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Evolution of technology in sports: Impact on performance, management, and fan experience

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Abstract

Like other aspects of life, sport, and exercise science have been significantly impacted by technological breakthroughs. Modern sports and the different subfields of exercise research are impossible to envision without technology. The usage of technologies is always clouded with ambivalence and irritation. Ironically, it is people's failure to completely comprehend the scale and depth of technology's influence and also doubt as to what function certain technical improvements play in sports that have contributed most to its pervasiveness. Sports technology has, in fact, significantly altered the field of exercise and sport research. It's important to note that technology has significantly altered how we perceive the athletic body. The impact of technology on sports performance is thus examined in this essay, taking into account technological ideas, the pursuit of increased performance, various sports technology kinds, and the benefits and drawbacks of sports technology in contemporary sports. It is advised that individuals who manage, handle, and utilize sports be prepared to make informed decisions about the kind and application of sports technologies that would support the correct performance.

Keywords: Sport; Impact; Technology; Performance; Player; ICT

1. Introduction

Modern sports are becoming more technologically advanced by fusing natural athletic ability with cutting-edge analytics and artificial intelligence to generate the best results in the field of play. People view sport as a triumph of human endeavor, with a multitude of factors, including technology, working behind the scenes to make it possible. Technology has been used in sports for a long time in many different ways, and it is especially important for elite sports. Technology has been defined in so many different ways that the variety of descriptions has led some people to accept that it cannot be defined. On the one hand, it encompasses every small device ever held in hand and is synonymous with science and logical thought. Claims that professional athletes, amateur runners, and armchair viewers are all being helped by technology to participate in the sport. Technology is not only present outside of us; rather, it is also present within of us. The fact that so many people have been technologically enhanced or made more technologically enhanced by artificial hearts, contact lenses, and other medical procedures is evidenced by the fact that on any given day, the leftovers of ibuprofen and multivitamins can be found in our bloodstream. Any material, conceptual, or methodical component of contemporary sport and exercise science that seeks to advance is referred to as technology. The broad term allows for everything from new developments in eyewear and running shoes to various perspectives on the body as technology.

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2. Theories of Technology and Performance

2.1. Theories of Technology

One of the foremost technology philosophers expressed their theoretical stances. Essentially, like lenses that allow us to view the effects of technology. The benefits or drawbacks of technological breakthroughs depend on the perspective from which they are viewed. Heidegger (1998) made note of more fundamental critiques of technology as ideology, where technology, rather than being the handmaiden of man, completes the circle to become its master, where technology is occasionally seen to dominate its users by instilling dependence and distorting human relations. The theories include instrumentalist, determinist, substantive, critical, and dynamic theories.

2.2. Instrumentalist Theory

The most popular philosophy of technology is the instrumental one. It is predicated on the rationale that technologies are "tools" available to fulfill the needs of their users. Technology is regarded as "neutral," lacking any independent evaluative content. But what does the idea of technology's "neutrality" actually mean? Instrumentalists consider all technology to be a tool that is mostly controlled by humans and may be applied either constructively or destructively. Instead of a succession of revolutions or technical leaps, they see the development of technology as an evolutionary process. Consider human aspiration and social conditions to be the main drivers of change. According to the instrumentalist approach, technology is a neutral tool with distinct purposes and means. Instrumentalists view technological advancement as the eventual result of a protracted period of modest, steady growth. Using high-tech tennis rackets as an example, instrumentalists see the new lightweight rackets as just another tool in the never-ending quest for better performance. Athletes are merely utilizing whatever resources are available, much like other technologies, to outperform their rivals (Levinson, 1996).

2.3. Determinist Theory

Technological determinists view technology as an autonomous force, beyond direct human control, and see technology as the prime cause of social change. Determinists regard the Technology development as discontinuous. In other words, they view technological advancement as a series of revolutionary leaps forward rather than a slow, evolutionary process. Among the most widely cited deterministic works is Alvin Toffler's (1971) book Future Shock. After providing multiple instances of rapid economic growth, he succinctly summarizes the determinist theory by writing, "Behind such gigantic economic facts sits that huge, growling engine of change technology. “The accelerative impetus triggered by man has now become the key to the entire evolutionary process of the planet, he continues, while conceding that technology is not the only factor influencing societal change. Though all technological determinists concur that technology is a revolutionary and autonomous force, they frequently disagree on the morality of technology. Determinists frequently hold radically utopian or profoundly pessimistic views of technology (Kaplan,1996).

2.4. Types of Sport Technologies

Technology is transforming coaching, sports psychology, and modern sports. Sports as diverse as cycling, speed skating, swimming, golf, skiing, surfing, football/soccer ball, tennis racket and ball, running, facilities, and many others use cutting-edge technologies to improve performance. There are innumerable ways in which technology is used in sports today, and each invention has the potential to be advantageous. Basic typology is used to categorize sport technology into six categories, albeit the categories are not mutually exclusive and the same technologies may occasionally fit into more than one category. Self-technologies, rehabilitative technologies, landscape technologies, movement technologies, implement technologies, and database technologies are some of the categories. While some technologies have yet to have an impact on sport, studying a variety of sport technologies gives us a better understanding of the technological options that athletes will eventually have access to and how those options will affect their performance in sports.

2.5. Landscape Technologies

This type of technology affects the athletic environment, including how fans see sporting events. The growth of contemporary multipurpose sport complexes, equipped with Jumbo Tron screens, retractable domes, soaring cameras, Mondo tracks, and artificial grass, is a notable development in landscape technology. Bates (1996) contends that contemporary athletes have a close bond with the technology sporting environments. Track and field athletes change their strategies since they can watch their rivals on the Jumbo Tron’s as they approach the finish line. Some people even throw the javelin and discus. It's amazing how often the high-tech stadium tries to imitate the ambiance of other traditional design stadiums. Technology has significantly impacted sport and exercise science, like most other areas of life (Wintler, 1996).

In fact, it's difficult to picture modern sports and the numerous branches of exercise science without the modern technologies that are now taken for granted. Imaginable actions without the use of computers, how would one conduct biomechanical assessments, test one's VO2 max, weigh oneself underwater, or prepare for Olympic-level track and field competitions? What if you could only see one or two camera views when watching sports on television?

2.6. Virtual reality

A computer-generated virtual or simulated three-dimensional environment is known as virtual reality. Typically, the user receives auditory and visual inputs through a helmet or headset with a built-in screen. The usage of virtual reality in sports is growing rapidly across the sector. Virtual reality is being used by NFL teams to aid quarterback training by adding extra mental repetitions. It is being used by the National Football League and Major League Baseball to assist with referee and umpire training. MLB teams are also looking into its potential to aid batters in pitching preparation. By producing virtual reality material for their fans, athletes are establishing their brands.

Football clubs are able to identify player concussions using eye-tracking data captured in a virtual reality environment. Offering full-body virtual reality video game experiences is a new concept being tested by startups. Fans can take virtual lessons from professional golfers. NBA players are looking for ways to raise their free throw success rate. Teams view the immersive virtual world as a novel and exceptional chance for fan involvement. In preparation for selling "virtual tickets" to live games in the future, broadcasters are streaming live games in virtual reality. Because of this, one of the biggest NBA free agent signings in history took place. A virtual reality "sales pitch" is on page 15. The list is endless. Virtual reality will almost certainly continue to have a significant impact on the sports industry because teams, leagues, and brands are constantly experimenting with and pushing the boundaries of virtual reality's applications in sports, and because major tech companies like Facebook, Samsung, and Google are making virtual reality headsets accessible to the average consumer. (Staff, 2017)

2.7. Rehabilitative Technologies

Rehabilitative technologies are made up of the medications and techniques that are used to treat mild to severe wounds. Additionally, they consist of medications taken by healthy athletes who merely wish to offset the negative effects of their training schedules. These technologies are typically found at sports clinics and training facilities, and professionals in athletic training or sports medicine administer them. Any anti-inflammatory substance, including acetylsalicylic acid, can be used in rehabilitation technology. Athletes who suffer from sore muscles and joints can also employ ultrasound and whirlpool machines as rehabilitation technologies. More recent innovations, such electronic stimulation or slim, stimulate blood flow and speed up the healing process by sending currents into the injured area.

Acupuncture and chiropractic adjustments, which are not technically technological in the conventional sense, are employed in conjunction to mechanical and digital treatment. Technology for rehabilitation may also be considered as performance since they enable athletes to train and compete at a level they otherwise would not be able to (winkler,1996).

2.8. Movement Technologies

It alludes to the tools and techniques used to evaluate the shape and functionality of an athlete's body. Although there are considerably more advanced tools that provide detailed digital information on an athlete's biomechanics, videotape analysis is the most typical of them. Similar to other forms of technology, movement technologies are frequently invisible in arenas of competition. The information produced by movement techniques may also enable conceptual or stylistic alterations that enable an athlete to compete in a mechanically, artistically, and kinesthetically unique way, in addition to aiding in the improvement of the athlete's current technique.

The advent of technology has drastically altered sports and sports participation. High-speed video technology (goal-line technology) could transform how officials react when a ball crosses the goal line without them being present or being seen. The way coaches and sport psychologists communicate with individual players and teams has been revolutionized by the use of (small) digital cameras, body-worn sensors, wireless transmission, and mobile computers. Individual body-worn sensors can produce real-time biometric player data that can be utilized to evaluate a player's development over time or to guide coaching decisions during a game. When compared to traditional cycling at constant, submaximal workloads, interactive video game cycling significantly increased steady-state heart rate and energy expenditure, according to Warburton and colleagues (2009). The two types of cycling (traditional cycling and interactive video game cycling) produced similar ratings of perceived exertion (Herren,2000).

2.9. Database Technologies

It involves technological technologies that provide athletes and coaches access to all the information they require about both themselves and their competitors. The manner that many and most professional coaches and players do their business has been significantly impacted by database programs. 17 Individual athletes can follow their development on critical physiological and performance markers continuously thanks to informational feedback technology (a Nike GPS sports watch; a Polar heart rate monitor). Technology can play a positive and assisting role in motivating people to stick to a healthy fitness program or in recovering from an injury, even when they are not training for an Olympic gold medal. The idea of using the natural advantages, unique training methods, to restrict human movement has long been a dream. The competitive level of modern sports, especially high level sport performance, has been close to the limits of natural conditions of mankind. The extensive use of modern science and technology in the fields of sports, including computer technology, biological engineering, new materials and energy technology, information technology, and theory, has significantly changed the nature of sports and the training environment for athletes. This has resulted in training methods being updated and site equipment being improved, raising the level of competitive sport and fully demonstrating the wide range of functions and effects of sports (Troped,2005).

2.10. Technology and Quest for Performance

Clothing and footwear for athletes should be comfortable to wear and have useful features including strength, flexibility, density, thickness, toughness, moisture resistance, and most crucially, affordability. While clothing, such as the full body suits used in swimming, is frequently claimed to rationalize the competitor's performance times where winning or losing the race is measured in hundredths of a second, footwear is typically considered more for comfort and injury prevention than performance enhancement. Sporting goods like the composite tennis racket have been developed to increase ball speed and lessen vibration, which can cause an ailment known as tennis elbow (damage to the small blood capillaries in the muscles and ligaments that surround the elbow joint). The overall bulk of other sporting equipment, like the golf club, has dropped, which is thought to produce a longer feasible range and maybe a more accurate shot. Modern technological advancements have been made in the bicycle with the creation of electric bicycles that speed up the cycle.

The bicycle is designed with 18 specialty wheels, pneumatic tires, brake levers, and pedals in an effort to increase stability and rigidity. For athletes who have a certain impairment, prosthetic devices have also been developed. Examples include the spring lite prosthesis device created for those athletes deficient of a lower limb, which acts with a ‘springboard-like’ effect where with each step as the runner strikes the track, the device returns energy and permits running gait. Wheelchair devices used in sporting activities have also become more sophisticated, for example, with sharply slanted back wheels in tennis to allow the player to move swiftly across the court from side to side, these and many more ways technology and quest for performance improved (Brown, 2005).

3. Positive impacts of technology

3.1. Correct Decisions Made by Referees

The game can benefit from technology by raising the bar for referee judgments. Soccer has benefited from technology since referee rulings are now more accurate. As a result, the game will be more appealing to play in and watch. This is because there are less things to dispute about, which means fewer people will become irate, turning the game into a banter competition rather than a football match. For instance, goal line technology is already in use and has made decisions that the referee may not have necessarily witnessed. resulting in a nicer environment for athletes and spectators.

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3.2. It Improves the Performance of Players

There is no doubt that technology enhances player performance. ability Even though we aren't excellent football players, technology is once again a good idea because it allows us to play a more pleasurable and professional game. The level of play has improved because to modern technology, including better soccer balls and footwear. By enhancing the

quality of the equipment the players utilize, lighter footwear, better-quality soccer balls, lighter jerseys, and artificial turfs all help players play better and perform better as a team. Soccer is continually being improved by technology. Becoming the best player is what sports are all about, and all players need to be able to break records and advance their skills, in order to achieve the use of technology can help players learn from experienced players in the world and practice better.

3.3. Higher Quality Training

The best possible conditions and nutrition are provided for players in higher quality facilities. With the use of technology, players are given much higher-quality facilities. The foot boat is a prime illustration of this. Research demonstrates that one week of passing exercise is equivalent to one training session with the foot boat, demonstrating how much more effective training has become as a result of evolution. Players may easily plan their diets and workout schedules with the help of software like Body Byte's nutrition plans. Players will gain from this implementation in terms of staying organized and staying healthy and active.

4. Negative Impacts of Technology

4.1. Destroys The Spirit of the Game

Some claim that technology kills the competitive spirit in sports. The judgments of match officials have brought people from all over the world together in conversation for years. The disagreements give people something to talk about over lunchtime at school (for the younger age) or over a drink at a bar (for the older generation). Additionally, it offers the "so-called" professionals who seem to be more qualified than we are something to discuss on television during halftime. the "negative" "Unfair decisions made lead to passionate discussions and cordial disputes with one another aspect of watching sports that I consider to be important. All this technology may not improve soccer because the decisions are what make history in the sport.

4.2. New Technology is Expensive

When it comes to football, new technology is often a novel and intriguing concept. When new boots, soccer balls, and jerseys are released, it's a big deal. These products receive a lot of " hype " due to community feedback and collaborations with famous players. Today, businesses like Nike and Adidas use the highest-quality materials to make their products in an effort to continually improve them. Naturally, this has a price, and it's usually a very hefty price, which puts families under a lot of financial strain merely to provide their children with these high-quality things. This leads to unequal access to clothing and equipment, which makes it more difficult for poorer families to provide their children with the finest opportunities. Because technology is so expensive and so many people cannot afford to buy these things, this is a huge negative.

4.3. It Can Be Faulty

New technology is great, but we rely too much on it and it isn't always accurate. When the supposedly immaculate technology breaks down, it can cause a lot of anxiety and misunderstanding among players and spectators, leading to a lot of speculation. In the 2010 World Cup in South Africa, for instance, the Jubilant soccer ball moved very strangely in the air, leading to several goals that cost games and championships for competing nations because of its technology. The introduction of this new soccer ball greatly disadvantaged goalkeepers in particular. Because new technology won't always be error-free, this is a drawback.

5. Conclusion

As a unique social phenomenon, sports have evolved into modern technology accessories. Technology is transforming sports because it has a big impact on how people live their daily lives and how their bodies look. As a result, technology keeps evolving and changing how sports are played, how injuries are treated, what sports are played, and how performance outcomes are improved. Sporting technologies are tools created by humans to further interests or objectives in or pertaining to a certain sport. Athletes use this technical method to try and make their training and competition environments better in order to increase their overall athletic performance.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] David. (2012). Retrieved from www.intechopen.com: https://www.intechopen.com/book/the use-of-technology-in-sport-emergin-challenges/introductory-chapter-the-challenges-ofthechnology-in-sports

[2] Solowan, J. J. (2019). Retrieved from www.workplaceprivacyreport.com: https://www.workplaceprivacyreport.com/2019/04/articles/health-information-technology/aswearable-technology-booms-sports-and-athletic-organizations-at-all-levels-face-privacyconcerns/

[3] Staff. (2017). Retrieved from www.sporttechie.com: https://www.sporttechie.com/virtualreality- sports/

[4] Barr G. (2016). How artificial intelligence plays into the future of sports technology. Sport Techie

[5] Bartlett RM (1997). Current issues in the mechanics of athletic activities: a position paper.

[6] Journal of Biomechanics, 30, 477-486.

[7] Bartlett RM (2000). Principles of throwing. In V. M. Zatsiorsky (Ed.), IOC Encyclopedia of Sports Medicine. Retrieved from https://stillmedab.olympic.org/media/Document%20Library/OlympicOrg/IOC/Who-We-Are/Commissions/Medical-and-Scientific-Commission/Encyclopaedia/2000_Zatsiorsky.pdf

[8] Cave, A., & Miller, A. (2004). Technology in sport: The speed of science. In A. Lees, D. Cabello, & J. P. Vilas-Boas (Eds.), Sports Medicine: Biomechanics in Sport (Vol. 6, pp. 365-380). Oxford: Blackwell Science.

[9] Bates, B. T. (1996). Single-subject methodology: An alternative approach. Medicine and Science in Sports and Exercise, 28(5), 639-644.

[10] Williams, A. M., Davids, K., & Williams, J. G. (1996). Visual perception and action in sport. Medicine and Science in Sports and Exercise, 28, 631-638.

[11] Cave, A. & Miller, A. (2015). Technology in sport: the speed of science. The Telegraph.

[12] Chandler, D. (1995). Technological or Media Determinism. http://www.aber.ac.uk/~dgc/tdet01.html)

[13] Ellul, J. (1964). The technological society, J. Wilkinson, trans. (New York: Vintage, 1964), p. 14. Elliott BC (1999). Biomechanics: an integral part of sport science and sport medicine. Journal of Science and Medicine in Sport, 2, 299-310.

[14] Robins, K. & Webster, F. (Eds.). (1999). Times of the Techno culture: From the Information Society to the Virtual Life. London: Routledge.

[15] Rodriguez, D. A., Brown, A. L & Troped, P. J (2005). Portable global positioning system units to complement accelerometry-based physical activity monitors. Medicine and Science in Sports and Exercise, 37(11) 572-581.

[16] Schutz, Y & Herren, R (2000). Assessment of speed of human locomotion using a differential satellite global positioning system. Medicine Science Sports Exercise. 32, 642-646.

[17] Williams, A. M, Davids, K & Williams, J. G (1999). Visual Perception and Action in Sport. London: Taylor and Francis.

[18] Winkler, W. (1992). Computer-controlled assessment and video technology for the diagnosis of a player's performance in soccer training. In J. Reilly, J. Clarys, & A. Stibbe (Eds.), Science and Football II (pp. 277-283). Routledge.

[19] Winkler, W. (1996). A player's performance in soccer training. In M. D. Hughes (Ed.), Notational analysis of sport, I and II (pp. 27-43). Cardiff: UWIC.