Policy and Integration of Different Technological Enhancement Gear in Sports

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Technological advancements, including smartphones, automobiles, and microwaves, have been essential to society's progress, enhancing efficiency and productivity across various domains. In the sports world, advancements have significantly impacted performance and competition. For example, the improvement of the camera facilitated the introduction of instant replay, allowing referees to review their rulings and fix their mistakes. Prosthetics and artificial body parts have also made it possible for amputee athletes to participate in sports.

These advancements also extend to sportswear and equipment. As sports clothing companies aim to improve the quality of these essential artifacts, athletes' performances are getting better annually. In the past few Olympics, we saw world records being broken at a historic rate, as there were 69 new world records in the 2020 Tokyo Olympics. These records aren't just being broken; they are being shattered. An example is from the marathon, as many believed that running a 2-hour marathon was an impossible feat. However, this feat was broken in 2019 when Kenya's Eliud Kipchoe wore the Nike Alphaflys (banned from the Tokyo Olympics for increasing speed by 6%). This questions whether these records belong to the athletes' improvements or their equipment. While some technologies, including the Alphafly's, faced bans from governing bodies, others, like the Wilson Tennis Racquet, encountered little to no policy alterations. This disparity poses the question of why some performance enhancers are accepted more than others and what features allow a performance enhancer to be integrated. In addition, it underscores the intricate considerations governing bodies need to make when determining the inclusion of the technology and how it would impact their respective sports.

The integration of these technologies has also sparked ethical and moral dilemmas regarding their inclusion in sports. They are met with resistance, raising questions about their morality. Through this paper, I aim to explore the influence of performance-enhancing technologies on sports policies, focusing on two contrasting examples: Nike Alpha and Vaporfly's, which elicited significant controversy, and the evolution of tennis racquets, which did not prompt many policy changes.

By incorporating a multi-faceted approach, I will draw upon information and data from various sources. Scholarly articles written by sports experts, sports laws and regulations from sports governing bodies like the International Tennis Federation and World Athletics, and interviews with professional sports players and experts will be utilized to draw the information necessary for analysis.

I will also employ two STS frameworks, the Social Construction of Technology framework and the Winner's Framework of a political artifact, to offer perspectives on how sports performance enhancers intersect within the realm of athletics. More specifically, the SCOT framework will provide insights into how performance enhancers impact different social groups. On the other hand, Winner's Framework of a political artifact will open a discussion into how and if enhancers will create or contribute to existing societal problems.

In conclusion, based on the information gathered from sources and the frameworks, I will analyze the integration and use of performance-enhancing clothing and equipment and their impacts on both sports and social communities. By addressing the different controversies and challenges these technologies bring up, this paper can contribute to the discourse on the future trajectory of not only sports technology but also other technological innovations.

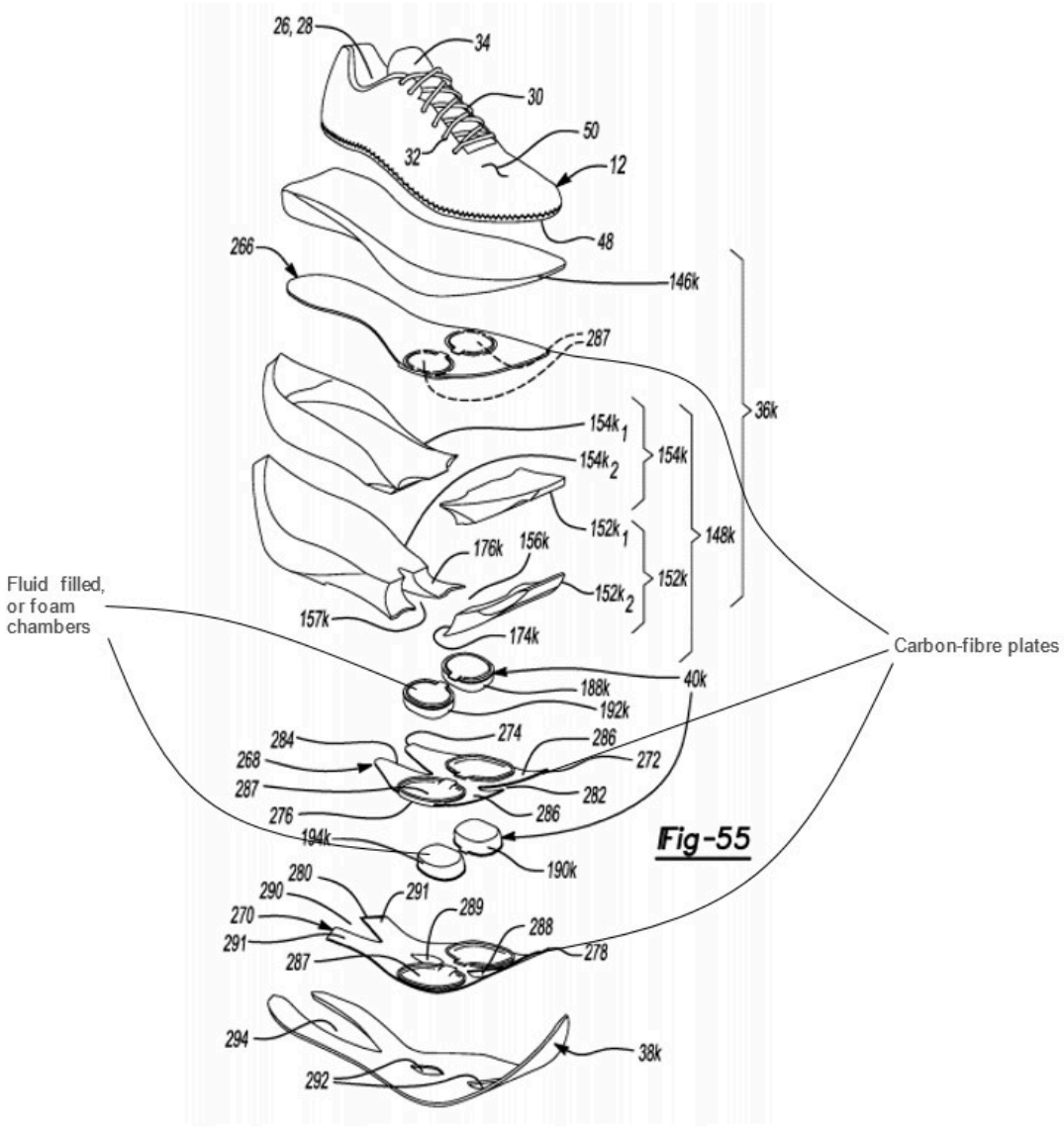
Nike's Vapor/Alphafly's

Prior to 2019, success in the sport of running and its different events was thought to be dependent on the runner's skill and speed. This fact changed in 2019 when Nike released the Nike Vaporflys, a new running shoe that featured many technological advancements. On the bottom of the Nike Vaporflys, the ZoomX foam, made from a Pebax thermoplastic polymer that is both rigid and flexible simultaneously, was featured. The Zoom X Foam featured an 85% energy return for its users, significantly improving from the 60% energy return that the previous Nike Shoe model offered. Inside the ZoomX, a midsole that consists of an upper part and a segmented lower part is featured, along with four separate chambers filled with fluid or foam. (Greenwood, 2020).

The layers within the midsole include a continuous upper section (146k in Figure 1 below) followed by the first carbon fiber plate (266), then a second foam section (154k) encasing the second carbon fiber plate (268), followed by a lower foam section (152k), which includes the third and final carbon plate atop the outsole (38k). (Greenwood 2020). These three carbon plates were the main technological advancements, as they allowed for more optimal support in the main contact point where the runner's foot and the ground touch while running. In addition, the curvature of the plate allows the runner to go from heel to toe as they land and push off. (Johnsen and Woodward, 2020). The plate was also weight minimized, as it kept the "overall weight of the shoe to around 200g in total" ("Technical Innovation," 2020). On top of this, on the upper part of the shoe, a new water-resistant lightweight plastic is incorporated to keep the weight of the shoe down. Nike boasts that the Vaporflys can increase a runner's speed by up to 4 to 5 percent.

Figure 1.

Dissection of the Nike Alphafly's



Nike's Alphafly running shoe, US Patent Application No. 16/543,825

Note From: Greenwood, S. (2020, February). Kicking up a Storm – a Breakdown of Nike's Ground-Breaking and Controversial Range of Running Shoes. *AA Thornton | An Intellectual Property Law Firm in London and Munich*.

After the shoes debuted, the performance-enhancing effects of the shoe could immediately be seen. Firstly, in the 2018 Berlin Marathon, Kenyan long-distance runner Eliud

Kipchoge, who wore the previous version of the Vaporflys, broke the world record marathon time at two hours, one minute and thirty-nine seconds. After the release of the newer prototype versions of the Vaporflys, Eliud Kipchoge broke his record by seventy-eight seconds the following year. When asked about the technological fairness of the shoe, Kipchoge has defended them, claiming, “They are fair. I trained hard. Technology is growing and we can't deny it we must go with technology.” The performance-enhancing effects were also seen on the women's side as Kipchoge’s compatriot, Brigid Kosgei, smashed the previous Women's World Record with the AlphaNext% version of the shoe (seen in the image below) in 2020. (Ingle, 2020) In addition, in all of the different 2019 major marathons that were hosted, thirty-one out of thirty-six runners who held podium positions wore the Vaporflys.

Figure 2.

Nike Alphafly’s

Note: From Deng, V. (2023, February 5). *Breaking down the Nike Air Zoom Alphafly Next% 2*. Complex.

After determining the shoe's major effects on runners and its competitive advantage, the World Athletics, a sports governing body that oversees the different running sports, had to intervene. In 2020, they developed new regulations concerning the type of shoes that could be worn in competitions. The new regulations "impose an immediate ban on any shoe with a sole thicker than 40 millimeters or shoes that contain more than one plate," which Vaporflys does not meet.

In addition to this, the new regulations state that shoes worn by runners "must have been available for purchase on the retail market for a period of four months," banning prototype versions and customization versions of different shoes, which Eliud wore during his sub-two-hour marathon. (Dennehy, 2020). The World Athletics rules and regulations have a whole section based on these prototype shoes, which they call "Development Shoes." They define these shoes as "not required to be made available for purchase" and say that an athlete cannot wear them without prior written approval. (World Athletics, 2021). This was a new rule added by the governing body in response to the Nike Vaporfly.

As a result of the new regulations and rules, Nike has developed new prototypes and different alternatives to evade these regulations while still enhancing performance. The solution that they came up with was the Nike Alphafly Next%. This new model contained only one carbon fiber plate and a soul thickness of 39.5 mm, meeting the governing bodies' constraints. On top of this, this shoe was prepared to be offered in limited quantities in the online market, meeting another requirement of not being a "Development Shoe" (Safdar and Bachman, 2020). Even after the changes that Nike made to the Vaporfly's to match the regulations, the World Athletics has changed its rules and regulations on the type of shoe that can be used. In response, Nike and other brands have changed their shoes to conform to the new rules while still boosting

performance. Currently, World Athletics has changed the “sole thicknesses across all athletic shoes in track and field events to a stack height of 20mm from 1 November 2024,” which is drastically less than the 40 mm restriction that it made for the 2020 Olympics. This shows that athletic brands will keep changing their shoe to meet restrictions made by governing bodies while still boosting performance. On the other hand, governing bodies will keep creating restrictions to decrease the impact of these performance-enhancing technologies. World Athletics has stated that its most complex challenge is to find "the right balance in the technical rules between encouraging the development and use of new technologies in athletics and the preservation of the fundamental characteristics of the sport: accessibility, universality, and fairness." (McFall-Johnsen, 2020).

As we have seen in this section, the Vaporflys is an example of a technological gear advancement that was not accepted by the sport. Through its design specifications and the enhancement to performance that it provides, we have a clearer picture of what it takes for performance-enhancing equipment to be banned by a sport. However, while the Vaporflys were not accepted, they still had a considerable impact on the running policy. Its governing body created new guidelines regarding shoe eligibility as a result of the shoe. This shows the impact of this specific technological innovation in the course of the moral debate of whether or not performance-enhancing equipment should be incorporated into a variety of sports.

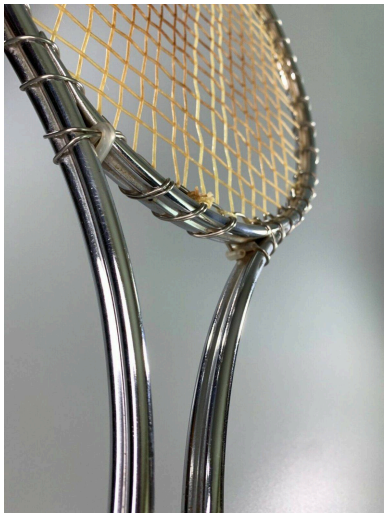
The Tennis Racquet

In the 16th Century, the first type of tennis rackets were made for royal tennis in both France and England, where the sport was first played and popularized. Racquets consisted of wooden paddles with long handles and an oval head. Between then and the 20th century, the

tennis racket and the type of wood used evolved. Racquets began to be made from timber, allowing them to bend into different shapes, and then transitioned into laminated wood for toughness; where in 1947, tennis brands like Slazenger, Dunlop, and Wilson used this material for design and decals. By the 1980s, wooden tennis rackets had been replaced by metal rackets, which became the most common tennis tool (as seen in the image below). What first started as only steel rackets, which, while increasing the power of the ball struck, compromised the weight of the racket. Like their predecessor wood racquets, the metal racquets evolved from different metals like aluminum and graphite. Currently, most racquets are made from graphite. (Mann, 2023)

Figure 3

The First Metal Tennis Racquet



Note: From Mann, A. (2023, January 7). The History of Tennis Racquets. *Tennisnerd.Net*.

The tennis racquet is an example of a technological advancement gear that was accepted into the sport. From wooden racquets to those made of composite materials, tennis racquets have been advancing throughout the history of the sport. Throughout its history, advancements in

tennis racquets are being “engineered for power, control, and maneuverability.” (Sanchez, 2023) Changes in the tennis racquet, in the head size, weight, materials used, and string patterns, have made the racquet easier to swing and easier to hold and have changed the way the ball is hit. Currently, the incorporation of 3D printing technology in the manufacturing of tennis rackets allows for “the creation of complex and customized racquet designs, tailored to an individual player’s preference.” (Sanchez, 2023)

The dramatic changes that a tennis racket can have in both design and manufacturing point to the fact that there are very few regulations and rules concerning the tennis racquet. The International Tennis Federation (ITF), which is the governing body of sports, states that first, “a tennis racket cannot exceed 73.7 cm in length and 31.7 cm in width.” In addition to this, the ITF states that the “racket shall have a frame in closing sturdy strings usually made of nylon interwoven and crossed and bonded pattern and a handle.” (Venkat, 2022). As described in the rule book, the only restrictions apply to the racquet's shape and the racquet's head. This allows for customization and a wide range of different types of rackets, opening doors for more technical advancements.

However, while there are few restrictions on the type and size of tennis racquets that can be used in professional tennis, there are still some controversies that have arisen because of them. Firstly, the ITF International Tennis Federation created the first “rule-book definition for its racquet” after Mike Fishbach defeated the at the time world number one, Stan Smith. Fishbach used a double-strung racket, which increased the grip on the ball at the point of contact with the racket, allowing for more spin on the ball. Critics claimed that this type of racket “wiped out natural talent and rendered years of dedicated practice null and void,” forcing the ITF to make one of few restrictions on the racquet (Goodall, 2010). Another advancement in the racquet

was stringing the racquets loosely. By doing so, players were able to "hit harder and create angles with spin," as professional tennis player Roger Federer expressed. (Goodall, 2010). Despite this technological enhancement that the racquet provides players, this technology was not restricted or banned by the ITF. Instead, more players came up with different ways to customize the gripping, string patterns, and material on their racquets for their on-court needs. In the next section, I will explore and analyze the challenges and controversies surrounding this technology.

Challenges and Controversies of these technologies

The integrity of the sport

Performance-enhancing gear causes problems, challenges, and controversy on two levels: sports and social. First, for sports, it's hard to determine if the accomplishments and the results of the athlete were based on his or her skill or because of the type of equipment or clothing that he or she was wearing. Geoff Burns, a Kinesiology researcher, states, "The runner runs the race, but the shoe enables him or her to run it faster for the same effort or ability… So for two athletes of equal ability on race day, the one with the shoes is going to beat the one without the shoes." (Johnsen and Woodward, 2020). This raises the question of whether fans or observers should be celebrating the athlete or the performance enhancement gear. In addition to this, in many sports, there are records that are set. Breaking a record is seen as prestige, as they have beaten their competition for that year and throughout the history of the sport. In the case of Elucid, who was described above and beat the marathon world record by over a minute, was his performance because of him or the help of technology? Many critics would argue the latter. In the early stages of each sport, the technology and existence of performance-enhancement gear were limited to a difference in materials or the deduction of weight to the gear to increase speed. Are we able to

compare the records that are made now with those that were made in history? Questions need to be asked when integrating performance-enhancement gear into sports.

Social Impacts

One may ask, however, what social impacts do both of these technological enhancement gears have on society, and not just for professionals? The Nike Vaporflys are listed at $275, while the Wilson Custom Rackets go for at least $305. For professional or semi-professional athletes, these prices may not be a big deal to them, as most athletes have sponsorships that provide the gear or have enough money to purchase this gear. The same cannot be said about amateurs and aspiring athletes.

In most cases, the parents of amateurs and aspiring athletes are in charge of making sure their child has the suitable types of equipment, sportswear, and gear needed for their child's sport. While an amateur from an upper-class family may be willing to invest in these types of gear for their child's success, the same cannot be said for an aspiring athlete from a middle or lower-class family. Then, as amateurs or aspiring professionals who are competing against each other, it begs the question of whether their performance is based on their talent and skill or the type of gear that they have. Many amateurs, especially at the high school level, use sports as a means to receive a college or professional offer. For amateurs at the low-income level, the goal of getting these offers is to one day help their family financially by either providing money or receiving a scholarship. By receiving a scholarship, these athletes will have access to higher education that has never been more expensive. As the Scholarship America Fund describes it, "higher education is the best ticket out of poverty," and a scholarship can help athletes with access to it. (Scholarship America, 2023).

In addition to this, aspiring athletes from lower-class families are already at a disadvantage without these performance enhancements, as athletes from upper-class families often hire a private coach or professional trainer to help them perform better in competitions. The implementation of these expensive technological advancements has the potential to widen the already substantial gap between upper and lower-class families and also economically discriminate against athletes from lower-income families.

Using frameworks to analyze

The social impacts of these technological enhancements can also be analyzed through the lens of both the Social Construction of Technology (SCOT) framework and Winner's Framework of Political Artifacts amidst a problematic situation. Firstly, the SCOT Framework highlights the influence of social factors when shaping the emergence and integration of technology. In addition, it also stresses the importance of how technology influences and shapes society. In this context, the development of performance enhancers like the Nike Vapor/Alphafly's and Custom tennis racquets not only affects sports but also, as described above, affects socio-dynamics. Both of these performance enhancers are far from neutral, as they are filled with values, interests, and power relations. We see that the expensiveness and availability of these products are determined by factors beyond just their technological capabilities and specifications. For one, a specific brand's performance enhancer can be perceived in both good light and bad by the sponsorship deal between the athletic brand and a professional athlete. If the athlete is one with great importance and popularity, the products influence customer preferences and, as a result, the company's pricing. On top of this, there's a widening gap between sponsored athletes and non-sponsored athletes, as sponsored athletes endorsed by brands can often access specialized equipment and exclusive discounts. Another factor that influences expensiveness and availability

is individual purchasing power. As described above, affluent individuals may have the financial resources to buy these premium enhancers, while those from low-income backgrounds cannot. The SCOT Framework's approach to understanding these factors and how they interact and influence performance enhancers is essential for addressing where the disparities come from.

Using Winner's framework, we can also view performance-enhancing gear as a political artifact amidst a problematic situation. Winner's framework states that technology embodies social values and also shapes and reinforces existing inequalities. In this context, one can argue that performance-enhancing technology shapes and also increases the existing socioeconomic inequality. Exorbitant prices are making it harder for athletes from lower-class families to perform at a higher level than athletes from upper-class families. By this, we see that the rich get richer and the poor get poorer, as these athletes from upper-class families with this advantage will have more access to scholarships and professional positions.

Discussion and Conclusion

Several questions remain: First, what characteristics of performing enhancement gear allow it to be accepted while a characteristic of another performance enhancement gear is rejected at the professional level? From the Vaporfly's, we see a product that was made and engineered by a global sports brand leader. Nike was the first to revolutionize this type of Technology with carbon plates, and other brands were lacking. During the time the Alphafly's and Vaporfly's were manufactured and released, this brought athletes sponsored by Nike a significant advantage over those who were sponsored by smaller brands. However, with the tennis racket, most professional tennis players have sponsorships with tennis brands that are able to customize their own tennis rackets. Therefore, everyone was on the same playing field at the professional level. This drastically contrasts with running because certain brands have the money

and resources to produce these performance-enhancement gear, while others don't. Therefore I believe that for performance enhancement gear, if it is able to boost everyone's performance, not only explicitly limited to a particular group of people wearing a certain brand, then I think that it should be accepted. However, there should also be a fine line. Drastic speed returns more significant than the ones produced by Alphafly's and Vaporfly's in the sport of running should be avoided by brands as the integrity of the sport should be maintained by trying to respect the history of the sport and the records that came along with it.

The analysis of the first question brings us to the second question: How should performance enhancement be monitored at the amateur level, where it is affecting not only athletes but also families, causing certain socioeconomic groups to be higher than others? The discrimination against these athletes reveals the need for more policies regarding technological gear advancement to be made at the youth level. Currently, in professional sports, there are guidelines and rules regarding the type of gear that they wear and use, as seen through the Vaporflys and tennis racquet. There are no guidelines regarding the monetary aspect of the problem, as these athletes are paid and can, the majority of the time, afford these technological advancements. However, as for the Youth and Amateur athletes, different organizations should look into not only the guidelines and rules of what gear can be used and worn but also how expensive the gear can be. By doing so, the inequality and gap between the upper and lower classes can be minimized.

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