IMPROVEMENT IN SPORTS PERFORMANCES THROUGH TECHNOLOGICAL ADVANCEMENTS

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ABSTRACT: Like other aspects of life, sport science and exercise have been significantly impacted by technology breakthroughs. Modern sports and the different subfields of exercise research are impossible to envision without technology. The usage of technology is always clouded with ambivalence and irritation. Ironically, it is people's failure to completely comprehend the scale and depth of technology's effect and also doubt as to what function certain technical improvements play in sports that has helped contribute greatly to its pervasiveness. Sport technology have, in fact, significantly altered the field of exercise and sport research. It's significant to note that technology has drastically changed how we perceive the athletic physique. The influence of technology on performances of sports is therefore examined in this essay, taking into account technological ideas, the pursuit of increased performance, various sport technology categories, and the benefits and drawbacks of sport technology in contemporary sports. It is advised that individuals who manage, handle, and utilise sport be prepared to make informed decisions about the kind and application of sport technologies that would promote the correct performance.

KEYWORDS: Sports Technology, Video Technology, Instrumental Theory, Determinist Theory, Rehabilitative technologies, Landscape Technologies, Movement technologies, Performance

INTRODUCTION:

Modern sports are becoming more technologically sophisticated by fusing natural athletic ability with cutting-edge statistics and artificial intelligence to deliver the greatest results on the pitch. Sport exciting people as a victory of human endeavour, but technology is just one of many factors at play in that achievement, according to Barr (2016). Technology has been used in sport for a long time in many different ways, and it is especially important for the elite sports. Technology has been defined in so many different ways that the variety of definitions have led some people to accept that it cannot be stated. On the one hand, it encompasses every little device that has ever been in hands and is a synonym for science and logical reasoning. Technology is increasingly helping armchair viewers, amateur runners, and professional athletes participate in the sport, as mentioned by Cave and Miller (2015).

Technology is not solely present outside of us; rather, it is also present within of ourselves. The fact that so many people have been technologically enhanced or made more technologically advanced by artificial hearts, contact lenses, and various other medical operations is evidenced by the fact that on any given day, the leftovers of painkillers and multivitamins are still present in our bloodstreams. Any material, conceptual, or procedural component of contemporary sport and exercise science that seeks to advance is referred to as technology (Feenberg, 1999, 2003; Miah, 2004). The broad term allows for everything from new developments in eyeglasses and running shoes to various perspectives on the body as technology. In the pre-digital era, the use of technology in sports was mostly focused on athlete testing (diagnostics), better sports gear with the help of improved design

and engineering, and increased usage during contests. Photo finishes (1888), physiological testing apparatus (1920s), the instant replay screen (1955), and the first usage of electronic timed touch pads for swimming (1957) are all great examples of early sport technology.

Technology does, in fact, play a significant role in modern sport, both as a required component of some sports (like motorsport) and as a tool used to enhance performance in others. Thematic uses of technology include media broadcasting and communications, performance analytics, facilities, competition adjudication and formats, apparel and wearables, and athletic equipment. As a result, there has been a rather tumultuous connection between technology and sport over time (Bass & Eynon, 2009). According to Turner (2013), at first, technology and athletics didn't appear like the most natural combination. With the recent convergence of technology and the nature of sport and the equipment required to play, numerous functions are combined into one tiny gadget.

However, without the specialisation and customization of sports science, which allowed athletes to flourish in ways that were feasible, current icons would not have evolved as they have. Technology is rapidly taking its place in the advancement of sport and improving performance across the board. Therefore, technological applications provide a variety of tasks, including more efficient training, stimulations, administration and tracking of players, accuracy of results, increased spectator observing, performance development, and injury prevention (Busch, 1998). In sports, technology is a technological tool that players use to try and improve their practise and competition environments in order to increase their complete athletic performance. It is regarded as a technological tool or technique used to achieve certain goals. As a result, the research explores how technology affects athletic performance.

1. TYPES OF PERFORMANCE THEORIES RELATED WITH TECHNOLOGY

One of the most prominent technology philosophers, Feenberg, (1999, 2003), detailed his theoretical stances on technology. Essentially, they operate as glasses through which we may view the effects of technology. The benefits or drawbacks of technological breakthroughs depend on the perspective from which they are seen. Heidegger (1998) made notice of more basic critiques of technology as ideology, where technological advances, rather than being the handmaiden of man, completes the circle to become its owner, and where technology is occasionally considered to control its users by instilling dependence and distorting human connections. As a result, the theories are now Instrumentalist, Substantive, Determinist, Dynamic and critical.

INSTRUMENTAL THEORY

The most popular philosophy of technology is the instrumental one. It is predicated on the rationale that technology are "tools" available to fulfil the needs of their users. Technology is seen as "neutral," without any independent evaluative content. But what would the idea of technology's "neutrality" truly 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 technology's development as a process of evolution (Levinson, 1996). Consider human desire and social conditions to be the main drivers of change. According to the instrumentalist approach, technology is a neutral tool with distinct purposes and methods. Instrumentalists view technological advancement as the eventual result of a protracted period of modest, steady progress. Using high-tech tennis rackets as an example, the instrumentalist viewpoint sees modern lightweight rackets as merely another tool in the never-ending drive for enhanced performances. Athletes are merely exploiting whatever resources are available to them in order to outperform their rivals, much like other technology.

SUBSTANTIVE THEORY

Despite the instrumental theory's appeal to common sense, a minority viewpoint contests the technology's objectivity. The most well-known examples of substantive theory are from the works of Ellul (1964) and Heidegger (1998), who both contend that technology is a new kind of socially constructed system that restructures the entire social environment as an object of control. This system is distinguished by an expanding dynamic that eventually engulfs every pre-technological outpost and moulds all aspects of social life.

The substantive hypothesis is a different theoretical viewpoint that holds that technology is neither unbiased nor entirely within human control. According to substantive theory, the effects of technology on people and the environment are more significant than its stated objectives. With regard to how it would perceive the new tennis racket, this viewpoint is a negative one (Tenner, 1996). Newer rackets would be seen to carry certain ideals associated with them.

For instance, despite the fact that the goal of the racket architects may have been to create a better, lighter racket that would enable players to smash the ball harder and quicker, the results of this new design appear to place more emphasis on speed and power than elegance. The determinist and the substantive positions both believe that once technologies are in use, they have the ability to take on a life of their own and that it will become more and more difficult to return to more "natural" types of performance-enhancing methods. Technology will ultimately determine what kinds of sports we play, what technique do we use to play, and who is most qualified to take part.

DETERMINIST THEORY

Technological determinists believe that technology is the primary driver of societal change and perceive it as an autonomous force independent of direct human control (Chandler, 1995). The development of technology is seen as discontinuous by determinists. In other words, they view technological advancement as an ongoing series of revolutionary steps ahead rather than a slow, evolutionary process (Kumar, 2001).

Alvin Toffler's book Future Shock from 1971 is one of the most often mentioned deterministic writings.

He succinctly summarises the determinist worldview, writing "behind such prodigious economic facts lies that great, growling engine of change technology" after presenting multiple examples of faster economic expansion. Although he notes that other factors contribute to social change, he continues by saying that "technology is undeniably a major force behind this accelerative thrust" and that "by now the accelerative thrust caused by man has become the key to the entire evolutionary process of the planet".

Though all technological determinists concur that technology is a revolutionary and independent force, they frequently disagree on the ethical implications of technology. According to Kaplan (1996), determinists frequently have radically utopian or profoundly dystopian views of technology. Technology, according to utopian determinists, is a good and inspiring force that will eventually lessen or eradicate the majority of the human condition's evils. They contend that technology is advancing civilization closer and closer to a perfect world. In conclusion, this techno-utopianism implies that technological advancement is neutral and supports a technologically determinist interpretation of history (Robins & Webster 1999). According to dystopian determinists, technology is an unavoidably morally repugnant or dehumanising force that will ultimately result in the moral, intellectual, or physical annihilation of humanity.

According to the determinist perspective, technology is neutral or devoid of values, but it has evolved into an independent or self-directed system. Using the tennis racket as an example once more, the determinist viewpoint would view the newly developed racket as a tool that, once introduced into the sport, would have a "life of its own" and force sportsmen to use it whether they desired to or not. By virtue of the racket's very existence, if one athlete makes the decision to utilise it, others will be compelled to follow suit. Additionally, if the newly developed racket offers high-velocity servers an even bigger edge, this one piece of technology might alter how tennis is played for all time.

DYNAMIC SYSTEM THEORY

In the movement sciences, the theory of dynamic systems has become a strong theoretical foundation for modelling athletic performance. In light of this, the human movement system can be viewed from the perspective of dynamical systems as a highly complex network of interdependent subsystems (skeletomuscular, circulatory, nervous, respiratory, perceptual) made up of a large number of interacting parts (oxygen molecules, muscle fibres, connective tissue, metabolic enzymes, blood cells, and bone). According to the dynamical systems theory, movement patterns develop through universal self-organizational mechanisms that are present in both biological and physical structures (Williams et al., 1999).

According to theorists of dynamical systems, the creation of coordinated structures or transient collections of muscle complexes significantly reduces the biomechanical levels of freedom of the motor system (Turvey, 1990). The motor system's decreased dimensionality and complexity promote the growth of functionally favoured synchronisation or attractor states to facilitate goal-directed actions. The dynamics of the system are highly organised and stable within each attractor area (an attractor's immediate vicinity), resulting in predictable movement patterns for certain objectives. However, variation across many attractor zones enables adaptable and flexible motor system function, permitting each person to freely explore different performance environments. Because of the contradictory link between stability and variability, experienced athletes are able to maintain their level of motor output while changing it throughout competition. In fact, movement behaviour variability enables performers to investigate task and contextual restrictions in order to gradually develop stable motor solutions and improve motor learning.

A more thorough explanation of the stability-variability dilemma in skill learning is given by Handford et al. (1997). Many prominent researchers have long expressed the worry that biomechanical research, and particularly sports biomechanics research, demands to go from a descriptive to an analytical level (Elliott, 1999). According to Bartlett (1997), the majority of performance-focused sports biomechanics research lacks a strong theoretical foundation and seldom refers to motor control theory, general biomechanical principles, or the underlying physical laws that govern them. Due to its multidisciplinary approach to the processes of coordination and control in the human motor system, dynamical systems theory may thus offer a useful theoretical framework for performance-driven sports biomechanics research (Glazier, Davis & Bartlett, 2002).

CRITICAL THEORY

Modern technology represents the ideals of a certain industrial civilisation, particularly those of its elites, and is no more unbiased than mediaeval churches or The Great Wall of China. Technology criticism acknowledges that we should ultimately be in-charge of technology.

Feenberg (1999, 2003) encourages a shift towards a technology theory that is more sceptical. Critical theory contends that technology is an "ambivalent" process of progress poised between several possibilities rather than a thing in the traditional meaning of the word. This "ambivalence" of technology, which differs from neutrality, is characterised by the importance it accords to social norms in the development of technical systems as opposed to only their application. This perspective sees technology as a battleground rather than a destiny. It is a social battleground however a better metaphor may be a parliament of things where civilizational options are discussed and chosen. Technology's politics and values are seen in a critical theory. Therefore, sceptics of the proliferation of new tennis racket technology would encourage more candid discussions about the politics of the game and ponder issues like "Who will have accessibility to this equipment?" "Who decides whether a particular gear should be legal or prohibited on the professional tour?" and "What long-term effects will new racket technologies have on the game?"

2. DIFFERENT TYPES OF SPORT TECHNOLOGIES

Technology is transforming coaching, sports psychology, and modern sports. Sports as diverse as cycling, speed skating, skiing, surfing, tennis, football, squash, swimming, golf, jogging, and many more employ

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 categorise 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, database technologies, movement technologies, implement technologies, landscape technologies, and rehabilitative technologies are among them. While some technologies have yet to have an influence on sport. Studying a variety of sport technologies gives us a better understanding of the technological possibilities that players will ultimately have access to and how they will affect their performance in sports.

LANDSCAPE TECHNOLOGIES

This type of technology affects the athletic environment, including how fans see sporting events. The growth of contemporary multifunctional sport facilities, equipped with Jumbo Tron screens, collapsible 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 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 older design stadiums. Technology has had a significant impact on exercise and sports science, as it has on other aspects of life (Wintler, 1996). In reality, without the contemporary technology that are taken for granted, it is difficult to envisage today's modern sports and the different subdisciplines of exercise science. Can you picture doing biomechanical studies without computers, evaluating VO2max without underwater weighing, or preparing for Olympic-level track and field competitions without the use of contemporary training methods and evaluation techniques? Imagine seeing sporting events on television with just one or two camera views.

The global positioning system (GPS) calculates geographic coordinates and precisely tracks a particular activity using 24 satellites and base stations as points of reference. For instance, while hiking, utilising a handheld GPS device offers data on altitude, distance, duration, and average velocity.

There is also a graph that shows the terrain's incline and decline. Accelerometers and global positioning systems can be used to measure and track activity levels (Schutz & Herren 2000; Rodriguez, Brown & Troped 2005; Troped et al. 2008). GPS may be used more often to monitor and encourage physical activity as the compact receivers become more commonly available and inexpensive (in laptop computers and cell phones).

In fact, the flood of sport advancements has significantly altered the field of sport and exercise research, but probably more significantly, technology has started to alter the athletic body in many ways. Contrarily, the continual presence of technology has exacerbated our incapacity to properly comprehend the breadth and depth of its impact and increased our ambiguity about the proper place of various technical breakthroughs in our life.

REHABILITATIVE TECHNOLOGIES

Rehabilitative technologies include the drugs and techniques used to treat mild to severe wounds. They also include medications taken by fit athletes who only wish to offset the negative outcomes of their workout schedules. These technologies are often found at athletic training centres and clinics, and they are handled by professionals in athletic training or sports medicine. Any type of anti-inflammatory substance, such as acetylsalicylic acid, is included in rehabilitation therapies. Athletes who suffer from aching muscles and joints can also employ ultrasound and whirlpool devices as rehab technologies. More modern innovations, such electronic stimulation or slim, increase blood flow and speed up the healing process by sending currents into the injured region.

Acupuncture and chiropractic adjustments, which are not essentially technological in the conventional sense, are utilised in addition to mechanical and computerised treatment. Because they enable athletes to practise and perform at a level, they would not otherwise be able to, rehabilitation technologies can also be seen as performance-enhancing tools.

SELF-TECHNOLOGIES

Due to its capacity to fundamentally and frequently permanently change an athlete's physical or psychological make-up, this technology is the most evident and pervasive for many individuals. The most well-known of these technologies is the use of prohibited performance-enhancing substances. Other contentious sporting developments are under the category of self-technologies. Further self-technologies include genetic engineering, healthcare services, bionic or artificial limbs, and sport psychology treatments. Some self-technologies, like Oscar Pistorius's bionic prosthetics, may be viewed as being present in sports in the future. Researchers who are developing a muscle-building vaccine by modifying genes are already aware of the ramifications of their work for athletics. Thus, a human genome project to map every gene in the human body is a general change of sportsmen or gene doping, which can improve the muscle growth. However, it is not apparent whether or whether the long-term effects are risky.

This point of view holds that technology is morally neutral. Its own nature is neither beneficial nor harmful. Instead, the objective or purpose—to which technology is only a means—is what counts. While equipment such as a prosthetic device or a wheelchair are necessary for many individuals who are having a disability to continue their daily life (Haisma, vanDerwoude, Slam, Bergen & Bussmann, 2006; Pasquina, Bryant, Huang, Roberts, Nelson & Flood, 2006), developments in this technology, such as an energy storing prosthetic foot, make a lower limb amputee's gait faster and more efficient (Brodtkorb, Henriksson, Johanesen-munk & Thidell, 2008).

MOVEMENT TECHNOLOGIES

It alludes to the tools and techniques used to evaluate the shape and functionality of an athlete's physique. Although there are considerably more advanced tools that offer extensive computerised 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 a professional athlete to be competitive in a mechanically, artistically 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 processing (goal-line technology) might transform how referees react when a ball passes the goal boundary without them being there or being seen. The way coaches and sport psychologists communicate with individual players and teams has been revolutionised by the introduction of (small) digital cameras, wireless communication, and mobile computing devices. Individual body-worn sensors can produce real-time biometrics player data that can be utilised to evaluate a player's development over time or to guide coaching decisions during a game.

When in comparison to traditional cycling at constant, submaximal workloads, engaging online game cycling significantly increased steady-state heart rate and energy expenditure, according to Warburton and colleagues (2009); the two types of cycling (traditional and interactive video game cycling) produced similar ratings of perceived exertion.

IMPLEMENT TECHNOLOGIES

It also covers any gear that athletes employ or they use to punch, fling, or otherwise push. Other examples are football/soccer helmets with radios and warning systems, shark suits that let swimmers move through the water quickly, and high-tech tennis rackets, golf clubs and running shoes. The employment of fish-finding machines in sport fishing is the intriguing topic of dispute surrounding these sorts of technology.

This technology manipulates people's conduct without their knowledge using instruments (such as a pedometer or balancing board), media (such as video, audio, or both), and social contact (such as playing with another person).

DATABASE TECHNOLOGIES

It incorporates computational technologies that provide players and coaches access to all the information they require on their rivals and selves. The manner that many and the majority of professional athletes and coaches do their business has been significantly impacted by database initiatives. Individual athletes may measure their progress on critical physiological and performance metrics continually thanks to information feedback technology (such as a Polar heart rate monitor or a Nike GPS sports watch). Technology may be a beneficial and supportive factor in people's lives, even when they are not trying to win an Olympic gold medal. It can inspire individuals to stick to a regular workout schedule or to recover from an injury.

The notion of leveraging the natural advantages, unique training techniques, to restrict human mobility has long been a dream. The competitive level of current sports, particularly high-level athletic performance, has been near to the boundaries of natural circumstances of humans. The vast array of sports-related functions and effects have been fully realised as a result of the widespread application of modern science and technology, including technological advancements in computers, biological engineering, new materials and energy technology, information technology, and contemporary science and technology theories. As a result, the face of sports and sports training environments have significantly changed and improved, training methods have been updated, site equipment has been improved, and the level of competitive sport has significantly increased.

3. **HOW TO IMPROVE PERFORMANCE THROUGH TECHNOLOGY?**

Clothing and footwear for athletes should be comfortable to wear and have useful features including durability, adaptability, volume, depth, toughness, moisture resistance, and most crucially, affordability. While clothing, such as the full body suits used in swimming, is frequently claimed to rationalise the competitor's performance times where the outcome of the race is determined in hundredths of a second, footwear is typically considered more for comfort and injury prevention than performance enhancement. Tennis elbow is a condition that damages the tiny blood vessels in the ligaments and muscles that surround the elbow joint. Sporting goods like a composite tennis racket have been developed to increase ball speed while minimising vibration. The total bulk of other athletic equipment, like the golf club, has been reduced, which is thought to produce a longer feasible range and maybe a more accurate shot. Modern bicycle technology has also advanced with the creation of specialised tyres, pneumatic tyre treads, pedals and break levers, and these are intended to increase the stiffness and stability of the bicycle.

For athletes who have a certain impairment, prosthetic devices have additionally been developed.

Variations include the spring lite prosthetic device designed for athletes lacking a lower leg, which functions similarly to a springboard by returning energy with each stride the runner makes as they contact the ground and allowing running gait. As technology and the pursuit of performance advanced, wheelchair gadgets used in athletic events also became more complex. For instance, in tennis, rear wheels on the chair allow the player to travel quickly around the court from one side to the other.

CONCLUSION:

As a unique social trend, sports have evolved into modern technological accessories. Technology is transforming sports because it has a big impact on how people live their everyday lives and how their bodies look. As a result, technology keeps evolving and changing how sports are carried out, how injuries are handled, what sports are played, and how performance results 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. It is the understanding and use of specialist tools and the newest technology to do jobs more quickly. Sports technology must thus be understood by coaches and athletes in order for them to make informed decisions on how it influences their performances.

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