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Technological Fair Play: An Ethical Framework for Olympic Sports

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

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Abstract

This research strived to address age-old concerns clouding the governance of sport technologies, specifically in sports under the Olympic umbrella. Anti-doping has long been a mandatory clause in the Olympic Charter. Yet, other forms of technological incursions have long been left unaddressed or prohibited via premature reactive judgments. Utilizing a multidimensional philosophical lens encompassing scholarship in the fields of philosophy of sport, applied ethics and the philosophy of technology - this thesis is aimed at creating an accessible, structured, and principled ethical framework to guide the integration of emerging technologies within Olympic sports. Taking an analytical look into WADA's underlying guiding principles for its anti-doping policy, several discrepancies have been unearthed; these gaps reside generally within the 'spirit of sport' interpretive weaknesses, as well as problems rooted in naturalistic misconceptions. Through reflective consideration of sporting ideals and principles inherent in leading conceptions of Fair Play and the Fundamental Principles of Olympism, this research distills these philosophies into a benchmark - 'the conditions for the ideal Olympic Contest'. The evaluation process, throughout this study, leans on this benchmark for guidance.

A rich understanding of sports' technological biases was brought to life by Feenberg's critical theory of technology. The subsequent stage developed an analytical structure discerning six primary technological orientations: Technology intended to facilitate constitutive elements; Technology intended to restore performance; Technology intended to improve performance;

Technology intended to promote safety; Technology intended to monitor officiating and integrity; and Technology intended to enhance consumption and participation. These technologies are assessed using the Doctrine of Double Effect (DDE), aiding judgment about 'good effects' lining up with prescribed conditions for the 'Ideal Olympic Contest' balanced against foreseeable 'bad effects'. To demonstrate practical utility two hypothetical cases were explored: HOTA - an AI assistant coach, and mRNA protein therapy intended for performance enhancement. This study delivers a pragmatic toolkit for academics and professionals alike - a 'fair play' counterbalance to the ever-growing risks posed by emerging technologies in Olympic sports.

Key words: Olympic sports technology, Ethics of sports technology, Technology integration in sports, Sports technology regulation, Performance enhancement technology, Doping in sports, Fair play in sport, Philosophy of sport, Ethics of emerging technologies, Responsible innovation in sport, mRNA doping, AI in sport.

Summary for Lay Audience

The prevalence of emerging technologies is rapidly reshaping the face of sports, in particular those under the Olympic umbrella. AI and advanced gear now pervade competitions, testing the bounds of fairness. This study addresses this need by creating an accessible model for ethical decision-making, encouraging and guiding sports regulatory bodies away from reactive policy making and towards principled foresight grounded in ethical principles. Informed by work from the fields of philosophy of sport, applied ethics, and philosophy of technology, the model fosters proactive, principled governance. I started with unearthing limitations in existing anti-doping policies which have long been used to regulate enhancing technologies but are proving inadequate given rapid and wide ranging technological advancements. These policies often reference under defined concepts like "*spirit of sport*" without being anchored on solid moral foundations or transparent accessible reasoning. In this thesis, I have developed a philosophical foundation using literature on sportsmanship, fair play and the fundamental principles of Olympism, distilling it down into key ideals or conditions constitutive for what I termed as the "*Ideal Olympic Contest*". This builds clarity around aspects like safety, equality, justice - essentially addressing how innovation should be evaluated against these values pillars. To further reinforce this structure, I categorized technology in sport using an intention focused lens: does the technology aim at restoring performance? Improving performance? Promoting safety? Integrating intention with the foreseeable unintended impact, while weighing these elements against the developed benchmark - the conditions for the ideal Olympic contest. Two hypothetical cases were

examined: an AI assistant coach (HOTA), and mRNA protein therapies aimed at boosting performance; by assessing benefits lined up against potential 'bad effects'. Both became useful by illuminating complex interplays between advancements matched against potential consequences breaching fair play norms or the ratified principles underlying Olympism, thereby exposing detailed dilemmas when faced with integrating emerging technologies into Olympic sports.

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Table of Content

Abstract.....	ii
Summary for Lay Audience.....	iv
Acknowledgments.....	vi
Table of Content.....	viii
List of Tables.....	xi
List of Figures.....	xii
List of Abbreviations.....	xiii
Introduction.....	1
Objectives and methodology.....	4
Importance and the contribution of the work.....	7
Chapter 1	
The Legacy of Antidoping: The only Universal Olympic Policy on Technology Regulation.....	9
What is the Moral foundation of the anti doping Policy?.....	11
The Internalist Rationale Behind the ban of performance enhancing substances and methods.....	14
Performance enhancement, fairness, moral norms and practices.....	16
Navigating the Natural.....	18
The exception to the rule: Therapeutic Use Exemptions.....	22
What do the critics say?.....	24
The Spirit of Sport.....	24
Pro-doping and Anti-anti-doping.....	26
Anti-doping Policy and Athlete's rights.....	30
Discussion.....	31
Conclusion.....	34
Reference List.....	34
Chapter 2	
Establishing the theoretical foundation for the Ideal Olympic Contest.....	42
Sportsmanship and Fair Play - Drawing a distinction.....	43
Fair play a broad concept.....	47
The Dual Nature of the Olympic Games.....	52
Fair Play as internal to the Olympic Games.....	56
Fair Play as a moral norm system for the Olympics.....	62
Establishing the Groundwork for Ideal Olympic Contest.....	65
Conditions of Fair Play Embedded With Fundamental Principles of Olympism:.....	70
Conclusion.....	73
Limitations.....	75

Reference List.....	75
Chapter 3	
Technology and Olympism: An Ethical Framework For Olympic Sports.....	78
Technology and sport.....	79
Sports and philosophy of technology.....	81
Alignments with Feenberg's critical theory.....	83
The Doctrine of Double Effect (DDE).....	86
Responding to possible critiques of the proposed sports technology evaluation framework.....	90
Dual Use, Doctrine of Double Effect (DDE) and Technology.....	93
A Taxonomy for Technological Integration in Sport.....	95
Non-categorized: De-skilling and Re-skilling.....	96
1) Technology intended to facilitate constitutive elements.....	98
2) Technologies intended to Improve Performance.....	103
3) Technologies intended to Restore Performance:.....	112
4) Technology intended to promote safety in sport.....	121
5) Technology intended to monitor officiating and integrity.....	124
6) Technology intended to enhance consumption and participation.....	128
Conclusion.....	132
Limitations and Future Research.....	134
Reference List.....	135
Chapter 4	
The Case of Artificial Tacticians in Sport.....	142
Introduction.....	142
Literature on emerging AI and AI integrated sensor technologies in sports.....	143
Case study: Artificial Intelligence (AI) - Hypothetical Optimal Tactical Assistant.....	149
The Analytical Framework.....	150
Evaluating HOTA against the Conditions of the Ideal Olympic Contest:.....	152
Applying Doctrine of Double Effect to HOTA.....	168
Conclusion.....	172
Reference List.....	173
Chapter 5	
The Case of mRNA protein therapy.....	177
History of Gene-doping.....	178
mRNA from zero to hero.....	179
The feasibility of using mRNA technology to enhance performance in sport.....	181
Case study: A hypothetical model for an mRNA printing system.....	183
Assessing the Ethical Viability of mRNA Technology Doping as a Safer Alternative to Gene Doping in Sports: A Governing Body's Perspective.....	185
Evaluating mRNA intended to improve performance against the Conditions of the Ideal	

Olympic Contest.....	186
Applying Doctrine of Double Effect from the perspective of Governing bodies to mRNA enhancement.....	201
Conclusion.....	204
Limitations.....	206
Reference List.....	206
Conclusion.....	211
Limitations.....	213
Practical Recommendations.....	214
Reference List.....	215
Curriculum Vitae.....	216

List of Tables

Table 1.1: Examples of emerging technologies over the past decade in sport (beyond doping).....	3
Table 2.1: Examples of actions that impact Fair Play in a multi-denominational system.....	51
Table 2.2: Summary of the distinctions made so far.....	56
Table 2.3: Summary of discussed Fair Play conceptions.....	64
Table 2.4: A comparative analysis of the viewpoints on the ideal Sporting contest...	66
Table 3.1: A comparative overview between Dyer’s (2015; 2020) systematic review of the literature discussing the impact of technology on sport and the conditions for the Ideal Olympic Contest presented in Chapter 2.....	85
Table 4.1: Examples of emerging technologies that integrate AI in sport.....	148
Table 4.2: Summary of Intended Good Effects.....	166
Table 4.3: Summary of unintended bad effects.....	167
Table 5.1: Summary of intended good effects.....	199
Table 5.2: Summary of unintended bad effects.....	199

List of Figures

Figure 2.1: UEFA's conception of Fair Play.....	49
Figure 2.2: Fundamental Principles of the Olympism in the July, 2021 version of the Olympic Charter.....	53
Figure 2.3 The diagram illustrates the interrelation between respect for the game and the core elements of the Olympic Games.....	62
Figure 2.4: The chart illustrates the concept of "Fair Play" in the context of the Olympic Games.....	64
Figure 3.1: The flowchart of the proposed ethical framework.....	89
Fig. 3.2: Graph of the average best times for each year in the Men's 50m Freestyle since 2008.....	97
Figure 4.1: AI analytical capacity of sport performance (Stats Perform, 2023).....	148
Fig 4.1 : Flow chart guiding ethical analysis.....	152
Fig 5.1 : Flow chart guiding ethical analysis.....	186

List of Abbreviations

AASs - Anabolic Androgenic Steroids
AIPS - International Sports Press Association
AI - Artificial Intelligence
BMP-2 - Bone Morphogenetic Protein 2
CAS9 - CRISPR Associated Protein 9
CIEPSS - International Council of Sport Science and Physical Education
CIFP - International Committee for Fair Play
CRISPR - Clustered Regularly Interspaced Short Palindromic Repeats
DDE - Doctrine of Double Effect
DL - Deep Learning
EPO - Erythropoietin
FEOP - Fair Equality of Opportunity Principle
GPS - Global Positioning System
HOTA - Hypothetical Optimal Tactical Assistant
HPLC - High Performance Liquid Chromatography
IAPS - International Association for Philosophy of Sport
IFs - International Federations
IOC - International Olympic Committee
IVT - In Vitro Transcription
LNP - Lipid Nanoparticle
ML - Machine Learning
mRNA - Messenger RNA
NOCs - National Olympic Committees
NSFs - National Sporting Federations
OBSO - Off-Ball Scoring Opportunity
PEG - Polyethylene Glycol
PEDs - Performance-enhancing drugs

PL - Prohibited List

PSSS - Philosophical Society for the Study of Sport

TUE - Therapeutic Use Exemption

TRT - Testosterone Replacement Therapy

UEFA - Union of European Football Associations

UNESCO - United Nations Educational, Scientific and Cultural Organization

VAR - Video Assistant Referee

VE - Virtual Environment

VR - Virtual Reality

WADA - World Anti-Doping Agency

Introduction

The birth of philosophy of sport as its own distinct discipline traces back to 1972 when the Philosophical Society for the Study of Sport (PSSS) first came into being. In 1999, the metamorphosis of PSSS into the International Association for Philosophy of Sport (IAPS) established an advancement landmark in sport philosophy scholarship. Visionaries like Warren Fraleigh and Paul Weiss played key roles in the PSSS's founding, with Weiss serving as its first president. The publication of *'Sport: A Philosophic Inquiry'* by Weiss in 1969 was a pioneering step that propelled this discipline into an intellectually rich area recognized globally. The early days of the philosophy of sport tended to focus more on analyzing fundamental concepts like 'play', 'game', or 'sport' itself, as philosopher Mike McNamee (2007) notes. There were some exceptions though, like Kretchmar's (1975) examination into test-contest relationships, which gained well-deserved attention. Another big debate back then centered on the nature of games, with Bernard Suits (1967, 1978) challenging Wittgenstein's claim that games only share family resemblances.

As the scholarship in the field grew more complex, applied ethics started taking the center stage. Fraleigh's 1984 publication *'Right Actions in Sport'* describing duties for athletic competitors and coaches was hugely influential, reflecting a deontological focus of the times. After the popularity of MacIntyre's (1981) work *'After Virtue'*, scholars including Schneider and Butcher (1993) and Loland (2002a) among others increasingly viewed sport as social practices, transitioning away from deontological approaches towards more virtue-based ones. The use of performance-enhancing drugs (PEDs) in competitions has been one of the main

ethical issues raised in sports philosophy chats. Brown's 1984 article, the works by Simon (1984) and Lavin (1987), documented some early PED debates. Brown (1984) argued restricting informed athlete decisions based on factors like harm wasn't morally justifiable, concluding there's no good reason to limit athletes' drug use. Simon (1984) disagreed, arguing that doping undermines the integrity of sports contests. Lavin (1987) argued that doping is coercive and should be prohibited. We can oppose both Brown's libertarian stance and Simon's idealism yet still find drug use in sports objectionable. Conversations have evolved significantly over time amid new research, ethical debates and technological advances. The evolution of biomedical and pharmaceutical technologies and the increased emphasis on sports science, spotlight ethical considerations of doping within sports ethics discourses. Performance enhancement has been central to rich interdisciplinary exchanges, sparking debates on ethics, ontology, paternalism, coercion, fairness, autonomy and authority structures in competitive sports. Seminal works by leading scholars like Brown (1984), Simon (1984), Lavin (1987), Fraleigh (1984), Kretchmar (1975), Weiss (1969) and Suits (1967, 1978) offer valuable insights here. These pioneering sports philosophers inspire today's scholars wrestling with persistent ethical issues in sports.

In the scholarship on technology in sport, its roles and ethics, specifically beyond doping (Biomedical and pharmaceutical enhancement) issues, several scholars have attempted to critically examine issues and controversies that occurred overtime. Loland (2002b; 2009), Miah (2005 & 2007) among others attempted to conceptualize the relationship between technology and sport. Most scholarship on the issues of technology in sport seem to have behaved in a reactive manner to contemporary issues that rose over the past decades. The introduction of controversial technologies in sport like depth finder in fishing, spaghetti

sprung rackets in tennis, the U-groove golf club in golf, the full body polyurethane swimsuits in swimming, and the Nike-Vapor Fly shoes in running, have all generated critical scholarship on the effects of technologies in sport (Hummel & Foster 1986; Gardner, 1989; Sheridan, 2006; Savulescu, 2006; Foster et al., 2012; Dyer, 2020). Yet, to this day there are limited scholarship-based frameworks that study the relationship, ethical permissibility and integration of emerging technologies in sport. With the rapid rate at which technology is being developed and implemented in sport over the past decade, the existence of a framework to evaluate the permissibility of technologies before their adoption into sport has never been more valuable.

Table 1.1: Examples of emerging technologies over the past decade in sport (beyond doping)

Type of Technology	Brief Description	Potential Ethical Concerns	Citations
Artificial Intelligence, Machine Learning & Deep Learning	Utilized in sport for automated detection of sport movements, calculating goal-scoring probabilities and detecting match phenomena.	Privacy concerns, bias in AI training data, over-reliance on technology, unfair competitive advantage, accessibility	Cust et al., 2019; Pavitt et al., 2021; Loquercio et al., 2020; Ramkumar et al., 2022; Aroganam et al., 2019; Anzer & Bauer, 2021; Schlembach et al., 2022
Biometric Technologies, Nanobiosensors, Wearable Technologies & Sensors	Used for assessing athlete's performance, preventing injuries, biomechanics research, and monitoring fatigue levels.	Privacy and data security, informed consent, unequal access, fairness in competition	Adesida et al., 2019; Aroganam et al., 2019; 2020; Owen, King & Lamb, 2015; Taborri et al., 2020; Karkazis, Fishman, 2017; Evans, McNamee, Guy, 2017
Global Positioning Systems (GPS)	For tracking and monitoring of team sports performance and strategy.	Privacy concerns, unauthorized surveillance, fairness in use, accessibility	Cummins et al., 2013
Virtual Reality (VR), Virtual Environments (VEs)	Used to enhance spectator experience and for team sports training, and to improve sensorimotor skills in ball sports.	Potential misuse, cyber sickness, digital divide, fairness, accessibility	Kim & Ko, 2019; Faure et al., 2020; Nor et al., 2020; Miles et al., 2012

Video Assistant Referee (VAR) technology	Used in soccer for making more accurate rule-based decisions.	Impact on referee decision-making, over-reliance on technology, fairness in use, accessibility	Tamir & Bar-Eli, 2021; Oliveira et al., 2023; Zglinski, 2022; Errekagorri et al., 2020; Spitz et al., 2021; Petersen-Wagner & Ludvigsen, 2022; Samuel et al., 2020
Motion-Based Video Games	Helps in improving motor skills.	Gaming addiction, physical health risks, fairness, accessibility	Jenny et al., 2017
Streaming Services	Have transformed sports broadcasting in a process termed as “Netflix-ication”.	Inequality in access, online piracy, fairness in access, accessibility	Lindholm, 2019
Social Media Platforms	Major tools for professional sports leagues to communicate and engage with their fans.	Privacy, misinformation, cyberbullying, fairness, accessibility	Trivedi, Soni & Kishore, 2020
Heart Rate Variability Biofeedback Training	Employed to enhance sports performance in athletes.	Privacy, data security, fairness in use, accessibility	Jiménez Morgan, Mora, Molina Mora, 2017
Assistive Technology Devices	Particularly crucial for disabled individuals.	Accessibility, affordability, fairness in access	Cooper and Cooper, 2019;
Protective Equipment, e.g., Headgear	For ensuring safety of athletes.	Unintended consequences	Tjønndal, Haudenhuyse, de Geus & Buyse, 2021
Nike's Vaporfly and Alphafly Running Shoes	Controversial technology that may significantly influence long-distance running performance.	Performance enhancement, unfair advantage, accessibility	Dyer, 2020; Rodrigo-Carranza et al., 2021

Objectives and methodology

This research aimed to create an ethical framework for evaluating the integration of emerging technologies in Olympic sports. Accomplishing this challenge was done through engagement with comprehensive works in philosophy of sport, applied ethics and philosophy of technology in order to develop an accessible, principled, and orderly approach for technological incorporation in Olympic sports. In Chapter 1, a philosophical literature review was conducted, critically examining conceptual frameworks regulating performance

enhancement technologies in Olympic sport. Anti-doping policy in its current form under the World Anti-doping Agency (WADA) or before 1999 under the IOC's umbrellas, has long been the only universal technological regulatory policy in the Olympic arena. Instead of starting from rudimentary analysis of the value and permissibility of technology (will be covered in chapter 3), analyzing anti-doping policy as a starting point gave a head start in the journey to achieve the main goal of this dissertation. The overarching goal of Chapter 1, is learning lessons from this enduring policy. The main guiding questions in Chapter 1 are: 1) What is the moral foundation of the anti-doping Policy? And 2) What do the critics say? A conceptual analysis methodology was adopted using close reading of scholarly perspectives to reveal limitations in predominant regulatory models like anti-doping policies.

Chapter 2 sets out to establish the philosophical foundations for envisioning an ideal Olympic contest, building on the limitations identified in Chapter 1, and utilizing conceptual analysis by engaging with perspectives on concepts such as sportsmanship, fair play, and Olympism. A philosophical lens elucidated nuances and integrated insights. Drawing a distinction between sportsmanship and fair play helped clear the conceptual terrain. Exploring literature on sport as MacIntyrean (1981) practices and The Fundamental Principles of Olympism provided further grounding. Evaluating varied conceptualizations of fair play highlighted contextual needs for a situated perspective within the Olympic context. Adopting Loland's (2002) normative system with interpretive insights from Butcher's and Schneider's (1998) work, enabled a contextual value framework. Comparative analysis of conditions from different theories brought nuanced coherence to light. The goal in Chapter 3, was to develop an ethical assessment framework for the integration of sports technology. Using an integrated approach: 1) I delved into the literature on the philosophy of technology;

2) I will argued on why Feenberg's (1991) critical theory offers a good lens for my analysis; 3) I categorized technologies by primary aims; 4) Then applied the Doctrine of Double Effect to weigh intended benefits against unintended ethical risks. This fused intention-focused and consequentialist ethics for multifaceted analysis. Abbreviated examples of cases like Video Assistant Referee (VAR) and testosterone replacement therapy, provided a demonstration of the evaluatory framework.

In Chapter 4, analyzed a hypothetical AI assistant coach technology called HOTA using the ethical framework from Chapter 3. I categorized HOTA as a technology intended to improve performance, then applied the Doctrine of Double Effect to assess intended goods against unintended harms across the conditions for an ideal Olympic contest developed in Chapter 2. The demonstration applied the conceptual toolkit to a hypothetical case, demonstrating the framework efficiency. Chapter 5 presented a second case study to further demonstrate the efficiency of the framework. I analyzed mRNA protein therapy as a technology with potential use as a performance improving method. I will categorize mRNA protein therapy as a technology intended to improve performance, then conducted an intention-focused and consequentialist evaluation against ideal contest conditions using the Doctrine of Double Effect.

Importance and the contribution of the work

Several key contributions to both the fields of philosophy of sport and sport governance were made in this thesis. A major gap addressed is the lack of a principled framework guiding proactive governance beyond reactive bans or vague appeals to "spirit of sport." The analysis unpacks conceptual limitations in regulatory approaches like anti-doping policies, which rely more on rhetorical ambiguity versus substantive ethical reasoning (Chapter 1). To construct a robust foundation, the thesis elucidates nuances between "sportsmanship" and "fair play," with the latter encompassing systemic responsibilities among diverse stakeholders, not just individual conduct (Chapter 2). Synthesizing scholarship on fair play and Olympism grounds coherent conditions for the ideal Olympic contest, spanning dimensions like safety, equal opportunity, and justice.

Chapter 3 proposed a novel integrated approach across philosophical fields; a conceptual analysis of technology from philosophy of technology traditions; an adaptation of these traditions to sporting context, and the use of applied ethics tools. Feenberg's (1991) critical theory illuminates how technologies propagate biases, requiring democratizing reforms. A novel taxonomy categorizes technologies by primary aims. The Doctrine of Double Effect supplies a practical protocol weighing intended benefits against potential harms when evaluating technologies (Chapter 3). Fusing intention-focused and consequentialist ethics enables multifaceted analysis. The framework's efficacy is demonstrated through the analysis of two case studies. Chapter 4 scrutinizes a hypothetical AI assistant technology called HOTA under the taxonomy. Despite potential strategic optimization, uncontrolled HOTA risks profound privacy, fairness and humanistic harms. In Chapter 5, the ethical ambiguities surrounding mRNA enhancement are analyzed using the proposed framework. These

examples further advocate proactive moral vision as opposed to reactionary policy adjustments.

In essence, this thesis presents a comprehensive strategy for implementable governance of technology in sports, while upholding fair play. It represents an attempt to provide an avenue that can help regulators steer away from emotional appeals and reactive judgment, towards contemplation, empirical verification and participatory inclusion, by creating a transparent tool - thus protecting fair play principles governing Olympic contests. Drawing from diverse theoretical disciplines it aims to transcend mere technocratic deliberations or rhetorical appeals; rather exercising prudence in immersing with the evolving technological landscape, assuring innovation propels human potential without erasing entrenched sporting values. Achieving this necessitates fortifying our moral toolkit coupled with a standardized fair and just mechanism of decision-making; thereby equipping us towards fulfilling the ethical potential inherent within sports technology judiciously.

Chapter 1

The Legacy of Antidoping: The only Universal Olympic Policy on Technology Regulation¹

The historical development of policy frameworks regarding Biomedical and Pharmaceutical enhancements (a practice commonly referred to as doping) in sports represents a dynamic, multifaceted, and complex process. Rooted in a philosophical examination of the literature and policies, this section demonstrates how doping technologies have emerged in response to shifting ethical viewpoints, scientific advancements, and socioeconomic forces that have transformed the sports landscape over time. The first attempt to seriously address the doping phenomenon in sport can be traced back to 1963 when the Council of Europe raised concerns about its growing prevalence (Kremenik et.al, 2006). The International Olympic Committee (IOC) responded by voting to ban doping at the Olympic Games a year later, eventually leading to the publication of the first version of the Prohibited List of Drugs in 1967 (IOC, 2023). This action was largely prompted by tragic incidents like British cyclist Tommy Simpson's death during the Tour de France in 1967 - an event which attracted widespread public attention due to its live television broadcast. After discovering amphetamines as a contributor to his death, more substances were added to the list in subsequent years, including stimulants, tranquilizers and narcotics (Kremenik et.al, 2006). The IOC first adopted a philosophically 'wide' definition of doping that could easily cover not just biomedical and pharmaceutical enhancement, but all forms of technological enhancements as well. Doping was defined by the IOC's Medical Commission in 1967 as:

¹ Universal here refers to the policy being applied across all Olympic sports.

“The use of substance or techniques in any form or quality alien or unnatural to the body with an exclusive aim to obtaining an artificial or unfair increase of performance in competition”

(Kremenik et.al, 2006, p.25).

With time, however, Biomedical and Pharmaceutical advancements demanded updates: Anabolic Androgenic Steroids (AASs) joined the list in 1974 before the Montreal Olympics. Subsequent years witnessed even more additions including Human Growth Hormone, Erythropoietin (EPO), diuretics, blood doping techniques - each reflecting broader developments of the technology. Dimeo (2016) portrayed early selection criteria for the Prohibited List (PL) as ambiguous at best, influenced by a “*core group of western male elites*” seeking to preserve power through abstract ideas about the essence and ethics of sport. The subsequent proliferation of doping scandals, from Ben Johnson's case in 1988, East Germany's state-sponsored program in the 1970s/1980s that was exposed after the fall of the wall of Berlin involving minors, to the 1998 Festina Scandal has resulted in a public uproar. In response to growing political pressure, the IOC and world governments collaborated to form the World Anti-Doping Agency (WADA) in 1999.

WADA's Code provided an updated definition of doping to a more ‘legal’ definition, based on specific rule violations (11-possible violations according to the 2023 version of the Code - up from 8 in the original Code) as alternative to the older version that carried moral intonations.

“Doping is defined as the occurrence of one or more of the anti-doping rule violations set forth in Article 2.1 through Article 2.8 of the Code.”

(WADA, 2003)

These included presence or use of a prohibited substance, refusing compliance with testing, whereabouts discrepancies, tampering with samples, possession, trafficking, and involvement in prohibited activities among athlete support personnel (WADA, 2003). Drawing from the UNESCO International Convention against Doping in Sport (2004), these guidelines have been widely adopted by more than 183 countries (UNESCO, 2017).

While WADA's formation generated high expectations, rampant doping scandals demonstrated that significant challenges persisted - from Lance Armstrong publicly admitting long-term use of banned substances during his Tour de France victories, to allegations implicating Russia in a state-sponsored doping scheme affecting numerous Olympic sports (BBC, 2014). Such incidents have spurred calls for rigorous policy evaluation and alternative approaches within the anti-doping community (Waddington & Møller, 2019; Kayser, 2018). These insights are essential context for understanding anti-doping policies' evolution over time as pretext to my philosophical examination of this type of technology in sport. This subsection will explore factors such as ethical dimensions rooted in normative internalist perspectives on sport, and shed light on the complex ethical arguments surrounding Biomedical and Pharmaceutical technologies in sport. This area merits comprehensive academic inquiry given long history, and being by far, the most debated and studied type of technology in sport.

What is the Moral foundation of the anti doping Policy?

The philosophical concept of Olympism serves as the foundational principle behind the current anti-doping policies. The World Anti-Doping Agency (WADA) Code declares that the fundamental rationale for anti-doping programs is to safeguard the "*intrinsic value*" of

sports, which WADA has characterized as the " *Spirit of Sport*" (WADA Code, 2021). The Code delineates this spirit as follows:

"Anti-doping programs are founded on the intrinsic value of sport. This intrinsic value is often referred to as "the spirit of sport": the ethical pursuit of human excellence through the dedicated perfection of each Athlete's natural talents. Anti-doping programs seek to protect the health of Athletes and to provide the opportunity for Athletes to pursue human excellence without the Use of Prohibited Substances and Prohibited Methods. Anti-doping programs seek to maintain the integrity of sport in terms of respect for rules, other competitors, fair competition, a level playing field, and the value of clean sport to the world. The spirit of sport is the celebration of the human spirit, body and mind. It is the essence of Olympism and is reflected in the values we find in and through sport, including: • Health • Ethics, fair play and honesty • Athletes' rights as set forth in the Code • Excellence in performance • Character and Education • Fun and joy • Teamwork • Dedication and commitment • Respect for rules and laws • Respect for self and other Participants • Courage • Community and solidarity....The spirit of sport is expressed in how we play true. Doping is fundamentally contrary to the spirit of sport."

(WADA Code, 2021)

WADA's restrictive stance on doping aligns with this internalist theory of sport; Sports as practices that have internal goods of its own that are worth valuing. Adopting this interpretation leads to prioritizing fundamental virtues within sport alongside human excellences (Simon, 2000; Russell 2007). This approach recognizes that principles inherent in sport provide a basis for restricting performance-enhancing substances that conflict with internal goods. WADA's conceptualization of the Spirit of Sport is what Butcher and Schneider (1998) might be called a '*bag of virtues*' conceptualization of the internal goods of sport - a method that is often criticized for being inconsistent, as different ethical theories generate different and often competing sets of virtues. For instance, the WADA Code emphasizes virtues such as "Ethics, Fair Play, and Honesty," "Excellence in Performance," and "Respect for Self and Other Participants." While these are commendable virtues, different ethical theories could prioritize or interpret these virtues differently. For instance, an emphasis on "Teamwork" might sometimes conflict with "Excellence in Performance" if

individual achievement takes precedence over team goals. Such a broad spectrum of virtues, while comprehensive, can lead to ambiguities in application and interpretation.

WADA holds broad power to prohibit substances and methods in sports. As outlined in section 4.3 of the World Anti-Doping Code, WADA may ban any substance or method it believes could enhance performance, pose a health risk, or violate the 'spirit of sport'. A substance need only meet two of these vague, subjective criteria to make the Prohibited List. WADA has full discretion to classify substances and methods as it sees fit, and its decisions cannot be challenged, even if experts disagree. Additionally a substance that masks use of other prohibited substances, also prohibited even if it doesn't fulfill the criteria mentioned. WADA is not transparent on how each substance qualified for the prohibited list, i.e., which criteria (out of the three) each substance fulfilled to be prohibited. This unfettered authority raises ethical concerns about transparency, accountability, and athletes' rights. WADA's opaque Prohibited List process conflicts with basic principles of good governance. Greater scrutiny is needed to ensure WADA's bans are evidence-based and protective of athletes, not arbitrary dictates by unaccountable regulators.

*"4.3 Criteria for Including Substances and Methods on the Prohibited List
WADA shall consider ...criteria in deciding whether to include a substance or method on the Prohibited List: 4.3.1 A substance or method shall be considered for inclusion if WADA ...determines that the substance or method meets any two of the following three criteria: 4.3.1.1 ...evidence...that the substance or method...has the potential to enhance or enhances sport performance; 4.3.1.2 ...evidence...that the Use...represents an actual or potential health risk to the Athlete; 4.3.1.3 WADA's determination that the Use...violates the spirit of sport... 4.3.2 A substance or method shall also be included on the Prohibited List if WADA determines there is...evidence...that the substance or method has the potential to mask the Use of other Prohibited Substances or Prohibited Methods."*

(WADA Code, 2021)

The Internalist Rationale Behind the ban of performance enhancing substances and methods

Within sports philosophy, internalist theories focus on the values and principles intrinsic to sport itself (Schneider & Butcher, 1993; Simon, 2000; Dixon, 2003; Russell 2007). These notions underline that maintaining these core virtues - such as excellence and dedication, following rules, and adhering practices are paramount for preserving a just and even competitive field. This theory is particularly relevant when considering anti-doping measures within sporting settings (Loland 2009; Devine, 2011; 2022). The primary objective of this segment is to critically evaluate the ethical foundation stemming from an internalist standpoint.

Drawing upon the concept of "*internal goods*" as proposed by MacIntyre (1981) - effectively defined as virtues inherently attained via suitable engagement in a particular practice - Schneider and Butcher's work from 1993 contends that doping behaviors compromise the innate value system intrinsic to the Olympic Games. The core of their argument against performance-enhancement practices such as doping is grounded in preserving these inherent values, which can be achieved through abiding by apt norms established by key regulatory authorities like the International Olympic Committee. Schneider and Butcher (1993) argue that athletes' personal motivations often drive them to avoid doping practices, as they view it as detrimental to the intrinsic value of sports. Indeed, by participating in the Olympic Games, these athletes inherently pledge themselves towards complying with ethos and rules governing those practices. Moreover, Devine's (2011 & 2022) analytical research on pursuing excellence in sport underscores various facets integral to developing excellence in performance within this context. Elements like: 1) cluster, which involve different types of

skills; 2) quantum, defining degree or level excellence; 3) clarity, relating visibility factor across skill sets involved particularly concerning excellence executed during gameplay; 4) and 'balance' element denoting equilibrium adjustments among varying competencies have been highlighted substantially throughout his work. At a more nuanced ethical dimension lies an intricate relationship binding together elements influencing sporting excellence with athlete preparation methods (Loland & McNamee, 2016). Loland's (2018) delineation of the "gratuitous" logic embedded in Morgan's (1994) sports conceptualization as self-imposed constraints. He presents sport as a cultural practice that showcases human capabilities against defined benchmarks in order to achieve mastery. The usage and incorporation of performance-enhancing drugs, however, distort this measurement process and hinders the achievement of mastery. This interpretation aligns with Suits' (1978) portrayal where engaging in gameplay equates to voluntary attempt to overcome unnecessary obstacles; it is this acceptance towards inefficient methods which fuels excellence within sporting practices. Doping disrupts the inefficiency of the accepted methods limitation, directly interfering with athletes' display of excellence - thereby contravening Suit's notion and terminology for 'lusory attitude'.

Expanding upon the earlier discussions, Devine (2022) adds another dimension of internalist reasoning for anti-doping measures. To Devine, doping stands as an "*eroder of excellence*". Performance-enhancing substances blur achievement recognition by artificially inflating abilities beyond natural constraints (Devine, 2022). These attributes also misalign with sporting values and skew ranking criteria by unfairly prioritizing some qualities over others within competitive environments (Devine, 2022). Within this framework then lies a clear justification for imposing restrictions on performance enhancement use given that they

undermine sports' central mission: the pursuit and display of human excellence. Importantly, Devine's antidoping stance does not reject concerns about athletes' welfare; as he acknowledges that other values or requirements may override the Excellence Principle (Devine, 2022). Herein lies an essential nuance to the internalist position: grappling with additional values such as health and safety is another thing to consider when dealing with technologies that might be considered 'eroders of excellences'. For example, the International Skating Union (ISU) banned backflips in ice skating competitions back in 1976 (now banned under ISU 'Special Regulations and Technical Rules' Section II, Part A, Rule 610). Even though backflips are highly technical and are an impressive demonstration of 'human excellences', some may claim that the ban prioritizes health and safety above excellences. By asserting that excellence is constitutive within sport and foregrounding its aspects as part of antidoping justifications provided by governing bodies, Devine (2022) offers valuable input to the broader debate surrounding sports ethics.

Performance enhancement, fairness, moral norms and practices.

Sigmund Loland, one of the most distinguished scholars in the field of sports ethics and previous president of the International Association of the Philosophy of Sport, as well as a member of WADA's Ethics Panel since 2004, proposes in his 2002 book *'Fair Play: a moral norm system'* a mixed ethical theory for sport grounded in fair play, justice, and equal opportunity. He advocates for adherence to a moral norm system for 'fairness' and 'play' consistent with both consequentialist and non-consequentialist reasoning. While this perspective doesn't directly address the topic of performance enhancement itself, Loland's framework offers a perspective to understand the implications of such practices, in sports competitions. In another work, Loland (2009) presents three viewpoints of technology that

enhance performance in sports; the relativist theory, the narrow theory and the wide theory. The relativist theory argues that sport values are only significant when they serve external goals such as political prestige or commercial profit (Loland, 2009). The narrow theory may endorse contentious practices like doping due to its focus on efficiency over intrinsic factors. Although relativism highlights certain sports realities, it fails in guiding the distinction of permissible and impermissible technologies based on principled ethical consideration. The narrow theory proposes that sports' primary value lies in enhancing human performance (Loland, 2009). Often labeled the 'liberal view of enhancement,' this perspective draws from technological optimism and focuses on developing individual talent within a meritocratic framework-it promotes unrestricted usage of performance enhancers in competitions. Despite the view's alignment with elite sports' relentless pursuit of improvement, critics argue this view is socially naive (Loland & McNamee, 2016). The liberal view assumes that athletes can make informed decisions within power dynamics, which leaves them more susceptible to exploitation. Sport, according to the wide theory, is seen as a practice that promotes integration and the cultivation of moral excellence. This is achieved by developing abilities or learned skills through effort (Loland, 2009). The rationale behind doping programs aligns with this perspective as it is grounded in Aristotelian virtue ethics and the idea of fairness in sport.

Carr (2008) also explores fairness concerns regarding performance enhancement in sport. He critiques arguments based on fairness while advocating for a conceptualization centered around 'fidelity' to the social practices that define specific sports. Carr's analysis is essential for understanding how fairness arguments apply to performance enhancement. It resonates with Schneider and Butchers (1993) emphasis on adhering to rules and internal values

associated with each sport. Moreover it emphasizes how elite athletes commit themselves to upholding the core values of their chosen sports. Both Loland (2002) and Carr (2008) shed light on aspects of fairness in sports, whether through adherence to norms or dedication to contextual social practices. These perspectives provide a basis for evaluating the acceptability of performance enhancing practices. Loland and Hoppeler (2012) derive a method, from Lolands (2002) research, which is known as the principle of Fair Equality of Opportunity (FEOP). In relation to FEOP, Loland and Hoppeler (2012) reference the famous work of Beauchamp and Childress (2001):

“Persons should not be treated unequally based on inequalities that they cannot influence or control in any significant way and for which they therefore cannot be claimed responsible.”

(p.349)

They use the FEOP to examine WADA's notion of 'the spirit of sport'. Their perspective emphasizes the fair equality of opportunity principle as central to antidoping efforts, offering a comprehensive argument against doping practices rooted both in ethics and biological considerations.

“To a certain extent, it makes sense to say that substances and methods on WADA’s prohibited list enhance performance independent of talent. Training, on the other hand, invokes the phenotypic plasticity of the human organism, a consequence of the specifics of the evolution of the human species. Accepting bodily reaction patterns and using the innate adaptability of humans to physical challenges cohere with the idea of developing natural talent.”

(Loland and Hoppeler, 2012, p.352)

Navigating the Natural

The idea of what's considered ‘natural’ has played a role in philosophical debates about performance enhancement and doping in sports. Those who support the bans on doping argue

that there is something superior about athletes relying solely on their innate talent and abilities (Loland and Hoppeler, 2012; Loland, 2018; Lopez Frias, 2019; WADA, 2021). However this notion of the 'natural' has faced criticism. Scholars have questioned the coherence and meaningfulness of distinguishing between what's 'natural' versus 'unnatural' or 'artificial' when it comes to performance. There are also concerns about whether appeals to nature can justify policies that prohibit forms of human enhancement (Butcher and Schneider, 1993). Upon examination understanding what constitutes athletic performance proves to be a complex and elusive task.

In his 2018 work, Sigmund Loland puts forward the argument that the notion of what's considered "natural" holds importance when discussing the prohibition of performance enhancement. Supporters of this perspective claim that utilizing 'un-natural' methods to improve performance would diminish the significance attributed to athletes' innate abilities. This aligns with Loland's concept of "equality of opportunity " which asserts that individuals should be rewarded in sports based on their abilities and effort. Loland (2018) suggests that the idea of what qualifies as unacceptable in competition can be derived from a 'normative rule of thumb' from the conceptions of 'the natural' performance. However some scholars such as Lenk (2013) and Bonte (2013) express concerns about categorizing talent and performance as superior arguing that this viewpoint is susceptible to the naturalistic fallacy. This fallacy occurs when we assume that inherent abilities automatically hold value solely because they represent a state believed to be ideal (Lenk, 2013; Bonte, 2013). Nevertheless there are challenges associated with this concept of naturalism. The connection between the concept of 'natural' and what is deemed "good" or morally ideal can pose some challenges. According to Lenk (2013) we cannot derive claims from biological conditions. Therefore

although natural athletic ability may currently hold prominence in sports, its 'naturalness' shouldn't be grounds for moral judgment.

The perspective of naturalists in sports has also been influenced by the Protestant work ethic as suggested by Lopez Frias (2019). This work ethic emphasizes the value of effort and natural talent rather than achieving success through artificial means. Natural talent is regarded as a God-given gift. The concern that performance enhancement undermines talent and compromises the essence of sport can be traced according to Lopez Frias (2019) at least in part to these origins. However, relying on religious tradition as the basis for policy decisions may be questionable. In response to criticisms from naturalists, some scholars have taken a more open approach to enhancement (Bonte, 2013). Of viewing 'natural' abilities as superior, this perspective critically examines society's culturally constructed emphasis on innate talent in sports. Bonte (2013) argues for a concept of "*dignified doping*" - the right of adult athletes to make informed decisions about performance enhancement, challenging the belief in natural talent's necessary superiority. From this perspective, policies banning doping technologies require extensive ethical justification, rather than simply appealing to preserving nature in sport.

Given these difficulties, some philosophers suggest focusing on "nature" as a social construct with problematic ideological dimensions (Kaebnick, 2014). Cahn (2015) argues the idea of nature has historically been used to establish social hierarchies based on perceived biological differences, as in racism and sexism. Even if nature is conceived more positively as denoting ecological balance, Kaebnick (2014) suggests that 'nature' carries connotations of moral value that require interrogation. The language of 'natural' exerts rhetorical force in

enhancement debates, glossing over the ‘vague and multifarious’ (Kaebnick, 2014) properties underlying the concept. While strong naturalist claims face extensive criticism, this does not wholly discard ‘the natural’ as a worthwhile concept. As Kaebnick (2014) argues, naturalness may still be an ethically relevant consideration, if not necessarily a decisive one. A moderate naturalist position can argue that while nature's value is socially constructed, rather than intrinsic, the idea of 'natural' performance retains heuristic value in enhancement debates. The natural can act as a “*rule of thumb*” pointing to morally salient qualities, provided its conceptual limitations are recognized (Loland, 2018. p.13). This view acknowledges nature's constructed dimension while retaining some role for naturalness in ethical reasoning. To move forward, some scholars advocate for a ‘realist’ understanding of natural athletic performance based in biology rather than ideology (Loland, 2018). From this perspective, natural performance refers to capabilities arising from gene-environment interactions that have been subject to evolutionary selection pressures (Loland, 2018; Loland & Hoppeler, 2012). Athletic talent emerges through the systemic manifestation of genetic potentials within certain environmental conditions (Loland & Hoppeler, 2012). The realist view suggests valid concerns may remain about forms of enhancement enabling abilities that bypass these 'natural' biological processes. As Loland (2018) notes, some ways of improving performance through technology may undermine values of human integration and embodied selfhood in ways natural training does not. Loland (2018) also notes, the realist perspective must be paired with a philosophical examination of principles like fairness and human dignity to yield justified policy. A nuanced naturalism may be compatible with ethically regulated access to enhancement technologies that augment natural capacities, rather than overriding them entirely (Loland, 2018).

The exception to the rule: Therapeutic Use Exemptions

The process of Therapeutic Use Exemptions (TUE) aims to strike a balance between two principles: 1) promoting athletes' well being; 2) ensuring fairness. This comprehensive framework allows athletes with medical conditions to receive treatments involving substances or methods that are otherwise prohibited without unfairly excluding them from competitive events. The TUE system attempts to maintain fairness and health in sports while also allowing athletes with conditions to participate (Gerrard & Pipe 2017). A significant debate surrounding TUEs revolves around distinguishing between restoring and enhancing performance. Challenges arise when it becomes difficult to differentiate between using substances or methods for purposes that restore an athlete's health status versus those that might give them an advantage beyond that level. In one perspective, on TUEs, Pike (2018) and Scheider (2018) introduce the Doctrine of Double Effect (DDE) which highlights the importance of considering intentionality when evaluating exceptions. This approach helps differentiate between the use of medication, for healing purposes and potential enhancements associated with doping. According to this philosophy, if a player seeks treatment for managing a condition rather than gaining an unfair competitive advantage, they may deserve an exemption.

However, relying on the intentions of the athletes alone might ignore impact. For example since it is assumed that banned substances do enhance performance (assuming otherwise they wouldn't be on WADAs list - which is not necessarily true) the challenge arises when necessary medical interventions inadvertently enhance abilities beyond natural levels in certain situations or specific sports contexts (Pike, 2018). Let's consider a scenario involving endurance events in which athletes with asthma use banned beta-2 agonists as part of their

Therapeutic Use Exemptions (TUEs) to provide relief for respiratory issues. However these substances also have enhancing effects due to their properties, giving an advantage to athletes with asthma over competitors who are not legally allowed to use them. Consequently, relying on intentions, as the basis for justifications, has its limitations. This is mainly because objectively evaluating these aspects becomes complex in competitive contexts. Therefore some critics argue that adopting different approaches could be more effective than the current systems, which rely on exemptions (Dimeo & Møller 2018).

Moreover, despite the complexities surrounding intentional influences, in these applications additional complications arise from issues of transparency and accuracy within the process itself. Many cases involve judgments made by authorities who carefully examine clinical data for each relevant request (Gerrard et al., 2017; Di Luigi et al., 2020). The ongoing debate revolves around whether we should address the dilemmas related to restoration and potential enhancements, solely based on credibility and intentions, or if it would be more effective to make systemic changes that reflect the widespread public sentiment advocating for increased transparency and incorporating the expanded roles of competing athletes themselves (Pike, 2018). However, as Gleaves (2021) pointed out, there is a need to bridge the gaps in inconsistencies observed in governing criteria particularly regarding the distinction between treatment and enhancement. Exclusive accreditations allowing therapy exemptions should prioritize patients who have been confirmed to have disorders with no alternative remedies available. This approach helps prevent misuse situations that seem to be increasingly common in sports with liberal extensions becoming more normalized. As Fiorentini et al. (2022) strongly emphasize through allegorizing Icarus's fate, our ultimate goal should always be prioritizing health concerns while striking a harmony, between

therapeutic necessities and maintaining fair competition that strictly adheres to universal anti doping regulations.

What do the critics say?

The Spirit of Sport

The ‘spirit of sport’ clause is often accused of being introduced by the WADA Code in 2003 to justify bans on substances and techniques without sufficient evidence of performance enhancement (Kornbeck, 2013). As Ritchie (2013) explicates, the drafting of this clause was influenced by key events between 1988 and 2003, especially the Dubin Inquiry in Canada which revealed the widespread use of banned substances in sports. However, the vagueness in defining ‘spirit of sport’ has attracted criticism over interpretational inconsistencies and lack of legitimacy in enforcing bans (Ritchie, 2013). Kornbeck (2013) argues that the ambiguity facilitates questionable bans without credible evidence. Loland and Hoppeler (2012) also highlight the complex moral dilemma concerning WADA’s unclear threshold and criteria in deeming substances as contrary to the ‘spirit of sport’. Hence, the origin of this clause points towards reactionary policy-making while its abstract definition harbors risks of misuse through inconsistent interpretations. Some scholars have adopted a historical lens to locate ‘spirit of sport’ within the evolving Olympic principles. Beamish and Ritchie (2006) challenge the orthodox prohibition on performance enhancers as incongruent with the political and economic transformation towards high-performance Olympic frameworks. Ritchie (2014) extends this critique by illuminating how the prohibition policies and myths were part of a broader agenda to portray the modern Olympics as ‘pure’ sport divergent from its traditional philosophical relief. Savulescu et al. (2004) construe ‘spirit of sport’ as the use of performance enhancers in pursuing superhuman athletic feats. These contrasting ethical

interpretations highlight the difficulty in clearly defining moral values embodied within the 'spirit of sport'. These perspectives compel a re-examination of the 'spirit of sport' philosophy codified in the WADA code against the founding ideals of Olympism that carried a more humanistic ethos.²

Some scholars have scrutinized anti-doping policies for prioritizing performance enhancement over health risks and standards. Henne et al. (2013) highlight inconsistencies in WADA's criteria, including the ban on illicit non-performance substances, proposing a health-centric approach to reconcile this discrepancy. Loland and Hoppeler (2012) indicate ambiguities in determining substances as contrary to the 'spirit of sport' based on medical and health standards. According to Malloy et al. (2007), WADA's blurry philosophy underpinning bans on technologies needs to be situated within discourses of authentic physiology versus performance enhancement. Waddington et al. (2013) argue that WADA has misinterpreted 'spirit of sport' to justify controlling non-performance recreational drugs in sports. These critiques illuminate the tensions between health and performance approaches underlying 'spirit of sport'. Some studies emphasize fairness, transparency and consistency as essential virtues aligning with the 'spirit of sport'. McNamee (2012) calls for upholding the 'spirit of sport' in the decision process by encouraging the consultation of ethics experts in anti-doping policy making to engender transparency. As highlighted by Obasa and Borry (2019) empirical research, transparency, consistency and active engagement of stakeholders are essential when reformulating policies to align with the principles that embody the universal spirit of competitive sports.

² It's worth noting that Butcher and Schneider's seminal 1993 report is central to 'internalist' conceptions of the 'spirit of sport.' Their philosophically rich framework was subsequently simplified, regrettably, for legal and political expediency.

Pro-doping and Anti-anti-doping

Murray (2016) provides a comprehensive analysis of the major positions surrounding anti doping policy, as well as the ethical considerations that underpin anti-doping policies and their implementation. This part of the literature review aims to elucidate the complex landscape of scholarship on doping in sport by critically engaging with key authors and ideas presented within Murray's work. Murray (2016) divides the arguments into three main categories: Antidoping (discussed earlier), pro-doping (Pro-enhancement) and anti-anti-doping (against the anti-doping policy). Anti-doping stances highlight the need for fairness, health protection, and preserving sports' meaning (Murray, 2016). Pro-doping arguments assert that using PEDs is morally permissible or even admirable, often emphasizing individual autonomy, personal choice, and the human spirit (Savulescu, 2004; Brown, 1984). On the other hand, anti-anti-doping arguments focus on the perceived flaws of current anti-doping policies and practices (Brownsword, 2013; Kornbeck, 2013), such as conceptual ambiguities, potential injustices, cost-effectiveness concerns, privacy issues, and proposals for harm reduction approaches. These critiques call into question the ethical foundations upon which current anti-doping policies are based.

Pro-doping:

One of the key arguments for allowing doping in sports is predicated on upholding individual autonomy (Brown, 1984). According to this perspective, athletes should be granted the liberty to make informed and voluntary decisions about how they improve their performance. Brown (1984) posits that there are no ethically convincing reasons to ban drug use by athletes as these choices are made consciously and willingly - align with the principles endorsed in a free society, and constraining such freedom may imply imposing alternate

values onto them. Another important aspect discussed by Brown (1984) is paternalism-referring more specifically John Stuart Mill's view-that constraints on liberty could not be justified when it comes to adults although they might apply in case of minors. Thereby he addresses Feinberg's and Dworkin's differentiation between soft and hard paternalism. The concerns surrounding safety risks associated with doping indeed fall under these categories of paternalistic debates; however once again Brown does not see any compelling moral grounds for banning athlete drug usage based solely upon these contentions. Savulescu et al. (2004, p.670) further support this argument by stating that *"performance enhancement is not against the spirit of sport; it is the spirit of sport."* They believe that athletes should be given this choice and that their welfare should be paramount. However, he also adds that taking drugs is not necessarily cheating and that the legalization of drugs in sport may be fairer and safer. This position has been criticized for being socially naive (Loland, 2009), as it disregards that vulnerable position of the athletes.

Brown (1984), in his seminal work explores arguments against doping, specifically concerning whether or not it aligns with the nature of sport. He ultimately finds no morally compelling arguments against drug use in sports based on sport's nature, stating that restricting choice denies athletes the values of self-reliance, personal achievement, and autonomy. Similarly, Kious (2008) argues for a distinct lack of moral differentiation between doping and other morally acceptable performance-enhancing techniques. In his view, until there is definitive evidence proving an action to be ethically incorrect or distinguishable from already permitted practices, it should not face prohibition.

"when we cannot give good arguments for an action's being wrong (or why we ought to forbid it), and when the wrongness of an action is not obvious in the absence of any such arguments, then it should (other things equal) be permitted"

(Kious, 2008, p. 214).

Anti-anti-doping

Among the first arguments against doping is the belief that using performance-enhancing drugs (PEDs) violates the principles of fairness in sports by giving users an unfair advantage over their competitors - the cheating argument (Luschen, 1976). Kirkwood (2009), however, debunks this claim by highlighting its inherent circularity: the unfairness argument only stands because of the rules prohibiting drug use themselves. Kirkwood thus challenges those justifications for drug bans that rely solely on notions of cheating or unfair advantage. Another perspective centers around the "internal goods" of sport. According to Schneider and Butcher (1993) who have adopted MacIntyre's (1981) notion of practices, some goods are intrinsic to sports practices and can only be experienced by those who partake in them properly, without resorting to PEDs. Kirkwood (2009) refutes this idea by arguing that many PEDs could plausibly enable athletes to access these internal goods more effectively than their drug-free counterparts, thereby undermining arguments that hinge on preserving the supposed purity or essence of sport. Kirkwood (2009) proposes a harm-reduction model that seeks to minimize the negative consequences of drug use without necessarily attempting to eradicate doping entirely.

Kayser and De Block (2021) delve into the impact of performance enhancing substances on athlete health by exploring a criticism of the harm reduction approach to doping in sports; a coercion based version akin to an arms race. They argue that if doping regulations were more relaxed, situations where all competitors feel pressured to use performance enhancing drugs to maintain their competitiveness - resulting in the development of even more powerful and riskier drugs, might not be as significant practically. This suggests that adopting a medically supervised approach could potentially lead to better safety outcomes by allowing athletes

access to less harmful substances under enhanced medical supervision. However Holm (2007) challenges the idea that medically supervised doping would unequivocally improve safety and transparency. Drawing on game methods he demonstrates how widespread safety improvements are unlikely due to athletes' motivations and sport doctors interests.

This analysis sheds light on the challenges faced by those who support the legalization of doping and their efforts to justify its use under supervision. In terms of combating doping, Kayser and Broers (2015) propose a health oriented approach that focuses on reducing harm caused by drug use without trying to control consumption rates (i.e. monitoring athletes bio-markers for any redflags). This perspective falls between prohibiting doping measures and fully liberalizing them. Similarly, Savulescu (2014) introduces the concept of “physiological doping” which involves legalizing performance enhancing drugs within limits while still upholding the essence of each sport. This approach challenges the World Anti Doping Agencies criterion of banning substances solely based on their potential to enhance performance. Instead Savulescu advocates for allowing doping as long as it adheres to predetermined safety standards, thus preserving the integrity of the sport. Piispa and Salasuo (2012) draw comparisons between approaches to the war on drugs and anti doping policies suggesting that unintended consequences of banning doping are mainly driven by inspection and repression strategies. Along the lines, acknowledging the inevitability of doping, Christiansen and Møller (2016) argue that athletic excellence can still be maintained in a more lenient approach towards doping. They suggest that the allure of sports lies in the narratives, drama and beauty of competitions rather than solely relying on physiological disparities. Examining inconsistencies and ethical dilemmas within WADAs doping policies Kayser et al. (2007) advocate for harm-reduction over prohibition. According to them this

approach allows for risk management associated with performance enhancing drug (PED) usage while prioritizing athletes' well being.

Anti-doping Policy and Athlete's rights.

WADAs strict approach to doping has faced criticism on legal and practical grounds. One primary objection is that anti doping regulations excessively limit athlete autonomy while representing an overreach of power (Waddington, 2010; Kiou, 2008; Tamburrini, 2013). By determining which enhancements are allowed or prohibited WADA brings athletes individual choices under its purview, in upholding the "spirit of sport." However scholars argue that this concept lacks definition and justification (Obasa & Borry 2019). The principle of Strict liability also creates a problem of accountability as they unfairly place the burden on athletes to prove their innocence (Kornbeck, 2013). Privacy is another aspect that has drawn criticism. WADAs extensive biological monitoring and constant disclosure of whereabouts have been argued to violate athletes dignity and confidentiality (Tamburrini, 2013). While the goal of ensuring drug sports is apparent, some scholars argue that these practices erode privacy and treat athletes as objects of suspicion rather than full human beings (Waddington, 2010). The lack of athlete participation in policy development further highlights transparency and governance issues (Kornbeck, 2013).

Holm (2007) contends that WADA overstates the health risks of doping while ignoring social and commercial factors pressuring athletes. Zero-tolerance prohibition does little to mitigate the incentives for athletes to cheat or engage in harmful practices to succeed. Allowing medically supervised doping under strict parameters could alleviate some health

risks associated with unregulated use (Kayser et al., 2007). While not without risks, this harm reduction approach recognizes the status quo also endangers athletes.

Evidence based arguments represent another area requiring improvement according to critics. Several scholars highlight inconsistencies in prohibited substances lacking clear performance benefits or health risks (Heuberger & Cohen, 2019). Heuberger & Cohen (2019) evaluated evidence of enhancement for substances on the WADA's prohibited list:

“Only 5 of 23 substance classes show evidence of having the ability to enhance actual sports performance, i.e. anabolic agents, β 2-agonists, stimulants, glucocorticoids and β -blockers. One additional class, growth hormone, has similar evidence but only in untrained subjects. The observed effects all relate to strength or sprint performance (and accuracy for β -blockers); there are no studies showing positive effects on reliable markers of endurance performance. For 11 classes, no well-designed studies are available, and, for the remaining six classes, there is evidence of an absence of a positive effect. In conclusion, for the majority of substance classes, no convincing evidence for performance enhancement is available, while, for the remaining classes, the evidence is based on a total of only 266 subjects from 11 studies.”

(Heuberger & Cohen, 2019, p.525)

The inclusion of substances like cannabis exemplifies morality-driven decisions versus empirically grounded policy. Greater use of data could enhance proportionality and fairness in anti-doping measures. In effect, prevailing anti-doping approaches may distract from protecting athletes' overall wellbeing. Kirkwood (2004) provocatively argues that branding and public relations motives better explain WADA's activities than athlete-centered aims. Critics suggest redirecting resources to understand cultural values underpinning doping could better serve sports' integrity (Obasa & Borry, 2019).

Discussion

This chapter critically reviewed philosophical literature and policy frameworks concerning performance enhancement technology in sport. The analysis aimed to identify conceptual

limitations in current models regulating doping and biomedical enhancement. These gaps highlighted the need for innovative ethical frameworks grounded in sport philosophy ideals. A historical analysis revealed the reactive evolution of anti-doping policies in response to high-profile incidents, lacking proactive foresight. Definitions shifted from moralized concepts like ‘artificial advantage’ toward legalistic criteria circumscribing specific violations (IOC, 1967; WADA, 2021). This reactionary approach risks misaligning regulations with ethical underpinnings as biotechnology rapidly advances. The philosophical basis rests on contested internalist notions of "*spirit of sport*" and upholding "*natural talent*" (Loland & Hoppeler, 2012; Schneider & Butcher, 1993), relying more on rhetorical appeals versus substantive justification. Naturalistic fallacies conflate nature with inherent value absent supporting arguments (Kaebeck, 2014; Lenk, 2013). Meanwhile, exemptions for therapeutic use require clearer standards that balance treatment and enhancement in ways respecting athletes’ rights and dignity (Gleaves, 2021).

The concept of “*spirit of sport*” lacks coherence, transparency and democratic input (Obasa & Borry, 2019; Waddington et al., 2013). Its justification for banning enhancement technologies remains ambiguous, enabling questionable decisions by regulators (Kornbeck, 2013). Natural talent appeals insufficiently address technology’s role in redefining excellences as cultural constructs, not just preserving nature (Bonte, 2013). Rights-based objections contend that strict prohibition disregards athlete health (Kayser & Broers, 2015) and autonomy (Tamburrini, 2013; Waddington, 2010). While risks of technology misuse are real, critiques argue blanket bans ignore social complexities and deter open dialogue on ethical integration. This conceptual instability leaves Olympic regulators vulnerable when navigating emerging technologies. Lacking clear principles, adhoc decisions prevail.

Technologies propagate cultural values in complex ways that mere prohibition overlooks (Winner, 1980). What endures is the pertinence of fair play, excellence and the cooperative Olympic spirit. But substantiating these in relation to evolving technologies requires updating ethical foundations. Simply relying on “spirit of sport” no longer suffices absent transparency and coherent moral reasoning accessible to diverse stakeholders. Key limitations of WADA anti-doping policies identified in this chapter that can help inform reasoning in the later chapters are:

- Definition of doping has shifted from broad moral concepts like ‘artificial advantage’ to legalistic rules violating specific provisions (IOC, 1967; Ritchie, 2013; WADA, 2021). This reactionary approach risks misalignment with ethical foundations as technology advances.
- Justification grounded in contested internalist notions of “spirit of sport” lacks solid substantive reasoning and relies more on rhetorical appeals (Obasa & Borry, 2019; Waddington et al., 2013).
- Naturalistic fallacies conflate nature with inherent value absent supporting arguments. Appeals to nature require critical examination and should be the primary driver of permissibility evaluation (Lenk, 2013; Bonte, 2013; Kaebnick, 2014; Loland, 2018).
- Concept of “spirit of sport” lacks coherence, transparency and input from diverse stakeholders (i.e. consistency and transparency in its interpretation). Its use as a justification for banning enhancements remains ambiguous (Obasa & Borry, 2019; Waddington et al., 2013).
- Rights-based critiques contend prohibition disregards athlete health, autonomy and proportionality (Kayser & Broers, 2015; Tamburrini, 2013).

- Evidence basis for banned substances warrants re-examination. Many lack proven performance benefits or health risks to athletes (Heuberger & Cohen, 2019).
- Overall, existing frameworks lack proactive foresight and principled justification needed to address complex, context-dependent cases as technology advances. Reliance on rhetorical appeals is insufficient.

Conclusion

This review elucidates conceptual limitations within prevalent regulatory approaches to performance enhancement technology in sports. Probing notions like "spirit of sport" reveals reactionary origins and rhetorical ambiguity in justifying prohibitionist policies (Kornbeck, 2013; Obasa & Borry, 2019). Rights-based critiques underscore how blanket bans infringe upon athlete autonomy and health (Tamburrini, 2013; Waddington, 2010). Re-examining banned substances exposes evidential inconsistencies lacking clear performance or health risk bases (Heuberger & Cohen, 2019). These insights reveal gaps between abstract principles, empirical foundations, and evolving technological realities. From a philosophical perspective, addressing these limitations requires transcending reactionary models reliant on appeals to contested concepts lacking coherent reasoning, that is inaccessible to diverse stakeholders. Beyond rhetorical mystification, substantive dialogue is needed on reconstituting the essence of "fair play" amidst shifting technical capacities. But what exactly constitutes substantive reasoning? I will be reviewing this question in the next chapters.

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Chapter 2

Establishing the theoretical foundation for the Ideal Olympic

Contest

“We promise to take part in these Olympic Games, respecting and abiding by the rules and in the spirit of fair play, inclusion and equality. Together we stand in solidarity and commit ourselves to sport without doping, without cheating, without any form of discrimination. We do this for the honour of our teams, in respect for the Fundamental Principles of Olympism, and to make the world a better place through sport.”

The Olympic Oath

(IOC, 2021a)

Introduction

Chapter 1 critically analyzed the limitations of performance enhancement regulation in sports. This chapter aims at building principled conditions for the ideal Olympic Contest. This conceptual undertaking starts off by making crucial differentiations between "sportsmanship" as pertaining to individual athletes' conduct (Keating, 1964; Arnold, 1983; Feezell, 1986; Sessions, 2004; Abad, 2010; Vallerand et al., 1996) - as opposed to "fair play" as systemic construct involving collaborative responsibilities among multiple actors (Loland, 2002; Butcher & Schneider, 1998; UEFA, 2021). Appreciation of this distinction is central to fully grasping multifaceted issues that are made even more complex due to emerging technologies persisting within the Olympic Games. The need to preserve integrity here goes beyond players' actions and behaviors. This chapter then explores the dual nature of the dynamics embedded in the Olympic Games, representing the fusion of elite sport with philosophical and humanistic goals. Integrating insights from fair play conceptions from the seminal works of Loland (2002) and Butcher and Schnieder (1998), and the Fundamental Principles of Olympism (IOC, 2021b), I plan to present key parameters necessary for

fostering an idealized Olympic contest. These include: 1) non-discrimination and fair equal opportunity; 2) preserving sporting excellence; 3) adherence to safety and harm prevention; 4) meritocracy in advantages distribution; 5) justice in rule enforcement; 6) goal realization facilitating humankind's harmonious development; 7) striving through peak performance; and 8) preserving competitive uncertainty.

Sportsmanship³ and Fair Play - Drawing a distinction

The philosophical ethos underlying sports has been the subject of numerous academic debates, focusing on intricate notions such as 'sportsmanship' and 'fair play.' While 'sportsmanship' and 'fair play' are often used interchangeably (Hummel & Foster, 1986; Session, 2004; Abad, 2010; Serrano-Durá et al., 2021), drawing a distinction can offer the coherence required for a solid conceptual foundation. Scholarship on sportsmanship as an ethical construct reveals multifaceted perspectives on this complex phenomenon. Keating (1964) contends that the concept has been muddled by confusion between sporting pursuits as amusement versus hardcore competition for prizes and victory. He suggests virtues like generosity apply variably depending on recreational or elite athletic objectives. Arnold (1983) analyzes sportsmanship through three lenses: social union, pleasure promotion, and altruism. For Arnold, the ideal entails a concern for others beyond self-interest, though each viewpoint captures unique facets. However, Feezell (1986) challenges firm dichotomization between sports and elite athletics, arguing that individuals often simultaneously embody player and competitor identities. Feezell conceptualizes sportsmanship as balancing serious competition with playful joy, emphasizing the importance of 'play' at all levels. Vallerand et

³ 'Sportsmanship' as used throughout this dissertation is considered gender-neutral, adopted to maintain consistency with pre-existing literature and avoid potential confusion in bridging various conceptions of 'Sportsmanship'.

al. (1996) delineate five sportsmanship dimensions: commitment, respect for rules/officials, social convention adherence, respecting opponents, and avoiding win-at-all-costs attitudes. Sessions (2004), however, focused on honor as a central aspect of sportsmanship, which concerns player behavior during interactions demonstrating mutual admiration and recognition amid competitive environments. Similarly, yet distinctively, Abad's (2010) approach encompasses values oriented towards fairness, equity, good form, and the will-to-win attitude, contextualizing sportsmanship. Sportspersonship as an evolving process of epistemic meditation (Nlandu, 2008). These varying interpretations suggest that no unifying element exists, but rather emphasize unique virtues intrinsically intertwined with individuals (essentially sportspersons) engaging appropriately during sporting events.

In contrast to the conceptions of sportsmanship in the literature, which primarily concentrates on the personal conduct of playing participants, fair play can be argued to encompass broader stakeholders and dimensions beyond mere players. For example, Loland (2002) provides an ethical framework based on play, fairness, and justice norms applicable to addressing player behavior and organizational policies to ensure equal opportunity to perform. These values serve as a basis for rule development respected and accepted by all cooperating parties involved in competition. Moreover, Butcher and Schneider's (1998) conception of fair play rooted in respect for the game showcases shared commitment towards respecting sports as practices that have internal goods that are unique and worth valuing. Other fair play conceptions exist but face critiques. Some like WADA's approach to the 'Spirit of Sport'⁴ may portray fair play as a "*bag of virtues*" (Butcher and Schneider, 1998) - a method that is often criticized for being inconsistent. For instance, while one ethical theory might prioritize

⁴ Check p.11-13 of this thesis for more information on the 'bag of virtues' conceptualization.

virtues like honesty and respect as fundamental to fair play, another might emphasize perseverance and self-discipline. This approach can lead to inconsistencies; a divergent value like 'striving for personal excellence' may clash with 'collective teamwork.' Such a “bag of virtues” methodology becomes problematic as it lacks a standardized framework, leading scholars like Butcher & Schneider (1998) and Sheridan (2003) to critique its lack of cohesion in truly defining fair play. Others emphasize fair play arising from sport's playful nature, but the sport/play distinction proves problematic (Butcher & Schneider, 1998; Sheridan, 2003). A third conception views fair play as an agreement to follow formal rules in contests. However, this overlooks informal norms (Eassom, 1998). A fourth conception fair play as respect for the rules themselves, but this neglects actions not explicitly prohibited yet still unfair (D'Agostino, 1981).

The literature presents varied conceptions of 'fair play' that capture elements of its complexity, yet each offers only a partial view. A multidimensional approach encompassing perspectives from various fields (i.e. philosophy of sport, sociology of sport, etc.) may be necessary. Such an approach would push the boundaries of traditional interpretations, digging deeper into the intricate layers that lie beneath the surface. Nevertheless, while this thesis underscores the importance of recognizing the profound depth of 'fair play,' the primary objective remains to delineate a clear distinction between the concepts of 'sportsmanship' and 'fair play.' Additionally, in this chapter, I seek to draw on the distinction made and amalgamate the prevailing conceptions of 'fair play' that resonate with the philosophy of the Olympic Games. To conceptualize 'fair play' from scratch, on the other hand, would be tantamount to undertaking a separate thesis in its entirety. While acknowledging the potential

profundity of 'fair play' is pivotal, an exhaustive exploration of its vast depths remains a challenge to be met in subsequent research.

The literature exploring the concepts of sportsmanship and fair play raises several concerns that warrant critical examination. Three key points stand out: (1) an emphasis on the moral and motivational aspects of athletes in most conceptions of sportsmanship; (2) a lack of a clear distinction between 'sportsmanship' and 'fair play'; (3) a lack of conceptualizations of fair play that are specific to the Olympic Games. It is evident from various interpretations offered by scholars such as Keating (1964), Arnold (1983), Feezell (1986), Sessions (2004), Abad (2010), and others, that they have focused primarily on athletes' internal states or actions as a determinant factor for sportsmanship. Although these aspects are vital in understanding sportsmanship at the individual level, a clearer conception might arise from integrating these conceptions with other dimensions such as social influences, institutional policies, cultural context, and coaching principles, among others, that also significantly shape an athlete's behavior and sporting outcomes. To elaborate further on this point, consider the issue of doping in sports. Despite athletes being responsible for complying with anti-doping rules by avoiding the use of performance-enhancing drugs, addressing doping adequately requires numerous essential stakeholders' cooperation. These crucial players encompass coaches, team managers, and medical staff members, along with national governing entities coupled with international organizations like the World Anti-Doping Agency (WADA) and the International Olympic Committee (IOC). Successfully battling doping involves each stakeholder upholding certain ethical standards. By broadening the scope of analysis beyond personal motivation and conduct, we can enable a better conceptual understanding of sportsmanship and fair play as concepts and their role within an ethical framework suitable for contemporary challenges.

Fair play a broad concept

In this section, I argue that the key distinction between sportsmanship and fair play, is that fair play transcends individuals' conduct, behavior and motivations to encapsulate a broader array of sporting and ethical norms adhered to by multiple stakeholders. These stakeholders include: players themselves, as well as, policymakers such as NOCs or IOC members engaged in framing related policies or procedures that impact sporting outcomes directly or indirectly. Butcher and Schneider (1998) adopts a similar position in their conceptualization of fair play as 'respect for the game'; respect at the personal level and the level of policy.

*"We can think about the implications of viewing fair play as respect for the game at two levels. At the personal level of the individual athlete, fair play as respect for the game will provide guidelines as he or she considers what ought to be done. At this **personal level**, respect for the game will influence actions on the Field of play, attitudes toward one's opponents, and even one's own level of commitment to the game. Fair play as respect for the game also has implications for actions and decisions at the **level of policy**. Most sports have, in MacIntyre's sense, institutions. These institutions are comprised of sports governing bodies, rule committees, administrative superstructures, and so on. At this level, too, fair play and respect mandate particular decisions that refer to the best interests of the game concerned."*

Butcher and Schneider (1998, p.14)

To better understand how fair play encompasses not only the behavior of individual athletes, and how it also extends to various policies established to uphold conduct by prioritizing the internal interest of the sport at different levels within, I will explore various examples in this section. The International Committee for Fair Play (CIFP) is a non-profit organization founded in 1963 by the International Sports Press Association (AIPS) and the International Council of Sport Science and Physical Education (CIEPSS). Governed by French Law, the CIFP has its headquarters at Maison du Sport Français in Paris. Recognized by the International Olympic Committee and a partner of UNESCO, the organization's primary objective is to protect and promote the spirit of fair play, alongside observing written and

unwritten rules, respecting opponents, combating violence, and preventing doping in both elite sports and sports for all.

“In order to promote the values represented by fair play, the CIFP influences the behaviour, methods and the social and ethical role of:

- *athletes*
- *coaches*
- *sports managers*
- *parents*
- *medical personnel*
- *physical education teachers*
- *sports organisations*
- *referees and judges*
- *the public in general and especially sports fans*
- *the media*
- *partners and sponsors.”*

(CIFP, 2006)

The Financial Fair Play guidelines implemented by the Union of European Football Associations (UEFA) between 2010 and 2022, served to restrict excessive spending and endorse long-term financial security in European club football (UEFA, 2020). In this instance, fair play includes specific actions taken by clubs. The current (as of 2023) UEFA Statutes - Article 7 relating to member associations, adopts a broad conception of fair play that precedes “*loyalty, integrity and sportsmanship*” in the conceptual hierarchy.

*“Article 7 - Fair Play, Statutes, Laws of the Game: **Member Associations** shall have the following obligations: a) to observe the principles of loyalty, integrity and sportsmanship in **accordance** with the principles of fair play....”*

(UEFA Statutes 2021).

“in accordance with a rule, law, wish , is, following or obeying a rule, law, wish, etc.”
(Cambridge Dictionary, 2023)

UEFA defines Fair play as:

“‘Fair play’ means acting according to ethical principles which, in particular, oppose the concept of sporting success at any price, promote integrity and equal opportunities for all competitors, and emphasize respect of the personality and worth of everyone involved in a sporting event.”

(UEFA, 2021)

UEFA insightfully frames fair play as a vital ethical principle fostering integrity, equity and respect amid relentless competitive intensity (UEFA, 2021). Though imperfect, their broad conceptualization valuably conveys fair play's normative influence and utility as a systemic construct necessitating collective ethical adherence, beyond just individual virtues.

Conceptualization of Fair Play and Sportsmanship in UEFA Statues

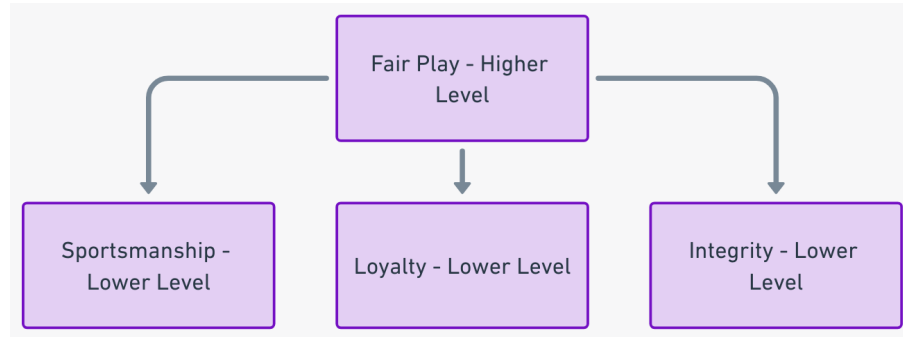


Figure 2.1: Shows the conceptual hierarchy with Fair Play being at a higher and broader level and sportsmanship at a lower level of the Hierarchy

Distinguishing sportsmanship and fair play necessitates examining cases where ethical decision-making involves collective, not just individual responsibilities. As mentioned in the earlier example, effectively combating doping requires close cooperation between diverse entities - coaches, medical staff, governing bodies, and others. - not just athletes personally abstaining. While individuals choosing not to dope demonstrates personal sportsmanship, collaborative prevention efforts embody systemic fair play. This example reveals how sportsmanship centers the player, whereas fair play encompasses multifaceted networks upholding competition integrity. Intriguingly, Butcher and Schneider (1998) identified other potential uses of the term 'sportsmanship'; in manifestations beyond competitive events, like graciously sharing job information with rivals. Another case is jeopardizing personal victory to demonstrate general moral obligations, as a Canadian Olympian yachtsman rescuing a drowning opponent. Those examples might highlight the complexity of 'sportsmanship' as a

concept, yet it continues to demonstrate that sportsmanship relates more to individuals' actions and behavior.

Analyzing these examples allows us to comprehend that both sportsmanship and fair play are essential components within modern competitive sport's ethical fabric. However, where sportsmanship is primarily concerned with personal virtues exemplified by individual players' actions (e.g., respecting others or playing cleanly), fair play necessitates broader networks; coaches instilling codes of conduct on their teams; referees ensuring equitable contests; event organizers upholding essential equipment's universal accessibility, all working in tandem toward facilitating and maintaining ethical sport. From this perspective, fair play encompasses not only athletes' actions but also policy decisions made by sporting institutions that promote the sport's internal goods⁵, like equal opportunity and competitiveness among all participants (Loland and Hopler, 2012). Given the strong influence of various stakeholders involved in Olympic events, it's essential for researchers to understand the differences between sportsmanship residing in individual-based virtues and the broader regulatory systems of fair play. This understanding is crucial for developing models that outline theoretical frameworks for future advancements that affect a wide range of participants.

It is important to note that I don't intend to draw my own conceptualization of either 'sportsmanship' or 'Fair Play', my goal here is only to highlight differences that are enough to make a clear distinction. This distinction can be easily adopted by existing conceptualizations of both concepts to increase their utility in the real world. Separating

⁵ Please refer to page 11 for an in-depth explanation of internalism.

concepts of sportsmanship and fair play acknowledges nuanced layers involved in the multi-stakeholder realm of sport, particularly regarding challenges, such as, technology regulation at the Olympic Games. Sportsmanship, as primarily concerned with athletes' personal conduct and virtues, is essential, but inadequate when analyzing complex multi-layered issues precipitated by emerging technologies. Fair play, by contrast, considers broader circles and stakeholders: athletes, officials, policymakers, institutions, and assorted influencers shaping conditions impacting the interest of the practice.

Table 2.1: Examples of actions that impact Fair Play in a multi-denominational system

Stakeholders	Actions positively impacting fair play	Actions negatively impacting fair play
Athletes	Displaying respect for opponents and accepting the outcome gracefully.	Using performance-enhancing drugs to gain unfair advantage (e.g., the Russian state-sponsored doping scandal during Sochi 2014 Winter Olympics)
Coaches	A coach demonstrates respect for the rules and spirit of the game by acknowledging a misjudgment that goes in their favor and requesting a correction (e.g., accepting a penalty)	Encouraging athletes to find loopholes or exploit rules for advantage (e.g., Badminton coaches instructing players to lose intentionally to gain favorable draws in London 2012)
Sports Clubs	Instituting robust anti-doping programs and ethical training (e.g., UK Athletics' Clean Athletics program)	Failure to uphold standards of integrity, resulting in institutionalized cheating (e.g., systemic doping in Russian Athletics Federation)
Referees	Enforcing rules impartially and consistently (e.g., the handling of false start rule in Athletics in 2012 Olympics)	Inconsistent or biased adjudications, undermining trust in fairness (e.g., the boxing judges controversy in Rio 2016)
IOC/NOCs/IFs /NSFs	Implementing rigorous testing and strict penalties for doping (e.g., IOC's retesting policy)	Neglecting duty to ensure fair and clean competition (e.g., inaction or cover-ups in the face of doping evidence)

Event Organizers	Ensuring equal conditions and accessibility for all competitors (e.g., Tokyo 2020's measures for heat and accessibility)	Failing to maintain standard conditions for all competitors (e.g., variable wind conditions affecting results in ski jumping at Pyeongchang 2018)
Venue Managers	Ensuring venues are equipped for equal opportunity (e.g., Tokyo 2020's measures for heat)	Failing to maintain standard conditions across all venues (e.g., uneven track surface at Rio 2016 velodrome)
Sports Scientists	Developing techniques and tools that enhance performance without breaching fairness (e.g., sports psychologists' work on athlete's mental resilience)	Researching and promoting performance-enhancing substances (e.g., BALCO (Bay Area Laboratory Co-operative) scandal in 2003).
Inventors	Innovating sports equipment that enhances fair competition (e.g., improvements in timing equipment)	Creating equipment providing undue advantage to some athletes (e.g., Speedo's LZR Racer suit controversy in swimming)
Media	Highlighting examples of fair play and sportsmanship (e.g., media praise for Abbey D'Agostino and Nikki Hamblin's actions in Rio 2016)	Undue focus on winning at all costs, without due regard for fair play (e.g., media hype and pressure on athletes to win by any means necessary)
Fans	Applauding sportsmanship over mere victory (e.g., fans' respect for athletes showing sportsmanship in Tokyo 2020)	Encouraging or celebrating unsportsmanlike behavior (e.g., fans condoning aggressive or unfair behavior for the sake of victory)

The Dual Nature of the Olympic Games: A Nexus between Sporting Contest and Olympism

The Olympic Games occupy a unique position in the realm of sporting events, serving as both a competitive contest and an embodiment of a broader philosophy-Olympism (Scheinder and Hellal, 2022; Schnieder and Butcher, 1993). Drawing upon the Fundamental Principles of Olympism, provided by the International Olympic Committee (IOC), I can analyze how these two aspects are intertwined and shape the very essence of this exceptional event. Olympism, as stated in the Olympic Charter, is defined as "*a philosophy of life,*

exalting and combining in a balanced whole the qualities of body, will and mind" that seeks to create "a way of life based on [...] social responsibility and respect for universal fundamental ethical principles" (IOC, 2021b). In contrast to other significant championships like World Championships, which primarily focus on athletic competition itself, the Olympic Games endeavor to transcend conventional sports events' confines by embracing deeper values associated with human development and global harmony.

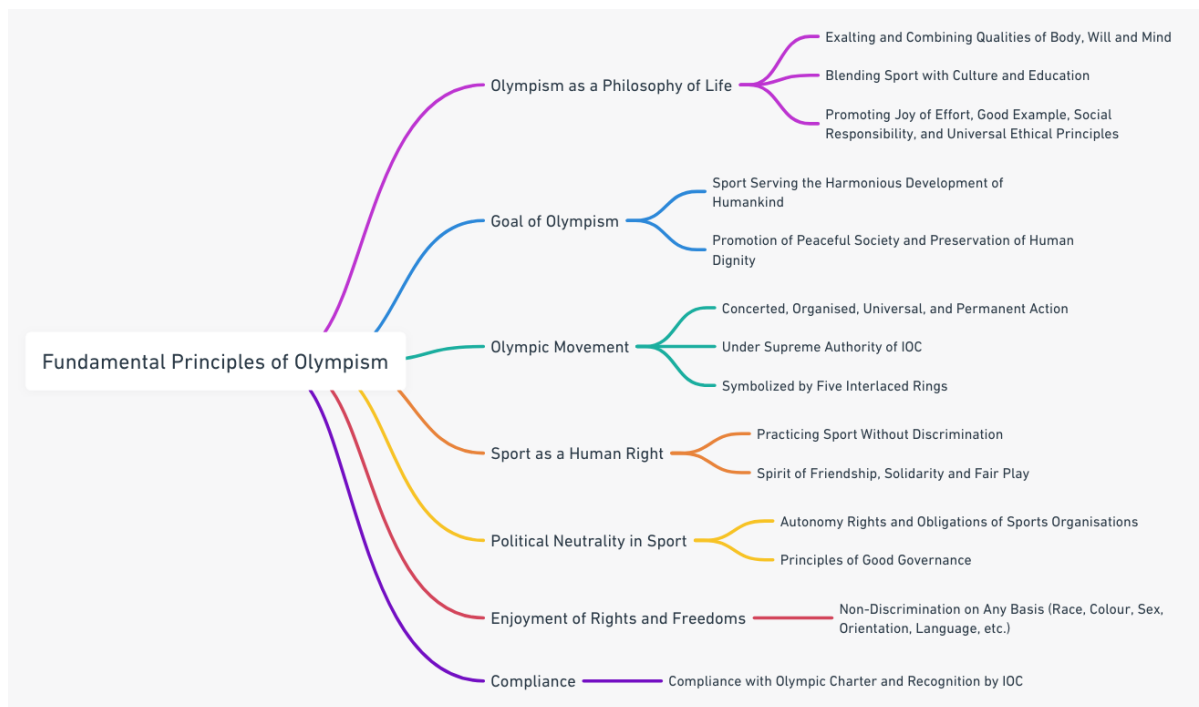


Figure 2.2: A summary of the seven Fundamental Principles of the Olympism in the July, 2021 version of the Olympic Charter

The Olympic Games have a duality, acting as both a sports competition and a worldwide celebration of fundamental human values embraced by the philosophy of Olympism. It may initially appear contradictory to some that an event primarily centered around winning medals could uphold its ideals, like peace, unity and equal opportunities for all. However, this argument doesn't consider the ways in which sport competition itself becomes a platform for expressing the core values and principles of Olympism (Parry, 1998). For example, when

participants compete at or near their best during Olympic competition - demonstrating intense dedication towards achieving optimal results, they simultaneously enact a deeply-rooted commitment to upholding Olympism's social values. Moreover the structure of the Olympic Games allows for the promotion of both sports interests and Olympism through policies, such as, ensuring non discriminatory contests (as stated in Fundamental Principle 4 of the Olympic Charter) and demanding political neutrality from participating organizations (as stated in Fundamental Principle 5 of the Olympic Charter). Embracing these principles enhances the Olympic Movement belief in harmony and fairness in sports governance. The Olympic Games hold a position as both a sporting contest and a representation of Olympism, which strengthens its moral foundation and sets it apart from other major championships. As a result, this exceptional event not only showcases physical abilities, but also exemplifies profound ethical commitments that captivate athletes and audiences alike, an accomplishment to which few other sporting events can lay claim.

However, some critics argue that the actual realization of the ideals embodied in the philosophy of Olympism falls short at times (Loland, 1995). The lived reality of the Games might reveal tensions and contradictions between competition and Olympism that cannot be easily resolved. The Olympic Games is driven more by factors rather than the actual embodiment of Olympism (MacAloon, 2011). Loland (1995) argues that knowledge about the origins of Olympism offers insights into why the Olympics continue to captivate people even though they may not perfectly align with its ideals in reality. As he explains,

"In a modern society characterized by secularization and rationalization, by die Entzauberung der Welt, to use Weber's description of the process, the Olympic Movement represents an alternative. Every Olympic year, it offers to a world wide audience strong and deep experiences in a setting of rituals and ceremonies in which

human possibility and freedom, at least in a symbolic form, is celebrated and cherished"

(Loland, 1995, p. 68).

While one might criticize the Olympic Games for not fully embodying the ideals of Olympism, it is important to recognize and pursue the philosophical values that this movement represents (DaCosta, 2006). Despite the challenges posed by competition and commercialization the vision of celebrating excellence and fostering harmony through sports remains significant (Naul, 2008). While Olympism may have shortcomings, we should rededicate ourselves to saturating the Games with its core doctrine fostering fair play. The grandeur of the Opening Ceremonies, the inspiring performances by athletes from all nations, and the shared experience of spectators worldwide, serve as reminders of the enduring importance of the Olympic Games. When instances of discrimination or questionable ethics arise they should compel us to reaffirm our commitment rather than abandoning the potential offered by the Olympic Movement. In short, Olympism matters deeply, especially when forgotten; its duality with competition is inherently generative, as overcoming contradiction drives progress. Our task is thus not to surrender Olympism but to strengthen it, approaching each Games as an opportunity to enact its values more fully.

Table 2.2: Summary of the distinctions made so far

Concepts	Sportsmanship	Fair Play	Olympic Games
Distinctions	Focuses on player behavior and personal virtues during sporting events. Varies in interpretation - including honor, pleasure maximization, respect for others, the will-to-win attitude, and commitment to one's sport participation (Keating, 1964; Arnold, 1983; Feezell, 1986; Sessions, 2004; Abad, 2010; Vallerand et al., 1996).	Encompasses ethical norms adhered to by multiple stakeholders (e.g., officials, institutions, policymakers). Applies to both individual conduct and broader policies and practices in the sports industry, including but not limited to promoting integrity, equal opportunities, and respect (Loland, 2002; Butcher & Schneider, 1998; UEFA, 2021).	Unique dual nature that combines sporting contests with a broader philosophy-Olympism. Promotes both sport interests and deep ethical commitments (IOC, 2021b).

Fair Play as internal to the Olympic Games: Navigating the Dual Sport-Philosophical Dimensions of Olympism

Conceptualizing fair play within the Olympic context requires a nuanced examination of Olympism's unique dual nature. As delineated in the Fundamental Principles of Olympism (IOC, 2021b), Olympism transcends mere sporting contests. This facet is crucial to comprehending what constitutes fair play at the Olympics, as a practice with a defined philosophy that is worth a conceptualization of fair play that is 'internal' to the practice itself (Butcher and Schneider, 1998; Scheider and Hellal 2022). The dual nature of the Olympic Games becomes clearer in reference to key passages from the Olympic Charter (IOC, 2021b), which defines Olympism as a "*philosophy of life, exalting and combining in a balanced whole the qualities of body, will and mind.*" This tenet signals that Olympism extends beyond sporting contests themselves by seeking to instill specific universal ethical principles across diverse realms such as culture, education, social responsibility, and respect for human dignity.

"The practice of sport is a human right. Every individual must have the possibility of practising sport].....] requires mutual understanding with [.....] fair play."

(IOC, 2021b - Fundamental Principle 4)

Grasping fair play in relation to Olympism requires an analytical approach that is attuned to such ambitions within this domain, rather than focusing exclusively on athletic prowess or rule adherence. The MacIntyrean perspective offered by Schneider and Butcher (1993) and Butcher and Schneider (1998) is very invaluable when navigating arguments pertaining to fair play and its significance for both sporting aspects as well as underlying philosophical commitments entrenched within Olympism. Butcher and Schneider (1998) examine the nature of sports as Suitian (1977) games as autotelic activities that are performed for their own sake and defined by their 'constitutive rules'; Kretchmarian (1975) contests which emphasize the competitive aspect of sports; and MacIntyrean (1981) practices focusing on the pursuit of internal goods within a specific activity. They argue that understanding sports through this framework enables a more nuanced interpretation of fair play as "*respect for the game*". This lens offers a unique conceptualization of fair play in the Olympic Games.

Kretchmar's theory differentiates sports into tests and contests (Kretchmar, 1975). Tests are characterized by a binary outcome, whereas contests involve a spectrum of success gauged against other competitors. A balance between vulnerability and impregnability is maintained in tests, ensuring fairness and unpredictability. Contests, on the other hand, focus more on outperforming others and require continuous adjustment in response to the rivals' performance, which adds a layer of strategic intricacy (Kretchmar, 1975). Applying Kretchmar's (1975) perspective on sports as contests in an Olympic context reveals that competition is not only significant for determining excellence in athletic performance but also necessitates maintaining fairness beyond contest rules. Given the pursuit of relative superiority in contests, competitors must agree on common grounds for conducting their

respective games. This shared understanding emphasizes the a shared interest in fairness required among athletes and serves as a vital foundation for advocating fair play during these strategically intricate and comparative contests where victory margins may be slim but significant (Kretchmar, 1975).

Simultaneously, Butcher and Schneider (1998) acknowledge MacIntyre's concept of practices to further enrich our understanding of sporting contests. A practice that has interests worth pursuing, aligning the internal motivation of the athlete with the internal goods of the sport will lead to personal growth or mastery through actively participating in a specific activity. This participation often involves adherence to established standards while still remaining open to change within historical traditions. In taking up both the competitive focus of Kretchmarian contests and the pursuit for inner fulfillment of MacIntyrean practices, Butcher and Schneider (1998) ultimately suggest an innovative interpretation of fair play grounded in respect for one's chosen endeavor.

“There are two commonly used and rather similar senses of respect. In the first, weaker sense, one can respect merely by observing or following. In this sense, We respect the rules of the road by adhering to the speed limit, stopping at stop signs, and so on. The second sense of respect is stronger and carries connotations of honoring, holding in regard, esteeming, or valuing. It is this second sense of respect that is operative in moral discussions of respect for autonomy, or equal respect for persons. Here, the idea is that one should, from a moral point of view, value the interests, rights, preferences, and so on, of others as one values one's own. In the context of sport, it is easy to run the two senses together.”

(Butcher and Schneider, 1998, p.9)

One significant implication drawn from this conception is that respect for one's sport entails adopting its interests, an idea particularly relevant when examining ethics within Olympism. For instance, athletes, coaches, and officials partaking in a specific event must adhere to

ethical principles associated with fair play based on both contest rules and an evolving ethos embedded in MacIntyrean practices. Consequently, such adoption creates a motivation for all parties to strive for excellence while maintaining fairness within the framework of Olympic competition.

“A practice involves standards of excellence and obedience to rules as well as the achievement of goods. To enter into a practice is to accept the authority of those standards and the inadequacy of my own performance as judged by them. It is to subject my own attitudes, choices, preferences and tastes to the standards which currently partially define the practice.”

(MacIntyre, 1981, p.190)

Schneider and Hellal's (2022) study takes Butcher and Schneider's foundation further by presenting an argument pinpointing fair play at the Olympic Games, integral to its sporting aspects as well as philosophical themes - as respect for these Olympics themselves. Upholding this notion involves maintaining rules and values pertinent to each sport while concurrently committing to Olympism's wider philosophy of life. Drawing upon the concept of transformation of interest (Butcher and Schneider, 1998) and on principles like inclusivity within each sport practice, illustrates how accepting responsibilities connected with the Olympic Charter signals transformative acts, whereby involved parties, implicitly or explicitly, consent towards upholding its core principles. These stakeholders' collective agreement demonstrates their willingness in prioritizing both components - sporting prowess alongside Olympism's core philosophy throughout all dimensions of their work during these games, or as Olympism aims, a 'life philosophy'.

“Belonging to the Olympic Movement requires compliance with the Olympic Charter”

(IOC, 2021b - Fundamental Principle 7)

“We promise to take part in these Olympic Games, respecting and abiding by the rules and in the spirit of fair play, inclusion and equality. Together we stand in

solidarity and commit ourselves to sport without doping, without cheating, without any form of discrimination. We do this for the honour of our teams, in respect for the Fundamental Principles of Olympism, and to make the world a better place through sport."

(The Olympic Oath - IOC, 2021a)

In the general context of sport, Butcher's and Schneider's (1998) position of Fair play as respect for the game, has been criticized in the literature. Sessions (2004) writes:

"Many speak of sportsmanship as "respect for the game," a devotion or commitment to a sport that transcends particular triumphs and failures. Doubtless most competitors do love the competition independently of the winning (or love the winning in large part because of the competition), but it is not clear how this love extends to "the game" itself. It is even murkier why this love should extend beyond the player's playing lifetime: Why should a competitor care about some abstraction-a constellation of rules of play and principles of fair play-or some future instances of that abstraction that he or she will not participate in or even be around to enjoy?"

(p.49)

This critique doesn't stand on much ground in the Olympic context. My interpretation posits that accepting the Olympic Charter represents a transformation of interest, where all parties involved, whether through employment or volunteerism (e.g., International Olympic Committee members and employees), signing onto specific agreements or the Charter itself (e.g. International and National Sporting Organizations), or participating in the Olympics and swearing an oath (e.g. athletes) - implicitly, or explicitly, consent to uphold its principles. By doing so, all parties collectively agree to prioritize both components - the sporting contest and Olympism. I can go further and argue that this specific distinction is what defines an Olympian, a title that is retained for life. This raises an intriguing question for future research and ethical considerations: Should the title of 'Olympian' be revoked if an individual later violates the philosophy of Olympism, whether through committing a crime, doping, or any other actions contrary to its principles? If the essence of being an Olympian is intrinsically tied to upholding these values, then does straying from them in the future undermine that very essence? While these questions merit further exploration, given the confines of this

research, I shall limit my discussion to recognizing the distinct nature of the Olympic dynamic.

To comprehend fair play in the context of the Olympic sports, it is necessary to acknowledge the interplay in between ‘sporting contests’ and ‘cultural-philosophical’ facets targeted at promoting global ethical concepts. Making use of the intellectual groundwork offered by Butcher and Schneider (1998) along with Schneider and Hellal (2022), respect for the Olympic Games includes attending to these two vital dimensions concurrently. This concurrent attainment requires adherence to rules and values within each sporting activity, while also remaining dedicated to supporting the ‘Olympism’ part among all participants throughout their participation in particular games. For example, the historical reunion of North and South Korea's women's hockey teams at the 2018 Winter Olympics, held jointly under a united flag for the first time in Olympic history. While contentious political issues surrounded this event, players demonstrated solidarity and shared ambition respecting the internal values of the games, an embodiment of the Olympic version of fair play and the fundamental principles of Olympism, that reconciles competition with global unity and inclusivity. This rich interplay showcases the unique capacity of Olympism for encouraging respect that is derived from participants' equal commitment to upholding internal values entrenched in the Olympic Games, while competing at the highest level in their sport. The unification of the North and South Korean hockey teams provides a tangible example of how the Olympic Games can transcend political divides through athletes' shared commitment to the ideals of Olympism. Despite ongoing tensions between their nations, the players came together under a united flag in a powerful display of harmony. Their solidarity and mutual

respect, even as competitors, embodied Olympism (i.e. the sociocultural facet of fair play) that prizes inclusivity and global connection alongside athletic excellence.

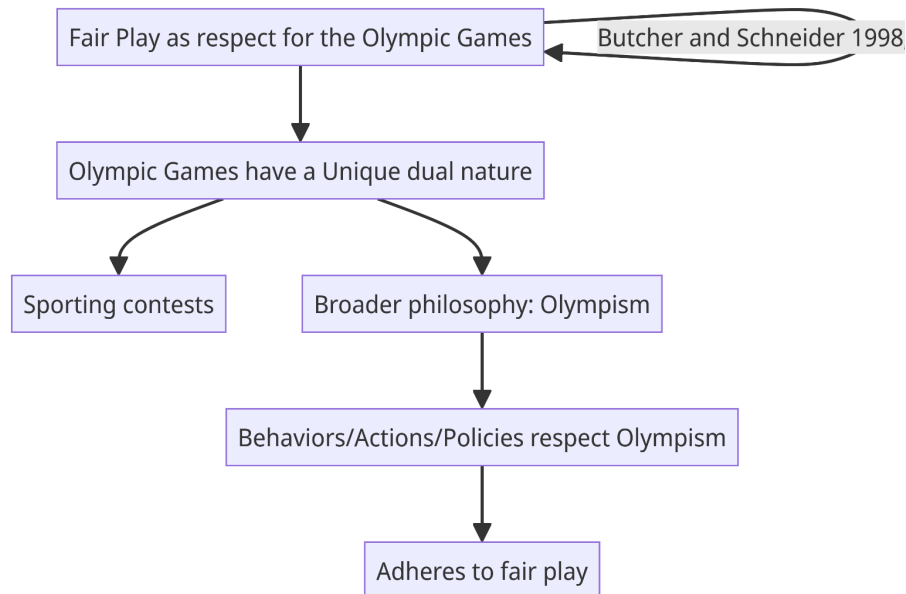


Figure 2.3 The diagram illustrates the interrelation between respect for the game and the core elements of the Olympic Games. While this diagram emphasizes the 'Olympism' aspect (and its fundamental principles). The 'contest' component will be delved into in the subsequent section.

Fair Play as a moral norm system for the Olympics

Loland's scholarship sets the standard for understanding and assessing fairness and fair play in sports, having developed the most rigorous ethical model to date (Loland, 2002, 2020; Loland & Hoppeler, 2012). In this analysis, I will draw on the extensive work of Sigmund Loland (2002) and Loland & Hoppeler, (2012). Loland (2002) constructs a moral norm system for fair play that encompasses two main norms: fairness and play. The fairness norm advocates adherence to a shared ethos when participating in sports competitions, ensuring equal opportunities for competitors and abiding by rules set out for just competitions. On the other hand, the play norm emphasizes maximizing intentional goal-realization among participants while conforming to the shared ethos. This delicate equilibrium between fairness

and play, and between predictability and unpredictability, manifests what Loland (2002) (after Warren Fraleigh) famously called "*the sweet tension of uncertainty of outcome*," an experiential value characteristic of good sport competition.

A Justified Fairness norm:

"Parties voluntarily engaged in sport competitions ought to act in accordance with the shared ethos of the competitions, if this ethos is just, that is, if:

- *The competitors are given equal opportunity to perform by eliminating or compensating for significant inequalities that the competitors cannot influence in any significant way and for which they cannot be held responsible;*
- *Athletic performance is interpreted as based on talent and individual effort, and performances adhere to a basic norm of not exposing others or oneself to unnecessary harm;*
- *Unequal treatment in the distribution of advantage is in reasonable accordance with actual inequality in athletic performance, and unequal treatment in terms of eliminating or compensating for advantage gained through rule violations is in reasonable accordance with the actual inequality that has arisen due to the violation."*

(Loland, 2002, p.105)

A Justified Play norm:

"2 Parties voluntarily engaged in sport competitions ought to act so that all parties concerned have their intentional goals linked to the competition realized to the greatest possible extent by:

- *realizing a norm for competitors playing (according to a shared, just ethos) to win to the greatest possible extent;*
- *realizing a matching of competitors of similar preference strength and of similar performance potential to the greatest possible extent."*

(Loland, 2002, p.144)

One key concept in Loland's work is the principle of Fair Equality of Opportunity (FEOP), which elaborates on earlier ideas related to formal equality and justice as fairness (Loland & Hoppeler, 2012). It makes a strong argument emphasizing that individuals must not be treated unequally based on factors beyond their control. This principle aligns with Kantian ethics, which consider human dignity and respect essential values, besides being congruent with neo-Aristotelian theories emphasizing virtue development through overcoming

challenges morally guided by fairness norms. Loland (2002) suggests that there's a link between fair play in sports and human flourishing, or eudaimonia, in line with Aristotle's proposal (1976). When sport strikes a balance between agonistic elements (equal opportunities to perform) and aleatory factors (chance moments), it creates an exhilarating yet nurturing space for individual growth (Loland, 2002). Putting emphasis on just competition, as well as respect for opponents, within an environment based on merit, cultivates human flourishing that aligns with the Olympic values. Loland's moral norm system recognizes how critical having a 'shared and just ethos' is. This shared and just ethos can be extended to the collective efforts of various stakeholders and policy makers, and it aligns well with the broad conceptualization of Fair Play discussed earlier in the chapter.

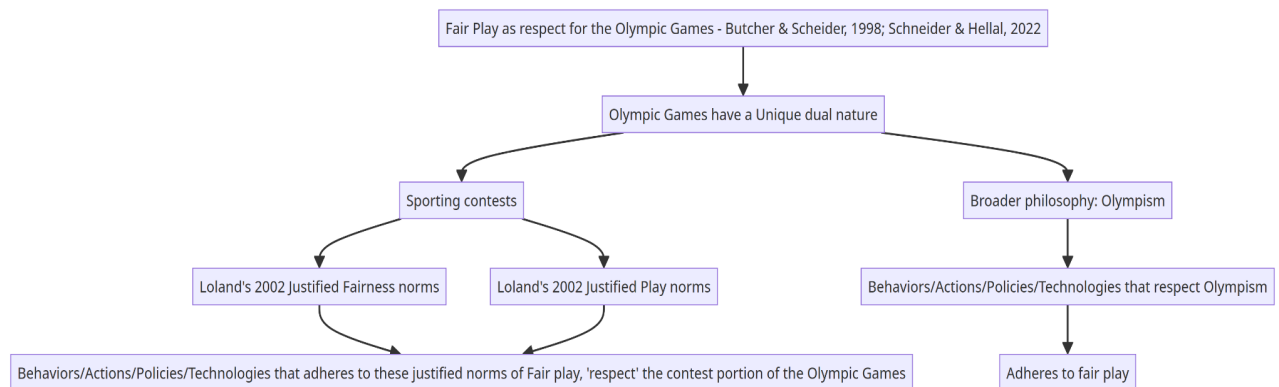


Figure 2.4: The chart illustrates the concept of "Fair Play" in the context of the Olympic Games. It emphasizes the dual nature of the Olympics, encompassing both sporting contests and a broader philosophy of Olympism. The sporting aspect is effectively conceptualized by Loland's 2002 norms of fairness and play. Adherence to these norms and Olympism ensures respect for fair play, with behaviors, actions, policies, and technologies playing a pivotal role.

Table 2.3: Summary of discussed Fair Play conceptions

Conceptualization	Butcher and Schneider (1998); Schneider and Hellal (2022)	Loland (2002)

Definition of fair play	Fair play is seen as "respect for the game" - following the rules and values of sports as MacIntyrean practices.	Fair play involves adhering to shared just norms of fairness and play in sports competitions.
Theoretical foundation	Interpretive approach drawing on understandings of contests, games, practices, and transforming interests within practices.	Combines consequentialist and non-consequentialist moral philosophy using principles of equality, justice, internal interests and fairness.
Role of the Olympics	Fair play means respecting the sporting practice and broader Olympism commitments.	Olympics are high-stakes competitions requiring adherence to Loland's moral norms.
Possible Criticisms	Abstract notion of respecting a transcendent "game" beyond wins and losses.	Complex, abstract norms may not apply well in real sports contexts.
Implications	Enriches views of sports and Olympism by prioritizing sport's interests.	Shapes how we see sports/competitions and how stakeholders should act regarding them.

Establishing the Groundwork for Ideal Olympic Contest

In the quest to better understand, and indeed shape, the ideal conditions of an Olympic contest, this section embarks on a triadic endeavor. It draws from Loland's (2002) normative framework for fair play; Butcher and Schneider's (1998) interpretive approach that extrapolates from the idea of transformation of interest within MacIntyrean practices; and the adoption of the principles that underpin Olympism. While Loland's mixed approach, emphasizing fairness norms intertwined with play norms, stands seemingly disparate against Butcher and Schneider's (1998) MacIntyrean perspective inclined towards respect for the game - there exists convergence in understanding what constitutes 'ideal' sporting behavior within their differentiated methodologies. It is important to acknowledge that the attempt to integrate various perspectives into a coherent set of conditions for the ideal Olympic contest that are embedded with fair play is ambitious at best. It risks oversimplifying nuances in each viewpoint. The synthesis may gloss over tensions between different theories. For this reason,

one must endeavor a comparative analysis of the different norms and conditions presented by the different perspectives.

Table 2.4: A comparative analysis of the viewpoints on the ideal Sporting contest.

Loland's (2002) Justified Fair Play Moral Norms	Butcher's and Schneider's (1998) Necessary Conditions for Fair Play	Fundamental Principles of Olympism
"Parties voluntarily engaged in sport competitions ought to act in accordance with the shared ethos of the competitions, if this ethos is just." (Loland, 2002, p.105)	"The match must be fairly contested, that is, played within the rules of the game" (Butcher and Schneider, 1998, p.15)	"Sport as a Human Right" - "Practicing Sport Without Discrimination" - "Spirit of Friendship, Solidarity and Fair Play"
"Competitors are given equal opportunity to perform by eliminating or compensating for significant inequalities that the competitors cannot influence in any significant way and for which they cannot be held responsible." (Loland, 2002, p.105)	"The contestants should be evenly matched. The ideal contest requires that the contestants be at comparable levels of skill and fitness." (Butcher and Schneider, 1998, p.15)	"Enjoyment of Rights and Freedoms" - "Non-Discrimination on Any Basis (Race, Colour, Sex, Orientation, Language, etc.)"
"Athletic performance is interpreted as based on talent and individual effort, and performances adhere to a basic norm of not exposing others or oneself to unnecessary harm." (Loland, 2002, p.105)	"The outcome of the contest should be determined by sporting skill or ability, not extraneous factors such as egregious luck or errors in officiating. Conditions of play, such as weather, may create additional obstacles but must not be so severe as to undermine the exhibition of skill." (Butcher and Schneider, 1998, p.15)	"Philosophy of Life" - "Balancing Body, Will and Mind"
"Unequal treatment in the distribution of advantage is in reasonable accordance with actual inequality in athletic performance." (Loland, 2002, p.105)	-	-

"Unequal treatment in terms of eliminating or compensating for advantage gained through rule violations is in reasonable accordance with the actual inequality that has arisen due to the violation." (Loland, 2002, p.105)	-	-
"Parties voluntarily engaged in sport competitions ought to act so that all parties concerned have their intentional goals linked to the competition realized to the greatest possible extent." (Loland, 2002, p.144)	Parties involved should align their interest with those of the sporting practice. (Butcher and Schneider, 1998)	"Goal" - "Sport Serving the Harmonious Development of Humankind" - "Promotion of Peaceful Society and Preservation of Human Dignity"
"Realizing a matching of competitors of similar preference strength and of similar performance potential to the greatest possible extent." (Loland, 2002, p.144)	"For an ideal match, the contestants must have a high degree of skill. Good contests can, however, take place between evenly matched opponents at any level of skill. The contestants should be evenly matched. The ideal contest requires that the contestants be at comparable levels of skill and fitness." (Butcher and Schneider, 1998, p.15)	-
"Players must play to win." (Loland, 2002 p.148)	"The contestants should play at or near their best." (Butcher and Schneider, 1998, p.15)	"Philosophy of Life" - "Promotes Joy of Effort, Good Example, Social Responsibility, and Universal Ethical Principles"
"The sweet tension of uncertainty of outcome" (Loland, 2002, p.148)	"The outcome of the contest should be in doubt until the end. (This should be guaranteed by having evenly matched contestants playing at their best.)" (Butcher and Schneider, 1998, p.15)	-

Discussing the comparative analysis:

Analyzing Loland's justified fair play moral norms (2002), Butcher and Schneider's (1998) necessary conditions for the Ideal Contest and the Fundamental Principles of Olympism, give us a deep understanding of the conditions for the Ideal Olympic Contest. This comparison reveals common ideas, varied views, and evolving interactions, that together, outline what makes an ideal Olympic contest. One striking similarity among these philosophies is their shared focus on equality and fairness. All three agree that sport contests should be based on equal chances, but reward athletes differently based on merit - essentially by skills, talent or effort they bring to the game, rather than factors beyond players' control.

"Athletic performance is interpreted as based on talent and individual effort, and performances adhere to a basic norm of not exposing others or oneself to unnecessary harm."

(Loland, 2002, p.105)

"The outcome of the contest should be determined by sporting skill or ability, not extraneous factors such as egregious luck or errors in officiating. Conditions of play, such as weather, may create additional obstacles but must not be so severe as to undermine the exhibition of skill."

(Butcher and Schneider, 1998, p.15)

"Philosophy of Life" - "Balancing Body, Will and Mind"

(IOC, 2021b)

Most sports are designed to give competitors equal opportunities, while rewarding the superior skill, effort and strategy of the victor. For instance, in a 100-meter sprint, all runners start side-by-side, facing the same distance to the finish line. Yet the fastest sprinter demonstrates the most honed abilities and conditioning to earn the gold medal. Similarly, during a tennis match, both players take turns serving and returning, but the player with better skill and stamina wins more points and ultimately prevails. In soccer, each team fields

the same number of players on a regulation-size pitch, yet the squad that passes, dribbles and shoots more adeptly will score more goals and seize the win. So while the format of the contest is equitable, the triumphant athlete or team rightfully reaps greater rewards for excelling thanks to merit. Another facet that all three approaches agree on, is fairness. The essence of sports lies in voluntary participation, grounded in community values and the shared ethos of competitions, as long as it is just (Loland, 2002, p.105). Competitions must adhere to the rules, ensuring fairness (Butcher and Schneider, 1998, p.15). The Olympic spirit embodies principles like practicing sports without discrimination, emphasizing friendship, solidarity, and fair play (IOC, 2021b).

There are however differences evident in their specific orientations towards justice and fairness. Whilst Loland (2002) highlights the Fair Equality of Opportunity Principle and the unequal treatment proportionate to the impact of rule violation-induced inequalities as part of sporting justice, neither Butcher & Schneider (1998) nor the fundamental principle of Olympism explicitly touch upon this aspect. Similarly, Loland (2002) emphasizes individual intentional goals being realized within competition which augments his philosophical stance towards individualism within collective settings - something less explicit or absent in other examined contexts.⁶ The intersection of the examined ethical positions cultivate conditions conducive for optimal Olympic contests - ones fostering physical excellence paired equitably with moral integrity. For instance, Butcher & Schneider's emphasis on evenly matched contestants playing at their best underpins an unwritten creed of striving ceaselessly for personal betterment - a sentiment synonymous with Loland's push towards realizing athletes'

⁶ Butcher and Schneider (1998) evaluated internal and external motivation in their paper. Yet, they didn't integrate these discussions into their necessary conditions for fair play. The theory relies on the 'transformation of interest' within the practice, i.e., prioritizing the interest of the practice over motivations.

intentional goals whilst also resonating with the promotion of joy derived from effort invested, which is a goal of the Olympic Games.

Another example embarks on perceived fairness induced via balance between competitions executed in safe, yet purposeful settings, exploiting sporting talent without the risk of undue harm, while rendering violations accountable via appropriate sanctions. A tenet central to Loland's norms, whilst indirectly echoing Butcher's and Scheidner's idea around skill-based outcomes unaffected by extraneous influences, and the focus on peaceful harmony safeguarding human dignity as demanded by Olympism. A synthesis of these established moral philosophies of sport indicates that certain shared principles can create optimal conditions for Olympic contests. The interplay between equality of opportunity and merit-based recognition surfaced in these doctrines, typifies idealized Olympic Games. Here, cutting edge competitive endeavors, presented in a spirit of virtue, allow extraordinary triumphs over human limitations. Such events celebrate sporting excellence while advancing the common good. Moreover, they aim to foster peace and enact societal well-being. In this way, the Olympic spirit promoting cooperation, dignity and community becomes intertwined with advancing civilization.

Conditions of Fair Play Embedded With Fundamental Principles of Olympism:

This comparative exploration offers synergistic outlooks aiming not just at marrying these academic viewpoints, but also weaving them into fundamental principles espoused by Olympism. Through this process, one could perceptively distill essential attributes that can determine an ideally enacted Olympic contest rooted in mutual respect, fostering equality of

opportunity, embodying meritocracy, whilst guarding against unnecessary harm. Thus, athletically vested parties who play to win, can nurture the further goals of harmonious human development, advancing civilization.

Distilled Conditions for the Ideal Olympic Competition⁷

1. **Non-Discrimination and Fair Equal Opportunity for Performance:** participants should be given equal opportunity to perform, practicing sport without discrimination. This means eliminating, or compensating for, significant inequalities that competitors cannot influence or be held responsible for (Loland, 2002). The ideal contest requires that the contestants be evenly matched, with comparable levels of skill and fitness (Butcher & Schneider, 1998). This aligns with the Olympic Charter's Fundamental Principle 4 of "practicing sport without discrimination" and the spirit of friendship, solidarity and fair play (IOC, 2021b).
2. **Preserving Sporting Excellence:** Sporting performance should be interpreted as based on talent and individual effort. The outcome of the contest should be determined by sporting skill or ability, not by extraneous factors such as luck or errors in officiating (Butcher & Schneider, 1998). Conditions of play may pose additional

⁷ This analysis aimed to distill key conditions for an ideal Olympic contest by drawing from Loland's (2002) framework of fair play norms, Butcher and Schneider's (1998) necessary criteria, and the Olympic Charter's fundamental principles. However, an extensive defense validating this synthesized set of ideal conditions will not be undertaken here, as both Loland (2002) and Butcher and Schneider (1998) have already provided rigorous examination and justification of their respective positions in their published works. Loland devoted an entire book to systematically developing and advocating for his pluralistic moral theory of fair play in sport grounded in the Fair Equality of Opportunity Principle. Meanwhile, Butcher and Schneider's article meticulously laid out an interpretive approach situating fair play as "respect for the game" within MacIntyrean philosophy. Thus, the scholarly foundations upholding the distilled conditions outlined already exist. This analysis aimed not to duplicate previous academic efforts in re-establishing this conceptual territory but rather to synthesize from existing discourse shared tenets that could inform a composite vision of the ideal Olympic contest. The conditions represent a distillation - they are extracted and condensed from broader, nuanced perspectives that merit direct consultation for deeper understanding. Further defense of the conditions was avoided here because Loland (2002) and Butcher and Schneider (1998) thoroughly validated similar arguments previously within their published works which served as key sources for this distillation.

obstacles but should not undermine the exhibition of skill (Butcher & Schneider, 1998). This upholds the principles of excellence and joy of effort outlined in the Olympic Charter (IOC, 2021b).

3. **Adherence to Safety and Harm Prevention:** Performances should adhere to the Olympic spirit of friendship, solidarity and fair play (IOC, 2020), adhering to a basic norm of not exposing others or oneself to unnecessary harm (Loland, 2002). This emphasizes protection of competitors' wellbeing.
4. **Meritocracy in the Distribution of Advantages:** Unequal treatment in the distribution of advantage should be reasonably aligned with actual differences in sporting performance (Loland, 2002). In other words, any discrimination should be based on merit, primarily sporting performance, adhering to the principles of good governance outlined in the Olympic Charter (IOC, 2021b). This maintains integrity through fair competition.
5. **Justice in Rule Enforcement:** Any unequal treatment or punishment due to rule violations should be proportional to the unfair advantage or inequality arising from the violation (Loland, 2002), ensuring the enjoyment of rights and freedoms in sport as per the Olympic Charter (IOC, 2021b). This upholds justice.
6. **Goal Realization Promoting Harmonious Development of Humankind:** All parties concerned in sport competitions should act so that their intentional goals which align with those of the practice and the goal of the Olympism, the harmonious development of humankind, are realized to the greatest possible extent (Loland, 2002; Butcher & Schneider, 1998; IOC, 2021b). This fosters human flourishing through sport.

7. **Striving for Excellence through Maximum Performance (i.e. Players must play to win) :** Players and other stakeholders should strive to win and perform at or near their best (Butcher & Schneider, 1998), promoting the joy of effort, a fundamental principle of the Olympism (IOC, 2021b). This celebrates the pursuit of excellence.
8. **Preservation of the Uncertainty Outcomes:** The game should maintain what Fairleigh and Loland described as the "sweet tension of uncertainty of outcome" (Loland, 2002), the outcome of the contest should be in doubt until the end, ideally guaranteed by having evenly matched contestants playing at their best in the spirit of friendship and solidarity (Butcher & Schneider, 1998). This preserves the excitement of competitive sport.

Conclusion

In this chapter, through a critical review of seminal literature on sportsmanship, fair play and Olympism, philosophical foundations were developed to conceptualize conditions for an ideal Olympic contest. The analysis attended to the conceptual gaps, outlined previously, regarding governance regulating performance-enhancing technology. Crucially, distinctions between 'sportsmanship,' attributed to an athlete's conduct, and 'fair play', depicted as being systemic and encompassing diverse stakeholders' responsibility were identified. Such contrasting notions established sport's ethical intricacies as extending beyond personal traits - demanding considerable collective endeavors while maintaining standards. I then explored how the Olympic Games uniquely fuse elite sporting competition with a profound philosophy (Olympism) that exalts human excellence alongside universal values like "*social responsibility and respect for fundamental ethical principles*" (IOC, 2021b, p. 8). This duality shapes the Olympic Games' essence.

To conceptualize fair play within this context, I examined influential scholarly perspectives. Butcher and Schneider (1998) proposed fair play as 'respect for the game' - adherence to rules, competitive spirit, and internal goods worth valuing. Loland (2002) offered a normative system upholding equality, intentional goal realization and uncertainty. Integrating these views while drawing on the Olympic Charter, I contend that fair play in the Olympics requires respecting the games themselves (Schneider & Hellal, 2022), including both sporting and philosophical facets. Accepting the Charter signifies consent to prioritize the ideals of Olympism. I also explored Loland's (2002) framework emphasizing adherence to justified moral norms of fairness and play. Loland's (2002) complex ethical theory addresses intricate ideas of justice, equal opportunity, and safety norms, in the sport sphere. Along with Butcher's and Schneider's (1998) perspectives, Loland's (2002) work has shaped key conditions for ideal Olympic competitions. A comparative evaluation of these theories alongside Olympism's fundamental principles, enabled a detailed understanding of synergies and tensions between these theories. While divergent in approach, the analyzed philosophical perspectives reveal much synergy regarding principles for an ethically ideal sporting contest, providing a foundation to address issues threatening the integrity of the Olympic Games. The synthesized examination identified eight conditions vital for an ideal Olympic contest. These conditions encompassed principles of non-discrimination, sporting excellence, safety and harm prevention, meritocracy, just rule enforcement, human flourishing through sport, the relentless pursuit of excellence, and the preservation of outcome uncertainty. Together, these elements, grounded in seminal scholarly perspectives and the essence of Olympism, painted a comprehensive picture of what constitutes a fair, ethical, and exemplary Olympic competition.

Limitations

While this chapter achieved its stated goal of establishing foundational ethical parameters for conceptualizing ideal Olympic contests, certain limitations must be acknowledged that present avenues for refinement through future research. The conceptual synthesis integrating Loland's (2002) sophisticated framework with interpretive perspectives risks glossing over meaningful nuances within each theory. Loland's (2002) highly detailed articulation of justified moral norms for fairness and play merits close analysis in its own right before attempting integration with other models. Collapsing varied conceptualizations into a consolidated list of principles inevitably loses certain subtleties. Tensions persist between understandings of justice, natural talent development, and uncertainty derived from the different theories analyzed. For instance, Loland's explicit focus on distributing advantages proportionally based on performance contrasts with Butcher and Schneider's focus on internal goals and not this dimension of justice. The brief treatment here was inadequate to fully unpack the roots of such discrepancies or their implications for technology regulation. Much work remains in undertaking comparative analysis that retains nuance within each theory.

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Chapter 3

Technology and Olympism: An Ethical Framework For Olympic Sports

Introduction

Expanding on the conceptual groundwork laid in Chapter 2, this chapter progresses onto forge an assessment framework that encapsulates ethics for evaluating technology integration within the distinctive sphere of Olympic sports. The preceding multidimensional analysis distilled principles deemed vital for engendering ethically sound and meaningful sporting contests at the Olympics. The eight criteria developed in chapter 2, serve as the basis for evaluation for the integration of new technologies in Olympic sport. While technologies aligning with, and augmenting, these foundational sporting principles may be deemed permissible, those severely undermining, or contravening, these values could warrant prohibition - regardless of intended functionality. In this journey, I will explore the debates between instrumentalism, substantivism, determinism, and Feenberg's critical theory of technology, to highlight how technologies may embody values, and emphasize the importance of evaluation that considers ethics (Heidegger, 1977; Jonas, 1974; Winner, 1980; Feenberg, 2005). Heidegger's perspective on technology transforming our world compels us to assess its essence beyond efficiency goals (Heidegger, 1977). To address the occurrence of consequences when adopting new technologies I incorporate the Doctrine of Double Effect⁸ as a practical tool for weighing intended benefits against potential harms (McIntyre, 2023). I

⁸ The Doctrine of Double Effect, rooted in Thomistic thought, posits a moral distinction between intended outcomes and merely foreseen ones in human action. It articulates a framework wherein actions causing harmful effects are permissible if they fulfill certain conditions, chiefly serving a good end and lacking a direct intention to cause harm. This doctrine holds significant influence in ethical discussions, particularly in medical, legal, and military domains, offering nuanced analysis of complex moral scenarios.

will classify sports technologies into six categories based on their intended aims and functions. Within each category, I then apply the Doctrine of Double Effect to strike a balance, between desired goals and possible side effects. Technologies that align with these conditions and generate benefits will be compared to harms that are considered ethically acceptable. Technologies that blatantly violate principles, or cause disproportionate disruptions, will raise concerns. This phased methodology provides a roadmap for integrating technology in ways that uphold fair play. The classification of technology into categories, based on their intended purposes, provides structure, while incorporating the Doctrine of Double Effect adds nuance when weighing trade offs.

Technology and sport

The predominant view in philosophy of technology in the context of sport has been one that sees technology as a means to an end, an efficiency driven tool to achieve human goals and values (Miah, 2005; Loland, 2002b). This instrumentalist perspective understands technology as lacking inherent moral value, with the intended ends of the agent supplying any ethical dimension. However, substantive and critical theories of technology philosophers have highlighted limitations in this perspective by arguing that technology inherently embodies and propagates certain values, shaping our relation to the world in non-neutral ways (Heidegger, 1977; Jonas, 1974; Winner 1980, Feenberg, 1991). Building on this, one could argue technology in sport not only serves intended purposes, but also transforms the nature of sport itself, by altering the human experience and embodiment of sporting activities, shifting sports towards techno-scientific paradigms, and embedding different values like quantification and efficiency into sporting cultures. For example, A simple ball in a game of football, can be seen as an instrument that facilitates play, but if the ball gets integrated into a

game of football, it transforms the game to the point that the game of football might no longer be definable without the technology. The values of competition, spectacle and progress take on new meanings through technological mediation (Tiles and Oberdiek, 1995). In sport, while technology serves instrumental purposes like improving performance, it can also have unintended ‘performance-altering effects’ (Miah, 2005) that transform the nature of sport itself. Integrating video replay, athlete tracking systems, and spectatorship technologies propagates values of high-performance that substantially reshape sport. An instrumentalist may define technology simply as applying scientific knowledge to serve sport interests, but a critical theorist may argue that technology redefines the ideals of ‘faster, higher, stronger’ (the Olympic motto) in light of new technical possibilities. Miah (2005) categorizes various performance-altering technologies in sport:

*“Technologies that make sport possible;
Technologies that improve Safety and Reduce Harm
Technologies that de-skill or re-skill sports;
Technologies that dehumanise performances;
Technologies that increase participation and/or spectatorship”*

(Miah, 2005, p. 53)

Dyer (2015; 2020) offers an impact-based lens in his analysis of the literature that can offer a critical view of technology in sport that further expanded these effect and determined the impact of technology in sport as the following:

- *“Harm or health (to the athlete or others)*
- *Un-naturalness*
- *Unfair advantage or consideration of fairness*
- *Coercion*
- *Safety and spectator appeal*
- *Integrity of the game, harm to or advantage over the sport itself, or the 'spirit of the sport'*
- *deskilling and reskilling*
- *Dehumanization*
- *Cost (or excess cost)*

- *The internal goods of a sport*
- *Equal opportunity or access*”

(Dyer, 2015, p.2)

Miah (2005) recognizes the overlap between his categorizations, and this can be confidently attributed to the overlap between intended application and the final impact of technology on sport. Indeed, we can see similar overlap in Dyer’s (2015) review of literature on the impact of technology. This intersection creates an interesting dilemma: Which lens is most suitable to evaluate new technologies in sport? Logically, a new technology unproven in sport can only be evaluated based on intentions. However, potential impacts of technologies can alter the practice of sport beyond our intended purpose. I aim to categorize technologies based on intended functions, and evaluate their permissibility considering unintended alterations to sport's values by applying principles like the Doctrine of Double Effect. This framework locates technologies on an intentions spectrum, then layers evaluative lenses asking if unintended impacts, problematically reconceptualizing the ideal Olympic Contest. Considering multiple ethical dimensions and principles enables to comprehensively judging technologies based on their holistic integration into sport.

Sports and philosophy of technology

In considering philosophical perspectives on technology, Feenberg’s critical theory of technology is best suited for this framework examining both intended, and unintended, consequences of technology in sport. Feenberg's critical theory moves beyond simplistic instrumentalism to see technologies as value-laden, propagating biases and unevenly distributing impacts based on their embedded values (Feenberg, 1991). While substantivism justifiably identifies how technologies propagate certain values and shape experiences, substantively beyond mere utility, it tends toward technological determinism in asserting

technologies have fixed trajectories, rather than mutability (Heidegger, 1977). Pessimistically focused on harms, substantivism underestimates potentials for democratizing reforms in sports technology integration to better align with ethical values. This one-sidedness obscures a more complete picture. Technological determinism can go further in portraying technology as an autonomous force impacting sports with determined outcomes, discounting possibilities for democratization or imaginative alternative configurations (Feenberg, 2005). Determinism exaggerates technology's agency beyond human control, failing to recognize sport's active shaping of technology based on cultural values. Determinism rigidly focuses on technology itself, giving technology significant agency. In contrast, Feenberg's critical theory strikes a balance - seeing technology as value-laden, so requiring ethical scrutiny, yet avoiding extremes of technological utopianism, or dystopianism, by highlighting prospects for democratic discourse on integrating technology responsibly (Feenberg, 2002). The emphasis on democratization, uncovering systematic biases, and linking technologies to cultural values, makes Feenberg's critical theory uniquely well-suited for comprehensively analyzing technology's multifaceted integration in the sociocultural realm of modern sport. Feenberg's critical theory frames technology not as fixed essence, but as a value-laden, culturally contextualized domain requiring ethical insight and inclusive shaping (Feenberg, 1991).

Where instrumentalist assumptions of neutrality ignore many aspects of how technology shapes the practice, Feenberg's critical theory unpacks these transformative impacts. Where substantivist assumptions of fixed trajectories exaggerate lack of human control, Feenberg's critical theory embraces potential benefits too. Where technological determinism ignores reciprocal sociocultural dynamics, Feenberg's critical theory can explain the co-shaping of sport and technology. In adopting Feenberg's balanced critical theory to examine technology

in sports, the resulting analysis can avoid these limitations, better capturing the nuances and ethical complexity involved. The alternative theories have merits, but limitations making Feenberg's critical theory the optimal

Alignments with Feenberg's critical theory

Several alignments suggest Feenberg's critical theory's relevance as a framework for this thesis:

- It sees technology as non-neutral, shifting meanings and relations - fitting the transformational lens in sporting culture (Heidegger, 1977; Jonas, 1974; Feenberg, 1991).
- It foregrounds democratization and participation - aligning with developing an ethical framework around technology evaluation (Feenberg, 1991). This aligns with the conceptualization of Fair Play in chapter 2 as a multi-stakeholder responsibility and the goal of the research to create an 'accessible' ethical framework.
- It reveals embedded social biases and uneven impacts, which Feenberg described as 'Technical Codes' (Feenberg, 2002) - enabling assessing technologies in sport for possible self-serving interest through power dynamics.
- It advocates reasoned discourse about ends and impacts - appropriate for ethical analysis (Feenberg, 2002).
- It links technology to social values and structures - contextualizing technology's cultural role in sport (Feenberg, 1991).

Integrating conditions for the ideal Olympic Contest and Technology Assessment

Drawing on the conceptual conditions established for envisioning an ideal Olympic contest grounded in fairness, respect, justice and Olympism's philosophy, Feenberg's critical theory

provides a foundation to assess technology's role in Olympic sports. Feenberg's critical theory sees technologies as non-neutral sociotechnical systems propagating certain values and carries a 'Technical Code' (Feenberg, 2002 and 2005).

"I have introduced the concept of "technical code" to articulate this relationship between social and technical requirements. A technical code is the realization of an interest or ideology in a technically coherent solution to a problem.... a technical code is a criterion that selects between alternative feasible technical designs in terms of a social goal. "Feasible" here means technically workable. Goals are "coded" in the sense of ranking items as ethically permitted or forbidden, or aesthetically better or worse"

(Feenberg, 2005, p. 54)

Feenberg's critical theory, through its emphasis on democratization and discernibility of embedded values and biases, is strategically positioned for analyzing sports technology within the framework of Olympism. The ideal Olympic contest can risk erosion or bias introduction of new technologies; potential risks should, therefore, be dialectically balanced against proposed benefits. Feenberg's critical theory enables proactive analysis during all developmental stages thereby fostering more comprehensive evaluation strategies. This approach facilitates judicious decision-making regarding technological adoption based on how well it aligns with fostering an equitable contest environment that respects Fair Play norms (detailed analysis of 6 different classes of technology will be presented later in this chapter). Consequently, cultural meanings are intrinsically linked to innovations, ensuring alignment with Olympic ideals in each integration instance. As such Feenberg's critical theory's salient features - democratization, contextualisation and thorough inspection - render it suitably fit as a perspective from which to ethically analyze sports technology.

Dyer (2015; 2020) extensively examined the influence of technology on sports by reviewing literature on aspects of technology in the field. The table provided below, compares Dyer's (2015; 2020) research with the conditions for the ideal Olympic Contest outlined in chapter

2. It emphasizes the themes discussed in the literature and how they align and intersect with the conditions for the ideal Olympic Contest.

Table 3.1: A comparative overview between Dyer's (2015; 2020) systematic review of the literature discussing the impact of technology on sport and the conditions for the Ideal Olympic Contest presented in Chapter 2

Themes of arguments that explore the Impact of technology on sport (Dyer, 2015; 2020)	Conditions for the Ideal Olympic Contest (Chapter 2)
Harm or Health (to the athlete or others)	Adherence to Safety norms and Harm Prevention
Un-naturalness in performance	Preserving Sporting Excellences
Unfair Advantage or Consideration of Fairness	Non-Discrimination and Fair Equal Opportunity for Performance; Meritocracy in the Distribution of Advantages; Justice in Rule Enforcement
Coercion	Adherence to Safety and Harm Prevention; Non-Discrimination and Fair Equal Opportunity for Performance
Safety and Spectator Appeal	Adherence to Safety and Harm Prevention; Preservation of the Uncertainty Outcomes
Integrity of the Game, Harm to or Advantage over the Sport itself, or the 'Spirit of the Sport'	Preserving Sporting Excellence; Meritocracy in the Distribution of Advantages; Justice in Rule Enforcement; Goal Realization Promoting Harmonious Development of Humankind; Striving for Excellence through Maximum Performance
De-skilling and Re-skilling	Preserving Sporting Excellence; Striving for Excellence through Maximum Performance
Dehumanization	Goal Realization Promoting Harmonious Development of Humankind; Striving for Excellence through Maximum Performance
Cost (or Excess Cost)	Non-Discrimination and Fair Equal Opportunity for Performance; Meritocracy in the Distribution of Advantages
The Internal Goods of a Sport	Preserving Sporting Excellence; Meritocracy in the Distribution of Advantages; Justice in Rule Enforcement; Goal Realization Promoting Harmonious Development of Humankind; Striving for Excellence through Maximum Performance

Equal Opportunity or Access	Non-Discrimination and Fair Equal Opportunity for Performance
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The Doctrine of Double Effect (DDE)

Having the vision of categorizing technology in sport through an intentional lens and impact against established conditions for the ideal Olympic contest, it is essential to align these two approaches to form a consistent evaluation methodology. This integrated approach allows us to develop a rich understanding of each technology and how it relates to and impact, the Olympic Contest. Just as different technologies underpin varying intentions (such as enabling sport, promoting safety, etc.), so too do they carry potential effects that can either enhance or distort aspects of our ideal Olympic contest. For example, technologies intended towards ensuring safety might inherently value the condition for harm prevention, but could counterintuitively undermine sporting excellence if it leads to a marked decrease in performance levels. The Doctrine of Double Effect (DDE) is a principle originating from the work of Thomas Aquinas in his text *Summa Theologica*, which understands that actions may have two effects - one intended and one unintended. Essentially, it justifies an action with harmful consequences if its primary intention is morally good or at least neutral, even when adverse side-effects could be foreseen. For example, in palliative medicine, certain treatments aimed to relieve pain might hasten death, sparking euthanasia debates - an act typically considered wrong rendered potentially acceptable due to this doctrine's precepts concerning proportionality (the good outweigh foreseeable harm) and discrimination (intent). Though primarily referenced within Catholic moral theology, contextually regarding war ethics and self-defense analysis historically-it remains impactful across diverse ethical discussions like abortion or problem-solving methodology. DDE has been explored before in

the context of assessing intention in the cases of restoration vs enhancement of performance by technology in sport (Schneider, 2018; Pike, 2018). Schneider and Sales (2019) apply an inverted doctrine of double effect from biomedical ethics to consider if treatments causing performance enhancement as a side effect of treating injury are ethically permissible in sport.

According to DDE, an action is permissible if it fulfills four conditions:

- The action (in this case, the introduction or use of the technology) must be morally good (intrinsically regardless of consequences) or at least indifferent.
- The agent (the person or organization introducing or using the technology) must intend the good effect (the intended purpose of the technology) and not the bad effect (any negative impacts).
- The good effect does not arise from the bad effect.
- There is a proportionately serious reason for permitting the bad effect.

(McIntyre, 2023)

According to the first condition of DDE, a wrong action would be one that is inherently evil regardless of outcome. For instance, taking the life of a person is always unacceptable even if it is done to save the lives of others (McIntyre, 2023). DDEs first condition emphasizes that the action itself must be good or, at least morally neutral. Consequently an action that is intrinsically evil fails to meet DDEs condition (McIntyre, 2023). Thus cannot be morally justified. Some examples of actions considered wrong that would violate the first DDE condition; committing murder, engaging in rape, inflicting torture, stealing, telling lies, cheating. All these actions are considered intrinsically evil and therefore cannot be morally justified under DDE. It's important to acknowledge that the sports governing body's action in the proposed framework is to act as a steward of the interests of the ideal Olympic contest.

The action of allowing or not allowing the integration of a certain technology in sport is rarely considered 'evil', the key here is having the right intention and foreseeing the impact.

Applying the Doctrine of Double Effect allows a nuanced evaluation of technological integration in sports. Firstly, looking through an intention-focused lens based on six different categories of technologies in sport: 1) Technology intended to facilitate constitutive elements; 2) Technology intended to restore performance; 3) Technology intended to improve performance; 4) Technology intended to promote safety; 5) Technology intended to monitor officiating and integrity; and 6) Technology intended to enhance consumption and participation. In each case, we can apply DDE by evaluating whether the technological innovation upholds Conditions for Ideal Olympic Contest (developed in Chapter 2) - as these represent 'good' effects:

1. Non-Discrimination and Fair Equal Opportunity for Performance;
2. Preserving Sporting Excellence;
3. Adherence to Safety and Harm Prevention;
4. Meritocracy in Distribution of Advantages;
5. Justice in Rule Enforcement;
6. Promoting Harmonious Development of Humankind;
7. Striving for Excellence through Maximum Performance; and
8. Preservation of Uncertainty Outcomes.

We then examine emergent impacts from these categories of technologies - are they enhancing or undermining our ideal contest conditions? A safety-promoting technology may enhance fairness by reducing injury risks but could disrupt sporting excellence if it limits performance levels too heavily. Assessing whether technology meets these eight ideal Olympic Contest conditions using the DDE principles as described above, assists us with ethical dilemmas about new sport technologies.

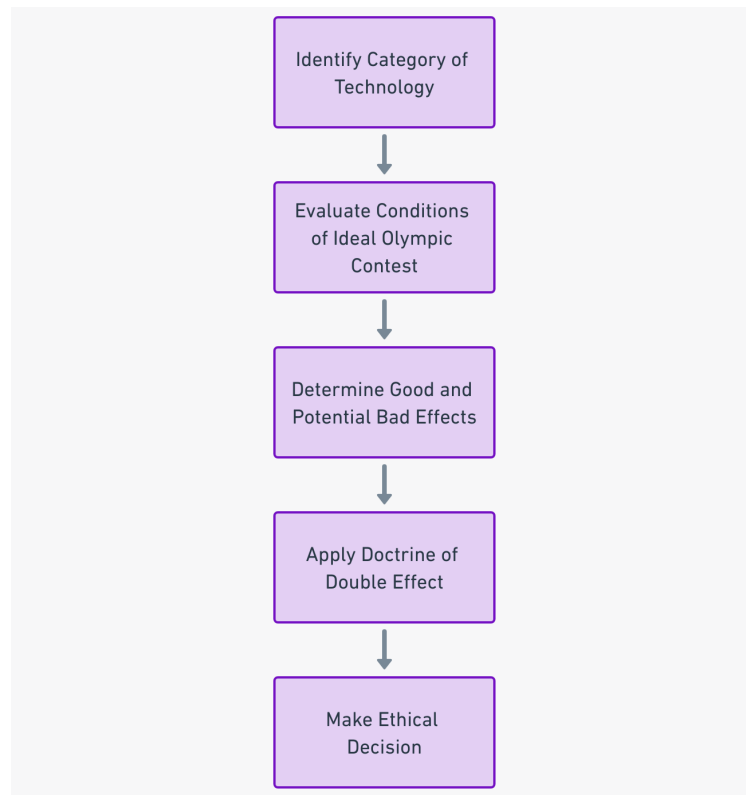


Figure 3.1: The flowchart visually presents the ethical decision-making process for integrating technology in sports.

The ethical decision-making process involves first categorizing the type of technology being considered based on its intended purpose, such as Technology intended to facilitate constitutive elements and Technology intended to restore performance. The technology is then evaluated against a set of criteria for an ideal Olympic contest, including fairness, safety, integrity, and human excellence. Using the Doctrine of Double Effect, the inherent values of the technology itself is examined along with weighing its positive intended effects against any potential negative unintended consequences. Finally, integrating these evaluations, a judgment is made on whether or not integrating the technology aligns with principles of the ideal Olympic contest. The approach underscores the importance of carefully discerning embedded values in innovations to preserve fair play at the Olympic Games..

Responding to possible critiques of the proposed sports technology evaluation framework

This section defends the sports technology evaluation framework, addressing possible critiques concerning taxonomy categorization, Doctrine of Double Effect application and others. I defend my approach of balancing Feenberg's critical theory insights with applied ethics' practicality for a mixed intention/impact focused analysis. It demonstrates how isolating categories based on intentions facilitate understanding while permitting detailed study; adaptation of DDE provides an easy to grasp ethical rule that considers technology's interwoven complexity.

It might be suggested that the taxonomy of categories risks oversimplification by overlooking technologies' subtle embedded values. However, the categories aim to orient initial technology grouping based on intended purposes in order to then apply further value-focused evaluation. The categories provide preliminary descriptive framing, not deterministic judgement. The analysis crucially probes how technologies propagate biases through what Feenberg might describe as "*technical codes*" beyond their explicit functions, aligning with Feenberg's emphasis on demystifying claims of neutrality (Feenberg, 2002). Categories offer helpful starting points for this unpacking by orienting analyses based on broad technology groupings. For instance, interrogating values embedded in a performance enhancement technology begins from recognizing its explicit aims. Categories need not preclude rich sociotechnical analysis but rather initiate it.

It might be argued that the DDE method inadequately engages technology's complex societal embeddedness by isolating cases abstracted from context. However, the categories schema

already orients contextual thinking by distinguishing broad technology groupings within sports. The DDE simply supplies a protocol for judging specific cases based on articulated principles. Its application occurs subsequent to categorization placing technologies in context. DDE enables navigating ethical trade-offs within bounded case assessments, not as a totalizing calculus. Use of DDE does not preclude dialectical analysis of technology's reciprocal shaping with social dynamics (Feenberg, 2005). It operates on a different register, offering an applied ethics toolkit to practically negotiate dilemmas within broader sociotechnical contexts. Isolating cases temporarily to focus ethical reasoning does not ignore their embeddedness. The method's utility lies in facilitating clear normative judgments despite inevitable uncertainties. DDE provides structured mixed intention and impact focused analysis complementing Feenberg's contextual emphasis.

Critics might argue the proposed framework insufficiently addresses power and bias in sports tech regulation. However, this framework prioritizes an evidence-based approach mindful of fair play values often compromised by ingrained interests. The technologies are grouped based on function not only to evaluate impacts, but also to discern underlying biases masked as neutrality claims. When technology categories threaten core sporting values, they can be justifiably contested, or controlled, through our methodology grounded on Olympic contest prerequisites such as inclusion, excellence and safety among others (chapter 2). This lends strength for challenging biased 'technical codes' that promote unethical motives (Feenberg, 2005). It empowers interventions against technologies that undermine humanistic sporting values, even if promoted under pretexts of efficiency or inevitability. The framework offers a democratizing counterweight to technocratic power.

One possible critique of fixing my analysis from the sport governing body's perspective is the causality paradox. DDE entails an action by an agent (e.g. introducing new officiating and safety technologies), but governing bodies, in many cases, don't 'do' the action of introducing a technology (e.g. the introduction of a new performance enhancing technology). Technologies, in many instances, are introduced by other stakeholders like athletes, coaches, teams, clubs, etc. There is a distinction between permitting an action versus actively doing it. In certain contexts, allowing something to occur can be morally distinct from directly doing it oneself (e.g. the famous trolley problem). However, in this Chapter's examination of technology in sports, allowing and doing will be treated equivalently. The focus is on the ethical acceptability of the technologies themselves, not fine distinctions between regulators allowing versus athletes actively using enhancements. Permitting a technology in sports implies acceptance of its use in competitive contexts. Given the aims of this analysis, allowing and doing will be viewed as ethically equivalent actions regarding these technologies.

Responding to potential claims of over-theorization of this ethical framework, it's important to revisit my central objective: to convert abstract ethics into a digestible tool for various sport stakeholders. Sport regulators necessitate justifications rooted in concrete rationales and operational methodologies rather than enigmatic philosophies. The taxonomic classification deployed delivers a series of distinct categorizations that unambiguously facilitate discourse across different sectors associated with sports organization and management. Principles like safety, fairness and undeserved advantage speak to shared norms among sporting communities. The DDE offers a structured sequence of questions framed in plain language amenable to everyday ethical reasoning. Sufficient background knowledge of sports is likely

adequate for basic application. The framework aims precisely to make Feenberg's critical theory actionable by diverse stakeholders through straightforward tools and joint concepts. Complex sociotechnical dynamics still require elucidation by experts, but the framework supplies initial scaffolding for pursuing evidence-based regulation anchored to accessible knowledge.

Dual Use, Doctrine of Double Effect (DDE) and Technology

A famous problem often discussed in the discussions of the ethics of technology is the problem of 'dual use'. The dual use problem is when a technology designed for beneficial purposes risks misuse for harmful ends. E.g., Anabolic Androgenic Steroids are approved as a treatment for male hypogonadism and burn victims, but are used illicitly to enhance performance in sport. Understanding distinctions between dual use and the Doctrine of Double Effect (DDE) helps frame technology regulation.

Dual use is an instrumental lens that refers to technologies with both legitimate and illegitimate applications (Uniacke, 2013). In this sense, a technology itself is neutral, but can be applied for good or ill. Dual use technologies have intrinsic characteristics making them susceptible to dual applications (Miller & Selgelid, 2007). For instance, certain biological agents could be used both in medical research and biological weapons. The dual use tension is between enabling benefits versus preventing misuse. The technology harbors dual potential depending on usage norms. With dual use, restrictions based on possible misuse force trade-offs between preventing harm and lost opportunities from curtailed access. But permissiveness also courts risks. In contrast, the Doctrine of Double Effect (DDE) deals with single actions having an intended good effect alongside unintended negative effects

(McIntyre, 2023). The core question is whether pursuing a moral end can justify causing foreseeable collateral harms. For example, certain risky surgeries aiming to save lives could also inadvertently hasten death. Under DDE, harm may be permissible if the intended outcome outweighs incidental effects, among other conditions. The tension exists within one's action, not between different applications of a technology. With DDE, inferences about intentions guide moral judgments. Acting in good faith to prevent harms also matters ethically, even if harms still occur. DDE considers an agent's purpose, while dual use focuses on wider consequences of enabling technologies susceptible to misuse by others. These distinctions matter for sports technology regulation. Governance often defaults to dual use assumptions of weighing risks against benefits with absence of the capacity to constrain usage. But Biomedical ethics traditions suggest DDE's intention-focused lens could enable more nuanced oversight when governing bodies and stakeholders control the practice's parameters similar to sports.

Sports rules deliberately define constitutive conditions for contests, shaping purposes and incentives. Governance can directly build selective intentions, controlling the "ends" competing serves within rules to curtail improper "means". Sporting authorities aim precisely to prevent misuse, not just reactively restrict access based on dual use potentials. Technologies then operate within regulated systematic contexts aligned to proper purposes. Still, unintended effects occur given complex sporting ecosystems. But institutional governance through enforced rules provides opportunity for intended good effects to dominate. Permissible intentions are then separated from unacceptable ones through regulating norms. As a formal institutional practice, sport can demand evidence of proper purposes before granting access to novel technologies. This contrasts with dual use assumptions of inevitable misuse in absences of constraints on the technology itself.

Top-down governance shaping norms around rules provides opportunity to define acceptable intentions technologies serve within contests. Integrity checks further verify compliance. While power asymmetries between athletes and governance exist, this doesn't have to be the case with the democratization of decision making processes to regulate the practice itself, including technology integration, based on principled definitions of purpose. There are limitations, but sports hope to prevent harms by formalizing intentions, not just restricting access.

A Taxonomy for Technological Integration in Sport

The next part of this chapter aims to enhance the conceptual clarity regarding the roles of technology in sport. I will categorize technology in sport based on intention from the perspective of sports governing bodies⁹, then conduct an abbreviated analysis of the potential good and bad effect, followed by a brief example Doctrine of Double Effect (DDE) analysis to balance a representative of each category against the conditions for the ideal Olympic Contest. The following chapters will provide more detailed case studies. Given their broad nature, categories possess significant variance regarding any associated impact due to different specific technologies falling under them even though they share similar agent's intentions. In other words, by virtue of being unique entities - each bestowed with its individual set of characteristics - distinct technologies necessitate separate examinations for competent assessment. When implementing DDE evaluations therefore, proper care should be taken that critical emphasis is placed on individuality rather than collective categorization.

⁹ It is essential to acknowledge that intention focused analysis must be tied to a single agent, in this case, governing bodies. A good effect for the athlete might not be good for the governing body and vice-versa. While all stakeholders should 'respect' their practices and prioritize the practice's interests (the conditions for the ideal Olympic Contest), the DDE framework weighs actions and intentions of a single agent.

It is important to acknowledge the six technology categories presented are wide-ranging in scope and are not inclusive of all possible technological integration in sport. For example, we might see in the future technologies getting introduced in sport only for the sake of environmental sustainability. Thus, the six proposed categories are only meant to be used as a starting point for future technologies.

Non-categorized: De-skilling and Re-skilling

As argued earlier, technology doesn't just serve its intended purpose in sport, but shapes our understanding of the practice itself. For example, the ball, pitch, and pitch lines in a game of football might have originally intended to serve as tools that facilitate game play, but it's highly doubtful that any of us can recognize a game of football without these elements. The incorporation of all technology into sports naturally results in a transformation of the practice that may lead to a relative process of either re-skilling, and de-skilling, as they serve to reshape the practice. However, it is important to acknowledge that these processes are often secondary (unintended) to the objectives of the technology, rather than being an end in themselves. Therefore, it is prudent that when examining the intended goals of technology in sports, we should not generally treat re-skilling, and de-skilling, as major intention based categories. Instead, they should be seen as inevitable effects that accompany most technological categories in sport. Let's consider the example of technologies that can result in de-skilling. The incorporation of depth finders, bait casting reels and sonar in angling, aimed to simplify fish detection and landing, consequently lead to increasing the popularity of the sport (Hummel & Foster 1986). The primary objective is enhancing participation and enjoyment, not the de-skilling effect (even this action was 'drastic'). In instances where certain technologies were prohibited, such as the croquet style putter design in golf or

'spaghetti' strung rackets in tennis (Carr, 2008; Dyer 2015; Sheridan, 2006; Savulescu, 2006), the decision to ban these innovations was based on their re-skilling impact, rather than re-skilling being their primary goal, the primary goal could have simply been performance improvement or increasing participation and fan engagement.

de-skilling as a "primary intention" is usually assumed as 'bad' as this contradicts the principle of preservation of excellences. The paradox occurs when de-skilling is used as a means to bring about good effects; i.e. the good effect (e.g. safety) arising from the bad effect (de-skilling)? E.g. in cases like actions/or impacts that de-skill the sport to improve safety like in the case of the ban on backflips in figure skating (an excellent exhibition of skill but carries high safety risks), even though this directly violates the third DDE principle '*The good effect (safety) does not arise from the bad effect*', the (4th) proportionality principle might still allow for de-skilling because it is the lesser harm vs safety risks.

"A third misinterpretation of double effect bases the impermissibility of causing harm as a means to a good end on the fact that it is wrongful in itself to intend to cause harm. There are many circumstances in which agents may cause harms as a means to a good end and in such cases, producing a harm as a means to a good end is compatible with having an appropriate attitude toward the harm. Surgeons may amputate limbs to save lives while regretting the damage, the disfigurement, and the disability that their actions will cause."

McIntyre (2023)

On the other hand, re-skilling can be argued to be an inevitable impact of all new technologies in sport and almost always comes as a secondary unintended consequence of adapting to the new technology (whatever category it belongs to). E.g. officiating technologies like goal line and VAR come with a primary intention to improve rule compliance and fair games, but eventually will lead to some form of re-skilling on the game; e.g. players not risking being offside as much - knowing that a goal can be overruled retrospectively even if the referee didn't catch the violation first hand. It is reasonable to

assume that re-skilling is an eventuality of all technological integration into sport (with a relative extent), that can be put in the proportionality balance when assessing the integration of these technologies.

1) Technology intended to facilitate constitutive elements.

Technology intended to facilitate constitutive elements are integral structural components that enable a sport to exist and function (Miah, 2005). Without them, the sport would not be recognizable, or from critical theorist perspective, these technologies once integrated into the sporting practice, evolve to a co-constitutive relationship ¹⁰. Sport and this type of technology can no longer be viewed separately. For instance, competitive cycling is reliant on bicycles, and bicycles as a fundamental mobility and mechanical structure in the sport of cycling (a technology initially intended to facilitate a sport) transformed the practice, and was shaped by the interest (technical code) of the practice. The core constitutive implements must remain compatible with, and ideally serve, a democratic and just interest of the practice, that preserve conditions fundamental to fair play. They enable and give structure to the essential interactions at the heart of a sport while transforming sport and get transformed by sport. Thus, one needs to be very careful with introducing or changing any aspects of this category of technologies in sport.

Other examples of (Co)Constitutive technologies include:

- Firearms and targets for shooting events.
- Balls tailored to specific sports (weight, size, bounce, etc.).
- Game equipment like bats, sticks, racquets, etc.

¹⁰ These technologies are extremely transformative to and by the sporting practices. These types of technologies warrant caution and extensive scrutiny before implementation as they risk transforming the practice substantially.

- Ice rinks, pools, courts, playing fields.

Good effects

Introducing new technology intended to facilitate constitutive elements can transform sports in ways that challenge traditional notions of fair play (Dryer, 2020). Many constitutive sports technologies introduced over the years align with the conditions of the ideal Olympic Contest. For instance, improved wave breaking lane dividers and time keeping and measuring methods in swimming, enabled fairer competitions and consistent results. Standardized parameters for equipment in competition like weight for rowing boats, swimsuits in swimming, etc. These uphold the values of fair equal opportunity, preserving excellence based on talent and effort, and competitive intensity. Most standardization of equipment specifications attempt to eliminate potential advantages unrelated to talent, effort, and skill (Loland and Hoppeler, 2012). Technologies broadening access also align with the conditions of the ideal Olympic Contest. Overall, technologies that standardize conditions, preserve the demonstration of sporting excellences, and expand inclusion, generally promote fairer contests at the Olympics.

Potential Bad effects

Specialized sports gear in general and equipment pose ethical dilemmas for Fair Play. As Loland (2002a) argues, competition requires "*equal opportunity to perform*" (p. 105). However, innovations granting significant advantage unrelated to effort threaten this equilibrium. The principle is not formal equality but Fair Equality of Opportunity (FEOP) - eliminating arbitrary inequalities outside competitors' control (Loland & Hoppeler, 2012). Prohibiting the LZR Racer and Polyurethane full body suits, Nike's VaporFly shows

granting disproportionate improvements fails this test, as access depended on financial means and access, not talent, skill and effort. However, FEOP does not demand eliminating all advantages, only that unequal treatment aligns with actual performance disparities (Loland, 2002, p. 105). The key is whether advantage derives from arbitrary factors beyond control versus talent and dedication. Equipment costs barring access contradict FEOP and meritocracy. Butcher and Schneider (1998) argue fairness requires that "*the outcome of the contest be determined by skill, not extraneous factors*" (p. 15). Pricing athletes out undercuts this aim. However, some differences in access to training resources are inevitable. The issue is when inequality becomes so substantial as to undermine the legitimacy of results. Reasonable people can debate where to draw this line. But at some degree of inequality, victory becomes less about effort than wealth, contravening fair play. Regulating access to preserve meaningful competition, even if imperfect, may be necessary.

Innovations benefitting all athletes equally may stand according to FEOP, might still create tension with the exhibition of sporting skill. In a situation where every swimmer has access to full body Polyurethane swimsuits, and assuming that all swimmers gain the same marginal benefit from using these suits, the issue of FEOP is suspended and it becomes an issue of how these suits undermine the demonstration of skill and sporting excellence (Devine, 2011, 2022; Butcher and Schneider, 1998), or how Miah (2005) and Dyer (2015; 2020) explained as a de-skilling technology. Advances in swimsuit technologies significantly influenced the performance of athletes to the point that breaking a swimming record was no longer about talent, effort and skill, but rather a direct impact of advances in technological swimsuits. The introduction of full body Polyurethane swimsuits in 2009 (Pre-ban) created significant distortion of swimming performances as seen in the graph below.

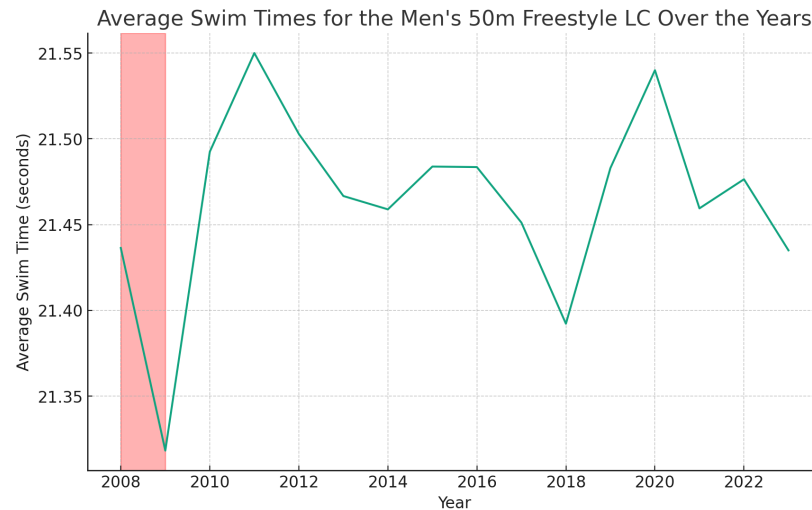


Fig. 3.2: Graph shows the average best times for each year in the Men's 50m Freestyle since 2008. The red area coincides with the introduction of full body Polyurethane swimsuits.

Example of DDE evaluation of LZR Racer and Polyurethane full body Swimsuits:

Using the Doctrine of Double Effect (DDE) as a guiding philosophical framework, a thorough evaluation of constitutive facilitator technology in sport can be undertaken. This doctrine will be applied through four conditions to illustrate its impact on sports ethics.

- 1) The action (in this case, the introduction or use of the technology) must be morally good or at least indifferent.**

The introduction of technological innovations that are intended to facilitate aspects of the sport maintain good or neutral effect. The action of introducing new swimsuits, is not of itself inherently evil. Swimsuits for swimming are a necessary part of sport, their design and availability can introduce disparities within competitions based on athletes' socio-economic resources or de-skill the game (Miah, 2005). Therefore, while they comprise essential elements of their designated games and are hence justified in this count, questions linger

regarding whether such use aligns with FEOP principles (Loland & Hoppeler, 2012) and undermine the demonstration of skill and sporting excellence (Devine, 2011, 2022; Butcher and Schneider, 1998).

- 2) The agent (the person or organization introducing or using the technology) must intend the good effect (the intended purpose of the technology) and not the bad effect (any negative impacts).**

The intent behind introducing these technologies is to facilitate gameplay and serve the interest of the sport (i.e., the technical code), but when innovation offers significant advantages unrelated to effort or skill but depends rather on access to financial means it undermines fair equal opportunity principle, meritocracy, and skill demonstration (Loland, 2002a). Therefore, the intention could be muddled as fairness the de-skilling effect starts undermining "skill and dedication" (Butcher & Schneider, 1998).

- 3) The good effect does not arise from the bad effect.**

The LZR Racer swimsuit transforms the practice of swimming. The initial intent is to serve the interest of the games, in this sense, facilitate the game. They might aim to directly increase game efficiency or assist sporting excellence. Thus, the good effect of increasing efficiency and sporting excellence is not a result of the inequality it creates.

- 4) There is a proportionately serious reason for permitting the bad effect.**

The proportionately condition of the Doctrine of Double Effect would consider if the good effect sufficiently outweighs, or balances, the negative impact. In this context, constitutive technologies present a tricky situation. On one hand, they indisputably shrink down inefficiencies and enhance overall sport's performance which is a value required for progress

in any sport. Conversely, they introduce disparities on grounds of financial access to premium equipment and might de-skill the sport; thus proportionality here is a delicate balance. The challenge lies in balancing benefits derived from advancements against potential disruptions to conditions for the ideal sporting contest i.e., access discrepancies due to arbiting factors like wealth, thereby breaching 'Fair Equality of Opportunity' and the demonstration of skill and sporting excellences. Paradoxically while incentivizing progress through innovating such technologies, regulating them cautiously is integral so that the basic equality among competitors does not disintegrate. These challenges epitomize tensions involved when applying DDE principles in assessing ethical implications associated with evolving contemporary Olympic Sports scenarios. The LZR Racer full-body swim suits and other Polyurethane suits undermine fairness, the demonstrations of sporting excellence, and meritocracy principles. With alternatives available that don't produce as potent negative effects, then it's reasonable to conclude that such swimsuits' good effect don't outweigh their unintended bad effect, and shouldn't be allowed in competition.

2) Technologies intended to Improve Performance

Technologies intended to Improve Performance, refer to any methods or tools used by athletes, coaches, sports scientists with the aim of improving physical and mental abilities of athletes/teams. These technologies have the value of efficiency as their primary driver. Technologies intended to Improve Performance in sport can be normatively categorized into two types: those that are acceptable and those that are unacceptable (this is a mere description and not prejudice). It's often hard to make that distinction (Morgan, 2009; Schneider, 2018; Heuberger & Cohen, 2019).

The Blurred Lines of Performance Tech

Conventionally, or at least according to the WADA Code (2021), ‘good’ performance improving technologies in sport are usually the one that maximize the athletes natural talent. One important distinction that is worth mentioning, is an acceptable performance improving technology can be argued to be the one that *“invokes the phenotypic plasticity of the human organism, a consequence of the specifics of the evolution of the human species. Accepting bodily reaction patterns and using the innate adaptability of humans to physical challenges cohere with the idea of developing natural talent”* (Loland and Hoppeler, 2012, p. 272). Technologies intended to Improve Performance in sport augment values of striving for excellence through maximum performance and preserving sporting excellence by pushing the boundaries of human potential. They may provide fair equal opportunity if made accessible to all competitors. Generally, these technologies possess the capacity to intend to do ‘good’. Historically, acceptable forms of performance enhancement utilize technologies that align with natural human adaptability and talent development. These technologies work within the range of normal human physiology to optimize performance potential. Examples of current acceptable technologies include:

- Scientific training principles and methods. Sports scientists research and develop training principles tailored to the human body's natural physiological capacities. Periodized training programs, recovery techniques, and optimized practice structure boost performance through natural talent development (Hopkins, 1991; Lockie et al., 2012; Renshaw et al., 2019; Viru & Viru, 2001).
- Sports psychology. Mental skills training, visualization, relaxation, and motivation techniques leverage the natural adaptability of the human brain and psyche for enhanced focus and confidence (Renshaw et al., 2019; Butler, 2020; Cox, 1998; Singh, 2022).

- Sports analytics. Data analysis and modeling sports performance allows coaches and athletes to make strategic decisions based on empirical trends. Analytics tap into natural human strategic thinking rather than artificially boosting physical capabilities (Fried & Mumcu, 2016; Singh, 2020; Szymanski, 2020).

Currently, according to WADA's interpretation of the 'Spirit of Sport' and their definition of 'natural' innate talent, there are technologies deemed unacceptable in sports. These unacceptable technologies according to Loland's and Hoppeler's (2012) conceptualization, exceed human phenotypic plasticity and disrupt natural talent development. For Example:

- Anabolic steroids and growth hormone. These drugs manipulate hormones and muscle growth in ways the body cannot naturally achieve (Cellotti & Cesi, 1992; Kadi et al., 1999).
- Blood doping. Boosting red blood cell counts beyond natural levels increases oxygen delivery for enhanced endurance. Methods include transfusions of stored blood or injections of erythropoietin (EPO) (Robinson et al., 2006; Schumacher et al., 2012).
- Gene doping. Inserting synthetic genes aims to switch on natural performance boosting processes the body cannot trigger itself. This constitutes clear artificial manipulation (Haisma & de Hon, 2006; Unal & Unal, 2004).
- Amphetamines and stimulants. These drugs provide unnatural metabolic and nervous system stimulation to increase alertness and delay fatigue (Docherty, 2008; Thevis et al., 2010).

Determining the ethical acceptability of performance improving technologies represents one of the most complex and divisive issues in sports ethics scholarship (Loland, 2002b; Miah, 2004). Despite extensive philosophical analysis spanning several decades, a clear consensus

on principles for distinguishing between acceptable and unacceptable forms of performance enhancement remains elusive (Tamburrini, 2005; Loland and McNamee 2016). The core of this challenge stems from the multifaceted nature of performance enhancement and the ways technologies become embedded in complex socio-cultural contexts of sport. There is profound disagreement among experts regarding how to prioritize and balance the various ethical values at stake, including fairness, safety, integrity, natural performance, human excellence, competitiveness, spectator entertainment and more (Loland, 2018a; Tamburrini, 2005). Diverse perspectives exist on which principles matter most and how to adjudicate conflicts between them. For WADA, a substance or a method is unacceptable if it fulfills two of three criteria: 1) Enhances or has the potential to enhance performance; 2) Causes harm or has the potential to cause harm to health; 3) Violates the Spirit of Sport (WADA, 2023).

The Literature Gap (Chapter 1): Addressing the Inadequacies in Regulating Sports Performance Technology

- Definition of doping has shifted from broad moral concepts like ‘artificial advantage’ to legalistic rules violating specific provisions (IOC, 1967; Ritchie, 2013; WADA, 2021). This reactionary approach risks misalignment with ethical foundations as technology advances.
- Justification grounded in contested internalist notions of "spirit of sport" lacks solid substantive reasoning and relies more on rhetorical appeals (Obasa & Borry, 2019; Waddington et al., 2013).
- Naturalistic fallacies conflate nature with inherent value absent supporting arguments. Appeals to nature require critical examination and should be the primary driver of permissibility evaluation (Lenk, 2013; Bonte, 2013; Kaebnick, 2014; Loland, 2018).

- Concept of “spirit of sport” lacks coherence, transparency and input from diverse stakeholders (i.e. consistency and transparency in its interpretation). Its use as a justification for banning enhancements remains ambiguous (Obasa & Borry, 2019; Waddington et al., 2013).
- Rights-based critiques contend prohibition disregards athlete health, autonomy and proportionality (Kayser & Broers, 2015; Tamburrini, 2013).
- Evidence basis for banned substances warrants re-examination. Many lack proven performance benefits or health risks to athletes (Heuberger & Cohen, 2019).
- Overall, existing frameworks lack proactive foresight and principled justification needed to address complex, context-dependent cases as technology advances. Reliance on rhetorical appeals is insufficient.

Proposing Distinctions Based on Ideal Olympic contest Conditions:

Confronted by limitations and controversy laden landscapes - this assessment proposes carving out distinctions regarding acceptability/unacceptability utilizing an empirical framework drawn from ideal conditions underpinning Olympic competition (Chapter 2). Technologies intending to improve performance must pass ethical security through the suggested framework to be deemed acceptable in sport. Technologies intending to enhance performance will be deemed unacceptable if they fail the DDE assessment proportionality balance. This implies that if a technology significantly violates one, or multiple of the following principles, without providing enough 'good' to offset the 'bad', it would not be considered tolerable. For instance, if a technology:

1. Creates unjust inequalities in access or opportunity between competitors.

2. Allows non-sporting factors like wealth or access disproportionately influence competitive outcomes rather than merit.
3. Poses significant health and safety hazards to athletes beyond normal risks inherent to the sport.
4. Confers benefits and advantages unrelated to talent, effort, skill or merit.
5. Compromises the integrity of regulatory systems by enabling undetectable violations. Like "invisible" doping techniques circumventing testing protocols.
6. Diverges from the broader goals of Olympism by overemphasizing results above holistic personal and humanity's growth. Win-at-all-costs mentalities contradict Olympic ideals.
7. Undermines athletes' motivation to perform to the best of their abilities in events. Like an AI tactician that encourages the athlete to lose a game to gain a strategic advantage later in the competition.
8. Dramatically reduces normal uncertainties and variability in performance inherent to sports. Excessive predictability strips away suspense and excitement.

Analysis of Intended Application and Potential Impact

Technologies intended to improve the body's natural innate capacity serve as invaluable tools that athletes, coaches, and sports scientists can utilize for enhancing an athlete's physical abilities in alignment with their natural talent. It is essential to critically evaluate the use of such technologies within the ideal conditions necessary for fair competitions that capture Loland's (2002), Butcher's and Schneider's (1998) perspectives and align with the Olympic Charter's ideals. From Loland's perspective focusing on fairness norms intertwined with play norms, participants should voluntarily engage in sport competitions using acceptable performance-enhancing technologies aligned with a shared, just ethos (Loland, 2002a). The use of these technologies should not expose athletes or others to unnecessary harm while ensuring equal opportunity for all competitors, irrespective of their socio-economic

backgrounds. Herein lies one potential issue. While these technologies are conventionally permissible, they logically tend to be more accessible by wealthier nations thereby perpetuating imbalances in competition due to inequalities related to country-specific resources. Butcher and Schneider (1998) advocate respecting the sporting practice itself including its inherent interests. Fair play involves not only adherence to rules but also respect for competitive aspects and philosophies undergirding sports practices. Hence, using training techniques like biomechanics analysis or mental training could contribute towards increasing competitiveness provided it does not compromise rules or challenge intrinsic values associated with a particular sport (Butcher & Schneider, 1998).

The essence of sport is rooted in a display of skill mastery and sporting prowess (Loland, 2018a). However, employment of enhancement devices or substances can severely undermine these core attributes. If we take gene doping as an example; altered genes are inserted to activate or switch off certain physiological behaviours which wouldn't occur naturally (Miah, 2007). Even though these actions amplify an athlete's physical abilities, it ultimately confines success to bio-manipulation, rather than merit-based competence and hard work. The blurring line between natural talent magnification through rigorous training versus artificial 'unearned' skill increases consequent to scientific tampering subverts conditions for the ideal sporting contest (Chapter 2). Further, compounding these techno-ethical issues are health risks associated with performance enhancement technologies usage. A notable exemplar is anabolic steroids - renowned for hormone manipulation - engenders acute liver malfunctions or cardiovascular disorders (Niedfeldt, 2018). Similarly problematic are blood doping strategies enhancing oxygen delivery aimed at augmenting endurance and drastically increase stroke risk factors (Eichner, 2007). Obligated adherence to health preservation enshrined within Olympic values signals profound reservations regarding

such risky ventures notwithstanding their monumental performance outputs. The epitome of fair competition rests on providing equitable opportunity for talents to be displayed coupled with advantage distributions primarily based on sheer ability and effort rather than externalities such as superior access to innovative advancements aiding superior performance output (Loland, 2002). Thus, unequal access or leverage over cutting edge biotechnologies could tip the scale favourably towards more affluent participants creating discriminatory cleavages violating distributive justice principle characteristic inherent in ideal sport contestation.

Doctrine of Double Effect (DDE) and Anabolic Steroids.

- 1) The action (in this case, the introduction or use of the technology) must be morally good or at least indifferent.**

The use of anabolic steroids in the context of sport embodies efficiency as its main value. The intended purposes, or 'good' effects as per DDE, includes enhanced muscle mass and recovery which could aid an athlete's performance (Cellotti & Cesi, 1992). Arguably, this aligns with some conditions for an ideal Olympic competition namely striving for excellence through maximum performance and preserving sporting excellence.

- 2) The agent (the person or organization allowing the use of the technology) must intend the good effect (the intended purpose of the technology) and not the bad effect (any negative impacts).**

In this case, the agent as the sport governing body allows the use of anabolic steroids to enhance the performance of the competitions and not the unfairness or the harm. The intention of itself is good as explained earlier.

3) The good effect does not arise from the bad effect.

Keeping a fixed perspective in my evaluation (DDE from the perspective of sport governing bodies), The good effect of performance improvement is independent from the bad effect. The use of anabolic steroids will directly improve performance of the user, i.e, the use of anabolic steroids doesn't lower the performance of the other competitors, rather just enhance the performance of the user. It can be argued using a probabilistic perspective that the user of the anabolic steroids will gain an advantage by lowering the chances of other athletes to win - thus the good effect (sporting excellence) might arise from the bad effect (unfairness). While it's true, the performance improvement can still be valued directly and independent of 'winning'.

4) Is There is a proportionately serious reason for permitting the bad effect of anabolic steroids in sport?

As specified in the provided definition, PEDs like anabolic steroids generate numerous 'bad effects' contradicting ideals integral to competitive sports. These include:

- Creating unfair inequalities since wealthier athletes or teams have greater access to more advanced and safer anabolic steroids compared to less privileged competitors (criterion 1). This violates principles of equity and fairness.
- Allowing non-sporting factors and resources to disproportionately affect outcomes rather than talent and effort (criterion 2).
- Posing major health hazards like cardiovascular disorders, liver damage and other adverse effects that endanger athlete wellbeing (criterion 3) (McVeigh et al., 2022).
- Conferring performance advantages unrelated to effort, skill development or merit (criterion 4).

- Enabling undetectable doping infractions through designer steroids eluding detection, undermining anti-doping integrity (criterion 5) (Fainaru-Wada & Williams, 2006).
- Overemphasizing winning-at-all-costs mentalities, conflicting with Olympism's holistic growth goals (criterion 6).
- Potentially demotivating clean athletes unable to match enhanced results from steroid users (criterion 7).
- Reducing normal variability in outcomes by enabling artificial performance spikes, diminishing suspense and excitement (criterion 8).

The grave harms posed, spanning health, fairness, motivation and integrity issues, appear too serious to justify allowing steroid usage simply for performance gains. These significant ethical costs outweigh the intended good as required by DDE proportionality (McIntyre, 2023). Strong grounds exist that the intended goods of enhanced sporting excellence fail to provide proportionately serious reasons permitting the multiple bad effects of anabolic steroids defined by established criteria. Upholding key ethical principles integral to sports necessitates prohibiting PED usage to foster fairness, health, integrity and human excellence. The costs appear disproportionate from an ethical perspective, precluding their justification under DDE guidelines.

3) Technologies intended to Restore Performance:

Performance restorative technologies are equipment, medications, therapies, and other aids that aim to help athletes recover from training, injuries or manage acute or chronic medical conditions that affect sports performance. These technologies embody the value of health. Performance restorative technologies can be categorized into two main types - recovery and compensatory technologies:

a) Recovery Technologies:

These technologies are designed to assist athletes in recovering from ‘temporary state’ of illnesses, intense training, competitions and other physically demanding aspects of sports. The goal of recovery technology is to help athletes regain their top performance. Outside of sports athletes can experience acute medical conditions like infections that directly impact their performance (Harris, 2011). For example, antibiotics or antivirals can be used to aid an athlete in fighting off an infection. In the realm of sports, restoring performance is crucial for maintaining exertion levels and minimizing the risk of injury. Various techniques are employed to speed up recovery, reduce muscle soreness, facilitate waste elimination from the body and ultimately restore athletes performance (Cochrane, 2004; Dupuy et al., 2018; Thorpe, 2021). Additionally nutrition and hydration management strategies play a role in assisting physical recovery by supporting energy replenishment after activity and aiding in tissue repair efforts (Malsagova et al., 2021). Moreover, periods dedicated solely for rest work synergistically with other techniques fostering a more rapid restoration process (Dupuy et al., 2018). Hydrotherapy is an approach primarily applied using contrast water principles entailing switching between hot/cold bathing - is popular among elite athletes. Despite its reception being anchored largely on anecdotal evidence it is suggested that said technique potentially mediates inflammation episodes while boosting overall cell revitalisation rates (Cochrane, 2004). This underpins periodization application designed to alternately structure training strenuousness combined with corresponding relaxation intervals leading to further optimizing sportspersons’ long term performances capacity (Thorpe, 2021).

Examples include:

- Pharmaceuticals that are non-relevant athletic performance: Antibiotics, Antivirals, Vaccines etc (Harris, 2011).
- Cryotherapy - helps reduce inflammation and speed up healing (Kwiecien & McHugh, 2021).
- Percussive massage devices - provide deep muscle stimulation to accelerate recovery (Konrad et al., 2020).
- Sleep trackers - optimize rest and recovery during sleep (Driller et al., 2023).
- Nutritional supplements - supply nutrients needed for rebuilding muscle and connective tissues (Huecker et al., 2019).
- Neuromuscular electrical stimulation - helps muscles reactivate after being dormant (Abitante et al., 2022).
- Proper recovery allows athletes to maintain high performance levels over periods of heavy exertion. The technologies optimize the body's natural recuperative abilities (Izzicupo et al., 2019).

b) Compensatory Technologies:

Compensatory technologies usually involve allowing the athlete to compensate for a chronic medical condition (e.g. diabetes, asthma, poor vision, etc.) or an acute condition that wasn't able to be properly treated using recovery technologies (e.g. conditions needing Therapeutic Use Exemption under WADA's framework). Their 'technical code' values Loland's Fair Equality of Opportunity (FEOP). These technologies help athletes manage chronic illnesses, disabilities or conditions that are uncontrollable by that athlete that may negatively affect sports performance.

Examples include:

- Asthma inhalers - allow clear breathing for athletes with asthma (Allen et al., 2022).
- Hormone Replacement Therapy - for athletes who suffer from hypogonadism, degenerative conditions, etc (Bhasin et al., 2018).

- Cochlear implants - restore hearing for athletes with hearing loss.
- Insulin for diabetic athletes.
- Corrective lenses - compensate for vision issues.

These technologies may potentially enhance performance in healthy athletes. The ideal is that sports governing bodies allow exemptions for the use of compensatory technologies for athletes in need - the key here is the intention to compensate for a disadvantage and not enhance performance (Morgan, 2009; Schneider, 2018). Compensatory technologies with enhancement potentials should only be explored as a last resort after all alternative 'recovery' treatments were ineffective. The technology intends to neutralize disadvantages from health conditions. Both recovery and compensatory technologies aim to restore athletes to their typical performance baseline, allowing them to continue competing when injuries or illnesses arise.

Analysis of Technologies intended to Restore Performance.

The integration of recovery and compensatory technologies into Olympic sport should be evaluated against key ethical conditions for ideal sporting contests proposed earlier in Chapter 2. Foremost, both types of restoration technology aim to promote equality of opportunity and fairness, upholding the Olympic Charter's principle of non-discrimination (Loland, 2002a; IOC, 2020). Caution is required to ensure that the technology stays within the bounds of offsetting disadvantage rather than enhancing performance. When applied judiciously and constrained within typical functioning bounds, performance restoration can also preserve the ideal of sporting excellence determined by talent and dedicated effort. Sustaining high training volumes and honing skill through recovery aids, or managing chronic conditions that otherwise preclude elite sport participation upholds the celebration of human potential through determination and grit (IOC, 2021).

A longstanding ethical debate in regulating performance technologies pivots on the boundaries between appropriate treatment versus improper enhancement (Morgan, 2009). The former aims to correct dysfunction and disadvantage, while the latter pursues supra-normal capacities (Schneider, 2018). However, as Morgan notes, clear delineation inevitably proves difficult, with risks of ambiguity about permissible restoration versus illicit augmentation (Morgan, 2009). Though ostensibly for equalization, compensatory interventions could enable unintended performance enhancement if not carefully constrained, undermining integrity of achievement (Schneider, 2018). For instance, permitted asthma medications like salbutamol could potentially improve performance if abused beyond medical need (Schneider, 2018). Strict evaluation against quantified standards of “normal” functioning collapses on the empirical reality of individual variability and practical infeasibility of precise equivalence (Pike, 2018). As Pike argues, granting exemptions based purely on calibrating some exact degree of advantage conferred is unworkable in practice (Pike, 2018). The complexities and uncertainties of sporting preparation and competition preclude such precision.

A procedural solution centered on deliberative transparency and athlete participation provides a principled path through the risks of ambiguity. As Pike suggests (2018), published deliberation about permitted exemptions offers a voice to concerned competitors in assessing potential unfairness. Review by representative athlete councils also helps ensure decisions reflect participant norms and avoid paternalism (Pike, 2018). Basically, the affected parties themselves can help mutually determine the bounds of reasonable advantage conferred by exempted technologies. This procedural justice approach eschews pretensions of precision in net advantage calculation, focusing instead on upholding reasonableness and trust. The

affected athletes themselves are empowered to debate and construct the standards sustaining integrity. Moreover, as the doctrine of double effect highlights, the intended purposes and uses of performance technology are ethically relevant, not just quantified outcomes (Schneider, 2018).

Consideration of whether exempted interventions aim at permitted ends of equitizing opportunity versus illegitimate enhancement provides moral grounds for deliberation. As moral agents, we properly make ethical distinctions between consequences which are intended versus those which are merely foreseen (Schneider, 2018). Technologies deployed consciously for improper augmentation contravene fair play, in contrast to technologies pursued in good faith for equity but with potential incidental effects. Transparency and athlete participation allow judging such intentions and purposes. Where potential for incremental advantage exists, voluntarily minimizing benefits through restraint demonstrates good faith. Ultimately, relying purely on quantified calibration of advantage ignores that sports unfold amid vast uncertainties, against a background of human variation. The affected athletes themselves should mutually determine the standards of reasonable advantage within zones of ambiguity. Their participation injects lived norms into regulating evolving technologies aimed at the human body. Technologies should elevate rather than diminish the essence of cooperative competition as defined by the Olympic Charter. These tenets include excellence, solidarity, respect and fair play (IOC, 2021).

Another intriguing case is the one of ‘doping down’. Schneider (2020) explains, doping down refers to athletes reducing their natural testosterone levels through medical intervention to be eligible for protected categories in women's sport. This constitutes the inverse of

performance restoration, which typically focuses on offsetting disadvantages beyond the athlete's control, rather than suppressing capabilities. However, the conceptual framework outlined in here still offers principles to evaluate doping down cases. The Doctrine of Double Effect (DDE) proportions intended goods against foreseeable harms (McIntyre, 2023). Here, enabling broader participation upholds inclusion, but risks violating integrity and agency. Layered analysis examining intentions, impacts and processes enables nuanced judgments about introducing technologies to 'doping down' with ethical tradeoffs. Structured application of DDE and emphasis on stakeholder democratic participation, and balancing principles of bodily integrity and agency, might offer a rich analysis of this specific case. While this case is certainly worth its own thesis, and doesn't directly fit into the proposed six categories, it's important to discuss (even briefly) how the proposed framework can accommodate this case.

Applying Doctrine of Double Effect to Testosterone Replacement Therapy (TRT).

- 1) The action (in this case, the introduction or use of the technology) must be morally good or at least indifferent.**

Testosterone replacement therapy (TRT) is a treatment for hypogonadal men aiming to normalize their testosterone levels through methods like injections or transdermal patches (Bhasin et al., 2018). From the perspective of sports governing bodies, allowing TRT for athletes diagnosed with hypogonadism can be seen as good or at neutral (DDE condition 1). The intention behind the action is to enable participation in sports by addressing a disadvantage caused by a condition that the athlete can't control.

- 2) The agent (the person or organization introducing or using the technology) must intend the good effect (the intended purpose of the technology) and not the bad effect (any negative impacts).**

The intention behind permitting TRT exemptions is restoring athletes disadvantaged by hypogonadism to typical testosterone levels, not artificially enhancing performance (DDE condition 2). Clinical verification of below-normal testosterone is required along with evidence TRT returns levels to an acceptable population range. However, governing bodies must ensure team doctors make proper diagnoses not fabricated to enable enhancement. Strict medical oversight, adverse health effects at supra-physiological doses, and random testing help deter intentional misuse. With proper safeguards against abuse, TRT for hypogonadism can be ethically deployed to offset disability versus illicitly augmenting abilities.

3) The good effect does not arise from the bad effect.

The performance benefit of TRT (bad effect) does not arise directly from the medical normalization it provides (DDE condition 3). Restored testosterone levels may indirectly enhance performance as a side effect but this is not inherent to the therapeutic purpose. However, incrementally raising levels beyond typical population ranges would constitute intentional enhancement. Clear dosage guidelines and ongoing monitoring of athlete levels are vital to constrain the performance boost to an incidental byproduct within the bounds of therapy, not the intended aim. Intentionally calibrating dosage to maximize performance would violate the proportionality limits of treatment.

4) Is There is a proportionately serious reason for permitting the bad effect?

For TRT to align with the DDE's proportionality principle, the benefits must outweigh the risks of permitting usage (DDE condition 4). A strong case exists that enabling sport participation for those with hypogonadism outweighs concerns about incidental performance gains. Banning TRT would unfairly preclude athletes with this condition absent an allowable

alternative. The threats must not outweigh the benefit of offsetting hypogonadal disadvantages. Strict medical oversight and dosage guidelines minimizing duration of exposure are thus essential to proportionality. It can be argued that permitting any risk of performance enhancement, however incidental, violates fairness. But forcing athletes to forgo treatment and suffer impaired functioning also seems unfair. There are no straightforward solutions given sports' contextual nuances (Morgan, 2009). Reasonable people in democratic settings (i.e. with proper diverse representation of all impacted parties) can debate where to draw proportionality lines amid ambiguity. However, provided conservatively managed within population testosterone ranges, the benefits appear to outweigh the ethical costs under a DDE analysis. Blanket bans seem disproportionate if medically supervised replacement aligns with therapeutic intent and avoids intentional enhancement.

DDE provides principles for weighing ethical trade-offs, but application relies on prudential judgements. Though risks exist, evidence suggests TRT for hypogonadism can meet proportionality standards if carefully constrained. Strict medical requirements confirming below-normal levels, constrained dosage aligning with population averages, ongoing monitoring and prompt cessation when levels normalize can constrain enhancement to an incidental byproduct of treatment, supporting therapeutic justification. However, athlete intentions matter, not just quantified testosterone levels (Schneider, 2018; Pike, 2018). Ultimately, managed TRT seems to pass DDE tests for ethically permitting an otherwise bad intervention, but only under close governance. Each case warrants thorough investigation before exemptions are granted, with diligent oversight sustained thereafter. If misused, TRT risks violating sporting integrity. When applied judiciously and transparently, TRT offers a path to preserving Olympic values of Fair play, friendship and solidarity. Our technologies should enable more to share in the enrichment of human achievement, not bar lives we do not

fully understand. While proportionality conclusions remain contestable, procedural fairness and compassion offer guideposts amid uncertainty.

4) Technology intended to promote safety in sport

Technology intended to promote safety in sport aims to protect the athletes from unnecessary harm- they embody the value of health. This category includes equipment, guidelines, and practices implemented to protect athletes from harm inherent in sporting practices. The primary intention of the technologies is to promote safety in sport by adhering to the safety norms. They aim to fulfill the key condition for an ideal Olympic contest of protecting competitor wellbeing by minimizing unnecessary risks of injury (Loland, 2002). While sports inherently involve some risk, exposing the athletes to unnecessary risk, opposes Olympic ideals of friendship and human development (IOC, 2021).

Analysis of technology intended to promote safety in sport.

Technology-focused solutions are increasingly prominent safety promoters. They embody values of safety and harm-reduction. Protective gear represents a traditional approach to reducing physical trauma - for example, helmets in American football, padded headgear in boxing and hockey, and shin pads used in soccer (Gelberg, 1995). While often effective, concerns arise on overly insulating athletes and enabling more dangerous play. Advances in impact-absorbing materials and designs like newer football helmet technologies better address concussion risks from collisions (Gelberg, 1995; Cournoyer & Tripp, 2014). More holistic, integrated approaches to injury prevention blend equipment innovations with training principles, biomechanics analysis, medical screening, and safety-focused rules and adherence (Owoeye et al., 2018). For example, “smart” wearables today collect physiological

data, tracking indicators like elevated heart rate to optimize training loads and avoid overtraining injuries (McCall et al., 2015). Even sports surface designs better absorb impacts, like engineered synthetic turf (Petrass & Twomey, 2014). Integrating these diverse safety-focused technologies more thoughtfully into sports training and competition could better optimize injury prevention.

However, potential conflicts between safety-promoting technologies and ideal competition conditions warrant consideration. Universal safety protocols could undermine fairness and meritocracy principles if implemented unequally across competitors. Mandating certain protective gear could also impede excellence, limiting maneuverability and physical capabilities. Proportional integration mindful of balancing safety imperatives and competition integrity shows promise. For example, data-driven “workload management” balances training stresses and recovery to curb overuse injuries, aligning with human development goals (Gabbett, 2016). Ultimately, transparent, evenly applied safety protocols enabling excellence represent ethical applications. Safety-focused regulations can also inadvertently undermine sporting skill demonstrations. For example, banning dangerous but athletically difficult maneuvers like backflips in competitive figure skating was well-intentioned for protecting athletes from serious injury risks. However, this also de-skilled performances by disallowing elite skaters from displaying their full athletic capabilities. Overly rigid restrictions on innovative maneuvers in the name of safety can constrain excellence, undermining the spirit of competitive virtuosity. Still, prudent regulation balancing safety and advancement, like only allowing very skilled skaters to attempt risky jumps, demonstrates ethical oversight. Sporting bodies should aim to expand possibilities for excellence through principled protections, rather than limiting achievement

potential through excessive constraints. With thoughtful guidance, safety protocols can mitigate risks while still celebrating human capabilities. Potential impacts also depend on how technologies shape competition norms over time. If safety improvements like advanced helmet designs enable increasingly reckless styles of play (Gelberg, 1995) then ethics are undermined. But normalized expectations around physiological monitoring and workload management may promote healthier training environments. This aligns with the Olympics' guiding vision of joy in effort towards excellence and friendship across rivals. Of course, uncertainty of outcome could suffer if safety technologies create large asymmetries in capability and advantage between competitors. But moderate, evenly distributed integration preserves competition integrity.

Applying Doctrine of Double Effect to padded headgear in boxing:

- 1) The action (in this case, the introduction or use of the technology) must be morally good or at least indifferent.**

Requiring padded headgear in boxing competition, aims to minimize traumatic brain injuries in boxing matches (Boxing Canada, 2019). The intention here can be easily considered as morally good. However, headgear could also alter competition dynamics in unintended ways.

- 2) The agent (the person or organization introducing or using the technology) must intend the good effect (the intended purpose of the technology) and not the bad effect (any negative impacts)**

Governing bodies mandating headgear, intend to uphold boxer safety, meeting DDE condition two. But critics may argue that added weight and bulk with headgear ironically increase risks from repetitive subconcussive blows. This complicates determinations of intended versus unintended effects.

3) The good effect does not arise from the bad effect.

Headgear directly intends to cushion head blows as a safety mechanism. But resultant changes to boxer tactics and spectator appeal may cause indirect side effects. However, some may contend that headgear encourages more reckless offensive styles. This potentially inverts the means-ends relationship if increased danger is an inadvertent byproduct.

4) Is There is a proportionately serious reason for permitting the bad effect?

A key dispute is whether headgear's protection outweighs any elevated injury risk from modified boxing styles, as required by DDE condition four. Proponents emphasize reduced superficial facial cuts and other acute trauma from adding protection (Boxing Canada, 2019). But critics argue subtler neurological damage could rise, violating the "do no harm" principle. In essence, the merits of mandated headgear hinge on uncertain trade-offs between acute injury reductions and potential rises in chronic neurological trauma. A DDE analysis reveals ethical complexity masked by straightforward safety assumptions. More data on headgear's injury impacts could better inform proportionality judgments. Short of definitive evidence, transparency and boxers participating in crafting regulations uphold ethical oversight amid uncertainty. If integrated compassionately, safety technologies like headgear can largely align with preventing needless harm while preserving boxing's inherent values.

5) Technology intended to monitor officiating and integrity

Technology intended to monitor officiating and integrity refers to any system, application, tool or device used in sporting events or competitions to observe and assess rule compliance - embodying the values of justice and fairness. The primary intention of technologies intended to monitor officiating and integrity in sports aligns with promoting the conditions for an ideal

sporting contest. The inherent goal of such tools is providing unbiased judgment, upholding compliance to rules, preventing illicit practices, like doping or illicit equipment use, are in harmony with the principles of non-discrimination and fair equal opportunity performance, adhering to safety and harm prevention, justice in rule enforcement, and meritocracy in the distribution of advantages. Further, these technologies strive for preserving sporting excellence by mitigating errors in officiating which might unfairly tilt match results. Henceforth, their introduction into a sporting context can be deemed fundamentally good/neutral from an ethical standpoint since they uphold the integrity and fairness that underpin competitive sports.

Analysis of Technology intended to monitor officiating and integrity

The emergence of sophisticated officiating and integrity technologies represents a development within the ethical evolution of competitive sports. Technologies like video assistant referee (VAR), goal-line sensors, and computer vision tools have been progressively incorporated across various sports to enhance real-time officiating accuracy and ensure closer integrity monitoring (Spitz et al., 2021). However, a philosophical rumination on these technologies reveals a complex interplay of ethical questions and trade-offs pertaining to their appropriateness. On one hand, such technologies uphold the cardinal sporting principles of fairness and ethical conduct. Enabling impartial and accurate officiation regardless of human limitations of perception, or bias, helps meet sporting contests' objective of establishing the best athlete through a standardized rules framework (Tamir & Bar-eli, 2021). Their use also deters ethical violations by applying consistent surveillance on events like simulation, illegal equipment usage or pharmaceutical doping - aligning with the emphasis

on rules compliance and integrity in sports. The VAR system has tangibly improved refereeing accuracy from 92.1% pre-VAR to a post-introduction of 98.3% (Spitz et al., 2021). Achieving such reliability exclusively through unaided human oversight may prove challenging. However, critics caution against pursuance of flawless officiation at the expense of other sporting ideals. Excessive interference through VAR reviews or sensors may obstruct the free-flowing tempo, spontaneity and unpredictability that characterize sporting contests (Zglinski, 2022).

Drug testing plays a crucial integrity role in sports by deterring doping via random, unannounced tests year-round, even requiring some athletes to report daily whereabouts (Tamburrini, 2013). While pivotal for fairness, constant surveillance, like observed urine sampling, raises privacy concerns. Testing procedures aim to uphold fairness but engender ongoing debates regarding privacy costs. Ultimately effectiveness necessitates invasiveness, but ethical unease persists around extensive, inescapable oversight confronting bodily autonomy. Drug testing exemplifies technology upholding rules yet straining against deeper values.

Applying Doctrine of Double Effect to VAR:

- 1) The action (in this case, the introduction or use of the technology) must be morally good or at least indifferent.**

When we apply DDE to VAR technology, the "action" here refers to its implementation in sports events-particularly football matches. As proponents argue, the primary objective or intended "good effect" of this action is associated with enhancing accuracy and objectivity within decision-making processes. Thereby it eliminates certain types of foul play or unethical behaviours and human errors inherent in officiating at brisk paces during live matches (Spitz et al., 2021). This goal aligns itself with enhancing impartiality (Tamir &

Bar-eli, 2021) while ensuring justice and preservation of sporting excellence - prerequisites for Ideal Olympic competitions.

2) The agent (the person or organization introducing or using the technology) must intend the good effect (the intended purpose of the technology) and not the bad effect (any negative impacts)

However, like any action taken in this world, implementing VAR isn't free from unintended or negative impacts-the so-called "bad effects". Herein lie issues arising from disruptions during match-play entailing additional playing time concerns; moreover certain subjectivities concerning interpretation remain - especially handball offences posing further challenges exploring broader transparency frameworks (Zgliniski, 2022). Also critical here are socio-cultural implications along with fan reception which substantially influence constructs shaping popular narratives around acceptability within power dynamics embedded globally across sports concerned.

3) The good effect does not arise from the bad effect.

For VAR, the good effect of enhanced integrity through video review stands independent of bad effects like disrupted pace. Correcting errors directly stems from footage, not indirectly from tempo loss. Though slowed flow, limited discretion, and diminished unpredictability are undesirable byproducts of VAR itself, the system's core benefit - upholding fairness via definitive evidence - arises separately, not from those consequences. Thus VAR meets the DDE principle that intended goods do not stem directly from unintended harms. The positive aims arise independently despite negative side effects.

4) Is There is a proportionately serious reason for permitting the bad effect?

Moreover, while acknowledging these potential disruptions causing added time implications during matches due to VAR review process- elucidated as 'bad effects' in DDE theory - their

ratio compared to tangible game-enhancement achieved through improved decision-making is pivotal too (Errekagorri et al., 2020). Applying such proportionality analysis holds validity, both empirically as well as ethically, considering significant accuracy rate improvements post-VAR inclusion reported consistently across studies attaining about a notable 98.3% efficiency level illustratively (Spitz et al., 2021). This amplifies safety standards preserving sporting excellence, alongside creating environments fostering merits based justly decided competitions, aligning strongly with foundational principles driving Olympic spirit. While critiques exist, e.g., subjective interpretation difficulties on matters such as handball offenses, leading to potential bias in decision making, current discussions overall support how technology can enhance transparency in enforcing the rules of the game. However, given changing circumstances over time, there remains room for improvement by simplifying guidelines and clarifying objectives that could reduce dispute possibilities and enable broader acceptance among all stakeholders involved in football - players, referees or fans alike thus underlying its significance universally. In conclusion, though challenges persist they do not form a strong case against using this technique, due to clear benefits from various ethical perspectives, namely, promoting fairness, non-bias competitiveness upholding ideals closely related with Olympism.

6) Technology intended to enhance consumption and participation

Technology intended to enhance consumption and participation refer to innovations aimed at augmenting and improving the spectator experience of sports, and encouraging participation (Real, 2002; Schneiders & Rocha, 2022). These innovations strive to create personalized and interactive experiences, for fans and viewers (Smith & Westerbeek 2010). Such technologies encompass many forms, including broadcasting advancements in venue innovations, digital

frameworks and platforms, new viewing formats, data driven metrics and diverse methods for engaging with customers or fans. They help popularize a sport by adopting strategies like optimizing real time analysis and delivering personalized content (Thompson et al., 2014). The primary intention driving this category of technology is to enhance sports consumption while promoting fan engagement and grassroots participation in sporting events. This category embodies many values, like financial and participatory sustainability - two crucial elements for the survival and the continuation of the practice.

Analysis of technology intended to enhance consumption and participation in sport.

An exploration into the implications of technology intended to enhance consumption and participation, when viewed through the lens of the Conditions for an ideal Olympic contest, reveals both enhancing and detracting elements. These technologies, including streaming platforms, social media networks, and mobile applications (Lindholm, 2019; Trivedi et al., 2020), may foster accessibility and inclusivity by bridging geographical or socio-economic gaps. The principle of non-discrimination is thereby reinforced as these innovations democratize viewership and broaden sporting communities. Furthermore, advancements facilitating consumption also enhance engagement between fans and athletes - creating a more immersive experience that encourages friendship and solidarity among diverse communities (Le Noury et al., 2022). This interactive dimension brought forth by virtual reality not only yields personalized experiences but also amplifies popularity in less accessible regions-the spark behind previously unseen growths in certain sports. For example, attracting audiences worldwide regardless of location-based limitations like heat issues impeding Ice Hockey's feasibility in Middle-Eastern countries.

Despite the impacts there are also consequences associated with the use of these technologies in sports. A direct impact technology intended to enhance consumption and participation, this is the way sports have become commercialized and turned into commodities (Ciomaga & Kent, 2015; Edwards & Corte, 2014). The growing use of technology has increased money, marketing, and media influences in sports, which raises concerns about the loss of independence and authenticity in the sporting world. There is also a worry about exploitation of athletes, fans and communities (Connor, 2009). Moreover technology can contribute to exclusion and discrimination in sports by creating divides, inequalities and biases. Athletes and fans may face discrimination or harassment based on their identities or performance data (Azzarito & Harrison 2008) - an underperforming athlete who is now very accessible on social media networks, can be harassed by thousands of angry fans not only on the pitch/venue but also during their private time. This situation deviates from the principles of non discrimination. Prioritizing accessibility may sometimes sacrifice the level of skill necessary to succeed in sport (i.e. de-skill), like in the example of the U-groove golf clubs and death finders in fishing, this goes against the principle of meritocracy. Although incorporating technology intended to enhance consumption and participation into sports has the potential to improve accessibility, engagement, inclusivity and popularity it's important to be aware of its drawbacks. These include commercialization, commodification, exclusion and de-skilling - all of which can compromise the conditions for competition. As we keep delving into and embracing technology in sports, finding a balance that maximizes its advantages while minimizing its drawbacks becomes essential, for upholding the integrity and principles of sports.

Application of Doctrine Of Double Effect to Augmented Reality (AR)

1) The action (in this case, the introduction or use of the technology) must be morally good or at least indifferent.

The integration of augmented reality (AR) technology, by governing bodies aims to enhance the enjoyment of spectating which is morally neutral. The use of AR can provide fans with enriched access to information during events (Craig, 2013; Le Noury et al., 2022). However, this intended spectator benefit risks inadvertent harms like commercialization, athlete exploitation, or discriminatory impacts. While the core purpose of AR seems acceptable it is crucial to have constraints in place to prevent the negative effects from overshadowing the intended positive outcomes according to the Doctrine of Double Effect.

2) The agent (the person or organization introducing or using the technology) must intend the good effect (the intended purpose of the technology) and not the bad effect (any negative impacts)

The introduction of AR technology by governing bodies signifies a morally neutral action. These entities are guided by their intention to enhance fan engagement and improve the sports experience. Therefore despite the consequences related to commercialization, athlete exploitation or discrimination (Ciomaga & Kent 2015; Connor, 2009; Azzarito & Harrison 2008) we cannot consider their intentions as ethically wrong. This delicate balance between advancements and potential drawbacks highlights the moral complexity that comes with technological progress and necessitates ongoing ethical considerations.

3) The good effect does not arise from the bad effect.

For augmented reality (AR), intended spectating good effects arise independently, and not directly from foreseeable bad effects. With careful oversight minimizing harms, AR's good effects could be achieved without necessarily producing significant bad effects. Still, responsible governance is essential to ensuring good effects dominate, given foreseeable

risks. AR must be carefully implemented to maximize the good effects while averting unintended bad effects.

4) Is There is a proportionately serious reason for permitting the bad effect?

The proportionality principle requires assessing if there are proportionately serious reasons for permitting foreseeable bad effects of an action (McIntyre, 2023). For augmented reality (AR) in sports, salient potential harms include exclusion, data exploitation, and commercialization, absent appropriate safeguards (Ciomaga & Kent 2015; Connor, 2009; Azzarito & Harrison 2008). The intended ‘good effects’ are spectatorship experience improvement and encouraging participation. For AR to satisfy proportionality, the advantages must sufficiently outweigh foreseeable adverse impacts, rather than the reverse. Positive initiatives, like generalizing access, proper oversight, and debiasing could address risks. Overall, AR integration seems to pass proportionality if governance curtails harm. But vigilance is essential as unchecked risks could easily override benefits and violate sporting values. The immersive powers of AR require oversight to ensure its advantages align with, and not violate, the conditions of the ideal Olympic Contest. With constraints minimizing foreseeable problems, proportional gains seem achievable. But absent prudent controls, AR risks disproportionate harms spanning exclusion, data ethics and commercialization - violating proportionality standards. Diligent governance and evidence-based risk assessment is vital to sustain proportionality and justify permitting AR in sports under a DDE analysis.

Conclusion

This chapter has developed a framework for ethical evaluation, specifically aimed at assessing technology adoption in Olympic sports. An integral achievement of this study lies in the conceptual clarity achieved by categorizing technology by primary intention, from the

perspective of governing bodies, and amalgamating two philosophical paradigms - Feenberg's critical theory and the Doctrine of Double Effect - crafting a comprehensive, nuanced examination schema for sports technology integration. Feenberg's critical theory spotlights how technologies propagate values, shape relations, and distribute impacts in non-neutral ways demanding ethical scrutiny (Feenberg, 1991). Complementarily, the Doctrine of Double Effect supplies principles for weighing intended goods against foreseeable harms, providing a systematic protocol for ethical assessment (McIntyre, 2023). Integrating these conceptual lenses allowed the development of a taxonomy categorizing sports technologies by primary aims, then evaluating specific cases against ethical criteria for ideal Olympic contests. This fusion of categorization, intention-focused and consequentialist analyses enabled examining sports technologies through diverse ethical dimensions.

The taxonomy of six technology categories - constitutive, performance improvement, performance restoration, safety promotion, officiating and integrity, consumption and participation - provides a broad orientation to sports technology dynamics. However, individual technologies ultimately require bespoke analyses accounting for nuanced details. The categories supply initial orientation, while case assessments offer particular insights. Demonstrating this, the thesis applied abbreviated Doctrine of Double Effect illustrations to specific technologies like VAR, testosterone replacement therapy, and headgear. But far more extensive analyses would be warranted to capture the full complexity of impacts against ethical criteria. However the broad categorical introductions set the stage for analyzing cases. By considering the Doctrine of Double Effect the thesis highlighted how ethical assessments depend on determining proportionality, in situations where uncertainty is inevitable. Rational individuals may hold judgment regarding what trade offs between principles are acceptable and what are excessive (Schneider, 2018). Articulating evidentiary bases and procedural

fairness in collective deliberation among stakeholders would strengthen practical application. This links to Feenberg's (1991) emphasis on democratizing technology decisions. Integrating affected parties injects lived norms into discerning proportionality. The merging of intention-focused, consequentialist and procedural ethics provides a multifaceted toolkit for technology assessments - but prudent, inclusive judgment remains essential.

Limitations and Future Research

While the ethical assessment framework offers a useful starting point, conceptual limitations provide opportunities for refinement through future research. The technology categories drawn in this thesis, provide conceptual clarity necessary for the model's accessibility, yet it presents broad generalizations needing qualification. As noted earlier, categories encompass significant internal variance between specific technologies. Individual tools must be judiciously examined in context, not painted with broad brushes. The Doctrine of Double Effect analyses done here may have only engaged one or two principles per category, the goal was to demonstrate the concept; in depth analysis will be presented in the next chapters in forms of rich case studies. More extensive assessments weighing technologies against all eight contest conditions could enrich understanding of holistic impacts. Formulating contextual adaptations of the principles for different sports may boost relevance, along with prioritizing certain values in specific contexts. I can self critique the methodology itself, as having over-reliance on procedural tools, risks technocratic reductionism devoid of humanistic insight. Close collaboration between sports philosophers, sport sociologist regulators, technologists and athletes would enrich the knowledge base. Integrating sociotechnical analysis of how innovations diffuse through complex sporting ecosystems

would complement the conceptual foundations established here. Consulting athlete communities directly in a participatory ethics approach would center lived experiences into ethical discernment.

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Chapter 4

The Case of Artificial Tacticians in Sport

Introduction

In the initial chapters, I developed a philosophical structure for evaluating the integration of technology in sports. My analysis on regulatory frameworks, like doping controls, revealed their inadequate approach due to reactive stances and vague use of "*The Spirit of Sport*" concept (Chapter 1). To improve this, in Chapter 2, I proposed a template for an ideal Olympic Contest, with principles such as equal opportunity, safety, meritocracy, and justice based on influential works on fair play and Olympism (Loland, 2002; Butcher & Schneider, 1998; IOC, 2021). Lastly in Chapter 3, I hybridized Feenberg's critical technology theory (1991) with the scholarship on the philosophy of sport, and the Doctrine of Double Effect, creating a methodology to classify technologies based the intended goals, which are then evaluated using 'intention-focused' and 'consequentialist' analyses against our earlier established model for Olympic contests. Engaged with philosophical instruments, my analysis now turns to examining a case study. Chapter 4 focuses on the ethical aspects of a hypothetical AI named HOTA (Hypothetical Optimal Tactical Assistant); an epitome of emergent algorithmic platforms streamlining competitive strategies and athletic performances using voluminous datasets and predictive analytics (Fernández & Bornn, 2019). HOTA's main goal is strategy enhancement and is classified as performance improvement technology. I will assess the beneficial implications designed to conform to Olympic ideals, while critically examining any foreseeable inadvertent adverse impacts breaching philosophical tenets of fair competition.

Literature on emerging AI and AI integrated sensor technologies in sports

Virtual Reality (VR)

The literature on Virtual Reality (VR) in sports embraces both its potential and ramifications. Emerging research illustrates the transformative impact VR can have, particularly in enhancing spectator experience and team training regimens (Kim & Ko, 2019; Faure et al., 2020). Kim & Ko (2019) explain the immense immersive potential of VR that can enrich the viewing experience of sports enthusiasts, while still enabling them to partake in the sense of flow in sport spectating experiences. Besides fostering engagement among spectators, there's indication that VR applications may also aid with team training. As posited by Faure et al. (2020), a simulated environment, provided through VR means, could be harnessed to analyze and fine-tune athletic performance, thereby strengthening players' strategy formulation and execution abilities. The potential of motion-based video gaming in enhancing motor skills is examined by Jenny et al. (2017). The authors emphasize the encouraging components of innovative teaching methods in video gaming, which promote both learning and physical activity within education. Along similar lines, Nor et al.'s study from 2020 asserts how marrying immersive VR technology with methods like gamification has promising implications for stimulating athletes' enjoyment during physical exercise, potentially prompting them to improve their performance levels as well. However, it's imperative we don't overlook ethical questions arising out of radical technological integration into sport. Synoptically, considering these revelations arouses philosophical musings concerning what exactly constitutes an authentic sporting encounter. This is where sporting simulations may come under scrutiny as some may argue that VR might distort notions about authenticity within spectatorship, or skill refinement practices inside virtual spaces, affecting historical

understandings around competition, training and nature. Epitomizing this debate are Virtual Environments (VEs), such as those proposed by Miles et al.(2012), suggesting VEs could hone sensorimotor skills integral to ball-sports mastery. Hence, novel explorations into integrating VEs necessitate rigorous evaluation balancing gains against repercussions, not only concerning utility, but ethical aspects regarding issues of fair play.

Digital Refereeing - Video Assistant Referee (VAR)

The ever-maturing world of professional football now depends significantly on VAR technology, carving the path for a moral revolution in the sport. Upholding ethical conduct and fairness has traditionally fallen onto referees who grapple with human judgement limitations potentially impacting match results (Tamir & Bar-eli, 2021). The reality is that today's fast-paced games present fresh challenges to referee decision making abilities. Several studies have noted key inaccuracies specifically around offside calls - which unveils a clear requirement for some form of technological intervention set up to prevent these inconsistencies while keeping match proceedings standardized (Tamir & Bar-eli, 2021; Oliveira et al., 2023).

The integration of the VAR has been an innovative approach for combating physical limitations faced by on-field referees while ensuring the highest possible judgmental accuracy. Moreover, psychological biases that traditionally tended to cloud referee decisions - including pre-existing knowledge, reputation bias and susceptibility to fan influences - have found a practical mitigation tool in VAR (Tamir & Bar-eli, 2021). While critics voice their concerns over disruptiveness and reliability issues related to certain subjective calls such as handball offenses (Zgliniski, 2022; Errekagorri et al., 2020), stats reveal the silver lining. The adoption of VAR has caused accuracy rates in offside judgement to increase from 92.1% to

98%, thereby celebrating improved accuracy capabilities of this digital innovation (Spitz et al., 2021). However, understanding this digital progression necessitates careful contemplation of socio-cultural aspects, including fan reception across different cultural contexts, which are yet unexplored territories. Subsequently, adapting transition phases efficiently toward inclusion is essential, as was reflected through the initial lower performance rate witnessed upon introduction processes related bottlenecks and teething troubles owing partly to the lack of clarity goals rewards systems, procedural incorporation difficulties that were observed (Samuel et al., 2020).

Wearable technology

Wearable technologies and sensors represent an area of profound innovation and escalating adoption across diverse sporting landscapes. From wearable physio-monitoring devices tracking athlete exertion and recovery, to inertial measurement units quantifying biomechanics, these tools promise more optimized training, safety and performance (Adesida et al., 2019; Arogam et al., 2019; Owen, King & Lamb, 2015; Taborri et al., 2020; Karkazis, Fishman, 2017; Evans, McNamee, Guy, 2017). However, ethical complexities around privacy, consent, access equity, data interpretation and competitive fairness necessitate judicious oversight integrating these transformative capabilities, congruently with sporting values and purposes. Adesida et al. (2019) emphasize wearable technology's transformative potential for sports biomechanics, specifically its pivotal role in reducing injuries, and subsequently, bolstering an individual or team's overall efficacy. As the technological landscape accelerates though, a point to ponder upon is whether every advancement serves a beneficial and ethical purpose within sports. Significantly amplified use of biomechanical sensors throughout multiple sporting disciplines attests to this growing phenomenon as outlined by Taborri et al., (2020). Owen et al. (2015) highlight the relevance

of wearables, from both enhancing safety and evaluating performance, in endurance motor racing. However, glancing through all these ubiquitous developments raises certain dilemmas; like questions around transgressions into athletes' privacy rights due to excessive data collection methods from devices? Tricky scenarios can occur, where already powerful dynamics existing among coaches and athletes, might push players into compulsive utilization of such technologies.

The evolution of AI into in-game tactics

Far beyond mere plays and formations, football tactics embody a distinctive style and ethos that come alive during competition. Examining the nuanced strategies teams employ reveals profound ethical dimensions inherent across sports. At its core, strategic decision-making in athletics mirrors our distinctly human capacities for judgment and agency. Yet the growing use of algorithmic techniques like machine learning, and deep learning in sports, poses thoughtful questions about technological determinism and its impacts on free will . As these data-driven methods enable comprehensive analysis for predicting outcomes and automating interpretations (Cust et al., 2019; Pavitt et al., 2021; Loquercio et al., 2020), are we stripping away space for human artistry, courage and meaning in sport?

Recent studies demonstrate these trends, with sophisticated models forecasting countries' Olympic medal counts and optimizing team selections (Schlembach et al., 2022). But seemingly objective algorithms gloss over intangible human elements that constitute true sporting achievement. Technical rankings reduce unique individuals pursuing excellence into mechanistic data points optimized by formulas. Crucially though, athletes demand treatment aligned with moral principles like human autonomy, non-maleficence, beneficence, justice

along with transparency and accountability (Carrio Sampedro, 2021). Techniques for data-driven strategic advice, from predicting goal-scoring chances to estimating decision parameters (Fernandez & Bornn, 2019; Cervone et al., 2014), require ethical evaluation. If optimized play usurps coaches' and athletes' agency, are we sacrificing cherished spontaneity and creativity for robotic efficiency? Does relentless optimization erode sports' enduring humanity and meaning? Thoughtful oversight is needed to ensure algorithmic models remain grounded in ethics, avoiding the technocratic reduction of dynamic human pursuits into formulaic processes devoid of spirit. With care, analytics may enlighten strategic decisions, but never override the personal growth and fellowship at sport's heart. Our innovations should empower sportspeople's excellence, not diminish their humanity.

Delving deeper into this discussion, guides us to Bojinov & Bornn's research (2016), where they scrutinized football's "pressing" tactic using AI. Pressing is a technique unemployed in football to disrupt an opposition's defenses. This breakthrough enables teams to navigate their opponents' strategic vulnerabilities more precisely, raising questions relative to ethics and fair play. What if an AI guides teams to press the injured opposition's athletes to take advantage of the opponent's vulnerabilities? Taking this analysis path even further, leads us back onto data driven individual performance evaluation models such as 'off-ball scoring opportunity (OBOS)' (Spearman, 2018) among others. The advent of artificial intelligence algorithms dictating player fortunes, yet again, flag up philosophical debate topics including determinism versus free-will, along with their associated ethical counterparts debatable under notions expressed in AI Ethics. This intricate web woven around sport strategy essentially spirals into infinite nuances, thus connecting various threads within in-game strategy across different spheres.

Carrio Sampredo (2023) argues that despite widespread use of AI in areas like performance enhancement, injury prevention, and refereeing, sports governing bodies have not adopted policies or regulations regarding responsible and ethical AI uses. This lack of governance poses risks to athlete rights and wellbeing. Carrio Sampredo (2023) argues that establishing an ethical framework and oversight mechanisms is urgently needed to promote fair, accountable, and transparent AI uses that align with principles of Olympism. Adopting global AI governance in sport could protect athletes while allowing AI's potential benefits.



Source: Stats Perform

Figure 4.1 : AI analytical capacity of sport performance (Stats Perform, 2023)

Table 4.1: Examples of emerging technologies that integrate AI in sport

Type of Technology	Brief Description	Potential Ethical Concerns	Citations
Artificial Intelligence, Machine Learning & Deep Learning	Utilized in sport for automated detection of sport movements, calculating goal-scoring probabilities and detecting match phenomena.	Privacy concerns, bias in AI training data, over-reliance on technology, unfair competitive advantage, accessibility	Cust et al., 2019; Pavitt et al., 2021; Loquercio et al., 2020; Ramkumar et al., 2022; Aroganam et al., 2019; Anzer & Bauer, 2021; Schlembach et al., 2022

Biometric Technologies, Nanobiosensors, Wearable Technologies & Sensors	Used for assessing athlete's performance, preventing injuries, biomechanics research, and monitoring fatigue levels.	Privacy and data security, informed consent, unequal access, fairness in competition	Adesida et al., 2019; Aroganam et al., 2019; Owen, King & Lamb, 2015; Taborri et al., 2020; Karkazis, Fishman, 2017; Evans, McNamee, Guy, 2017
Global Positioning Systems (GPS)	For tracking and monitoring of team sports performance and strategy.	Privacy concerns, unauthorized surveillance, fairness in use, accessibility	Cummins et al., 2013
Virtual Reality (VR), Virtual Environments (VEs)	Used to enhance spectator experience and for team sports training, and to improve sensorimotor skills in ball sports.	Potential misuse, cyber sickness, digital divide, fairness, accessibility	Kim et al., 2019; Faure et al., 2020; Nor et al., 2020; Nazira Nor et al., 2020; Miles et al., 2012
Video Assistant Referee (VAR) technology	Used in soccer for making more accurate rule-based decisions.	Impact on referee decision-making, over-reliance on technology, fairness in use, accessibility	Tamir & Bar-Eli, 2021; Oliveira et al., 2023; Zglinski, 2022; Errekagorri et al., 2020; Spitz et al., 2021; Petersen-Wagner & Ludvigsen, 2022; Samuel et al., 2020

Case study: Artificial Intelligence (AI) - Hypothetical Optimal Tactical Assistant

In this part, I present HOTA - the Hypothetical Optimal Tactical Assistant. Developed as an AI in-game strategist (or AI assistant coach). This hypothetical technology is drawn up for ethical analysis in this paper as a possible future technology. HOTA is engineered to provide almost instantaneous strategic advice to teams during competitions. Drawing upon substantial repositories of historic game, data and sport-specific records, HOTA becomes an all-knowing assistant coach. It collects and processes diverse information, such as player performance statistics, scouting reports, and medical profiles -optimizing these myriad insights, into effective strategic recommendations. A unique feature includes gathering live social media insights not only from players' social media accounts, but also from their broad circles (family, friends, team-mates, etc.) - doing so enables precise calculations about how significant personal life changes might ultimately affect an individual's tournament

performance. Indeed, weighing every possible outcome with remarkable confidence becomes conceivable, as it doesn't leave out coaches or referees either, when estimating probabilities centered around them too. Additionally, HOTA incorporates situational factors such as weather forecasts and field conditions alongside indirect influences, like fan engagement, which potentially influence outcomes by affecting morale or generating pressure scenarios induced by crowds on match days.

To achieve accuracy with biometrics, all players (including opponents) actions along with their movements, cutting edge technology powered stadiums filled with cameras are employed to capture all activity using computer vision. This massive influx of data is fed into a super-computer that processes super quick simulations runs within HOTAs advanced predictive engines. HOTA provides guidance via virtual reality visors and earpieces designed to optimize coaching decisions. Virtually overlaying gametime possibilities onto existing circumstances, through evaluation models based on criteria like degree of fatigue being experienced by participants, combined injury status, lets HOTA's strategically superior recommendation capabilities shine over traditional human coaching methods. It proposes alternative routes without dictating decisions that humans ought to be making themselves in sport related activities. This capacity goes far beyond just pointing out mistakes, as it includes play design optimization while synchronously reducing errors greatly.

The Analytical Framework:

In Chapter 3, a moral schema was formulated to evaluate sports technologies within the scenario of the Olympic Games. This approach entailed classifying devices according to their defined aims and implementing the Doctrine of Double Effect (DDE) as a measure for balancing possible gains against unintended adverse outcomes. The aspiration here was to

assess whether these modern enhancements uphold or challenge fundamental philosophical tenets and conditions intrinsic for an archetypal Olympic contest as elaborated in Chapter 2. In this chapter, I am poised to illustrate how this analytical method can be practically enacted using HOTA - a hypothetical AI assistant - as an exemplar; chosen due its designation towards enhancing athletic performance via data-informed strategic suggestions. Hereunder it is located within the performance enhancement category. I will probe into both supposed benefits offered by HOTA along with its potential risks that could contradict cardinal ethical principles presupposing fair and meaningful competition synonymous with Olympics. The DDE paradigm from Chapter 3 furnishes us with a comprehensive mechanism aiding our examination of impacts on ethics. By meticulously evaluating HOTA through previously structured philosophical techniques, my objective is demonstrating efficacy embedded in such theoretical technology assessment tools which prove invaluable whilst grappling complex queries lying at the convergence zone between Ethics, Artificial Intelligence & Modern Sports disciplines. The critique will underline notable aspects pertinent to discussion employing HOTA's case study.

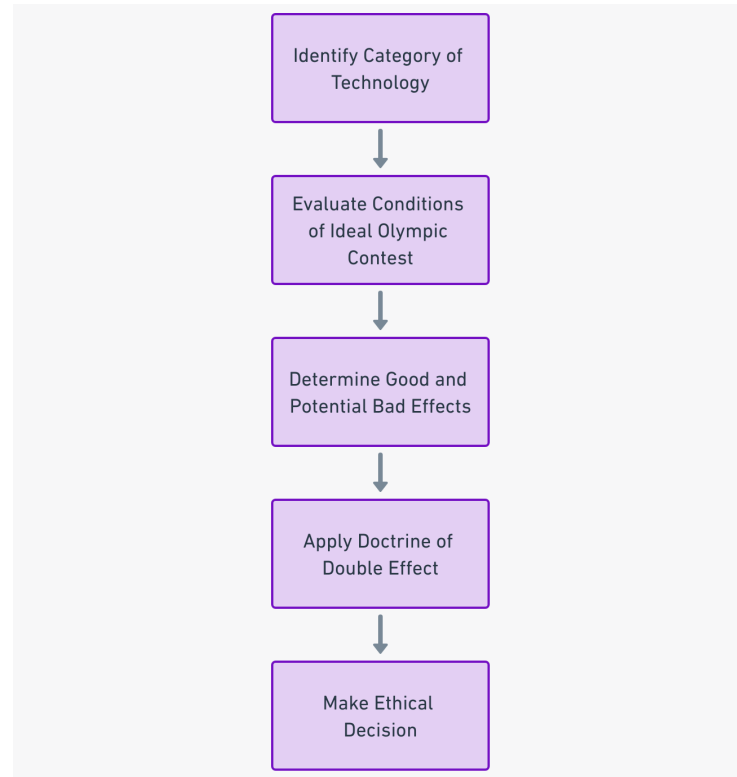


Fig 4.2 : Flow chart guiding ethical analysis

Identify the Category of Technology:

HOTA essentially belongs to the "Technology intended to improve performance" group, embodying the principle of facilitating efficiency. Primarily designed for sharper and faster strategic decisions during in-game situations using inputs from a multitude of sources.

Evaluating HOTA against the Conditions of the Ideal Olympic Contest:

- 1) Does the technology promote fair equal opportunity for all athletes to perform, regardless of their backgrounds or circumstances?**

HOTA brings with it a host of issues linked to non-discrimination and fair equal opportunity.

This kind of AI operates on historical and live data that captures performances of individual

players and teams. However, critical evaluation might reveal potential biases that could be inherent within historical and training datasets due to various societal disparities prevalent in sports, such as gender inequality or racial discrimination (Mehrabi et al., 2021). If unrectified, these biases could translate into potentially unfair tactical recommendations from AI models. For example, if training data reflects persistent undervaluation of certain player groups, due to systemic social prejudices rather than their actual performance ability, resultant predictive models could suggest game plans that inadvertently reinforce such negative stereotypes. This raises a foundational query related to justice - will the implementation of AI-based tactics give all players a fair equal opportunity for performance? The decisions should primarily depend on competitors' abilities, talent and effort. Notably though, artificial intelligence systems would not directly affect physical competition but mainly informs strategic decisions. Therefore, from one perspective, one might argue that since coaches and players retain agency, choosing whether or not they adopt advised strategies, they are collectively responsible for match outcomes.

Adversely, algorithmic biases in statistical models could lead to some athletes being systematically disadvantaged thereby creating an unequal sporting environment contrary to Olympian principles (IOC Charter: Fundamental Principle 4). Hence, prudent steps needed to ensure initial development phases include techniques like fairness constraints or adversarial debiasing reducing possible discriminatory effects (Tomalin et al., 2021; Mehrabi et al., 2021). Moreover, determining optimal strategies based purely on quantitative assessments risks eliminating opportunities for creative styles, is contradictory towards essential qualities valued in sport settings like aesthetic expression (Parry, 1989) and tactical creativity (Memmert & Roca, 2019). Could this mean losing sight of the beauty intrinsic within unpredictability elements, embodied by sporadic creative moves, devised from flexible

human cognition? Future studies might explore how we can balance predictable efficiency derived from machine learning models in modern sport. The implementation of HOTA inevitably brings forth debates on equal access. The advancements in technologies demand substantial monetary and knowledge investments. This consequently means that rich clubs, or nations, are more likely to afford, embrace, and adapt effectively to AI technologies, compared to their less affluent counterparts (DiMaggio et al., 2004). While notions of fairness presuppose participants entering the Olympic games on equal terms strictly based on merit and resilience, it is clear that disparities exist regarding accessibility of technology-driven transformations. This raises critical questions breaching fair-play principles inherent within Olympic sport ethos (IOC, 2021).

On the other hand, viewing through a distributive justice lens (Rawls, 1971) underpinned by Robin Hood's principle (robbing from the rich giving poor) might suggest AI tech potentially operating as a balancing mechanism across uneven playing fields. As the technology becomes more accessible, poorer teams who might lack the financial capabilities of hiring experienced top-tier human coaches, due to scarce resources, could assimilate customizable, scalable automated analytics software to mitigate such disadvantages. Using inexpensive automation platforms compiling data-informed advice, previously reserved for those affording expert staff salaries, may indeed be game-changing. Kuhn's (1962) paradigm shift concept could well find applicability here with traditional sporting environments transitioning and replacing dependency around human tactical skill with artificial intelligence technology. By providing these economically disadvantaged teams access to sophisticated strategic insights, without overbearing financial penalties they otherwise bear, AI coaching support systems can evoke the Olympic spirit by redefining boundaries set respectively for the privileged and celebrate triumphs emerging from beyond mere richness.

Finally, maintaining transparency constitutes another ethical concern that is required to be addressed, principally when advanced deep learning methodologies are applied without clear interpretation into decision making processes (Ethics Guidelines for Trustworthy Artificial Intelligence European Commission, 2019). Keeping clear communication lines between technical developers, coaches, and athletes, supported by external audits reviewing whether the proposed system aligns with pre-empirical, just play regulations, emphasizes integrity is demanded throughout sport governance literature (Lepri et al., 2018). Striking a suitable equilibrium, amongst optimizing strategic analysis capabilities, embracing technological advancements, whilst preserving fundamental moral principles requires efforts spanning across transdisciplinary fields, ranging from computer scientists delivering unbiased algorithms (Tomalin et al., 2021), to policymakers formulating robust trustworthy governing architectures (Floridi, 2018) adaptable for evolving sporting environments.

2) Preserving Sporting Excellence: Does the technology support or enhance the display of athletes' skill or ability in the sport?

Artificial Intelligence (AI), and its increasing role in shaping sports strategy, presents certain challenges and opportunities. However, the bedrock of any such advancements should be linked with preserving sporting excellence. Undoubtedly, HOTA has the potential to significantly enhance game tactics and teams' performances, but there are diverse elements to sporting excellence which may not be adequately captured, or diluted, by algorithmic analysis. Preserving Sporting Excellence signifies a culture where the outcome of the contest is determined predominantly by an athlete's or teams' skills, talent, efforts and abilities rather than being heavily influenced by external factors (Butcher & Schneider, 1998); in this case, technology-driven tactics. Under the lens of Olympism, that exalts the harmonization of

body, will, and mind (Fundamental principle of Olympism 1), it can be arguably posited, that strategy formulation and decision-making - facets directly tethered to mental exertion, are intertwined with physical prowess to embody holistic athletic performance. By this token, one may argue for AI incorporation, noting it as an extension and enhancement of human intellect, rather than a techno-centric usurpation. It exemplifies hard work, dedication and skill through the exploitation of data-driven insights for evolving sophisticated strategies. However, we must delicately calibrate this coexistence, ensuring that AI is utilized for augmenting human ingenuity and not replacing it, because fundamental to fairplay, is the unpredictability tied to human instinct which adds allure to competition. Upholding sporting excellence, hence implies striking this conscientious balance between tradition rooted aspects, like expert intuition, against innovation via technological tools such as AI tacticians.

On another note, over-reliance on AI could lead to hyper-rationalization of sports, potentially sterilizing forms of spontaneity or creativity that play into 'moments of magic' that are so often associated with sporting excellence. Coaching plays a crucial role in cultivating these aspects and empowering players which cannot be replaced purely through AI-based recommendations. Individual brilliance needs to shine through a tactical framework for true success and indication of sporting prowess. The over-standardization feared from the uniform adoption of AI-tactics could turn games into predictable outcomes devoid of unpredictability, which is intrinsic to live sports events (Butcher and Schneider, 1998). Furthermore, quantification driven nuances inherent in models like xG, or OBSO, focus primarily on isolatable actions which risks overshadowing intangible, yet instrumental, facets of sport, such as leadership qualities or mental resilience under pressure (Spearman, 2018; Decroos et al., 2019). While it is logical to leverage data metrics as part of overall performance analysis, unduly emphasis might risk turning athletes into optimization objects undermining their

agency and dignity. Autonomy undoubtedly enriches games - introducing prescribed paths might limit organic decision-making during play, constraining free-flowing expression that is central to sport ethos. The integration between technology-generated advice and human execution needs development ensuring athletes' exploratory instincts are not suppressed.

Finally, beyond responsible design standards, imbued within these technologies, active human oversight remains vital, especially given ethical quandaries that common-sense perspectives might raise against invariably complex statistical insights, that are served up by deep-learning frameworks. Failing this standard, runs the risk turning sport contests into primarily technological tour-de-forces, endangering long cherished norms that are constitutive for the world's most watched competitions. As we stand at inflection points regarding wider adoption within strategic evaluations including real-time match decision making -integrating these decisions enhancing technologies must keep paramount preserving principles underlying Sporting Excellence aligning machinogenic-advancement coherently with values intrinsic to athletic meritocracy.

3) Adherence to Safety and Harm Prevention: Does the technology prioritize the safety and wellbeing of the athletes?

Artificial intelligence technologies like HOTA bring potential advantages such as strategic optimization. We must weigh their implications against established ethical norms of Safety and Harm. What if an AI system suggests overly competitive or even unethical tactics? Like exploiting vulnerabilities of physically or mentally stressed opponents. We could see a significant increase in actions that violate sportsmanship and the values of respect, inherent to the ideal Olympic Contest. A winning at all costs attitude doesn't align with the values of respect, solidarity and fair play - viewing opponents as means or mindless obstacles to

overcome at any cost - dehumanizes the competition and violates their dignity. The suggestion for risky game plans from AI systems may undercut the role sport plays in promoting human development via the Olympic Games platform. While some might view AI-driven tactical optimizations as valid, so long as it is within regulations, it's crucial to consider how this can indirectly pressure athletes into making choices contrary to their moral stance, hence impacting self-governance adversely. The consequence is athletes feeling pushed into adopting questionable suggestions, made by these systems, rather than cultivating and expressing principles anchored in both Olympism and Fair Play.

Sports culture has always had room for gamesmanship. However, the entry of AI systems into sports strategies changes this equation substantially due to their rapid optimization capabilities. This could potentially alter inherent game cultures in ways not anticipated or accepted by traditional coaching methods, which might dangerously transform games into mere optimization experiments devoid of human meaning. Supporters may argue that advanced analytics are just additions to the coaching and planning toolbox, and teams who turn away from it lose competitive advantage (a classic case of Prisoner's dilemma), but can we simply normalize such tactics as ethical? If regulators do not step forward in time before AI-driven strategies encroach upon intrinsic fair play principles; they risk compromising the nature of sporting excellences. Sensible boundaries around extractive algorithmic tactics particularly those endangering participant safety seems an ethical obligation worth considering.

HOTA by virtue of its comprehensive data-driven approach entails a significant invasion of privacy. As an open box system, HOTA amasses enormous quantities of personal information not just from the players, coaches, and referees professionally involved in the sport, but

potentially from their social circles as well. While such depth of data collection might enhance the tactical sophistication provided by this AI assistant coach, it also poses unsettling ethical questions about individuals' right to privacy. A person's health records or private life changes should not be fodder for a tactical analysis program; it crosses boundaries that we ethically must respect and protect. Conversely though, employing a closed-box system which preserves opacity around decision-making processes does mitigate some potential violations to individuals' privacy arising due to explicit disclosure. However there still remains concerns about internal functionalities given how essential data is fed into training these models internally. In efforts to balance between maximizing the benefits drawn from this AI-based approach in sports strategy without compromising on players' rights, instead of opting for fully open or closed box systems , perhaps we could consider implementing hybrid strategies that employ what Philosopher John Rawls described as a 'Veil of ignorance' centered design principles within AI models ensuring privacy protection while retaining transparency wherever necessary in decision making processes. For instance some elements regarding performance metrics could remain translucent while those pertaining explicitly to private lives and social circles could remain opaque thereby striking an equilibrium between functional efficiency and right to privacy .

The utilization of AI technologies like HOTA, undoubtedly presents substantial risks to cybersecurity and invades privacy - given computer systems vulnerability to system breaches with incentives for manipulation. These models store massive private data that may include medical records and game plans. It's plausible for these AI systems created predominantly by sports teams seeking a competitive edge, to be infiltrated or corrupted. This poses a threat to fair play and privacy with the structure of the ideal Olympic Contest. This calls for an

effective framework that oversees such technologies. As more sophisticated analysis tools surface in what appears similar to an arms race scenario, inherent cyber insecurity follows closely behind the lack of proper technological governance. While skeptics may view governing such rapidly evolving technology as impractical due largely misunderstood boundaries posed by ethical concerns; we can counteract with how already successfully regulatory measures are applied consistently within sponsoring safe sporting practices thus aligning contests with humanistic principles.

4) Meritocracy in Distribution of Advantages: Does the technology distribute advantage based on merit, primarily athletic performance?

The use of AI systems as tactical advisors raises complex questions regarding impacts on meritocratic ideals seeking to align unequal distributions of advantage with actual athletic performance (Loland, 2002). If thoughtfully implemented, AI analytics could enhance objective assessment of ability. Sophisticated AI models enable quantifying decisions, potentially improving player talent evaluation (Fernandez & Bornn, 2019; Cervone et al., 2014). By supplementing subjective assessments with objective data-driven assessments, analytics may better align rewards like salaries with objective ability demonstrations. In this sense, AI could enhance meritocracy. However, unequal AI access allows disproportionate team advantages, disrupting fairness. Unlike coaching, AI's efficiency scale fundamentally alters dynamics. Vast data and computing confer algorithmic edges unrelated to skill or merit. For instance, an AI strategist could de-skill sport by usurping key strategic planning and decision-making. Or it could reshape sport by prioritizing superior AI over talent and effort recognition. Furthermore, AI's opacity obscures whether outcomes reflect talent or mere technological advantage. Dominance could stem from analytical asymmetry rather than prowess, disrupting integrity. This risks muddying the "clarity" of excellence Devin (2022)

describes. Additionally, biased training data risks decisions aligned with prejudices rather than objective merit (Michael et al., 2022), thus might create, discrimination perpetuating historic marginalization that contradicts meritocracy's egalitarian ethos. Strict governance and shared standards enabling accessible AI analytics for all athletes, rather than just elites, are imperative to preserve merit-based competition. With care, AI could enhance impartial assessment of talent. But unregulated AI risks misaligning outcomes with merit, undermining the spirit of fair play. Oversight mechanisms fostering equitable AI access are needed to maintain sporting ideals.

5) Justice in Rule Enforcement: Does the technology ensure fairness in the enforcement of rules and punishment of violations?

Justice in rule enforcement forms a core aspect of sport philosophy, invoking principles pertaining to fair distribution, equality and retributive justice in cases of violation (Rawl, 1971; Loland, 2002). One characteristic constituting justice is that penalties or ramifications should be proportional to actual transgressions committed aimed at correcting inequities caused from the original misfeasance. Thus striving towards platonic Justice which demands giving 'each their due' and upholding an overall balance within the sporting ecosystem. Viewing through this lens AI technology emerging as an "in-game tactician" probes interesting ethical dimensions.

Being non-human entities, AI lacks inherent intentions unlike human players, hence traditional blame-allocation principles cannot become seamlessly applied. A well-built AI model implements directives from coded algorithms constructed mainly in accordance with training data inputs - thereby their decisions are primarily reflections of past actions collected over measurable timelines. In conditions where biases have unknowingly infiltrated into

these datasets sophisticated models might unwittingly suggest strategies based on discriminatory profiles disregarding Olympian principles anchored by notions of universal respect for individual athletes irrespective backgrounds (IOC, 2021). In simpler terms, the key elements of transparency, including justice should be implemented in all stages of operation. There should clear communication between developers, coaches and athletes to external auditors who ensure the systems are accurately aligned with real-world competition conditions. Regular audits need to take place under set guidelines which check not only transactional information but also wider issues. These could promote socially responsible development and balance overall, achieving ‘Fair Play’, an ideal that sports is supposed to represent according to the Olympic Charter. To fully utilize emerging technologies for strategic analysis in sports, an ethical approach based on principles of fairness must be established. Timely development of regulatory frameworks is necessary to address the challenges posed by the rapid integration of artificial intelligence into the evolving domain of athletics. This allows for upholding foundational philosophical values and educational objectives intrinsically linked to the sanctity of competitive sport, while adapting to innovations in technology. The goal is to maintain the core tenets of ethical sport as technological landscapes continue to advance.

6) Goal Realization Promoting Harmonious Development of Humankind: Does the technology align with the broader Olympic goals of promoting human development and fostering a spirit of friendship and solidarity?

The use of AI systems as tactical guides in sports, brings up important questions about adherence to the Olympic ideals that encourage personal and cultural growth through sport. Even though data analysis offers several benefits, unrestricted optimization could undermine the purpose of sports as a method for cooperative human development. Ensuring responsible

control, that balances innovation with long-lasting principles, is crucial. Advanced AI analytics can enhance sports strategies, raising excellence, and thereby, further contributing to individuals' self-fulfillment. Tactics such as improving teamwork or reducing injuries by making optimized decisions, correspond well with goals focusing on humanity's wellbeing. From this perspective, AI provides a way to fine-tune how sports promote human potential. On the flip side, some may argue that unchecked optimization, without considering the social context, could reduce sporting events into soulless games based solely on data crunching. Placing too much emphasis on achieving maximum outcomes might lead competitors to be treated merely like tools, rather than athletes-it goes against traditional values in sport where participants are valued first and foremostly for who they are, not just what they do. This concern calls for some ground rules ensuring AI genuinely uplifts character-building instead of diverting focus away from it.

High-performance sports have always involved pushing limits. However, the Olympic Games emphasize embracing deeper ethical values. Without a moral compass, AI systems risk corrupting these values. Instead of humans balancing the costs and ethics involved in decisions, we might see an overemphasis on efficiency driven by AI's relentless pursuit for optimization. Without proper supervision, this singular focus could mean we surrender the philosophical meaning of Olympism for the sake of productivity. Therefore, it falls upon regulatory bodies to oversee how AI is used in sports, preventing its potential misuse that goes against developmental objectives. Opponents argue such intervention may hamper progress, but not scrutinizing analytics can lead to a significant loss; moving away from teamwork and human cooperation, which is what the Games fundamentally promotes. As long as there are checks put into place with careful attention paid towards humanistic aspects

during implementation - competitive intensity will only uplift harmony instead of creating conflict within athletes using them responsibly.

7) Striving for Excellence through Maximum Performance: Can it encourage the players to play to win?

The implementation of Artificial Intelligence (AI) systems as strategic consultants in sports, catalyzes intricate dilemmas between optimizing performance and preserving long-standing sporting ideologies that extol human endeavor and superiority (Butcher & Schneider, 1998). While AI pledges beneficial methodologies, its propensity for practical maximization risks being at odds with idealistic principles, glorifying genuine effort. On one side of the spectrum, lies advanced AI modeling purporting to strategically enhance outcomes by providing empirical insights to bolster performance (Fernandez & Bornn, 2019). This reflection of an intrinsic competitive pursuit for excellence seemingly harmonizes with sports philosophy. However, when engaged in this optimization journey, these sophisticated AIs are devoid of a comprehensive comprehension regarding human values; hence they might prompt insidious advice. For instance: An AI assistant coach could potentially guide players and coaches towards premeditated under-performance or even deliberate loss, calculatedly capitalized upon later in the competition. Arguably, it may be deemed logical in terms of maximizing probabilities; however intentional losses conflict with the pursuit of maximum effort. This is reminiscent of what we witnessed during the infamous Badminton debacle at the London 2012 Olympics, where athletes were intentionally trying to lose matches to gain an advantage later in the competition. The players were accused of "*conducting oneself in a manner clearly abusive or detrimental to the sport*" for intentionally losing matches (BBC, 2012). In such scenarios, huge risks exist as such actions by artificial intelligence can compromise crucial foundations underlying various sport practices..

Of course, gamesmanship has always existed alongside formal rules, as Loland (2002) notes. But again, AI's scale alters the calculus. Comprehensive automation enabling deliberate underperformance, risks normalizing an end-justifies-means attitude, violating sporting virtues. Unlike debatable human judgment, calculated algorithmic guidance erodes aspirational principles demanding top effort. Governing bodies should thus proactively prohibit AI directives that compromise maximum pursuit of excellence in competition, preserving integrity of performance. This need not preclude all strategic variance by humans, who can weigh competitive and humanistic considerations. But unconstrained AI optimization risks philosophic loss exceeding marginal gains. With care, innovation and enduring virtues can progress jointly. But responsible oversight is needed to ensure AI elevates rather than demotes sports' aspirational essence.

8) Preservation of Uncertainty Outcomes: Does the technology preserve the uncertainty of outcomes, thereby maintaining the excitement and competitiveness of the sport?

The use of intelligence (AI) systems, as advisors in sports raises important questions about maintaining the element of unpredictability, which is a crucial aspect of sports enjoyed by both participants and spectators. As Loland (2002) explains, the exciting "sweet tension" of outcomes is a part of competitive games. Fundamentally, sports are riddled with variables both controllable (e.g., player selection, tactics) and uncontrollable (e.g., weather conditions). While human coaches possess an incredible ability to analyze this landscape, they are still prone to inaccuracies and biases. Here lies HOTA's appeal; its predictive analytics offers a superior vantage point over these variables making game plans more robust. Analyzing minute details about the condition of each player alongside external factors, affords tactical flexibility based on real-time data analysis thereby enhancing the excitement associated with

live games. This retains an element of surprise as strategies will constantly change based on data metrics while keeping play unpredictable. On the contrary though, one may argue that said technology could potentially lessen uncertainty outcomes, hence negatively impact competitiveness and excitement associated with it. Advanced systems like HOTA can draw insights beyond human perception increasing outcome predictability by providing teams with access to advanced AI systems, an edge over their competitors, thus compromising equitable competition, thus the results will be inequitably skewed towards those who can afford such cutting-edge resources. Critics may also express concern that reliance on AI technologies threatens creativity (Memmert & Roca, 2019) by reducing sport into formulaic processes mechanically devoid of instinctive discoveries. Whereas talent often brings forth unexpected brilliance, and errors breathe life into a match narrative, giving character to matches despite their losses that can create legends out from underdogs - elements that makes sport dramatically appealing.

Table 4.2: Summary of Intended Good Effects

Conditions for the Ideal Olympic Competition	Intended Good Effects of HOTA and Explanation
Non-Discrimination and Fair Equal Opportunity for Performance	Enhances objective evaluation of player talent and advising on optimal tactics.
Preserving Sporting Excellence	Complements and augments human ingenuity rather than replacing it.
Adherence to Safety and Harm Prevention	Potential in advising on minimizing injury risk: By taking into consideration player fatigue, injury status, and other health parameters, HOTA can potentially recommend strategies that preserve player safety and well-being.
Meritocracy in the Distribution of Advantages	Rewards efforts and talents through empirical insights.

Justice in Rule Enforcement	Improves consistency and accuracy: AI technologies like HOTA provide objective assessments based on rules of the game and (ideally unbiased) training data, potentially ensuring fairness in rule enforcement.
Goal Realization Promoting Harmonious Development of Humankind	Enhances coaching and athletes' experiences: AI coaching tools like HOTA could possibly help elevate the game to another level of sophistication thereby fostering personal and cultural growth through sports .
Striving for Excellence through Maximum Performance - i.e. play to win attitude.	HOTA provides necessary guidance that help teams win games and demonstrate maximum efficiency.
Preservation of Uncertainty Outcomes	While HOTA can analyze and predict outcomes, the actual actions are still done by the human coach and athletes, making the outcome potentially unpredictable.

Table 4.3: Summary of Unintended Bad Effects

Condition for the Ideal Olympic Competition	Unintended Bad Effects of HOTA and Explanations
Non-Discrimination and Fair Equal Opportunity for Performance	Historical biases in the training data (e.g., racial or gender discriminations) used by HOTA could mitigate the equality of opportunity for performance (Mehrabi et al., 2021). Wealthy teams could also have an upper hand as they could invest more resources in AI infrastructure, creating a resource-based inequality.
Preserving Sporting Excellence	Relying heavily on HOTA's advice could potentially detract from the human elements of tactical brilliance and creativity that contribute to sporting excellence. The human story and personal endeavor that mark athletic achievement may also get overshadowed by technological influence
Adherence to Safety and Harm Prevention	HOTA's relentless pursuit for optimization could suggest aggressive or unsafe tactics exploiting weaknesses in opponent teams. Such outcomes could compromise the safety of athletes and undermine the principle of fair play.
Meritocracy in the Distribution of Advantages	Access to AI technology like HOTA might be linked with a team's financial capabilities rather than pure athletic merit, presenting a skewed distribution of advantage not necessarily tied to athletic performance.
Justice in Rule Enforcement	With AI involvement, decisions may appear more data-driven and less human-influenced; this could give rise to new forms of rule violations and unjust actions, especially if the AI system was using unfairly gathered information.

Goal Realization Promoting Harmonious Development of Humankind	While AI might aid in optimizing athletic performance, an over-reliance or misinterpretation by HOTA could forestall diversities in approach, reducing opportunities for personal growth and underlining collective development.
Striving for Excellence through Maximum Performance	An AI system to instruct the players to underperform to gain advantage later in the competition.
Preservation of Uncertainty Outcomes	Overuse of AI technology like HOTA could generate a more deterministic outcome in the sports field and subsequently reduce the unpredictability and chance encounters that make sports exciting.

Applying Doctrine of Double Effect from the perspective of Governing bodies to HOTA

According to the Doctrine of Double effect (DDE), an action is permissible if it fulfills four conditions:

- The action (in this case, the introduction or use of the technology) must be morally good or at least indifferent.
- The agent (the person or organization introducing or using the technology) must intend the good effect (the intended purpose of the technology) and not the bad effect (any negative impacts).
- The good effect does not arise from the bad effect.
- A proportionately serious reason for permitting the bad effect.

(McIntyre, 2023).

1) The Action Must Be Morally Good or at Least Indifferent

The primary action involves implementing an advanced AI system, in this case HOTA, in sports competitions. The technology has efficiency as a value integrated into it. It is designed primarily with the aim to enhance teams' strategies and improve performance during sporting competitions. HOTA's main purpose is to assist in improving performance and offer fair competition by leveraging objective data driven insights. This action appears as not

‘inherently’ bad. The act of implementation of HOTA is good or indifferent. HOTA’s ‘technical code’ embedded in its design warrants further scrutiny (Feenberg, 2005).

2) The Agent Must Intend the Good Effect but Not the Bad

Under this principle, stakeholders implementing HOTA should aspire towards desired positive impacts: chiefly enhancing player/team performances through quantifiable tactical advisories, whilst not intentionally aiming for negative repercussions, such as, privacy invasion or algorithmic discrimination. Herein lies a critical distinction between what is intended versus merely foreseeing probable collateral damage (Kamm, 2008). Assuming compliance with appropriate ethical guidelines when developing these AI systems, a process termed Ethical by Design, the stakeholders could indeed establish clear intentions striving for positive consequences without explicitly endorsing bad repercussions. However, systemic biases within the dataset, or algorithm construction, risks undermining intentions - hence the importance increases for running routine audits, performed under external discretion, ensuring fairness principles remain upheld in practice.

3) The Good Effect Does Not Arise from the Bad

According to DDE's third condition, the good effect must not be caused as a direct result from any potential bad effect. In other words, enhanced execution tactics suggested by AI should not arise due to non-consensual data collection infringing on individuals' privacy rights. Preserving athlete security constitutes paramount concern in all settings, especially when discussing sensitive areas like meticulous monitoring, that captures professional or personal life details intertwining wider social circles. Moreover techniques ensuring initial development phases include tested debiasing solutions that also need to be implemented,

addressing concerns regarding historical biases translated into unfair tactical recommendations emerging from model prediction probabilities.

4) Proportionality

The growing reliance on sophisticated AI systems like HOTA, as tactical advisors in sports, raises critical ethical dilemmas around privacy, bias, transparency, and the very meaning of athletic competition. While it can be argued that HOTA's data-driven recommendations can optimize strategy and performance, we must carefully weigh such benefits against the associated risks and costs, both tangible and philosophical. At the core of the concerns, is the sheer scale of HOTA's data gathering from athletes, coaches, referees and their broader social circles. This degree of surveillance violates reasonable expectations of privacy and autonomy (Barrett-Maitland & Lynch, 2020). Perhaps some performance metrics could be justifiably collected with consent. However, scraping sensitive personal data unrelated to the field of play represents an egregious overreach. Individuals maintain rights to privacy even as public figures. Strong procedural safeguards, and limited data use, are imperative when leveraging analytics. Further, algorithmic biases could propagate injustice if training data reflects distorted societal prejudices around factors like race or gender (Mehrabi et al., 2021). Audits help, but biases are often ingrained in subtle ways. HOTA's opacity around how recommendations are derived threatens to conceal any unfairness or errors. Such lack of transparency violates notions of human dignity. While HOTA may appear more "objective," its determinations still reflect subjective choices by its programmers.

Unequal access to advanced AI analytics creates inherent unfairness in leveraging this technology (Muller et al., 2020). Wealthy teams can invest heavily in sophisticated systems like HOTA, granting disproportionate strategic advantages unrelated to merit. This violates

notions of fair play by enabling greater success simply due to financial asymmetry, rather than athletic skill. Some propose equalizing access by making foundational AI capabilities freely available, akin to a 'Robin Hood' redistribution of resources. However, substantial gaps would likely persist given the resources needed to utilize AI optimally. Further, forcing access sharing could disincentivize innovation. A preferable alternative may be developing sports-specific AI within leagues and granting all teams in that league equal access. This democratized approach limits unfairness by putting all competitors, regardless of financial standing, on equal analytical footing. Of course, other factors like coaching quality may still confer advantages between teams. But equal AI access helps isolate determinations of success to elements more squarely within the athletes' control. This aligned utilization across a league allows AI's strategic benefits to augment human performance without unduly distorting competition. Clubs are not unfairly disadvantaged by lacking proprietary AI systems. Careful governance could still be required to ensure transparency and prevent AI misuse. But so long as all teams work from the same foundation of ethical, standardized analytics, competitiveness and meritocracy would be enhanced versus diminished.

More broadly, an over-reliance on relentless optimization risks diminishing the glory of human struggle and creativity so central to sports' appeal. If AI prescribed even the smallest choices, human agency would be suppressed, removing meaning from competition. Some guidance can help strategize, but room for spontaneous brilliance must be protected. Further, framing opponents as collections of vulnerabilities to exploit could erode ethics of fair play. Unchecked AI threatens privacy. It also enables a mechanistic, cynical view of athletic pursuits antithetical to the Olympic spirit. Non-technological alternatives like traditional coaching offer comparable strategic benefits without the same degree of ethical pitfalls. Ultimately, the principal aims of mutual growth, integrity and celebration underlying sports

should guide technological integration, not vice versa. With ethical foresight, analytic tools can augment human performance without usurping those qualities that define athletic excellence. Comprehensive systems like HOTA portend a dystopian path by valuing optimization above all else. The profound human elements underpinning sports must not be sacrificed at the altar of innovation. Selective transparent uses of analytics may be justified, but wisdom and oversight are indispensable to prevent technology's profound implications from corroding sports' ethical core. With prudence, both progress and principles can flourish. But first and foremost, we must affirm that no analytic advantage warrants trampling the sacred dignity of sport's participants and spectators. Under its current form, given HOTA's foreseeable harms and invasion of privacy, and with the availability of alternatives (traditional coaching), there is no proportionately serious reason for permitting the bad effect of HOTA.

Conclusion

This case analysis of the hypothetical AI assistant coach HOTA evidenced both potential benefits and grave risks of uncontrolled technological integration in high-performance sports. While HOTA's sophisticated data gathering and simulations aim to optimize strategic decision-making, implementation absent constraints comes at profound costs to privacy, fairness, human dignity and the enduring appeal of competitive exertion. Several salient conceptual implications emerge. Framing technologies purely in instrumental terms of efficiency goals disregards how their sociocultural embeddedness alters the very meaning of sports and excellences (Feenberg, 1991). For example, by quantifying every decision, HOTA risks reducing athletes to optimization objects fully predictable by algorithms. Such technocratic reduction strips away the human artistry, courage and solidarity that help

constitute achievements of true merit (Parry, 1989). Governance based solely on reactively banning technologies that advantage some competitors overlooks democratizing alternatives that expand access through constraints, not prohibition (Feenberg, 2002). Innovations like HOTA could be permitted under strict standardization ensuring equal availability. But this requires moving beyond reactive bans to proactive shaping that is aligned with ethical purposes.

Comprehensive technology assessments must recognize the inevitability of value trade-offs amidst uncertainty. In HOTA's case, augmented strategic excellence conflicts with privacy harms; determining proportionality depends partly on prudential weighing by a sporting community itself, not just technocrats. Dialogue, not top-down authority, must negotiate ambiguities. Sound regulation necessitates strengthening conceptual foundations and evidentiary bases given anti-doping policy limitations. For HOTA, verified performance impacts ought to determine permissibility. This analysis revealed governance gaps demanding proactive reforms upholding enduring Olympic visions through teamwork and human growth.

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Chapter 5

The Case of mRNA protein therapy

Introduction

Chapter 5 implements the previously established ethical assessment framework to evaluate a practical case: the potential use of messenger RNA (mRNA) technology as a novel method for enhancing sport performance. This application exemplifies the value of the conceptual model presented in Chapter 3 in highlighting dilemmas and suggesting ethically-principled integration of technologies to align with Olympic and fair play values. The entire framework is applied to scrutinize mRNA, a technology that promises transformative therapeutic benefits, yet potentially disruptive applications to improve performance in sport. Upon categorizing mRNA modification as being intended for performance improvement, I gauge its alignment with ideal competition conditions and utilize the Doctrine of Double Effect. I contend that unrestricted usage fails examinations concerning safety, fairness and societal responsibility, despite plausible justification existing for measured applications under principled constraints. This displays how the integrative methodology can direct innovation along ethical paths without compromising essential humanistic and fair play values inherent in the Olympic Games. It also acknowledges areas where conceptual refinement can strengthen this integrative blueprint further, showing that it presents channels through which sporting ideals might be retained amid rapid technological shifts.

History of Gene-doping

Ever since the creation of the World Anti-Doping Agency's (WADA) Prohibited List in 2003, gene-doping has been banned in sport. The concept of gene therapy was raised decades ago with the hope to create new classes of therapeutics that access previously inaccessible pathways. Gene-doping manipulate cells' genetic material by introducing exogenous gene-sequences with the aim of enhancing performance in sport. In 2023, WADA in its Prohibited List International Standard, defines gene-doping as follows:

“M.3 GENE AND CELL DOPING ... The following, with the potential to enhance sport performance, are prohibited: 1. The use of nucleic acids or nucleic acid analogues that may alter genome sequences and/or alter gene expression by any mechanism. This includes but is not limited to gene editing, gene silencing and gene transfer technologies; 2. The use of normal or genetically modified cells”
(WADA, 2023a).

WADA's non-exhaustive definition attempts to encompass all genetic manipulation that may enhance performance in sport, while still allowing some possibility for the use of such technology for therapeutic purposes. WADA mentions three examples of the use of gene technology to gain a competitive advantage in sport: gene editing, gene silencing, and gene transfer technologies. Utilizing these gene-doping techniques, scientists can tweak human molecular biology to induce beneficial phenotypic sporting responses. For example: EPO genes can be transferred to non-EPO producing cells to enhance erythropoiesis, or silence some genes like the Myostatin gene (a muscle regulatory gene) to increase muscle growth. The potential for abuse in sport is virtually limitless, yet it comes with many risks that may range from ineffective therapy to severe unintended DNA mutagenesis that is often hard to predict or fix (Fu et al., 2013). CRISPR-Cas9 is by far the most widely used technique for gene editing and gene transfer (Pradhan et al., 2020). Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR), a revolutionary gene editing technique invented by

pioneering scientists, Jennifer Doudna and Emmanuelle Charpentier, who were both awarded the 2020 Nobel Prize in Chemistry for their work on CRISPR-Cas9. A guide RNA is used that directs the Cas9 protein to a specific gene in the nucleus. Once the gene is identified by the CRISPR-Cas9 system, the Cas9 protein will cut the gene out of the DNA and ideally replace the gene with a supplied DNA template (new gene). While such technology holds huge potential for therapy and enhancement, it is not perfect, it suffers from some downfalls; it can lead to off-target edits and DNA mutagenesis (unintended changes to DNA sites that were not targeted) (Fu et al., 2013). Other uses of DNA gene transfer technology includes in-vitro mass production of recombinant proteins for therapeutic use. Current protein therapy (e.g., insulin, hGH, etc.) mostly use recombinant protein expression expressed by genetically modified cells in-vitro (Baneyx, 1999). Up until recently, DNA approaches captured the majority share of investigations (Pradhan et al., 2020), while limited attention has been given to a crucial transit molecule that is present in all cells in our bodies and plays an important role in molecular biology: messenger RNA (mRNA).

mRNA from zero to hero.

mRNA is a key player in protein synthesis in the human cell. It is the information package that carries the archived information from our DNA to the cell's protein synthesis machinery. The therapeutic potential of using synthetic mRNA sequences to slip information into the cell's protein synthesis machinery was obvious from day one (Melton et al., 1984). Synthetic mRNA can encode for virtually any protein, this includes human or non-human hormones, growth factors, enzymes, cellular receptors, antibodies, and much more. These proteins are produced, folded, and undergo post-translational modification by the human cell's own machinery - giving those proteins a unique advantage over proteins produced by

non-mammalian cell-based recombinant technology (Wurm, 2004). The therapeutic potential of mRNA was first explored in the 1980s (Melton et al., 1984). While the results were promising (Wolff et al., 1990), mRNA research didn't gain much traction compared to DNA research in the early days. Many challenges faced mRNA therapy: mRNA is relatively unstable, lacked efficient methods of delivery, triggered excessive immune response, and was thought to be cytotoxic (Balmayor, 2022). In the last decade, these problems were largely resolved by several new innovations. For example: the incorporation of modified uridine nucleotide (Karikó et al., 2005; Karikó et al., 2008), new optimized coding sequences (Thess et al., 2015), improved purification process that relies on High Performance Liquid Chromatography (HPLC) (Karikó et al., 2011), and the development of highly efficient nanotechnology-based delivery materials (Kowalski et al., 2019). Amid the global pandemic of the COVID-19 virus, mRNA technology had its first major impact on global health - it went from an intriguing idea to a big hit in the pharmaceutical world overnight. Born out of the need to create an easy, cheap and rapidly producible vaccine to bring the world out of the COVID-19 pandemic, scientists used mRNA technology to create a vaccine in a record time. Pfizer-BioNtech rapidly developed the world's first mRNA-based - FDA approved therapeutic (Tanne, 2021). By the end of 2021, billions of doses of mRNA based COVID-19 vaccine have been administered around the World.

The benefits of mRNA vs. other forms of gene therapy and conventional pharmaceuticals.

The production of mRNA is relatively easier, faster, and cost-effective compared to the conventional methods of biotechnologically produced proteins. It's mainly produced at a large-scale by in vitro transcription (IVT) (Sahin et al., 2014). mRNA has advantages over other forms of nucleic acid-based therapy as it doesn't affect the host's DNA nor enter the

cell's nucleus, thus resulting in very low risk of DNA mutations. mRNA therapy is efficient, and its immunogenicity can now be tuned as needed to accommodate multiple functions: protein therapy, vaccine therapy and others (Sahin et al., 2014; Weng et al., 2020). With a multitude of protein-based substances that are already abused and banned by WADA in sport, the introduction of mRNA technology only aggravates the situation. mRNA technology has the ability to induce the production of proteins by the human cell's own machinery that may be indistinguishable from the body's endogenous proteins. The possibility of abuse of such technology for performance enhancement in sport is significant.

The feasibility of using mRNA technology to enhance performance in sport.

WADA's Prohibited List bans the use of many protein substances from sport (e.g. EPO, IGF-1, etc.). Since mRNA technology can virtually encode for any protein molecule, it can potentially be used to induce the body's production of any of performance enhancing proteins. WADA's Prohibited List doesn't specifically mention mRNA technology as a possible prohibited technology. Also, mRNA technology doesn't seem to comfortably fit into section M3 of the Prohibited List: *"The use of nucleic acids or nucleic acid analogues that may alter genome sequences and/ or alter gene expression by any mechanism. This includes but is not limited to gene editing, gene silencing and gene transfer technologies"* (WADAa, 2023). Facing potential abuse of such technology, antidoping scientists might be intrigued to explore the feasibility of such technology as a doping agent in sport.

Two independent studies successfully used Erythropoietin (EPO) encoding nucleoside modified mRNA for protein therapy in mice (Karikó et al., 2012; Kormann et al., 2011). Thess et al. (2015) have performed a similar study using unmodified EPO mRNA

encapsulated in Solid lipid nanoparticles (LNPs) on larger animals. They have found that EPO mRNA therapy was comparable to recombinant EPO currently being used to treat humans.

“In healthy volunteers as well as anemic patients with chronic kidney disease, a dose of recombinant erythropoietin of about 600 IU/kg (which appears to be among the highest usually applied in clinical settings) led to maximum serum EPO levels of about 1,000 mIU/ml (equivalent to around 8,400 pg/ml) and an increase of the percentage of reticulocytes of about 2. These values are very much in line with those we obtained in nonhuman primates following intravenous administration of a reasonable dose of mRNA encapsulated in LNPs designed for hepatic delivery of nucleic acid therapeutics”

(Thess et al., 2015)

In the same study by Thess et al. (2015), the animals were challenged with a 10-fold dose of EPO encoded mRNA to induce possible inflammatory side-effects. Proinflammatory cytokines were measured six hours after the first mRNA treatment and showed no elevation in response to mRNA therapy, the same results continued after six administrations and for three weeks. These results demonstrate that EPO encoded mRNA protein therapy might be effective and safe in humans.

In another study (DeRosa et al., 2016), the pharmacokinetic profile of EPO produced by intravenous mRNA-loaded lipidoid nanoparticles was examined. Scientists have found that their mice subjects *“upon treatment with a 1.0-mg kg⁻¹ dose of EPO mRNA-encapsulated LNPs, ~11 µg of hEPO protein per ml of serum can be produced. This is several orders of magnitude (>125 000-fold) over the normal human physiological level of EPO (average normal levels reported to be 31.5-150 pg ml⁻¹, average ~90 pg ml⁻¹)”* (DeRosa et al., 2016). Supraphysiological levels of serum EPO continued after 7 days of a single intravenous injection, and hematocrit (Hct) levels increased by an average 20% in 2 weeks. In the same study, the pharmacokinetic profile of EPO produced by mRNA-loaded lipidoid nanoparticles

in cynomolgus monkeys showed “*striking similarity to what was observed in mice*” with much smaller dose of 0.050 mg/kg resulting in serum EPO protein levels of ~9000 pg/ml (6 h time point), an almost 100-fold increase in their normal physiological levels. The success of EPO encoded mRNA protein therapy in large animals like non-human primates, demonstrate the potentiality of mRNA to be used in the systemic delivery of many performance-enhancing substances in humans.

mRNA technology is also being explored for the use of local injury repair and tissue regeneration (Balmayor, 2022). For example: Bone morphogenetic protein 2 (BMP-2) is a protein that has been shown to accelerate bone production and is used to accelerate bone repair (Geiger, 2003). In a recent study, BMP-2 encoded mRNA was delivered locally to critical-sized femoral osteotomies in rats (De La Vega et al., 2022). The therapy resulted in the local production of BMP-2 and the healing of all mice who received more than 25ug of BMP-2 mRNA without forming the callus that is usually seen with recombinant BMP-2 use (De La Vega et al., 2022). mRNA technology has also been explored as a novel replacement to passive antibody therapy (not generated by the immune system) in all main fields: antitoxins, infectious diseases, and oncology (Schlake et al., 2019). This technique can generate antibodies that can enhance performance, e.g., myostatin specific antibodies have been shown to enhance muscle strength in animal models (Muramatsu et al., 2021).

Case study: A hypothetical model for an mRNA printing system:

Consider the case of an advanced technology known as "mRNA Printer". This remarkable innovation has the ability to produce virtually any human or non-human protein or antibody on demand. With time, not only it became more cost-effective but also gained global

accessibility. This hypothetical mRNA printer is already making waves in sporting circles with teams and athletes starting to experiment with it. Now picture this: an international sports governing body under the umbrella of Olympic authority finds itself needing to make an ethical judgment about this new technology's permissibility; particularly its use by healthy athletes aiming at performance enhancement via administering specific mRNA sequences. There are stories circling that many within athletic circles are drawn toward using such mRNA technologies because they exhibit a safer risk profile when compared to other bio-pharmaceutical enhancements.

Hardware:

- Automated system that synthesizes mRNA strands by combining the four RNA nucleotide bases (adenine, uracil, guanine, cytosine) according to programmed sequences.
- Contains large reservoirs of the four nucleotides (similar to ink cartridges in ink-jet printers).
- Using those four nucleotides, this printer is virtually able to print mRNA sequences of any human and non-human protein.
- Uses microfluidics and nanotechnology to rapidly assemble trillions of mRNA copies in parallel.
- Has capabilities for chemical modifications of mRNA to avoid immune system provocation.
- Couples directly to automated nanoparticle or lipid encapsulation equipment for delivery preparation.

Software:

- Database containing the sequences for all known human proteins, including enzymes and antibodies.
- Advanced AI algorithms for mRNA sequence optimization and protein folding predictions.
- User interface allows searching and selecting desired proteins/antibodies to print.
- Adjustable parameters to modify immunogenicity and circulating half-life.

- Options for varied delivery mechanisms (systemic, local, slow release, targeted cell types).

Operator:

- With a few clicks, the operator selects a protein from the database.
- Operators can customize sequence and injection/formulation properties as needed.
- Within minutes, obtain optimized ready-to-inject mRNA sequence for inducing chosen protein expression.

Assessing the Ethical Viability of mRNA Technology Doping as a Safer Alternative to Gene Doping in Sports: A Governing Body's Perspective

In this part of the thesis, I will position mRNA-based performance enhancement within the taxonomic structure outlined in Chapter 3. It is positioned as a technology intended to improve performance. Though not to be ignored is the feasibility of deploying mRNA technology for restorative means such as vaccines or therapeutics, this chapter will focus and hinge predominantly on the capacity to augment performance. I aim to shed light on how integration of mRNA technology converges with, or deviates from, previously defined parameters constitutive of an ideal Olympic Contest; these were elaborated upon in Chapter 2. The objective being pursued here is to provide insights into emergent ethical friction points closely affiliated with integration of such technology in Olympic sports. The analysis will proceed with an evaluation rooted in the Doctrine of Double Effect (DDE). Appraising mRNA technology for performance improvement using both consequences-based ethics approaches mixed with intent-focused examination lenses, captures a nuanced perspective when analyzing complex questions surrounding assimilation and application of such a new technology.

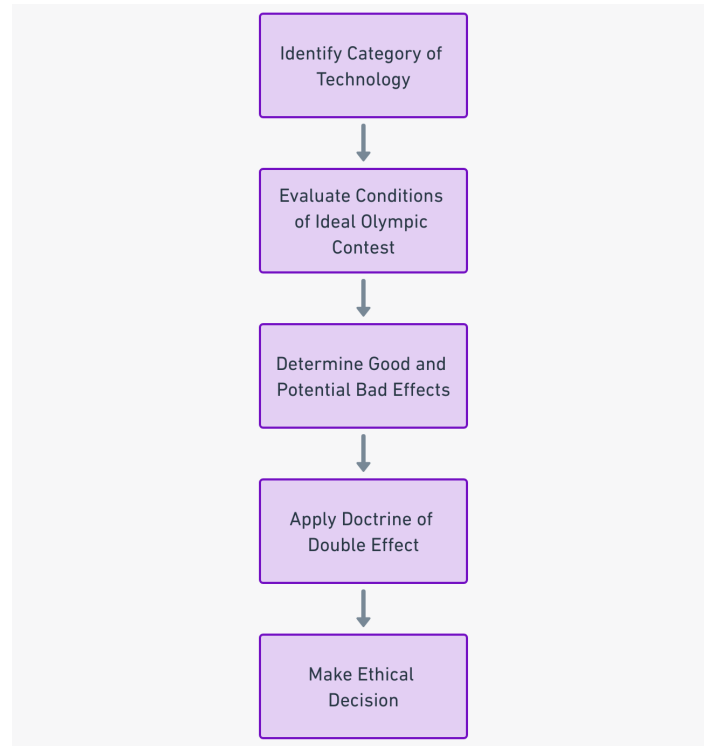


Fig 5.1 : Shows the flowchart of the ethical framework developed in Chapter 3.

Evaluating mRNA intended to improve performance against the Conditions of the Ideal Olympic Contest:

1) Non-Discrimination and Fair Equal Opportunity for Performance: Does the technology promote fair equal opportunity for all athletes to perform, regardless of their backgrounds or circumstances?

A primary concern is that mRNA technology could amplify existing genetic disparities between competitors (Tamburrini, 2007). Innate variations in genes related to athletic traits (e.g. ACTN3 variants for power/sprinting) already confer inherent physiological differences that transgress the ideal of equal opportunity (Eynon et al., 2013). mRNA therapies might circumvent such genetic "lotteries" by enabling athletes to artificially stimulate cells to mass-produce advantageous proteins regardless of their DNA. For instance, a sprinter genetically predisposed to lower anaerobic enzyme levels could use mRNA to increase

production beyond innate capacities. The specialized nature of mRNA therapies raises potential fairness concerns regarding athlete access. mRNA doping could be prohibitively expensive, restricting opportunities only to wealthier athletes in richer nations (Dimeo & Møller, 2018). Those priced out of access face discrimination from disproportionate opportunities available to competitors who can fund new techno-doping. However, parallels exist with other pioneering pharmaceuticals, suggesting costs could rapidly decline post-exclusivity, becoming more egalitarian. Further, advantages in scalability and cheaper raw material costs enhance mRNA's prospects for affordability compared to conventional biologics (Webb et al., 2022). While initial access may be limited, broader dissemination of new therapeutic innovations appears probable long-term. If supply grew adequate, then price would become a lesser barrier to fairness. But until that equalization, financial inequities could enable unfair early adopter advantages.

Another concern is that mRNA usage for performance enhancement (In a world where mRNA enhancement is prohibited) could enable undetectable cheating (at least till detection methods are developed) that discriminates against rule-abiding athletes. Conventional anti-doping tests may fail to distinguish naturally occurring endogenous proteins from those induced by mRNA as these mRNA can be customized to human protein sequences.¹¹ This kind of advantage might be tougher to detect and distinguish from endogenous proteins. Such “invisible” doping provides unfair opportunities only to dishonest athletes willing to utilize stealthier techniques less accessible to or rejected by those adhering to rules. However, anti-doping authorities are developing more advanced detection methods to address emerging pharmaceutical techniques like mRNA, as WADA's 2023 round for research funds highlights

¹¹ There is no data on the detectability of mRNA enhancement in sport. This is a hypothetical assumption.

mRNA detection as a priority (WADA, 2023). A further ethical issue is that mRNA's advent could increase pressures on athletes to partake in unwanted practices. The prisoner's dilemma presented by new enhancing technologies highlights how competitors may feel coerced to adopt new enhancements simply to keep pace if rivals do so (Lavin, 1987). Even competitors personally opposed to mRNA enhancement might feel compelled to use it to avoid disadvantage, despite health or moral objections. This perceived coercion to conform can unfairly discriminate against those wishing to compete clean, but concerned mRNA abusers could dominate.

2) Preserving Sporting Excellence: Does the technology enhance or diminish the display of athletes' skill or ability in the sport?

Preserving sporting excellence is a key ethical principle in competitive sport. It upholds that athletic performance should be based on talent and effort, not influenced by extraneous factors (Butcher & Schneider, 1998). From an internalist perspective focused on excellence, initial objections arise regarding mRNA technology used to enhance performance. Inducing cells to generate high levels of normally restricted proteins like EPO create performance changes unrelated to talent or training effort. This arguably disrupts the internal logic of sport where participants voluntarily develop skills under constraints that define each sport (Loland, 2018a). Unconstrained use of technology to boost selected capabilities, also risks shifting focus away from the multidimensional values that constitute human sporting excellence (Devine, 2022). However, some may argue that mRNA therapies align with displaying sporting excellence (Savulescu et al., 2004). mRNAs are transitory and do not alter genetics, thereby avoiding serious harm that comes with genetic alterations. The Harm-reduction discussions explored in Chapter 1, could see mRNA technology as a safer acceptable alternative to common more riskier forms of doping.

The use of mRNA technology to stimulate protein production might be misaligned with the philosophy of sporting excellence, as it enables shortcuts - circumventing athletes' talented, effort and dedication to develop skills through natural and innate biological plasticity and adaptation in response training (Loland and Hoppeler, 2012; Loland, 2018b). Unregulated use of mRNA technology threatens to shift focus towards inflated outputs for select dimensions of performance, rather than celebrating diverse expressions of human potential realized through effort. Some medical applications may be justified but non-medically indicated mRNA use undermines the display of sporting excellence. Some scholars may also worry about impacts on authentic human agency. Sandel (2007) argues enhancement technology that artificially inflates capabilities risks weakening admiration for talent and effort in achievement. Over-reliance on mRNA risks undermining athletes' sense of responsibility for skill development through practice (Loland, 2018a). This threatens deeper social values around celebrating diverse human potential and agency. More nuanced debate weighing medical benefits against ethical risks in context is still required. But the internal logic of sport provides grounds for strong caution regarding non-medically indicated use of mRNA technology absent compelling evidence of safety and alignment with sporting values.

3) Adherence to Safety and Harm Prevention: Does the technology prioritize the safety and wellbeing of the athletes?

mRNA-based enhancement could confer an unfair advantage and risks undermining values of fair play in sport. It poses uncertain safety risks that require careful evaluation. A theoretical circumstance wherein mRNA is engineered to produce proteins that essentially heighten critical athletic traits. This can range from amplifying muscle development, oxygen

transportation capacity, stamina or other coveted physical qualities. To achieve delivery into target tissues effectively, this customized-mRNA would be enveloped within lipid nanoparticles (LNP) for efficient administration. A study by Vlatkovic (2021) explores therapeutic mRNA modifications techniques that attempt to evade immune activation, e.g., employing nucleosides like N1-methyl-pseudouridine. However, despite these innovative strategies to circumvent our bodily defenses, we must address an inevitable predicament: residual stimulation of innate immunity following exposure to components of both mRNA and LNP is probable.

A major concern is that repeat dosing of LNP-mRNA could trigger serious cytokine release storms or infusion reactions. Both the mRNA and LNP coatings interact with pattern recognition receptors like toll-like receptors to induce inflammatory cytokines (Vlatkovic, 2021). Sudden surges in cytokines like interleukin-6 and tumor necrosis factor can lead to dangerous symptoms including fever, low blood pressure, breathing difficulty, and organ failure in rare cases (Vlatkovic, 2021). Milder symptoms with slower infusion might involve flu-like symptoms (Vlatkovic, 2021), an unacceptable risk for elective enhancement use, that may be acceptable for disease treatment. Another expected risk is that individuals receiving repeated LNP-mRNA could develop anti-drug antibodies and experience accelerated blood clearance of the mRNA payload (Vlatkovic, 2021). Especially with PEGylated LNPs, anti-PEG antibodies form over time and bind to subsequent doses, marking the nanoparticles for rapid removal by phagocytes and lowering therapeutic effects. This could necessitate constantly increasing doses to maintain enhancement, leading to higher antibody levels and infusion reactions in a vicious cycle. Frequent dosing may be impractical and the window for safe repeat dosing could be quite limited compared to single course treatment.

Toxicity to the liver and other organs is a potential concern if attempting to use LNP-mRNA therapy long-term for performance gains. Cationic lipid components of LNPs interact with cells to facilitate delivery, but this can also disturb membranes and may activate cell death pathways (Nogueira et al., 2020). Hepatotoxicity markers are assessed in animal studies but long-term effects in humans remain uncertain. For a healthy athlete without disease, even small added risks would be unacceptable. Compared to well-studied traditional doping methods like anabolic steroids, the toxicity profiles of repeated LNP-mRNA administration are less defined.

Our current ability to predict LNP-mRNA therapy risks in healthy subjects is limited by the lack of data from clinical trials in non-patient populations. Most of the information available is for disease treatment and preclinical animal testing. But immune status, dosing levels, risk tolerance, and toxicity, may differ greatly in illness versus enhancement use. We cannot yet confidently generalize safety data from mRNA therapies in development to hypothetical healthy athletic users. Strategies like incremental dosing, and waiting periods between doses, can manage some safety risks if mRNA modification is pursued for enhancement. But levels effective for clinically meaningful performance gains may be inherently unsafe for repeated elective use in healthy subjects. Risks like allergy and severe inflammatory response could occur even at low doses.

Using LNP-mRNA protein replacement therapy to enhance sport performance poses uncertain, but likely severe, risks that cannot currently be well quantified or managed. Safety profiling lags behind efficacy data in this rapidly evolving field. Core side effects involve cytokine release, anti-drug antibodies, organ toxicities, and genetic doping potential. These could manifest as anything from transient to permanent, mild to life-threatening in athletes.

More research is needed to define probability and severity across diverse subjects. Until then, non-medical uses should be prohibited due to substantial unknown risks to which athletes cannot reasonably consent. Any performance gains from mRNA modification may come at too high a cost from both safety and ethical perspectives.

4) Meritocracy in Distribution of Advantages: Does the technology distribute advantage based on merit, primarily athletic performance?

The potential application of mRNA methods for performance improvement in sport raises moral dilemmas concerning tenets of merit-driven competition. The introduction of mRNA technology as a tool for boosting performance could yield not only imbalanced, but also random, advantages unrelated to effort or skill (Loland, 2002). Such a situation risks undermining rightful compensation for effort or skill. Boundaries defined by meritocratic principles remain essential to guarantee that advances provided by mRNA treatments enhance, as opposed to erode, the ideal Olympic Contest.

Competitive sports purportedly aim to compare participants based primarily on developed talents, dedication, strategic decisions and effort exerted within standardized rules and just ethos (Loland, 2002). This concept of just reward for skill and labor aligns with the principle of meritocracy, a central tenet of fair competition (Loland & Hoppeler, 2012). For instance, illicitly utilizing mRNA techniques to boost endogenous erythropoietin (EPO) levels would provide a profound edge in endurance events by expanding oxygen carrying capacity (Thess et al., 2015). But such capability enhancement stems from exogenous scientific intervention rather than an athlete's own effort. The distorting capacity of unconstrained mRNA doping is illustrated by Thess et al.'s (2015) study showing serum EPO levels over many times the normal physiological ranges in animal models after mRNA treatment. Advantages of this

magnitude categorically differ from outcomes of permissible training. Parallels exist with earlier performance enhancements like anabolic steroids that augment strength or stimulants increasing alertness - effects unrelated to merit. But mRNA doping poses greater risks owing to customizable versatility. Scientists can potentially encode mRNA to produce any imaginable illicit substance from EPO to growth hormone at supraphysiological doses. This heightens the scale of attainable non-merit advantage. Without careful regulation, mRNA sequences used for performance enhancement can be viewed as performance distorters.

5) Justice in Rule Enforcement: Does the technology ensure fairness in the enforcement of rules and punishment of violations?

A pressing ethical dilemma centers upon the potential use of illegal mRNA doping, which could facilitate undetectable doping, thus contravening rule enforcement and justice in sport. The World Anti-Doping Agency's (WADA) centers its approach on detecting prohibited substance use, thus upholding rules and fair play norms (WADA, 2021). New technologies like mRNA may enable undetectable doping, evading standard testing (Nafziger, 2005). WADA bans many endogenous substances like erythropoietin (EPO) or growth hormone when administered exogenously for performance enhancement (WADA, 2023). Verifying illicit usage may involve demonstrating exogenous or the alien nature of a substance to the athlete's body. Administering temporarily expressed mRNA sequences to endogenously induce supraphysiological protein production could potentially generate proteins indistinguishable from endogenous ones. This already poses immense technical challenges with traditional biochemical doping (Thevis et al., 2019). By enabling invisible violations, mRNA doping could severely obstruct rule enforcement. Even perception of undetectable cheating can undermine justice by eroding athletes' trust in institutional safeguards for

integrity (Overbye, 2016). Another concern is that anti-doping protocols largely depend on explicit prohibition of named substances. But constantly amending lists to specify every imaginable mRNA encoded molecular entity, surpasses practical feasibility. mRNA's customizable versatility means scientists could theoretically encode novel muscle-building, oxygen-boosting, or metabolism-enhancing proteins evading broad bans. Current enforcement frameworks struggle with such adaptability. Reactive prohibition often lags behind biotech innovation (Miah, 2005).

6) Goal Realization Promoting Harmonious Development of Humankind: Does the technology align with the broader goals of promoting human development and fostering a spirit of friendship and solidarity?

Competitive sports occupy a paradoxical role both showcasing the heights of physical potential yet also frequently inciting divisiveness and questionable ethics (Loland, 2018a). However, the founding Olympic Charter envisions sports as instruments for unity, and mutual betterment, upholding ideals like "*social responsibility and respect for universal fundamental ethical principles*" (IOC, 2021, p. 8). This aspirational view of sports as ennobling human capacities for cooperation, despite contestation, warrants ongoing advocacy. Fulfilling the competitive environments' potential requires continually aligning practices with ethical goals for fellowship and human growth. Unfortunately, employing emerging technologies like mRNA, absent purposeful steering risks, amplify sports' glaring inequities and disconnection from humanistic ends. Unconstrained mRNA doping enabling supra-human performance levels could convert sports into bio-engineered spectacles diminishing athletes into instruments evaluated on narrow metrics (Miah, 2005). Contestants choosing engineered capacity, over cultivating skill and character, contradict the Charter's aims for sports to develop "*peaceful society [and] preservation of human dignity*" (IOC, 2021, p. 8).

Celebrating achievements emerging from tech-enabled shortcuts, rather than dedicated effort, also erodes meaning. Normalizing relentless competition over human bonds neglects sports' role in "*promoting a peaceful society*" through "*solidarity and fair play*" (IOC, 2021, p.8). While competitive zeal is expected, unchecked practices undermining mutual growth require ethical course correction.

A profound concern is that employing mRNA technology, without compassionate constraints, risks dehumanizing sports participation (Hoberman, 1992). The sheer scale of attainable augmented capacities using mRNA techniques threatens to reduce athletes into instruments valued only for measurable outputs. For instance, encoding mRNA to massively elevate muscle growth or oxygen delivery creates paradigms where success hinges primarily on access to biotechnology, rather than cultivation of character. Humans become reduced to programmed machines designed for narrow performance gains. But as the Charter recognizes, sports should develop the "whole person" by integrating "*body, will and mind*" (IOC, 2021, p.8). Obsessive optimization of single traits devalues multifaceted humanity. Related ethical issues arise from normalizing relentless competition grounded in self-interest rather than fellowship. The Charter envisions sports as avenues for "*friendship, solidarity and fair play*" (IOC, 2020, p. 11). However, elevation of individual glory, stoked through unconstrained technological advantage, breeds isolation and antipathy between rivals. Pressures for victory at all costs encourage exploitation of any opportunity without regard for shared dignity. Ends-justify-means mentalities violate sports' potential to build community. Competitors are first, and foremost, partners in a meaningful practice (Loland, 2018a). Without camaraderie in challenge, contests decay into zero-sum transactions. Technological integration must reinforce bonds between sportspeople, not amplify divisions.

Employing performance technologies should aim at more than efficiency and measurable results. Excellence of character matters alongside quantifiable achievement. Governance founded on cooperation, and collective growth, can orient competitive environments towards human development rather than self-interest. For instance, allowing exemptions for mRNA applications, like injury recovery aids rewards diligent effort over passive advantage. And supporting equitable access cultivates solidarity. Treating competitions as opportunities for mutual achievement fosters an athlete's holistic flourishing across physical, ethical and social dimensions. Realizing such aspirations certainly presents difficulties given sports' hyper-competitive realities. But the Charter's vision of using sports to develop "*ethical and moral standards*" and "*social responsibility*" (IOC, 2021, p.8) merits ongoing advocacy. With care and wisdom, virtue ethics frameworks could help strengthen sport's role in cooperative human growth (Loland, 2002). Premising rules on shared just ethos like sportspersonship, dignity, and mutual betterment, places ethics before capitulation to transactional pressures. Collective deliberation engages diverse voices, preventing narrow agendas from capturing governance (Lopez Frias, 2019). Procedural transparency and participatory decision-making uphold ethics and resist corrupting forces. With vigilant institutions and principled, compassionate policies, centered on human development, competitive sports can largely fulfill their monumental potential as schools for character.

7) Striving for Excellence through Maximum Performance: Does the technology encourage athletes to strive for their maximum performance? (e.g. Can it aid or undermine motivating the athlete's motivation to play to win?)

A foundational motive for involvement across competitive pursuits is determining one's relative superiority through comparison of developed talents, strategic decisions and effort exerted, within fair systems (Loland, 2002). Employing performance aids does not

fundamentally alter this aim to succeed based on preparation and execution of game plans or training regimens. For instance, utilizing prohibited mRNA techniques to enable muscle augmentation does not directly impact athletes' fundamental desire to train rigorously, make tactical decisions and perform determinedly. The motivation remains, outpacing rivals through commitment and grit. mRNA merely provides extraneous means unrelated to competitive motivations focused on excelling through preparation and performance. Of course, unprecedented amplification of capacities from mRNA enhancement may transform conceptions of what peak performance entails. New extremes of engineered strength, speed or endurance redefine competitive aims (Miah, 2005). This could reshape motivations by escalating expectations for augmentation. However, competitiveness, and the drive to play to win, persist regardless of absolute performance levels. The will to triumph through cultivated skill endures despite enhancement. Regulations constraining mRNA doping could contain negative impacts on motivations. With reasonable limits, desires for victory through hard work remain, even if tools enabling expression of talent evolve.

8) Preservation of Uncertainty Outcomes: Does the technology preserve the uncertainty of outcomes, thereby maintaining the excitement and competitiveness of the sport?

A salient concern is that mRNA doping (and other doping practices) could undermine key features of competitive environments such as suspense and unpredictability of outcomes. However, prudent governance approaches may allow leveraging mRNA's advantages while preserving uncertainty fundamental to meaningful contests. Competitive pursuits ostensibly aim to determine relative superiority between closely matched rivals striving to perform at their peak capabilities (Kretchmar, 1975). Outcomes remaining in doubt until the decisive moments helps sustain spectator excitement and participant exertions. However,

unconstrained mRNA doping, enabling supra-physiological capacities, could diminish uncertainty by conferring overwhelming advantage unrelated to cultivated skill. Lopsided dominance through engineered performance counters evenly contested, unpredictable matchups that characterize meaningful competition. Predictable outcomes drain sporting events of experiential richness for all involved. Excitement decays when results become foregone conclusions rather than uncertain until the end. While some disparities in advantage are inevitable, excessive amplification of imbalances through mRNA doping strips away unpredictability fundamental to compelling contests. Constraints narrowly tailoring applications to offset disabilities, without conferring runaway advantage, can help uphold uncertainty.

Of course, spectator experience remains subjective, not solely dependent on objective certainty of outcomes. Possibility of surprise endures even when contests feature heavily favored competitors. Underdog tales retain appeal (Christiansen and Møller, 2016) . The admiration may remain for extraordinary efforts against the odds. mRNA applications could objectively widen gaps between favorites and longshots. Results could stay uncertain so long as other factors are unaltered. It can be argued that performance enhancing substances may impact the delicate balance of uncertainty of outcome, specifically with unequal access or undeclared practices. While there is merit to such claims, it is crucial to acknowledge that the enhancement of performance resides in a complex intersection of many variables; biological, psychological, socio-cultural and economic variables all weigh heavily. mRNA applications could exacerbate disparities only as much as they're allowed by regulatory frameworks and ethical norms in sport. Thus, rather than a main driver of outcomes, mRNA technologies intended for performance improvement should be viewed as potential catalysts for change -

stirring dialogue about fairness and integrity in sports. Just as underdogs can triumph against odds, so too must sporting authorities strive to ensure a level playing field despite emerging forms of performance enhancement.

Table 5.1: Summary of intended good effects.

Condition	Potential Good Effect
Non-Discrimination and Fair Equal Opportunity for Performance	<ul style="list-style-type: none"> • mRNA therapies could provide more options to compensate for genetic limitations and offset natural physiological disparities between athletes, potentially leveling the playing field.
Preserving Sporting Excellence	<ul style="list-style-type: none"> • By inducing temporary effects, mRNA avoids permanent genetic alterations, upholding natural human capacities more than other enhancement methods.
Adherence to Safety and Harm Prevention	<ul style="list-style-type: none"> • mRNA protein therapy might be safer than other genetic alterations.
Meritocracy in Distribution of Advantages	<ul style="list-style-type: none"> • If access to mRNA technology becomes widespread, it could disseminate advantages more broadly rather than conferring benefits only to wealthy elites.
Justice in Rule Enforcement	<ul style="list-style-type: none"> • Advancements in detection technologies inspired by mRNA's emergence could strengthen anti-doping efforts and preserve rule compliance overall.
Goal Realization Promoting Harmonious Development of Humankind	<ul style="list-style-type: none"> • Celebrating expanded extremes of engineered human performance could inspire public imagination and scientific advancement.
Striving for Excellence through Maximum Performance	<ul style="list-style-type: none"> • Access to mRNA enhancement provides more tools for competitors motivated to maximize performance through any available means.
Preservation of Uncertainty Outcomes	<ul style="list-style-type: none"> • With prudent constraints, integration of mRNA performance aids could occur without overly disrupting competitive uncertainty.

Table 5.2: Summary of unintended bad effects.

Condition for Ideal Olympic Contest	Potential Negative Effect
Non-Discrimination and Fair Equal Opportunity for Performance	<ul style="list-style-type: none"> • Early adopter advantages prior to widespread dissemination could discriminate against athletes without access to new mRNA therapies. • Undetectable methods accessible only to some athletes undermine equal opportunities.
Preserving Sporting Excellence	<ul style="list-style-type: none"> • Inducing physiological processes circumvents development of skill through talent and effort (Loland, 2018a). • Shifts focus away from multifaceted human potential developed through effort (Sandel, 2007). • Risks reducing athletes to passive beneficiaries of technology rather than agents cultivating talent (Sandel, 2007).
Adherence to Safety and Harm Prevention	<ul style="list-style-type: none"> • Experimental technology with uncertain safety profile. • Uncertainties around repeated mRNA dosing risks like cytokine release storms and organ toxicity in healthy populations (Vlatkovic, 2021). • Long-term impacts require extensive further study before deeming safe for elective enhancement use.
Meritocracy in Distribution of Advantages	<ul style="list-style-type: none"> • Enables supra-physiological protein production conferring profound advantage unrelated to sporting excellence. • Arbitrary access inequalities based on wealth distribution undermine meritocracy (Loland & Hoppeler, 2012).
Justice in Rule Enforcement	<ul style="list-style-type: none"> • Could enable undetectable doping obstructing enforcement and eroding integrity (Nafziger, 2005). • Perceptions of unchecked cheating alone damage trust in justice of competitions (Overbye, 2016).
Goal Realization Promoting Human Development	<ul style="list-style-type: none"> • Reduction of athletes to bio-engineered instruments undermines moral, social, and personal growth aims in Olympic Charter (IOC, 2020). • Celebrating engineered capacity over character development contradicts humanistic principles.
Striving for Excellence Through Maximum Performance	<ul style="list-style-type: none"> • Doesn't affect athletes' motivations to play to win.
Preservation of Uncertainty of Outcomes	<ul style="list-style-type: none"> • Amplification of capacities may diminish uncertainty fundamental to exciting competition when outcomes become predictable.

Applying Doctrine of Double Effect from the perspective of Governing bodies to mRNA enhancement.

According to the Doctrine of Double effect (DDE), an action is permissible if it fulfills four conditions:

- The action (in this case, the introduction or use of the technology) must be morally good or at least indifferent.
- The agent (the person or organization introducing or using the technology) must intend the good effect (the intended purpose of the technology) and not the bad effect (any negative impacts).
- The good effect does not arise from the bad effect.
- A proportionately serious reason for permitting the bad effect.

(McIntyre, 2023).

1) The action of the agent (governing body) must be morally good or at least indifferent

The DDE first requires assessing whether the action itself is morally good or neutral irrespective of consequences (McIntyre, 2023). Fundamentally, mRNA technology aims to facilitate human protein production, which is a biologically neutral process (i.e not inherently evil). Therapeutic contexts demonstrate mRNA's profound potential for good by preventing diseases and treating medical conditions. However, the moral calculus shifts when mRNA is intentionally deployed in healthy athletes solely for performance gains exceeding normal species capacities. There are arguments to be made that integration of this technology threatens the integrity of athletic achievements grounded in skill and effort (Loland 2002; Loland, 2018b). Therefore, the act of allowing mRNA technology specifically to surpass natural limits might challenge foundational Olympic ideals of celebrating realized human potential (IOC, 2021).

2) The agent must intend the good effect, not the bad

The DDE next evaluates whether the agent intends the action's good effects and not the bad effects (McIntyre, 2023). Here, the “agent” refers to sports regulators who may permit mRNA use. Their intended good outcome would be enabling safer performance improvements compared to risks of gene doping. However, this discounts significant unintended effects. These include potential health hazards from repeated mRNA administration being unproven in healthy populations, unfairness due to inequitable access, coercive pressures to adopt unvetted enhancements (Lavin, 1987), and de-skilling of sports skills (Miah, 2005). Even proper intentions cannot negate these foreseeable consequences. Therefore, unintended negative impacts appear substantial despite aiming for safety.

3) The good effect cannot directly arise from the bad

This DDE criterion requires that the intended good outcome not arise directly from the bad (McIntyre, 2023). Here, the potential good effects of improved performance, safer enhancement, and fairness from offsetting genetic differences, are indeed independent phenomena not directly born from harms like health risks or access inequities. However, realizing benefits depends on widespread dissemination, which advantages early adopters initially until costs decrease. Therefore, independence exists theoretically but advantages for wealthier athletes could persist for some time, undermining fairness goals.

4) Proportionality: intended goods must sufficiently outweigh unintended harms

The final DDE criterion requires assessing whether there are proportionately serious reasons for permitting the foreseeable negative effects of an action (McIntyre, 2023). While mRNA technology theoretically enables safer performance enhancement and offsetting genetic differences, significant ethical risks remain concerning its integration in sports. Evaluating

proportionality requires weighing intended benefits against potential harms across the eight dimensions constituting an ideal Olympic contest:

- Regarding non-discrimination and fair equal opportunity, mRNA could help compensate for genetic limitations. However, benefits currently favor wealthier nations and athletes until costs decrease, conflicting with equal access (Miah, 2005).
- Concerning sporting excellence, mRNA risks reducing achievements to biochemical outputs rather than human effort (Sandel, 2007). Artificially inflating capacities also warps conceptions of excellence.
- For safety and harm prevention, long-term impacts of repeated mRNA dosing in healthy athletes remain uncertain (Vlatkovic, 2021). Also coercive pressures to adopt unvetted experimental enhancements exist (Lavin, 1987). Elective enhancement risks likely exceed those tolerable for medical treatment.
- Regarding meritocratic distribution, mRNA enables capability amplification unrelated to developed talent and innate biological adaptive plasticity of athletes' bodies (Loland & Hoppeler, 2012). Advantages unrelated to the actual inequality in athletic performance undermine fair play (Loland, 2002).
- For justice in enforcement, undetectable designer mRNA doping could obstruct integrity checks.
- In terms of human development goals, excessive focus on results over character cultivation conflicts with the Olympics' values (IOC, 2021).
- Concerning motivation for maximum performance, It can be argued that mRNA enhancement might help the athletes always perform at a near their best, but this argument is weak, since the key here is 'playing to win' regardless of physical state.

- Finally, the uncertainty of outcome might not be impacted, specifically with an equal access scenario.

The unrestricted use of mRNA technology to improve performance, engenders many conditions of the ideal Olympic contest that currently overshadow its potential gains. While it can be argued that it might provide a safe alternative to other more risky forms of doping, and that it may provide equal opportunities for athletes; however, unknown health risks paired with threats to authenticity, pose significant concerns. Further, enforcing this point is the risk of contravening several other principles, these factors hint at an imbalance where detrimental impacts seem greater than benefits. The benefits of mRNA technology intended to improve performance don't present a proportionately serious reason for permitting the bad effect.

Conclusion

With the advent of mRNA-based interventions, coveted physical traits in athletes, such as enhanced muscle growth, augmented metabolic capacity, and improved oxygen carrying capacity, can now be potentially manipulated. This occurs via cellular exposure to specific instructions via mRNA sequences which provoke a specific protein production that can have a favourable physiological function in sport. A thorough analysis reveals that utilizing mRNA technology for enhancement comes with risks that outweigh any potential benefits based on established criteria outlined in Chapter 2 and 3. Both an intention based/consequentialist assessment using the Doctrine of Double Effect, and a deontological evaluation considering conditions for the ideal Olympic Contest, strongly indicate that mRNA performance enhancement fails to meet key ethical principles, such as safety,

fairness, integrity, human excellence and social responsibility. The potential advantages of increased capacities, and a potential safer alternative to gene doping, do not provide enough moral justification for the numerous foreseeable harms, including health risks, unfair competition practices, and undermining the deeper values that sports represent. Upon examination it appears that the use of enhancement in sports goes against the core values we hold dear.

However, there are scenarios where acceptable applications of mRNA can be considered within responsible boundaries. For example, if the techniques are aimed at restoring functions rather than exceeding the plasticity of innate abilities, and implemented transparently under medical supervision, they may warrant further discussion. Further, as mRNA technology plays an important role in preventive medicine through vaccines, it holds undeniable positive potential. However, any utilization must address challenges related to health concerns, fairness, and other conditions for the ideal Olympic Contest. The presence of risks and uncertainties places a burden on justifying its use.

In conclusion, based on my ethical assessment tools and considering both capabilities and ethical implications at unrestricted utilization of mRNA technology for performance enhancement fails to meet fundamental moral criteria regarding participant safety, fair competition practices maintaining motivational integrity, and social responsibility. The usage of mRNA techniques in sport, without constraints, carries risks that outweigh speculative benefits. Therefore, It remains ethically necessary to prohibit their use beyond regulated preventive applications in order to preserve the philosophical essence of the ideal Olympic Contest. However it is crucial to adopt governance approaches that combine caution,

evidence gathering, and moral deliberation. This will allow us to gradually integrate techniques into sports while still upholding important sporting values. We must renew our commitment to the principles outlined here especially as sociotechnical forces continue to push the boundaries of achievement. By being diligent and wise in our regulations we can responsibly expand the possibilities for excellence in sports while also resisting dehumanization. However it is essential that technological integration in sport be guided by the ideals of the competition rather than the other way around. Through vigilance we can ensure that sports maintain their uplifting purposes while making progress in a prudently governed manner.

Limitations

As an early-stage technology, we are still gathering evidence. Many unknown factors persist regarding mRNA techniques' - its technical capabilities are yet to be fully tested, safety concerns persist, and production scalability specific to the case of sport performance enhancement remains uncertain. Theoretical implementation for enhancing sports performance is dependent on assumptions and extrapolations prone to misalignment with future actualities. Therefore, comprehensive examination including multi-disciplinary collaboration among specialists from philosophy, biomedical science, ethics, as well as sports technology fields, becomes paramount in discerning this technology's place and influence within our societies.

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Conclusion

This thesis undertook the task of constructing an accessible, structured, and principled ethical framework to guide the integration of emerging technologies within Olympic sports. Through critical analysis of conceptual literature, synthesizing ethical perspectives, formulating categorical classification, merging philosophies and demonstrating practical application, the research generated both theoretical and practical contributions to the underdeveloped domain of sports technology governance. The foundational analysis in Chapter 1, reviewed philosophical and policy frameworks regulating performance enhancement technologies like doping in Olympic sport. A conceptual lens illuminated reactive shortcomings in predominant anti-doping models, which lack proactive foresight, rely on contested internalist concepts like “spirit of sport”, and enforce blanket bans absent substantive, accessible, and transparent moral reasoning (Obasa & Borry, 2019; Waddington et al., 2013). The reliance on rhetorical appeals versus accessible justification creates ambiguity leaving regulators ill-equipped as Technology advances.

Having identified conceptual gaps in regulatory performance enhancement approaches, Chapter 2 undertook groundwork establishing parameters for envisioning the ideal Olympic contest. Engaging seminal literature on concepts like sportsmanship, fair play and Olympism, crystallized essential conditions for a benchmark; the Ideal Olympic Contest. Distilled principles like equality, safety, excellence, meritocracy, justice, human development, maximum performance, and unpredictability, outlined value touchstones for assessing technologies. Building on this conceptual foundation, Chapter 3 constructed an integrative ethical framework fusing Feenberg's critical theory of technology with applied ethics tools. Feenberg's (1991) balanced view highlighted technologies' embedded values demanding

ethical review. Complementarily, the Doctrine of Double Effect (DDE) supplied intention-focused and consequentialist principles for weighing intended benefits against potential harms (McIntyre, 2023). This fusion facilitated a technology taxonomy based on ‘intention’, then layered ethical analysis of specific cases against the condition of the Ideal Olympic contest and then weighing intentions and foreseeable impact using DDE. Together these methodological components enabled multilayered scrutiny of values propagation and proportionality when integrating innovations. Chapters 4 and 5 validate this framework through hypothetical cases of an AI coaching assistant and mRNA therapy technology.

This thesis comprehensively addresses known limitations in sports technology oversight by proposing a dynamic set of conceptual tools for comprehensive ethical appraisal and informed decision-making. The framework developed strategically employs contextual classification, along with the weighing of intention against impact and proportionality discernment to foster inclusive decisions that align with both fair play values as well as those surrounding Olympic practices. Through deep exploration of established literature, leading separate conclusions into actionable protocols ensures regulators are equipped with the knowledge needed to guide ever-evolving integration of emerging technologies in sport events successfully. The thesis significantly contributes both theoretical concepts and practical applications identified from areas where existing reactive mechanisms have been inadequate hence necessitating proactive participatory models rooted in ethics protocol. The robust concept architecture put forth acts as stepping stones enabling evolution within sporting practice while respecting mutual cooperation aiming at overall human progress.

Limitations

While I have provided limitations sections for each chapter independently, recognizing that each philosophical approach and case have their own limitations, here I can express some holistic limitations that might not have been covered in the previous chapter. Despite the comprehensive attempt made in this work, there are areas that can be improved or broadened to ensure a richer and more efficient framework. A potential drawback lies in our categorization of technology which could risk loss of context-specific details associated with each technological tool under review; hence careful analysis tailored for individual cases is necessary. It is also important to take into account variations unique to different sports may further improve this model's efficiency. The proportionality portion of the analysis can still provide a tailored approach to different sports - by prioritizing the principles that are more specific to each sport during analysis. The integration of empirical insights from multiple stakeholder perspectives on emerging technologies impacting lived experiences within sport will also bolster the study's foundational base. While acknowledging IOC's existing role not extending to enforcing 'technical rules' across all Olympic sporting disciplines, drawing attention towards fundamental notions common throughout - provides an important avenue through which ethical considerations come into picture during regulatory formation. The concept of fair play and the Fundamental Principles of Olympism, are both key tenets of the Olympic Charter, and extend to all International Federations (IFs) who are members of the Olympic Movement, and are obliged to abide by its Charter (IOC, 2020, p.53).

Practical Recommendations

- Sporting regulators should adopt structured ethics protocols for reviewing technologies against established criteria. Doctrine of Double Effect-style tools could be translated into standardized assessment procedures.
- Regulations should be reframed beyond reactive prohibition towards proactive shaping of technologies through anticipatory governance (Guston, 2014). Scenario analysis and forecasting of potential risks and benefits would enable prudent integration.
- Incorporating ethics checkpoints at multiple stages of technology development would maximize opportunities for constructive steering and avoidance of self-serving biases through power imbalance (Wilsdon & Willis, 2004; Feenberg, 2005). Early-phase perspectives prevent entrenchment of inadvertent biases.
- Transparency regarding evidence, reasoning and stakeholder participation in formal ethics reviews would boost perceived legitimacy and fairness of decisions.
- Regulators must recognize technologies as value-laden systems requiring ongoing evaluation, not inert tools subject to one-time rulings (MacKenzie & Wajcman, 1999). As sociotechnical environments evolve, revisiting assessments against ethical criteria is imperative. No single authoritative decree suffices amid changing contexts.
- Fostering a compassionate ethical climate focused on mutual growth over punishment remains vital. Restorative approaches seek understanding and reconciliation through open dialogue when values diverge. Integrating ethics reviews within a spirit of cooperative human development would uphold Olympism's vision of sports as ennobling human potentials for excellence, effort and friendship.

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Conference Presentations:

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