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Review Article

Philosophical and Ethical Investigation of Transhumanism Technologies in Sports: A Prospective Study

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Abstract

Introduction: Redefining human boundaries through transhumanism, particularly in medicine, biotechnology, and sports, is one of the major challenges of the modern world. Advanced technologies such as genetic engineering, artificial intelligence, brain-computer interfaces, prosthetics, and exoskeletons are capable of fundamentally altering human physical and cognitive abilities and the nature of sports. these changes give rise to, including standards for improving athlete performance, ethical and justice issues, and the management of these transformations. This study aims to examine the philosophical and ethical implications of transhumanist technologies in sports as a prospective study.

Material and Methods: The research was conducted qualitatively with an analytical-interpretive approach. Research data were extracted from libraries, scientific databases, and reputable electronic journal archives.

Conclusion: This study explores how transhumanist technologies transform sports by enhancing human abilities while raising significant ethical concerns. These advancements challenge traditional notions of fairness and integrity in sports by merging natural and augmented capabilities, thus prompting a reevaluation of core values such as equity and sportsmanship. While these innovations offer greater inclusivity and opportunities for individuals with disabilities, they also threaten the essence of fair competition. This research underscores the need for adaptive ethical guidelines and regulatory frameworks to address these issues, ensuring that technological progress aligns with the fundamental principles of sports and human endeavor. Future research should focus on developing such guidelines to maintain the balance between innovation and fairness.

Keywords: *Ethics, Philosophy, Sports, Transhumanism, Technology.*

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INTRODUCTION

The 21st century's remarkable progress in biotechnology and cybernetics has led to a new perspective on the human body and its cognitive and physical capabilities. Machines and technologies have significantly impacted human physical and intellectual abilities, leading to fundamental changes [1]. One of the greatest challenges of the modern world is the expansion of human boundaries through transhumanism, a movement particularly prominent in medicine, biotechnology, and even sports [2]. It is evident that such developments and prospects, while bringing about fundamental changes, also raise significant and critical ethical questions, which

have been extensively explored in scholarly literature [3].

In 2003, Oxford philosopher introduced transhumanism as a way to think about the future. He argues that humans have not yet reached their ultimate potential. This philosopher presents two main aspects of transhumanism: 1. Enhancing human conditions through the rational use of technologies to eliminate aging and improve intellectual, physical, and psychological abilities; 2. Examining the implications, promises, risks of technologies, and the ethical issues associated with them [4]. The dimensions of transhuman technology encompass artificial intelligence, genetic engineering, brain implants, prosthetic limbs, and computer simulations, among others. Some of these are already being utilized in industries, sports, and leisure activities, with the expectation of widespread adoption in the future. Technological advancements have posed challenges to several traditional assumptions and cherished beliefs, not only regarding the nature of sports and how they are conducted but also concerning the nature of reality and the meaning of being human [5].

The advent of sophisticated technologies and novel research programs has revolutionized the world of sports in recent years. From the perspective of the intricate advancements in transhumanist technologies within sports, this phenomenon has emerged as one of the most influential factors, as it directly interacts with the physiological, physical, and cognitive functions of individuals with disabilities, impairments, and those who are considered healthy [6]. In a recent inspiring display of resilience and technological advancement, a paraplegic tennis player participated in the Paris 2024 Olympic torch relay, carrying the torch using an exoskeleton. This event is a clear demonstration of the integration of advanced technologies to empower disabled athletes. The athlete's use of an exoskeleton not only highlights the progress of assistive technologies but also underscores the inclusivity and pioneering spirit of the Olympics, aligning with Paris 2024's vision of showcasing innovation and accessibility. This moment serves as a powerful symbol of human will and the ongoing effort to break down barriers for disabled athletes on the global stage [7]. It seems that such official and public symbols are paving the way for the introduction of transhuman technologies in sports in the coming years and highlighting the increasing need for ethical and philosophical discussions.

The advent of transhumanist technologies presents a myriad of challenges to the realm of sports. These challenges encompass the transformation of athletic performance standards, the philosophical and ethical dilemmas associated with implementing advanced technologies, and the legal and regulatory frameworks that must be established to address these evolving dynamics [8].

A paramount challenge lies in the transformation of athletic performance standards. Implementing advanced technologies can undoubtedly enhance athlete performance, yet this raises critical questions regarding fairness and equity in sporting competitions. Does the utilization of transhumanist technologies potentially favor certain athletes while disadvantaging others? How can balance and fairness be maintained within the realm of competitive sports?

Within this realm, philosophical perspectives delve into the question of whether technologically enhanced performance constitutes an overstepping of natural human capacities and whether this could lead to a fundamental alteration of both human nature and the very essence of sports?

Furthermore, ethical concerns surrounding the implementation of transhumanist technologies warrant careful consideration. Does the utilization of these technologies represent a

manipulation of human nature? Can the application of advanced technologies be deemed as a form of cheating in sports? How can the ethical boundaries of technology use in sports be defined?

In addition, legal and regulatory developments hold paramount importance. Given the rapid pace of technological advancements, sporting laws and regulations must adapt with equal agility to effectively address emerging challenges. How can laws and regulations be formulated that not only safeguard the health and safety of athletes but also uphold fairness and equity in sporting competitions?

The significance of the present research lies in the fact that the rapid growth of transhumanist technologies could lead to fundamental changes in the nature of the human body, the performance of athletes, and the fairness and competitiveness of sports. Furthermore, to date, there has been limited ethical and philosophical discussion regarding the use of technology in sports [9]. With the introduction of these technologies into sports, the need for establishing new legal and regulatory issues arises, which requires the development of appropriate laws and regulations. Therefore, research in this area contributes to a better understanding of these changes and their management, and helps prevent potential negative consequences. Accordingly, the aim of this research is to examine the philosophical and ethical implications of transhumanist technologies in sports.

MATERIAL AND METHODS

This research was conducted using a qualitative approach with an interpretative-analytical framework. Data and information were gathered from library resources, scholarly databases, and electronic journal archives. To achieve the primary objective of this research, an effort was made to provide an accurate and realistic understanding of the topic by avoiding personal judgments and subjective assumptions. Data and source collection encompassed a comprehensive range of research articles, from the most recent to those published in the past.

This paper is divided into four sections: the first section reviews the theoretical foundations and literature on transhumanism; the second section examines the applications of transhumanist technologies in sports; the third section addresses ethical issues related to transhumanism in sports; and finally, the fourth section provides conclusions and recommendations concerning future policy-making, regulations, and principles in sports.

DISCUSSION

Conceptual Framework: The Emergence and Definition of Transhumanism

Transhumanism is a term derived from the combination of the prefix "trans" meaning "beyond," "across," or "through" and "human," signifying a state of being beyond the present human condition. The term first appeared in a literary context in 1312, employed by the renowned Italian poet Dante Alighieri, who used the word "transhuman" [10].

Transhumanism, coined by Julian Huxley in 1957, is a philosophy advocating the use of technology to overcome human limitations and enhance well-being. It seeks to eliminate diseases and aging, achieve ultimate happiness, and replace body parts with superior artificial components. The philosophy promotes widespread technology adoption to accelerate human enhancement [11].

In 1972, F. M. Esfandiyari, also known as FM-2030, employed the term "transhuman" in a book and elaborated on transhumanist ideas, however, he did not label these ideas as "transhumanism." The term was first formally introduced in a 1990 article titled "Transhumanism: Toward a New Philosophy of Man" by Max More, which played

a significant role in shaping and defining this emerging philosophy [12].

One of the leading contemporary theorists in transhumanism outlines the following options for human enhancement: significantly extending healthy lifespan, eradicating diseases, eliminating unnecessary suffering, and enhancing intellectual, physical, and emotional capabilities. Other transhumanist topics include space colonization and the possibility of creating superintelligent machines, along with other potential advancements that could profoundly alter the human condition [13].

Transhumanism and Contemplations on Sports

Like sports, which center on human potential, transhumanism also emphasizes physical and mental improvement. Both rely on technological advancements, with transhumanism seeking to enhance these capabilities through artificial means, while sports prioritize natural development. However, the lines can blur, leading to ethical debates in sports as technology advances [14]. Scientific and technological studies that drive human enhancement encompass various areas, including:

- ***Doping***

Doping involves the unauthorized use of substances or methods to enhance physical and mental performance, with many such practices banned by the World Anti-Doping Agency (WADA) [15]. Gene doping [16] and Neurodoping [17] are two examples of doping in the transhumanist realm that could enhance athlete performance in the future.

Neurodoping generally refers to the use of drugs or methods aimed at enhancing cognitive performance in athletes, chess players, or eSports gamers. However, in line with Jonathan Pugh and Christopher Pugh's article "Neuro-stimulation, Doping and the Spirit of Sport," the authors argue that there are strong reasons not to prohibit neurodoping methods like tDCS, as enforcing such a ban is extremely challenging due to the difficulty in detecting its use. The only way to detect its use is through apprehending individuals in the act, which could jeopardize important ethical principles such as autonomy and privacy if applied rigorously [18].

- ***Exoskeletons***

Exoskeletons are advanced mechanical devices designed to replicate the human skeleton, integrating sensors, digital systems, and batteries to support or restrict human movement. Often referred to as "exoskeleton robots," these wearables apply electrical force similar to muscle function to assist in various bodily movements [19]. A prime example of prosthetic leg use is Oscar Pistorius, the famous South African sprinter who achieved remarkable success in the world of athletics using prosthetic running blades [20].

Recent innovations in AI-powered prosthetics by companies like Ossur, Otto bock, Blatchford, and Mobius Bionics [21] have enabled athletes with disabilities to surpass physical limitations and reach new performance heights. These prosthetics enhance strength, agility, and balance, expanding sporting possibilities and inspiring remarkable feats, as demonstrated by Amy Purdy, who won a bronze medal in snowboarding at the 2014 Paralympics [22].

Ethical concerns regarding enhancement technologies in sports include defining illegal versus fair enhancements, potential harm to athletes, and their social and ethical impacts. Some suggest separate leagues for enhanced and non-enhanced athletes, while exoskeletons raise questions about their effect on records and competition fairness. The presence of naturally genetically gifted athletes further complicates these ethical issues [23].

- ***Genetic Engineering***

Much of the accomplishments in biomedicine in the last 50 years, is in fact based on the success of

Watson and Crick in solving the double helix structure of deoxyribonucleic acid (DNA) more than half a century ago. The completion of the Human Genome Project in 2003 and early gene therapy attempts in the 1990s further propelled advancements [24].

The primary concern regarding technologies that alter our biological structure revolves around genetics, which may give rise to the concept of the "post-human athlete." Research, such as the use of the follistatin gene to inhibit myostatin, indicates that it might be possible to significantly increase muscle mass without extensive training. However, this could potentially result in sports injuries if not properly balanced with other tissues. Genetic modifications might also improve oxygen utilization and performance, but an excessive number of red blood cells could place undue stress on the heart. These concerns, initially raised in the late 1990s, led to the classification of genetic technology as doping by the World Anti-Doping Agency (WADA), although there is currently no evidence of genetically modified athletes competing in the Olympics [25].

- ***Brain-computer interfaces (BCIs)***

Brain-computer interfaces (BCIs), also known as mind-machine and brain-machine interfaces, originated from Hans Berger's 1929 work on recording brain waves. These technologies facilitate direct communication between the brain and computers, enabling various applications from cognitive enhancement to neurorehabilitation [26, 27].

Neuralink, founded by Elon Musk, recently made headlines by implanting a brain chip in a human patient to assist those with paralysis, with plans for further implants. This technology promises to improve recovery, muscle strength, coordination, and cognitive performance, potentially transforming sports and virtual experiences, though ethical and health concerns need addressing [28, 29].

Ethical Theories in Sport

The most credible ethical model for understanding and assessing ethics, fairness, and sportsmanship in athletics has been proposed by several researchers. His early work integrated Aristotle's formal equality principle with concerns of justice as fairness, while his later work considered a more specific principle called the Fair Equality of Opportunity Principle (FEOP). The first principle states that: 1. Relevant equal cases should be treated equally; 2. Relevant unequal cases can be treated unequally; and 3. Unequal treatment should correspond logically with the actual inequality between cases. In his first comprehensive account of his sportsmanship model, he argued that:

1. All competitors should have equal opportunities to compete by removing or compensating for irrelevant inequalities.
2. Competitors should only be separated into groups where inequalities arising from individual-specific issues, which they cannot significantly influence or be responsible for, have a systematic and significant impact on athletic performance.
3. Discrimination in sport is only permissible based on differences in athletic performance.
4. The degree of advantage given to an athlete through means and equipment should be proportionate to their actual advantage in athletic performance [9].

In sports competitions, the principle of meritocracy requires equal opportunities for all athletes to showcase their abilities. In the discussion of access to resources, particularly sports technology and equipment, theorists argue that inequalities not due to individual choice but significantly and systematically impacting athletic performance should be addressed or compensated through competition rules, regulations, or relevant standardizations [30].

The FEOP advocates for equal potential regardless of personal conditions, ensuring all Paralympic athletes have a fair chance to compete. Classification systems aim to balance competition among athletes with similar disabilities, though imperfections persist, necessitating compensatory measures like assistive technologies or additional training [9].

A researcher presents a three-dimensional model for equal opportunities in competitions. He defines equal opportunities as the normative regulation of competitions that distribute valuable opportunities. Jacobs' model focuses on the fair use of competitive procedures to ensure the equitable distribution of resources. This model comprises three dimensions: contextual fairness, procedural fairness, and fairness of outcomes. Similar to Lolland, Jacobs argues that competitive models of equal opportunities include three essential characteristics: (a) fairness is defined based on rules and procedures (i.e., an ideal for regulation); (b) the winner is determined by these rules, and there is no predetermined outcome; and (c) equality of opportunity is a normative standard for regulating certain types of competitions [31]

Justice in Sports Competitions: Jacobs' Three-Dimensional Model

The three-dimensional model of equal opportunities offers a revised approach to regulating competitions by defining equal opportunities as a normative framework for the fair distribution of resources. This model emphasizes three critical dimensions: contextual fairness, procedural fairness, and distributive fairness. Unlike traditional theories that narrowly focus on procedural fairness, this model introduces a more nuanced perspective by ensuring that justice is defined based on rules, outcomes are not predetermined, and equality of opportunity serves as a normative standard for achieving true equity [9].

- ***Contextual Fairness***

This dimension emphasizes fair background conditions for competition. In other words, the conditions for all participants before the competition should be nearly equal so that they compete on a completely level playing field. Jacobs highlights the concept of "equality of position" to achieve equality in the initial position of competitors. According to him, all individuals should have the same "position" in the competition.

- ***Procedural Fairness***

This dimension refers to the fundamental rules governing the competition itself, including how winners (or losers) are determined. Jacobs states that procedural fairness criteria are usually specific to each sports event, and what is considered fair procedure often relates to the interests involved in that competition.

- ***Outcome Fairness***

Outcome fairness focuses on the equitable distribution of benefits among participants in a competition, such as awards and recognition. Jacobs views it as a way to manage prize distribution beyond a "winner-takes-all" approach, acknowledging that not all participants need the same rewards. This concept aligns with Aristotle's principles of formal justice, where unequal treatment should relate to the differences among individuals.

The Role of Technology in Paralympic Competitions: Policies and Ethical Challenges

Given that transhumanist technologies have thus far been used only sparingly in the Paralympic sector, the examination of ethical, fairness, and justice challenges is also conducted within this sector. The (International Paralympic Committee (IPC) has established specific policies for sports equipment that apply to all Paralympic sports and those affiliated with the Paralympic movement. This policy acknowledges the impact of technology on athletic performance and

emphasizes the importance of sports equipment in facilitating competitions and creating a fair and transparent environment. It refers to tools adapted to the specific needs of athletes, such as wheelchairs and prosthetics, which are used in competitions [32]. Section 3.3 of the IPC policy emphasizes that the regulations of Paralympic sports federations must include detailed information about equipment and inspection methods. Advanced technologies can alter sports results and impact fairness. For example, running prosthetics are made from different materials with varying qualities and weights. Current regulations are insufficient and susceptible to manipulation [9].

- ***Safety***

"All Equipment in use must protect the health and safety of the user, other competitors, officials, spectators and may not cause damage to the environment (e.g., Field of Play) (Section 3.1.1)."

- ***Universality***

“The cost and large-scale availability of (principal components of) equipment to guarantee access to a sufficiently large number of athletes in the sport”. (section 3.1.3)

- ***Physical Prowess***

“Human performance is the critical endeavor to the sport performance, not the impact of technology and equipment.” (section 3.1.4) [9].

Ethical Challenges of Transhumanist Technologies in Sport and Society

- ***Inequality and Access***

One of the important issues with transhumanist technologies is their impact on social equality. Critics are concerned about the widening gap between affluent and low-income classes [13]. Philosophers like Francis Fukuyama warn that these technologies could exacerbate existing inequalities and create greater differences between individuals [33].

Transhumanist technologies may, like in other fields, lead to inequality and class divide between the wealthy and the poor in sports as well. In such scenarios, physical abilities and natural training will give way to advanced technologies, raising concerns about human equality [33]. It can be argued that if a competitor does not align with the notion of a "natural and ordinary human athlete" (and for Semenya, this would mean a "naturally female athlete"), they are accused of having an unfair advantage. In the case of Pistorius, this issue related to his prosthetic blades, and in Semenya's case, it related to her masculine appearance [25].

The employment of transhumanist technologies, such as enhancing physical or cognitive performance, could intensify these inequalities and reinforce existing advantages. This could result in the division of athletes into two or more distinct categories based on their physical and mental abilities. Athletes who benefit from these advancements would transform into flawless beings with extraordinary physical capabilities, while other athletes would remain at their current level and potentially lose some of their motivation and self-esteem. Even if there is no discrimination or exploitation in this scenario and the rules are properly enforced, the prospect of a society with extreme inequalities in sports remains troubling. This situation could lead to ethical and social crises and undermine the fundamental values of sports, such as fairness, merit, and individual effort.

- ***Changes in Rules and Regulations***

With the advent of new technologies, the need for reevaluating sports rules and regulations intensifies. Global sports organizations like the International Olympic Committee (IOC), FIFA, the World Anti-Doping Agency (WADA), and the United World Wrestling (UWW) must establish new rules for the use of genetic interventions and other performance-enhancing technologies to safeguard fairness and clean competition. Additionally, there is a need to strike a balance between technological

advancement and preserving the fundamental values of sports. This process can be complex and challenging, as defining the boundaries between authorized and unauthorized use of technologies is not always straightforward [14].

– ***Psychological and Social Impacts***

Technological changes can have far-reaching psychological and social consequences for both athletes and spectators. Athletes may face immense pressure to adopt new technologies to improve their performance. This pressure could lead to stress and anxiety, as they worry about falling behind if they do not embrace these technologies. Additionally, the inequalities caused by uneven access to technologies could lead to feelings of injustice and increased anxiety among athletes who do not have access to these advancements [34]. Moreover, these changes could potentially affect social relationships among athletes, creating a divide between those who have access to advanced technologies and those who do not.

Spectators are also affected by technological changes. While some may enjoy witnessing enhanced and exciting performances, others may feel that the traditional spirit and values of sports are being eroded, potentially diminishing their interest in sports [35]. Furthermore, media coverage of these technologies could place additional social expectations and pressures on athletes [36]. To manage these impacts, policymakers and sports organizations should establish appropriate regulations and provide the necessary psychological and social support.

– ***Performance Enhancement in Sports***

These transformations will also reverberate within the realm of sports. For instance, advanced technologies, including genetic interventions, nanotechnology, and biomechanical technologies, hold the potential to dramatically enhance athletic performance. These advancements could encompass increased speed, endurance, strength, and improved cognitive abilities of athletes [37].

The first documented case of gene transfer aimed at enhancing athletic performance dates back to 2006 in Germany. Thomas Springstein, a track and field coach, was convicted for attempting to administer Repoxygen to unsuspecting athletes. Repoxygen was a viral vector carrying the human EPO gene under the control of a hypoxia response element, intended to increase the number of red blood cells and oxygen-carrying capacity of athletes. This product was being studied in animal trials by the British company Oxford Biomedica, and there was no data on its potential effects and risks in humans at that time. Although gene doping had been on the WADA prohibited list since 2003, it was not until the 2006 Repoxygen case in Germany that gene enhancement became a documented reality requiring regulatory response [38].

Consequently, these changes will introduce new challenges in the domains of fairness, healthy competition, and the definition of human values, even questioning the very authenticity of sports. However, a crucial question arises: will the utilization of these technologies jeopardize fairness and the spirit of sportsmanship?

CONCLUSION

In this era of rapid technological advancement, the integration of transhumanist technologies into sports stands as a profound testament to human ingenuity and a catalyst for redefining the boundaries of athletic performance. This research has meticulously examined the burgeoning intersection of biotechnology and sports, highlighting how innovations such as genetic engineering, neurodoping, and advanced prosthetics are reshaping the athletic landscape. The advancements offer unprecedented opportunities for enhancing human capabilities, but they also introduce a host of ethical and philosophical dilemmas. The implications of these technologies extend beyond performance metrics, touching on fundamental issues related to fairness, the essence of sports, and the very nature of human

potential.

The findings of this study underscore the dual nature of transhumanist technologies in sports. On one hand, they promise to democratize athletic achievement and empower individuals with disabilities, fostering a more inclusive sporting environment. On the other hand, they pose significant challenges to traditional notions of fair competition and the integrity of sports. The potential for these technologies to create disparities between athletes, to blur the lines between natural and enhanced abilities, and to shift the philosophical underpinnings of what constitutes genuine human endeavor in sports is profound. This necessitates a reevaluation of current ethical frameworks and regulatory measures to ensure that advancements do not undermine the fundamental values of fairness and equity in sports.

In summation, as we advance into an era characterized by profound technological transformation, it is imperative to address the ethical, philosophical, and regulatory challenges posed by transhumanist technologies in sports. This research contributes to a nuanced understanding of these issues, advocating for ongoing dialogue and rigorous examination of the implications of such technologies. Future research should focus on developing comprehensive ethical guidelines and adaptive regulatory frameworks to manage the integration of these technologies. By fostering a proactive approach to these challenges, we can strive to preserve the core values of sports while embracing the potential for innovation and enhancement.

ETHICAL CONSIDERATIONS

Ethical issues (such as plagiarism, conscious satisfaction, misleading, making and or forging data, publishing or sending to two places, redundancy and etc.) have been fully considered by the writers.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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