetes mellitus in 1921.[78] In the beginning, endocrinology

[76] Medvei, *History of Clinical Endocrinology.*

[77] McCann, *Endocrinology*.

[78] Quackery refers to fake or untrustworthy science. Additionally, while Medvei's extremely detailed history of the three-part "Birth of endocrinology" might recount the claim that endocrinology was considered a quack study until the creation of insulin as medicinal, the emergence of insulin showed evidence of the usefulness of endocrinology to the wider public. Frederick Grant Banting et al., "The Effect of Pancreatic Extract (Insulin) on Normal Rabbits," *American Journal Of Physiology-Legacy Content* 62, no. 1 (1922); Robert D. Simoni, Robert L. Hill, and Martha Vaughan, "The Discovery of Insulin: The Work of Frederick Banting and Charles Best," *Journal of Biological Chemistry* 277, no. 26 (2002); McCann, *Endocrinology: People and Ideas*.

functioned through clinical medicine. Eventually, the community was developing aqueous solutions from endocrine structures for virile effects. This was perhaps Brown-Sequard's most significant contribution; that aqueous extractions could, in turn, be synthesized and distributed as medicine was a significant breakthrough for endocrinology.

In the 1930s, with the influence of organic chemistry, endocrinology was able to expand its reach. The evolution of endocrinology followed along with the evolution in medical technologies, such as advancements in peptide chemistry in the 1950s and molecular genetics.[79] One area of endocrinology notable to sports research was directly linked to molecular genetics. As McCann states, "The receptors are usually on the cell surface; however, the receptors for thyroid hormones and steroid hormones are in the cytosol and carry the hormone to the nucleus, where it interacts with DNA to evoke messenger RNA synthesis."[80] With the help of physiologists and pharmacologists, mechanisms of active hormones and their hormone receptors were documented.

One area of special consideration in endocrinology is the endocrine function of the ovary.[81] As supported by the genetic literature, ovarian function is determined by both gamete (genetic function) and endocrine functions.[82] Endocrinologists also believe that the hormonal activity involved in ovarian function helped facilitate the evolution of two sexes for reproduction.[83] This role would also strongly influence the necessary characteristics of reproduction, which include fertilization (internal and from an external source), egg processing and growth. Interestingly, the hormones commonly referred to as sex hormones related to reproduction are unnecessary for human survival, although the body would

[79] McCann, *Endocrinology*.

[80] McCann, *Endocrinology*, vii.

[81] See Ryan in McCann, *Endocrinology*.

[82] See the Genetics section in Glucksmann, *Sexual Dimorphism in Human and Mammalian Biology and Pathology*.

[83] Referred to as dioescism, see Minelli and Pradeu, "Theories of Development."

ultimately adapt to these changes. Their necessity relates to the continuation of the human species through reproduction.[84]

Endocrine physiology was also used for sex-determination 1980s.[85] Martin's textbook draws a useful map to show the interrelationships between the following medical aspects of sex in the 1980s: chromosome/genetic, gonads, hormones, phenotypes, psychology, behaviour, and legal.[86] Sex-determination and sex-differentiation mechanisms in endocrine physiology through the necessary distinction between asexual (i.e., hermaphroditic) and sexual (i.e., dioescist) forms of reproduction were ultimately bound to gametic functions in reproductive processes. For example, in asexual reproduction, a "single source of *hereditary* material"[87] is utilized to replicate equal descendants. Martin continues, "As a result, the new individuals that emerge are *genetically linked* with each other (and with the original parent)."[88] Although no known examples of asexual or hermaphroditic reproduction are recorded in bipedal mammals, Martin cites several known advantages and disadvantages for why a species would want to be able to reproduce on one's own. The advantages include that when in isolation, asexual would, in ideal settings, guarantee a species' survival over a dioecious form of reproduction. Disadvantages, however, are the lack of versatility in offspring, which could provide a more advantageous evolution for a given species, the possibility for mutations to be transferred, and a stagnation in a system.

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[84] Roy O. Creep, Marjorie A. Koblinsky, and Frederick S. Jaffe, "Reproduction and Human Welfare: A Challenge to Research. A Review of the Reproductive Sciences and Contraceptive Development," (1976); D. T. Baird, "Synthesis and Secretion of Steroid Hormones by the Ovary in vivo," *The Ovary, Vol* ed. S. Zuckerman and B. J. Weird (New York: Academic, 1977); Jennifer H. Dorrington, "Steroidogenesis in Vitro," in *The Ovary* ed. S. Zuckerman and B. J. Weird (New York: Academic, 1977).

[85] Constance R. Martin, *Endocrine Physiology* (New York: Oxford University Press, 1976); This text is still published through Oxford University Press, and it is now in its 6th edition: James E. Griffin and Sergio R. Ojeda, eds., *Textbook of Endocrine Physiology*, 6th ed. New York: Oxford University Press, 2011.

[86] Martin, *Endocrine Physiology*.

[87] Martin, *Endocrine Physiology*, 499, emphasis in original.

[88] Martin, *Endocrine Physiology*, 499.

Essential to a general understanding of this reproduction form is that gonads produce gametes. Testes (gonads found in typical males) produce spermatozoa, and egg cells are produced by ovaries (gonads found in typical females). Gonadal hormones may also provide secondary sex characteristics, which are not directly involved in the reproductive processes per se but play a role in selective behaviours. He makes clear that "there is no direct relationship between "reproductive efficiency" (the ability to produce adequate numbers of offspring) and the magnitude of 'sexual dimorphism.'"[89]

In depicting the gonadal hormones that were capable of sex-differentiation related to the brain, Martin proscribed sex-specific metabolic differences and the "sensitivities of certain types of receptors."[90] Martin equates the terms *male* and *masculine* (emphasis in original) to the spermatozoa, testes, accessory reproductive structures, secondary sex characteristics and related behaviours (e.g., aggression, territorial defence, courtship and copulation in the traditional sense). Conversely (or similarly according to Martin), *female* and *feminine* (again, emphasis in original) are referred to when speaking about the egg cells, ovaries, phenotypical characteristics, accessory organs and ovarian hormones.

Besides presenting a comprehensive overview of reproductive physiology and anatomy, Martin's recap of sex development is otherwise limited to basic endocrinology. His review details the role of the H-Y antigen (a male-specific cell protein directed by the Y chromosome) and its receptors and goes on to document the geminal cell maturation and the development of sex *in vivo*. While antecedent to much of the known knowledge around reproduction, Martin's chapter provides evidence for the synthesis of chromosomal reproductive knowledge and theories of sex allocation (including sex reversal and the sex ratio) to be commonly agreed-upon data at that time. Additionally, the regurgitation of any knowledge from within endocrinology or the genetic studies outside of basic understanding would appear to be selective and a biased contribution of relative medical knowledge.

[89] Martin, *Endocrine Physiology*, 500.

[90] Martin, *Endocrine Physiology*, 501.

What is vital for this research is identifying the role of the chromosomes in sex-differentiation and then how chromosome disorders and hormonal disorders might affect sex-based functionality. Before moving on to genetics and female testing, I briefly want to review the "indifferent" stage of embryology. In mammalian *in vivo,* there is an ambisexual or sexually indifferent stage where mammalian embryos exhibit morphological similarities for both XX and XY characteristics. Embryos are said to i) possess the beginnings of a pair of gonads, ii) one pair of ducts that could form into a male-type accessory organ, iii) a second pair of ducts that could form into a female-type accessory organ, and iv) higher brain-centre components such as the pituitary and hypothalamic components which could be conditioned by gonadal hormones. By the end of the sixth week in XY embryos, the gonads show signs of organizing into testes. XX embryos wait an additional 14 days to become morphologically identifiable as female gonads.

In identifying key academic textbooks, this research identifies a basis for a new tradition within a scientific revolution or paradigm shift. Since the textbooks on endocrinology that contiain knowledge about new findings like findings for sex development, then the text can only have occurred after those scientific findings and a potential paradigm shift occurred. In moving through the academic textbooks, this research can more readily identify key aspects of a female testing discourse.[91]

5.5 Tracing the female testing discourse

Because of science's increased involvement in sport and sport studies in recent years, an assessment of the sports medicine literature used in congruence with female testing can provide a unique perspective for conceptualizing how science (objectively) interacts with human life (phenomenologically). Since not much ethical or philosophical thought is applied to sports medicine and the sport sciences, the entrance into the medical basis for female testing provide grounds for developing such a methodology.

We know through the female test methodology and subsequently the language used by the IOC Medical Commission that genetics was the preferred knowledge-base for female

[91] Kuhn, *Scientific Revolutions*, 143.

testing methodology. The development of genetics was a growing field of research throughout the early twentieth century. It is generally agreed upon that the discovery of Mendel's published work on the laws governing inheritable traits in pea plants, initially published in 1865 and discovered in 1900, was the first introduction into genetics. Moreover, the term "genetics" was first coined in 1905 by English biologist William Bateson, the man who found and published Mendel's work. Therefore, it is easy to see how nascent the research area of genetics is.

In the 1950s and 1960s, this field was generally still in development, particularly so compared to studies in physiology and anatomy, for example. However, scientists consider the emergence of the Barr Body in 1949 to be a breakthrough in the 'stale' area of study considered intersex studies. While Murray Barr was ultimately against the use of the methods in identifying femaleness in sport (as he argued in a letter to the IOC Medical Commission), another colleague in the field and one involved with Barr Body research, Keith Moore, was happy to hear that their medical advancement was being put to use.

Ultimately the choice to use the Barr Body method to test females in sport profoundly implicated the IOC in endocrinological and genetic horizon research. Their use of female testing also encouraged scientists within the IOC Medical Commissions and those from outside the walls of the IOC Medical Commission to enter into a debate around the misuse, use, ethics and nuance of the female test methodology and definitions of sex.

One critical question that the use of the tests stirred was: Who should be excluded? What type of person should the test catch? This was a question posed by outside medical officials when trying to educate IOC Executive and Medical Commission members around biological sex and the results that the test would procure, and ultimately which results they would lack. This question was posed several times in order to try to understand what it was that the tests were looking for. Knowing what to look for would determine how the methodology would be used and what findings would emerge. It was generally agreed that the tests should eliminate 'true' males, even though definitions around maleness and femaleness remain ambiguous both in archival sources and in scientific sources.

Endocrinology also played a role in the development of female tests in Olympic sports. Firstly, endocrinology did not play a primary role in sex-differentiation until more recently. This means that even up until 1996, there was not much documented on what endocrinological testing was being performed. The only indicator that it is being used is in nuanced discussion. For example, all females submit a cheek swab to test for the Barr Body. If any test shows up as questionable, the athlete must undergo additional testing, including a gynecological exam and an endocrinological profile. Therefore, genetics served as a gatekeeper so that other exams helped eliminate the level of indignity that a physical exam possesses and save on time and money from having to complete endocrinological exams foremost.

Therefore, endocrinology played a supporting role within the female testing discourse, but its role is still considered necessary as the original determination of genetic sex naturally led to further assays in hormone profiling. There was never a jump from the physical exam (as was conducted in 1966) straight to endocrinological profile to determine sex because there was no endocrine test available that was as essay and affordable as the Barr Body test. Endocrinological analyzes were consistently vital in identifying the roles and functions of the gonadal function in athletes. While a gonadal misfunction might have caused a rise in androgen production, any tests conducted to identify that rise were still considered a prerequisite to genetic testing. Endocrinological testing would have led Olympic scientists to understand the cause or the role of the genetic influence.

Lastly, in 1992 there is a shift from the Barr Body test to polymerase chain reaction (PCR) testing to be used at the Albertville Winter Games. This shift occurred through the working group that medical research Dr. Arne Ljungqvist[92] established with professor in obstetrics and gynecology and human and molecular genetics Dr. Joe Simpson and human geneticist

[92] While tangential to this research, one notable aspect is the length and intimacy of involvement that Dr. Arne Ljungqvist had in the inquiry for sex testing. While Ljungqvist is most commonly known for his hunt for doping, he also was intimately involved in the development of sex testing as has been confirmed in private email communication with colleagues of his through the IAAF and IOC. Ljungqvist was a medical researcher at the Swedish School of Sport and Health Sciences in Stockholm from 1992 to 1996, which is an institute that worked closely with the Karolinksa Institution in the field of sport medicine. In addition to this, Ljungqvist was intimately involved with the Olympic program at the IAAF and is currently sitting as an honorary IOC member, chairman of the IOC Medical Commission, and vice chairman of WADA.

Dr. de la Chapelle,[93] and potentially geneticists Drs. Samia Temtamy and Sadika Al-Awadi, in order to establish a more effective method for testing females. Therefore, Dr. de la Chapelle's efforts afforded him and other established and respected individuals within the realm of genetics to contribute to female testing within the IOC platform.

With this framing in mind, we can see that the Medical Commissions members were involved in discussions around the scientific understandings of sex-differentiation in sport. Additionally, the medical knowledge around female testing is not housed in the sports medicine discipline but instead shows evidence of being a nascent area of study around the emergence of female testing. Since the medical knowledge had existed in endocrinology and genetics, it cannot be said that female testing was sports medicine at its origin. There was also evidence that the IOC Medical Commission was able to act separate from medical ethics. Although it was mentioned in correspondence that medical ethics were of the primary concern, the Olympic platform's ability to perform these tests at all indicates that the IOC exists outside of the boundaries of academic and research ethics.

This aspect is concerning because of the following: women were wrongly told about something of a sensitive nature, and doctors were not taking proper care to inform the athletes of what was going on, even though it was repeatedly reassured that doctors were handling these cases with sensitivity and all measures of the test were being done with the utmost care. While this may be true, there are instances where wrongful information was told without full analyzes being completed on the athlete. Furthermore, the tests were not fully encompassing various genetic variations that could affect sporting performance. The IOC Medical Commission knew this, but they instead kept the tests in place. The IOC Medical Commission never wanted to abandon testing, and therefore left a faulty method in place even while knowing the tests were faulty and questionable in several areas.

[93] Also interesting within this research is the role of Dr. de la Chapelle in genetics coming into the 2000s. There is a DSD syndrome named after de la Chapelle (known as de la Chapelle syndrome), which is a rare DSD where 46, XX karyotype is present, and it is characterized by male external genitalia with ranging presentation. Especially considering the lengths that de la Chapelle went to convince the IOC of the inaccuracy of the Barr Body method shows his significant contribution to female testing.

It is also important to note that these tests are organized around the following principles: to ensure equality on a physical basis, absolute secrecy, and low-cost, effective testing. The IOC wanted to develop a more sophisticated classification system that accounted for the anatomical, physiological, psychological and social markers for this new phenomenon – the intersex athlete. In a letter to Dr. Elizabeth Ferris, Dr. Hay asserts that, "The Medical Commission is neither an investigative nor a research institute. It receives advice from such associate scientific bodies as [FIMS]. Although the studies of the problems of sexual differentiation are not yet complete, many scientists are working in this area and it may not be long before the results of these studies are available to us. In the meantime, the I.O.C. must continue to eliminate from the competitions athletes who exhibit problems in the area of sexual differentiation and thus have physical advantage."[94] Testing labs are accredited laboratories under the IOC, and they house specialist within relevant departments.[95] Critical oversight should look to the regulations surrounding these laboratories and the implications of their operation.

Results were examined by Medical Commission members, which means that the IOC representatives were gatekeepers around who classifies as female and who does not. Whether they realized it or not, they were the gatekeepers for determining normality and abnormality within sport. We see that this type of normal/abnormal spectrum detailed by de la Chapelle, for example, in a 1987 letter, he wrote to Prince Merode with the essence of this: "[Numerous congenital abnormalities] lead to variable degrees of abnormal (usually defective) development of the gonads and secondary sex characteristics (such as body build, muscle strength, the pitch of voice, and pilosity). Besides, similar abnormalities of the primary and secondary sex characteristics may occur in individuals with normal sex chromosomes (e.g., as a result of non-chromosomal congenital disorders or after ingestion of sex hormones)."[96] This way of pathologizing bodies as normal and abnormal was

[94] Hay, Letter to Dr. Elizabeth Ferris, Feb 22, 1981: 2.

[95] IOC Medical Commission Fonds. Lausanne, Switzerland: Olympic Studies Centre Archives, 1967-1996.

[96] Albert de la Chapelle, Letter from Dr. Albert de la Chapelle to the International Olympic Committee, August 17, 1982 B-ID04-MEDIC, Ioc Medical Commission, 035/SD2: Olympic Studies Centre Archives, Lausanne, Switzerland.

ultimately based on the male athletic body as the gold standard. It also contributed to the definition of normalized sex/gender.

And then there is also the aspect that the tests were only conducted on females, which is a gendered viewpoint that I cannot ignore. The visual differences in physicality always reinforced rationales. Furthermore, testing worked to competitively divided athletes along an untraceable physiological line marked by a type of performativity. Drastically improved performances sometimes determined this divide, but sometimes something like the shape of the jaw might also determine it. Female testing acted as a performative of science's understanding of sex/gender distinctions and provided a circular relationship around women and man's definition. Within the female testing discourse, the 1980s marked a time for growing pains within empirical understandings of sex/gender.

The most telltale finding that emerged suggests that female testing should be considered an exploratory scientific experiment. Female athletes were incredibly confusing for sporting officials, but the testing encouraged a path of continued scientific scrutiny of the female athlete. This makes sense given the time period. In 1985, the United States (U.S.) first mandated that health research had to be conducted on women so that recommendations would make sense for women. Before, they would test men, perform a formula and then apply it to women. The effects of the female testing discourse can be seen through modern-day examples like the continued testing for females in the IAAF and sports medical literature's consideration for the female body as a unique population and presenting sex-based disorders that challenged medical professionals. While this is not to imply that there is a direct connection between these examples and female testing, it speaks to how the medical world has been slowly evolving to account for a progressive female body.

Another view into this finding is by looking at a process described by Nelly Oudshoorn, who has documented this in her archaeology of sex hormones. In her book *Beyond the Natural Body: An Archaeology of Sex Hormones,* Oudshoorn described the scientific process as relying on a cycle of contextualization.[97] This cycle can be generally understood

[97] Oudshoorn, *Beyond the Natural Body: An Archaeology of Sex Hormones*.

within the scientific paradigm as scientists initially creating the context of a problem (which could also be referred to as having a predisposition about the nature of something), then working towards creating the environment to produce this problem naturally (a process called re-contextualization), and then continually de-contextualize it (break it down by performing science and ultimately hiding the origination of the thought process) so that the platforms on which the science is done, the experiments – and the people – are rendered invisible.

In female testing, the initial context or re-contextualization was necessary because men were cheating or that women were too muscular. However, details did not matter because sports physiology research determined that sports be separated by gender and then determined by biological sex. Medical Commission members were scientists, so they understood an empirical rationale for sex segregation in sport; they were also experienced in navigating scientific networks and conducting their research. De-contextualization also revealed that sports officials did not have the most up-to-date, let alone accurate scientific methods needed to distinguish sex, even when tests were being performed.

Therefore, this allowed the tests to be carried out, data to be retrieved on the individuals tested, and a justification provided based on the results rather than natural findings. This means that the emergence of the genetically abnormal female was the marker that accounted for the necessary justification for testing in the first place. This athlete challenged several tenets of thought, including scientific notions of sexual dimorphism in humans, the system of sex-determination in biology and other sciences, and the standards of Olympism and sex segregation in sport. Language prioritized traditional viewpoints of the female body as scientifically agreed upon to be physically at risk, which was the common scientific viewpoint of the female athlete at this time and has been since forever. Interestingly enough, the language used throughout the correspondence and the testing measures did give credit to the idea that the women's category was worthy of risking cheating for. This is not a typical viewpoint of women's sports since women's sports are less popular and receive less of the scarce benefits compared to men's sports. This supports the idea that there is an aspect of women's sport that is valuable. This statement is an

improvement considering that previous research that documents the struggles of women's inclusion in sports and their struggle for popularity, funding, and appeal.[98]

5.6 Ethics and the development of sports medicine discipline

While completed in the domain of sports medicine, sex tests contributed to growing bodies of literature in physiology, endocrinology and genetics that seek to understand the scientific specificities of intersex individuals and the ways that women and intersex bodies interact with physical movement. However, this means that these tests are trying to distinguish womanhood within these scientific paradigms.

Acknowledging these scientific questions around womanhood is not that straightforward because we do not agree on a definition of womanhood.[99] Until the 1980s and 1980s, the health sciences and the sport sciences have only recently begun to identify the relationships between the menstrual cycle and the active female body and relationships between thyroid function and physical capacities, among others. The female athlete is still considered a unique population, most likely because knowledge around female bodily functions is nascent. Because menstrual function can affect the body in somatic and intrinsic ways, the woman's reproductive cycle is a cross females bear and still limits female inclusion in some

[98] Cahn, *Coming on Strong*, 278; English, "Sex Equality in Sports," 270-1; Guttman, Allen. *Women's Sports*.

[99] Definitions of womanhood are forever tied to its compatriot manhood. Unless the issue of gender/sex and the lack of definition can be separated from the male characteristics, then definitions of gender are tied with definitions of sex (i.e., with the human reproductive capacities). It seems that this discussion is one not suited for sports, even though sports have taken this debate head-on through the segregation of the sexes and the implementation of sex testing for the female category. In this sense, then, a woman would not lose womanhood when competing in international sport unless it somehow directly causes her to lose her reproductive capacities.

scientific and sporting endeavours.[100] The same could be said of women of colour, especially when considering the history of racist science.[101]

In the 1980s, we see that female athlete were part of a distinct rift[102] in the standard paradigms of research in health sciences and has changed what we know about humans and female bodies.[103] This rift was brought on by critical feminists and critical feminists within the medical sciences, which called attention to severe inequality rates within scientific research in the 1980s. These institutional changes were brought when researchers began to point out the significant sex-discrepancies in three large and influential studies. The most notable were: one from the Physician's Health Study, which studied the effects of aspirin on cardiovascular disease and 22,071 male physicians were included and zero women; another notable study was the Multiple Risk Factor Intervention Trial, a randomized trial that spanned 1973 to 1982 to evaluate coronary heart disease against several correlates and that study evaluated 12,866 males to zero women; the third was the National Institute on Aging's Baltimore Longitudinal Study of Aging from 1958 to 1974 which excluded female subjects entirely. These three cadences encouraged a critical reflection on the realm of public health, which largely ignored females. For example, the U.S. Food and Drug Administration (FDA) predominantly conducted clinical trials on men, where the results would be applied to women in terms of a formula. While women had been included in clinical trials, applying scientific research on males to women's medical needs increases the risk of overdose, such as in pharmaceutical research. Problems are

[100] Outside of reproducing, there are hardly any instances where aspects of one's sex must be taken into consideration by a medical professional. One instance might be if an individual presents a condition that is life-threatening. The only example that I have seen that is related to the contemporary sport's research in question is 21-hydroxylase-deficiency, also known as salt-wasting congenital adrenal hyperplasia. Although, this condition is almost always caught within four to six weeks after childbirth since the infant's body starts to show signs of hypoglycemic adrenal crisis and severe loss of blood volume.

[101] Londa L. Schiebinger, "Women's Health and Clinical Trials," *The Journal of Clinical Investigation* 112, no. 7 (2003). The Tuskegee Study is a clear example of racist scientific practice: Donald H. Rockwell, Anne Roof Yobs, and Brittain M. Moore, "The Tuskegee Study of Untreated Syphilis: The 30th Year of Observation," *Archives of Internal Medicine* 114, no. 6 (1964); Allan M. Brandt, "Racism and Research: The Case of the Tuskegee Syphilis Study," *Hastings Center Report* (1978): 21.

[102] Associated with second wave feminist movements, and feminists critical of the sciences paradigm, especially the human sciences.

[103] Schiebinger, "Women's Health."

exacerbated once factors like race, ethnicity, and socioeconomic status are taken into account.[104]

Notable in this chapter, though, is that in 1985, the U.S. Department of Health and Human Services created a Service Task Force on Women's Health that released a report called for more research to focus on diseases unique to women. From this, the National Institute of Health (NIH) advisory committee recommended in 1986 that grant applicants be from women or include women; if women were not included, there needed to be a sound rationale as to why. Finally, the NIH Revitalization Act of 1993 enforced this recommendation into law.[105] Women and minorities were to be included in NIH-funded biomedical research, phase III clinical trials, and other stipulations considering that cost was not a determining factor for including women in clinical trials. Most importantly, the NIH initiated outreach programs for equal opportunity recruitment.

5.7 Conclusion

In grappling with this concept of womanhood, the Olympic movement defines non-womanhood as having something to do with androgens and performance measures. These performance measures are visible. They differentiate between naturalness and non-naturalness, and then even further within each as being gendered versus non-gendered, and again racialized versus non-racialized.[106] For example, conditions that might add physiological advantages like height or increased red blood cell oxidation are not considered cheating within a gendered- or racialized- concept of womanhood. Ultimately, conditions related to non-gendered, non-racialized and natural performance enhancers are praised and held in high regard.

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[104] Schiebinger, "Women's Health."

[105] Institute of Medicine (US) Committee on Ethical and Legal Issues Relating to the Inclusion of Women in Clinical Studies, *Women and Health Research: Ethical and Legal Issues of Including Women in Clinical Studies: Volume I* Ed by A.C. Mastroianni, R. Faden, and D. Federman, (Washington (DC): National Academies Press, 1994), B, NIH Revitalization Act of 1993 Public Law 103-43. Available from: https://www.ncbi.nlm.nih.gov/books/NBK236531/

[106] See the *Olympic Encyclopaedia on Genetic Performance*.

Through this type of scientifically motivated lens, we can view the woman's body to be in a sports purgatory since the female athlete participates in sport and can only achieve an illusory goal. Female athletes will never be swifter, higher, or stronger, at least not in the sense that is expected of the Olympics. If the woman's physical capability is finite, then the tests are in place for protection but limit their growth potential. Nevertheless, as we have seen, women continue to surprise us year after year! The inclusion of the women's marathon is the most pertinent and well-known example.[107] This old trope of female frailty has been stated for millennia, and it continues to act as a compelling oppressive tactic, regardless of whether it is well-intended or not.[108] The discussion shift is around the language around female athletes.

Considering the Olympic movements' influence, and the fact that affiliates of the IOC were directly involved in the creation of several societies for sports medicine, including the FIMS and subsequently the ACSM, a faction of FIMS, this research contributes to understanding how the Olympics played a role in the growth of the sports medicine discipline and provided a platform for dominant narratives within science to label which bodies are more important than others. In understanding these relationships, researchers use relationships of scientific development for applying critiques to current practices.

[107] Jamie Schultz, "Going the Distance: The Road To The 1984 Olympic Women's Marathon," *The International Journal of the History of Sport*, *32* no. 1 (2015): 72-88.

[108] Piper, *Sex Testing*.

Chapter 6

6 Fair play and 'female testing'

In a recent interview from the Australian Daily Telegraph, the president of World Athletics[1] and influential politician and athlete Sebastian Coe stated, "The reason we have gender classification is that if you didn't then no woman would ever run another title or another medal or break another record in our sport."[2] His quote was referring to a recent CAS case, wherein the policies of hyperandrogenism in the sport of Athletics were challenged.[3] Semenya's particular case forces the sporting community and social critics to come together in the spirit of human rights, fair play, and moral integrity to identify just what sex segregation means to the athletes, not just how this affects the spirit of sport.

Critical sports scholars in philosophy, history and sociology have had lengthy conversations about sport's decision to segregate sexes, what that means for women in sport, and analyze the nuances of how sex segregation is enforced.[64] Sex segregation and female testing have been adopted based on values of fair play and paternalism in sport so that women can have the opportunity to earn valuable victories within sport that support the social and political advancement of the gender category.[5] Ethics scholars have analyzed

[1] Formerly known as the International Amateur Athletic Federation and International Association of Athletics Federations.

[2] Julian Linden, "Caster Semenya Case Set to Change Every Sport," The Daily Telegraph of Australia (Sydney, Australia) 2019, https://www.theaustralian.com.au/sport/olympics/caster-semenya-case-set-to-change-every-sport/news-story/dbd6f54cc9a1b56c7da3d2a4de347b25.

[3] Semenya and the Athletics South Africa (ASA) requested that the DSD Regulations issued by the International Athletics Federation (IAAF), titled "IAAF Eligibility Regulations for Female Classification (Athletes with Differences of Sex Development)" be declared invalid and voided immediately due to an infringement by the IAAF on athlete's human rights. Two requests for arbitration were dismissed as of May, but Semenya's cohort has since appealed and the IAAF's request to re-impose regulations (since they are lifted temporarily due to the appeal) was rejected only recently. BBC, "Caster Semenya: Swiss Court Rejects IAAF Request to Re-Impose Testosterone Rules," 2019.

[4] In this text, Pieper provides a tremendous overview of the history of sex testing, the controversies, and crucial bodies of literature. See Pieper, *Sex Testing*.

[5] Sheridan, "Conceptualizing 'Fair Play.'" Throughout this chapter, I refer to "female testing" as a term that brings together the names of tests used to test female athletes. Distinctions need to be made between sex/gender and femininity/masculinity. When discussing these distinctions, sex refers to the biology of a person (e.g., male, female, intersex, and hyperandrogenic), gender refers to a person's gender identity (e.g.,

the implication of the female athlete and how the female athlete sits paradoxically in a masculine realm.[6] Furthermore, the enforcement of female testing, which is required to maintain gender categories, has been deemed as discriminatory and unethical.[7]

6.1 Purpose

With this current understanding of female testing in mind and the findings from the previous chapters in this dissertation, this section ethically analyzes how the definitions of women in sport, which are identified through sports medical literature, hamper and altogether restrict the female athlete's growth potential. Starting with the IAAF's 2018 Eligibility Regulations for the Female Classification, and finishing with the first policy on sex testing enacted in 1967, this analysis tries to pinpoint the ways that the discourse on female testing affects female athletes and how these definitions can then be interpreted to mean fair play in sport.

6.2 Justification

The regulating eligibility requirements of femaleness in women's sports has been justified as necessary due to Olympic ideals of fair play, which are sometimes synonymous with the Olympic notion of Olympism. Olympism is a guiding moral philosophy within the Olympic movement and is defined as "a philosophy of life, exalting and combining in a balanced whole the qualities of body, will and mind."[8] Olympism further recognizes that sport, and the possibility to practice sport, is a human right and that people should be able to practice sport free from discrimination and follow with the Olympic spirit. The Olympic spirit "requires mutual understanding with a spirit of friendship, solidarity and fair play."[9]

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man, woman, queer, and nonbinary), and femininity/masculinity refers to social stereotypes associated with men and women.

[6] Schneider, "Ideal Olympic Athlete," 318; Sarah Teetzel, "The Onus of Inclusivity: Sport Policies and the Enforcement of the Women's Category in Sport," *Journal of the Philosophy of Sport* 41, no. 1 (2013), https://doi.org/10.1080/00948705.2013.858394.

[7] Caplan, "Fairer Sex," 549; Karkazis et al., "Out of Bounds."

[8] IOC, "Olympic Charter," 11; The Olympics is based on a moral model of Olympism as proposed by the founder of the modern Olympics, Pierre de Coubertin. No full definition of fair play or otherwise is developed officially in the Olympic Charter but can be found in supplemental material.

[9] IOC, "Olympic Charter."

As well, the *Olympic Charter* explains that the discrimination of "race, colour, sex, sexual discrimination, language, religion, political or other opinions, national or social origin, property, birth or other status"[10] shall not impinge on one's ability to partake in sport in general.

The *Olympic Charter* outlines seven fundamental principles of Olympism, with its primary goal of "place[ing] sport at the service of the harmonious development of humankind, with a view to promoting a peaceful society concerned with the preservation of human dignity."[11] The five Olympic rings symbolically represent the transcultural inspirational power of the Olympic Games. However, the Olympic program's main priority is promoting the good values inherent in sport, such as "the joy of effort, the educational value of good example, social responsibility and respect for universal fundamental ethical principles."

6.3 Methods

Recognizing the power of Olympism, we can then revisit a fair play definition through an ethical and philosophical analysis based on an explicit example of fair play provided by an Olympic organization. The IAAF's 2018 Eligibility Regulations for the Female Classification can provide a neat framework since the IOC bases its existence on maintaining a level playing field in sport. As well, since the IAAF's 2018 Eligibility Regulations for the Female Classification is contested, an analysis of this sort would provide ample ground for restructuring both theoretical and practical ethical arguments against the medical scrutiny of the female category. This analysis is approached the research question: how does the Olympic movement define fair play through the lens of the IAAF's 2018 Eligibility Regulations for the Female Classification? This analysis is structured by these policies and the "Explanatory Notes/Q&A" included with the regulations (hereafter referred to as "Q&A document") as a framework for understanding of fair play related to female testing. Since women of colour have been unfortunately targeted, considerations of race and gender must be considered.

[10] IOC, "Olympic Charter."

[11] IOC, "Olympic Charter."

6.4 Fair play related to policies about femaleness

In the introduction to the IAAF's 2018 Eligibility Regulations for the Female Classification IAAF first establishes that these regulations were approved in order "to address the eligibility of athletes with differences of sex development to compete in the female category of competition in certain track events."[12] The imperatives, provided through five A-level subcategories, immediately state, "(a) To ensure fair and meaningful competition in the sport of athletics [meaning track events], competition has to be organised within categories that create a level playing field and ensure that success is determined by talent, dedication, hard work, and other values and characteristics that the sport embodies and celebrates."[13] This first B-level subcategory (i) includes a statement that the IAAF wants to incentivize "huge commitment and sacrifice" that is inspiring to a new generation of athletes. It specifically does not wish to "risk discouraging those aspirations by having unfair competition conditions that deny athletes a fair opportunity to succeed."[14] Furthermore, the second B-level category (ii) states,

> Because of the significant advantages in size, strength and power enjoyed (on average) by men over women from puberty onwards due in large part to men's much higher levels of circulating testosterone, and the impact that such advantages can have on sporting performance, it is generally accepted that competition between male and female athletes would not be fair and meaningful, and would risk discouraging women from participation in the sport. Therefore, in addition to separate competition categories based on age, the IAAF has also created separate categories for male and female athletes.[15]

The second A-level subcategory (b) continues to denote that the IAAF recognizes the following as such:

> (i) Biological sex is an umbrella term that includes distinct aspects of chromosomal, gonadal, hormonal and phenotypic sex, each of which is fixed and all of which are usually aligned into the conventional male and female binary; (ii) However, some individuals have congenital conditions that cause atypical development of their

[12] IAAF, "Eligibility Requirements for the Female Classification."

[13] IAAF, "Eligibility Requirements," 2.

[14] See previous note.

[15] See previous note.

> chromosomal, gonadal, and/or anatomic sex (known as differences of sex development, or DSDs, and sometimes referred to as 'intersex'); (iii) As a result, some national legal systems now recognize legal sexes other than simply male and female (for example, 'intersex,' 'X', or 'other'). [16]

The third A-level subcategory (c) reiterates the IAAF's level of respect for the dignity of athletes with DSD, as well as their desire to ensure an inclusive sporting arena by providing "a clear path to participation in the sport for all." Thus, as stated, these conditions facilitate the participation of athletes with DSD and are only in place for meaningful and fair competition.

Finally, the fourth A-level subcategories continue with the scientism relevant to athletes with DSD:

> (d) There is broad medical and scientific consensus, supported by peer-reviewed data and evidence from the field, that the high levels of endogenous testosterone circulating in athletes with certain DSDs can significantly enhance their sporting performance. These Regulations accordingly permit such athletes to compete in the female classification in the events that currently appear to be most clearly affected only if they meet the Eligibility Conditions defined below; (e) These Regulations exist solely to ensure fair and meaningful competition within the female classification, for the benefit of the broad class of female athletes. [17]

Additional regulatory requirements are included, but more importantly, is the definition of the relevant athlete. A relevant athlete is one who meets three criteria:

> (1) she has one of the following DSDs: 5a-reductase type 2 deficiency; partial androgen insensitivity syndrome (PAIS); 17B-hydroxysteroid dehydrogenase type 3 (17B- HSD3) deficiency; congenital adrenal hyperplasia; 3B-hydroxysteroid dehydrogenase deficiency; ovotesticular DSD; or any other genetic disorder involving disordered gonadal steroidogenesis; and, (2) as a result of having a DSD, she has circulating blood testosterone of five (5) nmol/L or higher and; 3) she has sufficient androgen sensitivity for those level of testosterone have a material androgenizing effect.[18]

[16] IAAF, "Eligibility Requirements," 2.

[17] IAAF, "Eligibility," 3.

[18] IAAF, "Eligibility," 6.

There are three conditions that an athlete deemed ineligible must complete to become eligible in the female classification in a restricted event for international competition or "to set a World Record in a competition that is not an International Competition."[19] These include being recognized by law as either female, intersex, or some equivalent, reducing the blood testosterone to below five nmol/L for at least six months continuously, and maintaining a blood testosterone level below five nmol/L continuously for as long as the athlete wishes to remain eligible as previously denoted.

The document continues to guide athletes on what is necessary to meet conditions of eligibility, the assessment of cases for those who may be a relevant athlete, confidentiality, and dispute resolution, as well as Appendices with relevant definitions, medical experts, a framework for case assessment, and IAAF-approved specialist reference centres. The Explanatory Notes provided by the IAAF poses answers and evidence presented in the *CAS Ruling Chand v AFI & IAAF* in support of these new regulations.[20] IAAF's 2018 Eligibility Regulations for the Female Classification and subsequent "Explanatory Notes" is used to ground this analysis.

6.5 On ethos and fair play

One of the most supported claims of fair play is that each sport contains an 'ethos' that is a mutually and oft unspoken agreement between players, officials, and fans within that particular sport, an argument documented by sport philosopher Heather Sheridan.[21] Originating from the Greek word *ēthos*, which means "nature, disposition," or "customs" in the plural form, a more recent definition is: "the distinguishing character, sentiment, moral nature, or guiding beliefs of a person, group, or institution."[22] Sport philosopher Fred D'Agostino defines ethos as a set of "conventions determining how the formal rules of that game are applied in concrete circumstances… [the] unofficial, implicit, empirically

[19] IAAF, "Eligibility," 6.

[20] *Dutee Chand v. AFI & IAAF*, 2014/a/3759 (CAS, 2015) 1.

[21] Sheridan, "Conceptualizing Fair Play;" Loland, *Fair Play in Sport*; McNamee, "Olympism, Eurocentricity, and Transcultural Virtues."

[22] Merriam-Webster, 2018.

determinable conventions which govern official interpretations of the formal rules of a game."[23] Modern notions of fair play in sport equate fair play to morality and virtuosity towards fellow athletes.[24]

Loland proposed that fair play is centred around the equal opportunity to perform sport, which ultimately rejects essential inequalities that individuals cannot control.[25] Loland's adoption of a game's ethos accounts for both established (i.e., constitutive and regulative rules) and established but unspoken (i.e., conventional) rules. He states that ethos is hierarchical to regulating rules, and without the consideration for fair play to be structured within formal rules, sports are merely games. Therefore, the constitutive and regulative rules are interpreted based on the established but unspoken rules. Ethos are not always rules but sometimes rules depict aspects of an ethos in sport. Additionally, if ethos are part of a sport for long enough, they may become rules. Through a quick example, Loland's claim that basketball air pressure is a less critical rule than point-scoring shows the privilege in sport of relying on an invisible worker, unquestioning scorekeepers, or dutiful officials for game playing. It highlights how taken-for-granted rules can change the defining qualities of a sport. If the basketball shows up inflated (perhaps through sorcery or on its own accord), the game can be played. Nevertheless, if the ball shows up deflated, then a different type of game is created, but basketball is not played. Herein lies the importance of why rules need to stand alone and also be interpreted by an ethos. If we look at this type of prioritizing by Loland, and therein the players of a game, one could see how rule interpretation can be skewed, misunderstood, and subjected to misinterpretation and biases.

Consider the priority of the eligibility requirements for female classification in this context. The game's constitutive rules state that all women must start behind the starting line and start once they are told to start, race only on their two legs between the designated lines, and the race is complete once they pass the finish line. Regulative rules would include the dress each participant wears, which includes a bib with their representative country and a

[23] d'Agostino, "The Ethos of Games."

[24] McNamee, "Olympism."

[25] Loland, *Fair Play in Sport*. Variation in training, such as access to technology, science, facilities, coaches, and variation in the athlete's biology can significantly alter an athlete's success.

possible number, and that they do not have any extra materials like jewelry waving about and potentially disrupting the competition. Auxiliary rules might include competition entry requirements, like if their qualifying time placed them in the accurate rankings, or perhaps that they are within the eligible age group to compete. The (auxiliary) regulations exist prematurely to inform others that you *have already* proven to be women. In the Western sense, when at birth, the genitalia was examined by a doctor and declared, or adjusted, to represent the female sex. Raised with female genitalia, females typically were adorned in gender-typical garb. Menarche should have occurred during the pubescent years, and other phenotypic traits of the female sex would have appeared.

Nowhere in these core assumptions of femaleness and womanhood is there genetic testing. No government documents require such an invasive procedure. In the sense of medical ethics, in working with an adult, if there appears to be a concern for some type of ailment or abnormality, genetic testing might be recommended for concern of the quality of life or risk to life. In both instances, doctors may act collegially with or paternalistically toward the patient based on a mutual agreement to only help and not provide further harm. One could look at the medical code of ethics as a sort of medical ethos.

The ethos around womanhood in athletics is confused. Core assumptions about femaleness and womanhood are proven to an extent during the initial eligibility stage since the athlete has managed to get to that race's starting point and follow the constitutive rules. However, womanhood is in a tense state of questioning until the race is complete. If the athlete performs better (too well) or suspiciously faster than the other athletes in the race, the athlete's womanhood is called into question. The athlete's speed becomes dangerous to their own health and well-being through external performance-enhancing aids, internal diagnosable ailments, or social judgement.

Additionally, all previous measures for identifying womanhood (the core assumptions mentioned earlier) are thrown out the window because suddenly they are no longer good enough. At this point, there needs to be an added criterion for Western womanhood: an

ideal aesthetic.[26] Western womanhood's core assumptions include having correct genitalia since birth, adorned with typical gender-appropriate garb, menarche, other phenotypic traits appropriate to the female sex, and graceful. If a female runs fast and does so with *grace,* then they may be either fast or possibly doping. If a female runs fast but does so with *vigour*, then the athlete is too masculine-like and might be stripped of the title of a fast female. Judging the aesthetic appeal of a woman racing acts as a third judge, a judge to protect the ethos in women's athletics. Then, it would seem that this measure of aesthetic appeal or grace is tested using genetic testing. Only a true, genetic female is graceful even when running swiftly.

Eligibility regulations become more than or as important as the constitutive rules because they align with acts of deception. The IAAF's 2018 Eligibility Regulations for the Female Classification are even more treacherous to the *participant* for a few reasons. If a runner were to traverse outside the boundary of the lines during a 100-metre race, they would instantly know that disqualification is warranted given they know that the constitutive rules were broken or that the infraction can be objectively verified with modern technology in the case of instant replay (for example); this also applies to the known rules of the sport. The athlete can inhibit this kind of fair play infraction by not crossing the line. From a practical standpoint, the athlete can at least exhibit some level of control, and this type of infraction is applied equally to all athletes. In the case of the eligibility requirements around womanhood, the inverse is only possible. The athlete has no way of knowing if the disqualification is warranted and genuinely believes that it is not warranted given that they have lived their life under the knowledge of being a female. The female athlete has no way of inhibiting this infraction because they did not know it existing. They might also not agree with the infraction or agree with the necessary treatment for becoming eligible in sport.

In general, eligibility requirements are usually induced before a race but not tested until judgement has passed and the race completed. The eligibility requirements are referred to *again* once a female athlete wins, usually in a suspicious way, like being faster than

[26] Schneider, "Ideal Olympic Athlete," 317.

expected in a race. If a female athlete fails the womanhood judgement during the race, they have broken an unspoken rule in the women's category. The athlete's autonomy is severely limited but more realistically non-existent. Passing the second round of eligibility test relies on the results of biological tests, mandated once the competition has completed and others have judged the athlete on the sporting ethos. This second round of eligibility regulations is more powerful once the athlete has abided by the constitutive rules. Therefore, any adherence to womanhood regulations is likely forced on the athlete at race completion.

6.6 Issues of 'race' and female testing

Imbedded in regulations of female eligibility are neocolonial beliefs about race and sex, which assume Western normative beliefs about womanhood.[27] Race has commonly been touted as an issue within science since it has been used historically as a tool for undermining entire races, and it has contributed to negative stereotypes, false beliefs, and harmful science around race.[28] According to Schiebinger, Francois Bernier is credited with using the term race in the modern sense to distinguish four races of people.[29]

''In her article "The Metalanguage of Race," African American woman's historian Evelyn Brooks Higginbotham articulates race as a metalanguage because of "it's powerful, all-encompassing effect on the construction and representation of other social and power relations, namely, gender, class, and sexuality;" as well as its ability to "provid[e] sites of dialogic exchange and contestation, since race has constituted a

[27] While this dissertation did not take up 'race' directly, it is vital to consider how bodies of different 'races' might be treated related to female testing. Women of colour are more likely to be discriminated against as a population. This argument is not merely due to the tests' discriminatory nature in that they test only women and that they have recently found women of colour to be 'gender frauds.' See Patricia Hill Collins. *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment* (London: Routledge, 2002); Chandra Mohanty, "Under Western Eyes: Feminist Scholarship and Colonial Discourses," *Feminist Review* 30, no. 1 (1988); bell hooks, *Feminist Theory: From Margin to Center* (Pluto Press, 2000); Pieper, "Western Femininity in Sport, 1567; Brenna Munro, "Caster Semenya: Gods and Monsters," *Safundi* 11, no. 4 (2010), https://doi.org/10.1080/17533171.2010.511782.

[28] Brandt, "Racism and Research, 21-9;" Gould and Gold, *The Mismeasure of Man*.

[29] Schiebinger, *Nature's Body,* 119.

discursive tool for both oppression and liberation."[30] Race as a metalanguage means that it is transcendent and used as a global signifier, one that permeates many aspects of life through language choice, expressions, or ideologies, to name a few.[31] Since the White males' relationships with Black people have historically been one of imposition and dominance, the signifier of the master/slave relation continues to mediate how White culture perceives Black culture. This perception is not limited to a specific set of people, but markedly the distinct Other, the non-Western and visible minority.[32]

In "Slavery, race and ideology in the United States of America," historian Barbara Fields reminds us:

> The idea one people has of another, even when the difference between them is embodied in the most striking physical characteristics, is always mediated by the social context within which the two come in contact." Race came to life primarily as the signifier of the master/slave relation and thus emerged superimposed upon class and property relations. Defined as "animate chattel," slaves constitute property as well as a social class and were exploited under a system that sanctioned white ownership of black bodies and black labor.[33]

Re-reading these regulations with the idea in mind that race acts as a powerful metalanguage because of "it's powerful, all-encompassing effect on the construction and representation of other social and power relations, namely, gender, class, and sexuality," we can see how imbedded in these regulations are neocolonial beliefs about race and sex. Race becomes a global sign and a site of dialogic contestation, one that permeates through

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[30] Evelyn Brooks Higginbotham, "African-American Women's History and the Metalanguage of Race," *Signs* 17, no. 2 (1992).

[31] See Anima L. Adjepong and Ben Carrington, "Black Female Athletes as Space Invaders," in *Routledge Handbook of Sport, Gender and Sexuality*, ed. Jennifer Hargreaves and Eric Anderson (New York: Routledge, 2014), 173; Barbara Fields, "Slavery, Race and Ideology in the United Statss of America," *New Left Review*, no. 181 (1990): 148-49; Higginbotham, "Metalanguage of Race," 44. While race plays a role in scientific research and racial bias may permeate through unchallenged, this dissertation cannot consider this aspect of this issue as its main point of focus.

[32] Colonial myths are described as pathology in culture and in bodies, where women and cultures deemed to be previously violent are told they need to be saved from their communities. Ideas of people are mediated by the social context in which they came into contact. As stated by director of the Department of Science and Health of the IAAF, Stephane Bermon, "We [Olympic sports] have a lot of people coming from Africa, Asia and we have a lot of these cases coming from these countries." See Karkazis and Jordan-Young, "Powers of Testosterone," 36.

[33] Field, "Slavery," 16.

many, if not all, aspects of life through language choice, expressions, or ideologies. The need to identify race as a metalanguage articulates overlapping and convoluted discourses that would otherwise fall outside normative definitions.

Athletics has become a site for power struggles and displays of prowess between social norms and cultural expectations. What needs more insight is the roles between the Global South and Global North as well as race-based assumptions related to female testing. For example, normative medical behaviour in the Global North includes correcting genitalia at birth if someone is born with ambiguous genitality.[34] If this type of medical expectation is not commonly used in countries from the Global South and is adopted in the Olympics, then it may become expected for people from the Global South to also abide by these expectations and confirm (i.e., social, physical, medical, biological). In referring back to the earlier statement: *The athlete has no way of knowing if the disqualification is warranted and genuinely believes that it is not warranted given that they have lived their life under the knowledge of being a female*. If there are normative medical customs within a culture that allow female athletes to compete, then what normative medical customs are being allowed? Additionally, how do these normative medical customs relate to the unspoken ethos in sport?[35] Female athletes might be targeted by normative medical customs based on cultural differences or racial bias. Because of this, scholars need to address the intersecting ways women that normative medical customs and racial bias can harm female athletes.

A counter-argument could be made that no matter what the judging criteria are, these women no longer are respectful of their competitors and are somehow misaligned within their mutual agreement to play. This line of thought can be highly problematic because it places blame on malintent as if the women were seeking to cheat the women's category. Relating women's biology with slightly elevated testosterone levels to that of males'

[34] Karkazis, *Fixing Sex*.

[35] While it historically was not typical for cultures out of Western science to medically 're-align' the baby's genitalia to represent either a female baby or a male baby, there are major questions as to cultural differences or race-based differences based on location rather than based on race. See Karkazis, *Fixing Sex*.

biology confuses *slightly elevated* testosterone levels near equal to male testosterone levels.[36]

6.7 Conclusion

Critical sports scholars in philosophy, history and sociology have had lengthy conversations about sport's decision to segregate sexes, what that means for women in sport, and analyze the nuances of how segregation is enforced.[37] Sex segregation and female testing have been adopted based on values of fair play and paternalism in sport so that women can have the opportunity to earn valuable victories within sport that support the social and political advancement of the gender category.[38] However, by testing women for biological womanhood, guilty women are no longer respecting the game and are somehow misaligned within their mutual agreement to play. Until exposed, women have no way of inhibiting this infraction because they are not required to know that it existed. This simply refers to the idea that female testing is not universally accepted throughout everyday life.[39] This line of thought can be highly problematic because it places a blame on malintent as if the women were seeking to cheat the women's category.

[36] These arguments, and those for female testing, are predicated on the "advantage thesis," the concept that males have a significant physical and physiological advantage over females. This discourse is prevalent in sport concerning gender/sex since it assumes the normative dimorphic idea of gender/sex as man/woman, male/female. Sports are segregated by sex, and while there are benefits to this form of segregation, the policies manage the gender binary rather than creating a climate of fair play. Even after considering these discourses, the advantage thesis does not accurately mediate why women of colour from the Global South may be unfairly targeted. Cavanagh and Sykes, "Transsexual Bodies;" Sullivan, "Gender Verification," 401-2; Schneider and Gonsalves, "Science, Ethics, and Fairness."

[37] In this text, Parks Pieper provides a tremendous overview of the history of sex testing, the controversies, and crucial bodies of literature. Lindsay Parks author Pieper, *Sex Testing*.

[38] I am assuming that those attending this conference are very familiar with the fair play literature; regardless, I find Sheridan's review of literature an excellent starting source. Sheridan, "Conceptualizing 'Fair Play': A Review of the Literature."

[39] The only exception that I have found to this is at childbirth; however, not all sex abnormalities are discovered at childbirth. Additionally, not all countries conform to the same medical inspection of sex throughout. See Karkazis, *Fixing Sex*.

Chapter 7

7 Conclusion

While a challenging task, this research sought to look at the science the International Olympic Committee (IOC) used to support female testing elite female athletes. Female testing refers to the history of testing female athletes that originated as a genetic test and continue today as an *ad hoc* endocrinological test. Female testing has been argued to uphold the sex binary in sport and discriminates against certain women. In contributing to this discussion, this dissertation critically analyzed the IOC's use of medical science to implement sex testing in the past and support testing for hyperandrogenism currently.

This dissertation argued that the historical practice of sex testing and continued practice of testing for hyperandrogenism contributes to a function of 'female testing discourse' that targets female elite athletes. Archival data collected at the Olympic Studies Centre (OSC) contributed to an interpretation of female testing discourse, bringing the IOC's use of medical science to determine sex-based eligibility into focus.[1] The discourse was traced through three avenues, starting with the history of the sports medical literature related to historical sex testing, a critical analysis of the 2019 Court of Arbitration of Sport (CAS) hearing of middle-distance runner Caster Semenya, and discourse analysis of the IOC's implementation of sex testing through archival material. A modern analysis of fair play read through the female testing discourse concluded the work.

7.1 Methodology

At the outset, the primary research question was: *Can the current science on the female athlete explain medical (e.g., physiological, hormonal, or genetic) reasons to require sex testing for fair play in elite sports competitions such as the Olympic Games?* Secondary questions were: How are women being protected by these sex tests? Is this protection

[1] Part of the analysis included in this dissertation assesses whether or not the science used was based on biological or genetic determinism, or the belief that human physiology directly influences or controls human behavior. The concept of biological determinism was a thought child of feminist critiques of science from the 1980s. Notable scholars include Fausto-Sterling, *Sexing the Body*; Okruhlik, "Gender and the Biological Sciences;" Harding, *The Science Question*.

necessary? However, the research question was modified during the initial data collection phase. The research question was adjusted for historical methods and because initial data collection showed an absence of data (i.e., scientific research explaining sex testing). To better ascertain the role of the IOC in determining the sex testing science, the primary research question was: *In what ways (i.e., scientific, social, assumptive) do IOC members justify (if at all) sex testing in Olympic competitions?* The primary lens in data collection and analysis was to determine the role and relationship of the science used. Therefore, secondary questions included: *What types of scientific knowledge is used to support sex testing? How is the science or scientific knowledge applied?* These questions aim to identify how the IOC interacted with the relevant science and applied scientific knowledge to sporting females.

Methods include Kuhnian discourse analysis (through a form of geological tracing). This multi-layered research genealogical discourse analysis aimed to identify knowledge and knowledge contributors relevant to sex testing historically. A genealogical data collection occurred at OSC archives. The time range was between 1950 – 1999 due to the IOC's 25-year embargo, the data available at the OSC archives, and because this period encompasses the formal period when the IOC required sex testing competition. This genealogical tracing identified links between IOC members, Medical Commission members and other stakeholders and medical science support for sex testing. While semi-arbitrary, this time frame is significant because it centres on the decades where the debate about sex testing was most prominent and mostly formally reinforced.[2]

Data from this genealogy was used in subsequent chapters, chapters four, five, and six. A pragmatic analysis of *Mokgadi Caster Semenya & ASA v IAAF* was conducted. The role and relationships between lex sportiva (sports law) and fair play were analyzed. Semenya's eligibility rests on several values within sport, namely fair play and the right to participate, analyzed through philosopher Ioan-Radu Motoarca's case study of known versus unknown violations of fair play in sport.

[2] The IOC's Medical Commission was created in 1967, and testing was implemented by the IAAF in 1966 and formally for the IOC in 1969. Testing was suspending in 1992 and abandoned in 1996. Ljungqvist, Correspondence Regarding the Working Group for Sex Testing.

The genealogy was taken back up in chapter five with a technical weaving of the history of genetics and the history of endocrinology and how they correlate with female testing's historical development. In considering relationships with fair play, the genealogy, discourse analysis, and critical account of the science related to sex testing are brought to the forefront.

The dissertation concludes with a presentation of fair play and female testing discourse. The literature on fair play (also referred to as the level playing field) in sports competitions is comprehensive. This dissertation contributes to an understanding of how fair play relates to sex testing.[3] Additionally, the specific topic of gender categories (and the definition of woman within the sport context) and sex testing in sport is also addressed in the sport ethics literature.[4]

7.2 Critical scholarship on sex testing

Certain ideologies about females' bodies have existed for millennia and often impugn women's capabilities as being unable to withstand physical or mental strain, victim to a depleting energy supply, and needing to mirror an idealized aesthetic expectation.[5] Some of these beliefs contribute to notions of fair play in sport, which the IOC defines as a necessary component to ensure a fair, honourable competition. Providing fair, honourable competition through female testing has severe ramifications mainly since such practices have resulted in stripping athletes of public and personal identities, exiling them from their countries, and, in some cases, attempting suicide.[6] Critics have come out against sex segregation and female testing on claims that it upholds a mythical, primarily Western ideal

[3] Loland, *Fair Play in Sport*; Schneider and Butcher, "Pre-Lusory Games;" Simon, *Fair Play*.

[4] Sailors, Teetzel, and Weaving, "Complexities of Sport;" Schneider and Gonsalves, "Science, Ethics, and Fairness;" Tännsjö and Tamburrini, *Values in Sport*.

[5] Many of these tropes stemmed from Victorian era's ideas of gender and sexuality. In sport, women battled stereotypes around muscularity and manliness, see Cahn, *Coming on Strong*, 166; for non-sport related physical activity, women struggle for independence, see Vertinsky, *Eternally Wounded Woman,* 14.

[6] "Athlete Santhi Soundarajan Attempts Suicide," 2007.

of the binary sex divide through invasive scientific techniques.[7] Sociologists Dworkin and Cooky argue that female testing and sex segregation act cyclically symbiotic. The policies cannot be removed from sex segregation, and that segregation is maintained by the policies to reinforce gender/sex discrimination.[8] Based on these ethical conflicts and more, scholars advocate for continued examinations of female testing and its effects on female athletes.[9]

A prevalent discourse used to explain sex segregation in sport is the advantage thesis, which states that males have a significant physical (biological) advantage over females.[10] Scholars such as Sullivan argue that the advantage thesis bolsters fair play and sex categories.[11] Although, it wrongly assumes the normative dimorphic concept of gender/sex as man/male and woman/female. It also renders athletes' and female athletes' bodies defined by their biological makeup (i.e., biological determinism).[12] Blithe and Hanchey's findings on female testing resides in a unique space of physiological discrimination that interacts with sexism, patriarchy, racism, and imperialism but operates within a field of power that discriminates against non-normative bodily processes.[13] Sports are segregated by sex (and sometimes additional classifications) to promote a somewhat balanced competition. However, since there are no universally agreed-upon definitions of male and female, the categories and, in turn, the IAAF's 2018 Eligibility Regulations for the Female Classification manage the gender binary before contributing to a climate of fair play.

Historically, sex segregation in sport has been reinforced whenever a female outperformed a male. For example, women have been banned in baseball since Jackie Mitchell, the first woman to sign a professional baseball contract, struck out Babe Ruth and Lou Gehrig in

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[7] Karkazis and Jordan-Young, "Powers of Testosterone."

[8] Cooky and Dworkin, "Policing the Boundaries;" Dworkin and Cooky, "Unjust Marriage."

[9] Sailors, Teetzel, and Weaving, "Complexities of Sport;" Schneider and Gonsalves, "Science, Ethics, and Fairness,"1538-54.

[10] Cavanagh and Sykes, "Transsexual Bodies."

[11] Sullivan, "Gender Verification," 401-2.

[12] Sullivan, "Gender Verification," 401-2.

[13] Blithe and Hanchey, "Discursive Emergence," 489.

1931.[14] English's landmark article on sex equality in sport argued that the inability for women to succeed at the same level as male athletes hinder their cultural and political growth as a group because they do not receive as much of both the basic (e.g., things that all people should have access to like health, self-respect, cooperative learning with teammates, incentive, and fun) and scarce (e.g., fame and fortune) benefits of sport.[15] While sex segregation has been influential by promoting women athletes as successful in their own right, something that might not have happened if the two sexes performed together can also hinder long-term growth and development.

7.3 What is the 'female testing discourse'?

This dissertation has attempted to highlight the critical role that science plays and has played in determining female eligibility. Female tests' original and dominant rationale was based on IOC evidence that males might want to participate in the female category in sport.[16] In mapping the discourse of female testing, critical stakeholders identified were scientific inquiry, such as endocrinology and genetics, and the use of the IOC Medical Commission and potential the FIMS group for networking. Strategic linear language and tacit assumptions about gender, sex, race, and nation also played a role in decision making for implementing the tests and in scientific findings on individuals with 5a-reductase.

The athlete's physique and physical success play a part in the female testing discourse because it acts as an unspoken judgement. Historically, officials concerned with sex testing in the 1960s-1980s used observable differences as adequate justification for sex testing; sex testing was deemed necessary because hyper-muscular athletes competed in the 800-metre event. Scholars need to consider the unique language surrounding intersex, hyper-muscular, and transgender athletes as part of a discourse that targets female athletes.

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[14] Dworkin and Cooky, "Unjust Marriage."

[15] English, "Sex Equality in Sports," 270-1.

[16] See: In a letter to Dr. Elizabeth Ferris, Dr. Hay asserts the following, "The I.O.C. Medical Commission makes the examinations mandatory in order to eliminate any advantages a masculine type of athlete might have in a competition with female athletes …the I.O.C. must continue to eliminate from the competitions athletes who exhibit problems in the area of sexual differentiation and thus have physical advantage." Hay. Letter to Dr. Elizabeth Ferris; Hay, "Sex Determination," 39-41; For additional commentary, see Pieper, *Sex Testing,* 1; Caplan, "Fairer Sex," 549.

The decision ruled in *Mokgadi Caster Semenya & ASA v IAAF* conflates the regulations' need to regulate the women's category regulating the sex binary. The application of lex sportiva could favour Semenya by claiming that the procedure through the CAS violates the principles of a fair trial and, by proxy, the principles of the *odre public*. Additionally, through Motoarca's case study of known versus unknown violations of fair play in sport, it is clear that Semenya has never knowingly violated the fair play principle regarding sex regulation in sports. Endogenous fairness seems to revolve around a notion of fairness that reflects fairness for the common good rather than all. The IAAF does not provide an avenue for Semenya to continue to run in IAAF competitions, particularly considering that running in the men's category is not an option. This suggests that the eligibility requirements have no adequate solution. Without a sufficient opportunity for continuing to compete, the IAAF is affectively kicking Semenya out of elite competition.

Critical technical analysis of sports medicine science history for sex testing suggests that IOC Medical Commissions played a significant role in determining scientific and social judgements for a sex-based infraction. Since the IOC does not operate as a scientific or academic institution, it operates outside the bounds of medical ethics, posing a potential problem in using unregulated scientific testing to attempt to provide fair play.[17]

7.4 The role of fair play

Focusing on levelling the playing field tells us a few things. It first tells us that women are at risk of unfair play based on their sex. It also tells us that there are also different levels of fairness within this playing field, and some athletes are deemed to be competing fairer than others. Those who exhibit certain characteristics, for example, are considered to be cheating until proven otherwise, which is also a common claim heard in anti-doping methods. Therefore, sex tests in only the female category exert dominance of the male characteristics within sport.

Basic assumptions about femaleness are proven during the initial eligibility stage (getting to sport competition). However, womanhood is in a tense state of questioning until the race

[17] Hay, Letter to Dr. Elizabeth Ferris, Feb 22, 1981.

is complete. If the athlete performs better (too well) or suspiciously faster than the other athletes in the race, the athlete's womanhood is called into question. The athlete's speed becomes dangerous to the athlete's health and well-being through external performance-enhancing aids, internal diagnosable ailments, or social judgement.

Female athletes must concede to normative standards of femininity. However, Black female athletes, for example, are more disadvantaged due to social and cultural differences and sexist and racist ideologies. Most importantly, when understood related to female testing, fair play is hierarchized within the female category. Women who perform athleticism and who perform their gender within reasonable expectations have a higher chance of survival in sport. However, Black women become particularly exposed within this hierarchy because they cannot adequately perform gender expectations due to racialized biases against Black femininity.

7.5 Critical reflections

Based on these arguments and more, this research attempts to address the female testing discourse currently regulated by the IAAF's 2018 Eligibility Regulations for the Female Classification. The female testing discourse i) targets the women category in sport; ii) discriminates against females based on biology and science; iii) argues for a definition of femaleness fixed in biological or scientific terms; and iv) enforces a neocolonialist form of scientific racism and sexism. The choice to regulate Olympic athletes' bodies from a scientific and biological standpoint has played a role in the scientific production of human bodies. The preference to use science does not provide a complete understanding of the female athletic body. It, therefore, limits definitions of womanhood in athletics (and outside of athletes depending on its influence) to a Western-centric one.

The enactment of the IAAF's 2018 Eligibility Regulations for the Female Classification is significant because it solidifies sexist ideologies into sports law (an act of *lex sportiva*). Scientific eligibility requirements are more severe because they implement Western scientific knowledge on an international scale, which one scholar has argued as being a

form of modern colonialism.[18] Not only are women not allowed to participate if they do not fall under this definition of womanhood, but they must alter their bodies to fit a mould. All science, particularly in a gray area as in female testing, needs to be upheld under Popperian rigour, and it needs to be tested and continually refined. Even though the tests and their supporting material exist within a scientific paradigm, which undergoes peer review, the dated testing (that of the Barr method) was proven not to be an accurate indicator for sex.[19] Without Popperian rigour, testing for validity and reliability, or reflexivity, the science of female testing is limited and unable to appropriately guide IOC officials to make the right decisions for female athletes. Caution needs to be exerted for modern testing requirements.

Lastly, the female testing requirement rests firmly on assuming that women would not succeed or perhaps survive as a sport category if a test was not in place. Therefore, their continued practice means that their necessity outweighs the risk or potential harm. While medical officials have been discouraged from applying this type of sex regulation into broader society, verifying the sexes within sport applies to the very physical attributes that sport embodies.[20] Unfortunately, by reinforcing a level playing field through scientific measures, organizations like the IAAF are condemning gendered and racialized bodies in the form of biological determinism that limits women's participation in sport and their capabilities in life. This is counterproductive and reduces women's chances of receiving scarce benefits in sport equal to men.

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[18] Pieper, "Western Femininity."

[19] de la Chapelle made this very argument repeatedly in his mission to abandon the use of the Barr Body Method in the 1980s. See de la Chapelle, "Use and Misuse."

[20] The original implementation of these tests were based on what was considered the most recent knowledge in gynecology and reproductive research, and was eventually modified from Dr. David Barr's line of work, and act he later deemed disgraceful to his findings. Karkazis, *Fixing Sex*. If the conditions were serious enough, then we might see more proactive testing outside of sport to make sure that these females were okay. But this is also not the case. Intersex studies tells us that doctor's attempting to protect infants and their families from intersex conditions was a horrible idea, and doctors have since stopped providing proactive counseling, surgery and psychotherapy to infants and families born with an intersex condition. Karkazis et al., "Out of Bounds;" Caplan, "Fairer Sex," 550.

7.6 Future recommendations

Future recommendations suggest asking whether testing accuracy is more important than testing no matter what. Careful considering is needed when science has not caught up to testing practices.[21] I believe that the tests would not be abandoned and left without a replacement. Therefore, some recommendations to carry on with tests would include:

- Testing all athletes, even males, would diminish potential discrimination.
- Remove standard sex binary divisions and introduce a new kind of classification system, one which is based on the distinction like weight classes in wrestling but perhaps another metric.
- Add a third category; this recommendation is not the strongest primarily due to questions around how the category would be regulated. Would anyone be allowed to cheat? Who is the category for?

In addressing this issue, IOC officials need to consider why the tests are mandatory. If the tests are due to a perceived physiological advancement, then proper scientific research needs to publicly provide sufficient evidence that male physiology is advantageous in each sport that requires eligibility requirements. Accurate research would require more subjects to be intersex and the same for eligibility requirements for transgender athletes. Findings from one area and transferring to the other (i.e., using transgender research to support intersex eligibility requirements, or vice versa) does not suffice.

Critical oversight is needed on how these medical studies are conducted, the questions researchers ask, and researchers' assumptions about femaleness/maleness. Because of science's increased involvement in sport and sport studies in recent years, an ethical assessment of the medical literature used in congruence with female testing can provide a unique perspective for conceptualizing how science (objectively and subjectively) interacts with sport. Not much ethical or philosophical thought is applied to sports medicine and the sport sciences. Therefore, the entrance into the topic provides suggests its usefulness in other areas of sport science research.

[21] Hilton and Lundberg, "Transgender Women."

Interestingly, the phenomenon of female testing resides in the realm of sport, which portrays an aura as positioned tenable compared to the rest of society. For this reason, sport behaves somewhat relieved from standard social practices. Scholar Ian Ritchie argues that this unique position can be useful: "In other words, sport operates as a powerful ideological tool precisely because it is thought to be divorced from the rest of the world—a 'world apart.'"[22] Sport provides an optimal arena to assess how our global cultures can interact and therefore exist in a pseudo-societal position in society. This is mainly because while sport exists on the public stage and is intricately entwined with normalized social behaviours, athletes in the sports world must also adhere to standardized sporting behaviours, sports regulations, and social behaviours distinct to sport.[23] Not only are social norms elevated to the public sphere, but they are also encapsulated within a regulated world. Female testing is just one way our societal ideologies are emulated within sport's pseudo-societal position. Other ways include the segregation of the sexes, standardized sporting attire, and conduct like good sportspersonship.

Additionally, science sometimes favours certain normative assumptions from Western culture, primarily because science is prominent in Western society. Because of that, science fails to encompass the diversity of global identities wholly. At the heart of this issue is that female testing has been involved with curiosity regarding the variations of biological, genetic, and phenotypic sex differentiation and their complicated relationship to the social construction of gender. It could be said that female testing has contributed to the development of scientific paradigms like endocrinology and genetics.

In Western culture, an infant's sex is determined upon birth, solidifying the family's social practice preferences.[24] If an infant's sex appears ambiguous (i.e., referred to generally now as having an intersex condition), then the practicing doctor typically makes an informed decision (with parental consent) as to correcting the sex to the child's "appropriate" or the

[22] Robert Ritchie, John Reynard, and Tom Lewis, "Intersex and the Olympic Games," *Journal of the Royal Society of Medicine* 101, no. 8 (Aug 2008), https://doi.org/10.1258/jrsm.2008.080086.

[23] Helen Jefferson Lenskyj, "Sport Mega-Events and Leisure Studies," *Leisure Studies* 34, no. 4 (2014), https://doi.org/10.1080/02614367.2014.986509; Ritchie, Reynard, and Lewis, "Intersex."

[24] Karkazis, *Fixing Sex*.

most appropriate of two sexes: male or female. This can include surgical manipulations of genitalia, gonads, and, if applicable, ingestion of hormones.[25]

Beliefs about sex and gender and how sex should be corrected or manipulated are different between cultures. In other words, some cultures, such as many Aboriginal cultures, have not traditionally practiced the modification of one's sex and have been more embracing of a gender-and-sex fluid way of life. Adherence to Western empiricism fails to account for cultural differences and can result in vicious attacks on one's subjectivity and potentially contribute to systemic cultural issues.

[25] In *Fixing Sex*, Karkazis provides a thorough presentation of data of when things like the removal of testes is permitted, recommended, or required for intersex babies. Many of these decisions are aligned with the notion that some children who are born with intersex might have a (malignant) testicular tumor, or another form of cancer. Other concerns are raised over infants born with complete or partial androgen insensitivity syndrome (AIS). For individuals with AIS, partial (PAIS) or complete (CAIS) might develop malignant cancer (a rate that is 50% for PAIS). Therefore, oftentimes the removal of testes like what is discussed with intersex babies generally, there is often an aligned scientific rationale over concerns for cancer rates. See Karkazis, *Fixing Sex*. For more on the rate of malignancy, see Peter A. Lee et al., "Consensus Statement on Management of Intersex Disorders," *Pediatrics* 118, no. 2 (2006).

Glossary

46/47 +C mosaic	Referring to a rare genetic condition where an individual is born with 46, XXY and 46, XX
SRD5A2	Gene responsible for instructing the production of the enzyme steroid 5-alpha reductase 2
DHT	Dihydrotestosterone, an androgen which contributes to the development of sex characteristics typical genetic males
H-Y antigen	Male tissue-specific antigen
in vivo	The study of living organisms
IOC Medical Commission	A specialized medical committee housed under the IOC
PCR	A novel genetic testing method that rapidly duplicates billions of DNA tissue for study
SRY	Sex-determining region in a gene
Serum T	Serum Testosterone Levels
T-level	The level of testosterone found in blood serum
u	Atomic mass, used in this case for measuring distance
X	Refers to the X chromosome in genetic sex-determination
XO	Also known as Turner's Syndrome; referring to an individual born with one X and O chromosome and lacking a Y chromosome, who would be born genetically male according to genetic sex-determination
XX	Referring to an individual born with two X chromosomes, who would be born genetically female according to genetic sex-determination
XXX syndrome	Known as trisomy X and 47, XXX, referring to an individual born with three X chromosomes, who would be born genetically female with an extra X chromosome in each female cell according to genetic sex-determination
XXXY	Referring to an individual born with three X chromosomes and one Y chromosome, who would be born genetically male according to genetic sex-determination
XXY	Known as Klinefelter syndrome or 47, XXY, referring to an individual born with two or more X chromosomes and one Y chromosome, who would be born genetically male with underdeveloped testes or infertility according to genetic sex-determination
XXYY syndrome	Referring to an individual born with two X and two Y chromosomes, who would be born genetically male according to genetic sex-determination
XY	Referring to an individual born with one X and one Y chromosome, who would be born genetically male According to genetic sex-determination
Y	referring to the Y chromosome in genetic sex-determination

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North American Society for Sport History (NASSH), "Female testing's medical re-evolution: A genealogy of sports medical

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North American Society for the Psychology of Sport and Physical Activity (NASPSPA), "The Theory of Planned Behaviour, Menstruation, and Physical Activity: Using a diary approach to predict Intention and Physical Activity across the Menstrual Cycle," poster, California, 2017

Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS), "Menstrual Cycle and Physical Activity Participation: Daily Tracking of the Theory of Planned Behaviour Constructs during the Menstrual Cycle," poster, Ontario, 2016

North American Society for Sport History (NASSH), "Framing Gender: How Transitioned Female Athletes are Represented in the Media," lecture, Georgia, 2016

North American Society for Sport History (NASSH), "From Harmful to Healthy: The Modernization of Pathologies for Elite Female Athletes within the IOC's Medical Commission, 1969-2002," lecture, Florida, 2015

North American Society for the Psychology of Sport and Physical Activity (NASPSPA), "Being Physically Active during Menstruation: Using the Theory of Planned Behavior to Predict the Intention and Behaviour," poster, Oregon, 2015