

# Study on Advanced Technologies in Professional Sports Performance

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## ABSTRACT

Technology plays a significant role in making modern life simple and effective. Technology has had a significant impact on sports, science, and many other facets of daily life. The market for the sports business has grown along with popularity, and so has the necessity for technological research. The primary goal of this academic qualitative study was to examine how modern technology affects athletic performance. The role of particular games and sports is often emphasized in the discussion of various technological equipment. For the purpose of gathering data for this systematic qualitative study, an exhaustive online and offline search technique was used. The current researcher discovers a variety of technological tools now used in the world of games and sports. The researchers concur that these technological advancements raise performance scores and simplify games. Making the right choice when selecting the technology is essential for performance development since, in the modern environment, dealing with and managing players is a challenging process. Last but not least, the researcher also thought that a variety of systematic reviews could more precisely emphasize the impact of technology on sports performance.

**Keywords--** Sports, Athletic Performance, Cricket, Drone Technology, Equipment

## I. INTRODUCTION

By fusing natural athletic ability with cutting-edge analytics and artificial intelligence to generate the finest sporting results, the world of sport is becoming more technologically advanced today. Modern technology makes life easier in so many ways, and everyone has their own definition of technology. In today's world, almost everything is more comfortable and accessible due to technological improvements in almost every aspect of lifestyle. Everything in the world has an impact on society and daily life, both positively and negatively. More people than ever before play sports in the twenty-first century. Sport, according to the former U.N. Secretary-General Kofi Annan, has effectively become a universal language that unites people from all backgrounds, regardless of their origins, histories, religious beliefs, or economic status. In actuality, sports foster interpersonal relationships and global unity on a global as well as national level. The use

of technological devices has increased due to spectator demands for sporting performance. In many sports and games, as well as in step-by-step team maneuvers, there is a distinction between winning and losing games. Demand for research has expanded as the sports business has become more popular and has a larger audience. This is now a billion-dollar industry, surpassing sports and video games [4]. Researchers Roy et al. (2017) suggested that new technology simplifies existence in numerous ways and that each defines technology differently. Due to technological advancements in practically every sphere of lifestyle, almost everything in today's society is more comfortable and accessible. The most recent technological advancements have improved and streamlined the lives of the majority of people. Although the true essence of sport is in the potential of gifted athletes, their performance can be significantly enhanced by the incorporation of cutting-edge technologies, ensuring competitive play and positive results [5]. As a result, technology has a huge potential to increase performance and decrease sports injuries. Furthermore, the impact of technology on athletics is astounding. The way sports are played, evaluated, and improved in today's connected world has been changed by the use of wearable technology, big data analytics, social media, and sensor technologies. Through a variety of contemporary developments and apps, professional athletes can improve their training strategies, obtain greater insight into their performance, and develop their talents.

### 1.1 The Study's Goal

This academic qualitative study's main objective was to investigate how current technology affects athletic performance.

## II. REVIEW LITERATURE

Sports technologies are items designed to raise the level of athletic performance. Athletes are able to monitor and maintain their health as well as repair injuries more quickly thanks to specialised technological technologies. Sporting technology is the understanding and practice of employing specialised tools and cutting-edge equipment to complete tasks more quickly. Modern footwear and apparel are the key indicators of these technical breakthroughs. Athletes may now utilise these

technological advancements to their fullest ability in terms of speed, agility, and strength. Is there a moral difference between taking performance-enhancing drugs for sports and employing performance-enhancing technologies in diet, exercise, and gear.

### III. METHODOLOGY

In this systematic qualitative investigation, data was gathered using a rigorous online and offline search approach. Through the use of internet resources including PubMed, Google Scholar, and Google Advance Search, a critical examination of the literature was thoroughly searched.

### IV. DRONE TECHNOLOGY IN SPORTS

The use of unmanned drone technology with a built-in camera makes it easier to capture stunning pictures and films from a distance. A drone is essentially just a flying robot. With the aid of clever software, this aircraft can track anything in the air. Many athletes, including runners, basketball players, skiers, climbers, etc., use drones to track their training in order to determine whether any adjustments are necessary. The participant will lose seconds or break a second with a small improvement in personal best time. A sporting event is now more realistic and feasible to broadcast. The ability to get closer to international sportsmen is the key benefit of deploying drones or unmanned aircraft in significant international sports. A drone will record a clearly visible practice session in a variety of sporting events and evaluate it after the session is over.



**Figure 1:** Drone Technology

#### 4.1. Using Drones for Soccer Training

A physically fit soccer player is willing to go across the pitch in different directions. The game is popular nevertheless because it has a small number of straightforward rules and is quite simple. Additionally, studies focusing on agility raise the bar for sports research. This natural movement examines the requirement for drone technology to capture photos and movies. Today's drone technology maps rivers to accurately predict flooding and locate illicit logging operations. Sport imaging is becoming simpler thanks to drone technology. The primary benefit of deploying drones is their rapid navigation, which coaches find to be very difficult on the football field. Football coaches and administrators frequently have a side view of every tactical action, which is quite constrained and prone to incorrect tactical

interpretation. Drone technology's significance in soccer training was underlined by researcher Islam (2020). He claimed that it was possible to determine the offensive and defensive team lineups of a football game by looking at images and videos taken by a drone. Islam (2020) stated unequivocally, "The attackers immediately alter their role into a defender when they don't have the ball, and vice versa. Defenders must appropriately mark both the ball and the available space. Studying the drone photos and/or recordings would have reinforced the defensive approach.

## V. NORDIC HAMSTRIN AND ECCENTRIC STRENGTH DEVELOPMENT

The Nordic hamstring exercise (NHE) has been found to be more efficient than the standard hamstring curl at increasing maximum eccentric hamstring strength

torques. The H:Q (hamstring to quadriceps) muscle power ratio may be successfully preserved with Nordic exercise training on the hamstring curl. The H:Q ratio may lessen the damage to the hamstring muscle. A quick and simple method for accurately determining eccentric and isometric hamstring muscle strength is the scientific Nord Board technology created by Vald Performance.



**Figure 2:** Nordic Hamstring Exercise

**Source:** <https://www.bodybuildingmealplan.com/nordic-hamstring-curl/>

## VI. THE TECHNOLOGY IN CRICKET GAMES

Modern cricket matches use advanced technologies. The game is enjoyable for spectators because

of this technology. Cricket uses the following technologies:

### 6.1 Hot Spot

Technology enables commentators and umpires to determine whether the bat actually made contact with the ball.



**Figure 2:** The Hot Spot

**Source:** <https://www.cricketbio.com/cricket/hotspot-technology-in-cricket/>

### 6.2 LED Lights

In a cricket match, the stumps are equipped with bails and LED lights. The lights start to flash when these are moved.

### 6.3 Spider Cam

There are several other sports that use this technology as well. It is a wire setup that enables a camera to move both horizontally and vertically across the play area.



**Figure 3:** The Spider Cam

**Source:** <https://www.news18.com/cricketnext/news/>

### 6.4 The Mega-Sopper

The supersopper is a device that assists in removing water from the ground after a significant downpour.

### 6.5 The Hawkeye

The cricket ball's precise path after being hit may be determined using technology. Umpires frequently utilize this technology to determine whether a player is LBW.

### 6.6. Measuring Ball Speed

In cricket bowling, a camera can be used to gauge a ball's velocity.

### 6.7 Snick-o-Meter

The Snick-o-meter determines whether there was a snick. A nice sound is made when the cricket ball snicks against the bat. That is portrayed in the audio waves that were recorded. Whether the ball has made contact with the bat or a batsman's equipment is frequently unclear.

## VII. WEARABLE GPS TECHNOLOGY

Global Positioning System technology has been used in competitive sports for a while, both during play and during warm-up activities. Teams can monitor player movement on the field and gather a ton of performance data by deploying Electronic Performance and Tracking System (EPTS) devices. The initial attempts to validate GPS for use in field sports applications were made in 2006. Although GPS has been approved for use in competitive sports, there are still some concerns about its suitability for monitoring quick, high-velocity runs. Therefore, GPS has become widely employed in sports such as American football, baseball, basketball, rugby union, and soccer. Specific criteria, as specified for validity in detail above, have an impact on the effectiveness of GPS in evaluating human movement. In terms of GPS dependability, these are sample rate, speed, task duration, and task type, respectively. In order to determine its own position, the GPS is a tracking device that connects to the GPS satellite signal (or other satellite networks like GLONASS, GNSS, BDS, or NAVIC).



**Figure 5:** Wearable GPS Technology  
**Source:** <https://www.google.com/imgres?imgurl>

### 7.1 Electronic Vernier Calliper

A biomarker of the equilibrium between prenatal testosterone and prenatal oestrogen hormone is thought to be the manual second to fourth digit ratio (2D:4D) at the end of the first trimester of pregnancy. This digit ratio may serve as a biomarker for the prenatal hormone testosterone, which is beneficial for athletic competition. To determine the digital finger ratio, the lengths of the index and ring fingers are measured using a digital vernier calliper. It's interesting to note that the low second to fourth digit ratio (2D:4D) may be a sign when analysing potential athletes, especially football players.

## VIII. THE FIELD OF PUBLIC HEALTH

The field of public health has regularly used integrated technology (IT), which includes accelerometers, global positioning systems (GPSs), and heart rate monitoring. IT data has more recently been used to evaluate training and performance demands in sporting contexts. Major adjustments will be made in the design, conditioning, and rehabilitation of field-based competitive sports.

Sports equipment can be improved with the use of technologies like computer-aided design (CAD). Performance evaluations can make use of other technology, like "smart" equipment. Systems for assessing exercise intensity and aerobic capacity, measuring human response time and activity metre size, and developing systems with leaping and running capabilities are a few examples of "smart" technology advancements. On the other hand, hot spot technology in the cricket game is incredibly precise and is the ideal instrument for examining a raider's touches in Kabaddi action. Although it is said to be incredibly accurate, Hot Spot technology

has not yet been implemented in the Kabaddi sport. According to the authors' argument, previous research has focused on the commitment and classification of sustained impact forces and accelerations during the regular and varied Super 15 Rugby Union match-play contact elements.

### 8.1 Yoga Postures and Technology

Inter-beat durations are the time intervals between successive pulse intervals that make up heart rate variation (HRV). The NeXus-10 gadget (Medical gadget Directive 93/42/EEC; TMS International BV, the Netherlands) was used to collect the HRV data. Anup et al.'s (2019) study discovered that the LF% and HF% bands changed instantly after practising yoga postures for 15 and 21 minutes. But after practising yoga postures for 27 minutes, the LF% band shrank. Another element of HRV was HRV amplitude, which demonstrated a tendency towards a decline in yoga postures for 21 and 27 minutes.

### 8.2 Aerodynamics

Tennis, fencing, swimming, golf, and cycling are ideal examples of this new function of high-tech sports; however, practically any sport may be used to exemplify it. World-class tennis players (as well as their coaches and trainers) will be thoroughly versed in the laws of aerodynamics in the twenty-first century in order to understand the game and get an edge over rivals. As a result, when engineers create technological sports equipment, they must assess the actual aerodynamics of the relevant games and sports.

### 8.3 Technology-based Modern Track and Field Competitions

Track and field differs from the majority of other sports in that it uses just metres and seconds for measurement. A split second can have a significant impact on a course. Due to this, track and field race data tracking

equipment needs to be as dependable, accurate, and practical as possible. Another innovation used to enhance track event starts is an electronic starting pistol. Additionally, once the runner starts, radio frequency identification (RFID) chips will be used to track their advancement. Due to their high value, these chips have generally gained popularity. To track a runner's pace, distance, and running pattern, RFID chips may be taped to their trainers.

## IX. CONCLUSION

Numerous solutions to improve and boost athletic performance have been produced as a result of recent advancements in sports technology. In actuality, technology has a significant impact on modern motorsport, becoming an integral component of some sports and enhancing performance in others. Technology enables both the instrument and the athlete to assure peak performance and lower the risk of harm. Therefore, the demand for sports should rise as performance value rises. The coaches and physical educators in current coaching should be familiar with contemporary sports technologies.

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