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Modern technology and sports performance: An overview

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Abstract

In modern life technology is greatly helped in making life easy and well used. Technological advances have greatly affected sport science and other vast areas of life. As the sport industry's market has expanded alongside popularity, technological study demand has increased. This scholarly qualitative research primarily aimed to investigate the effect of new technologies on sport performance. The discussion of different technological devices also focuses on the role of certain games and sports. In this systematic qualitative study a thorough on-line and offline search procedure has been applied for the acquisition of evidence. Present researcher finds a number of technological devices now being implemented in the field of games and sports. Researcher agreed that these technological devices increase the performance score and make the game easier. In order to develop performance, correct decision should be needed to choose the correct technology as in the present world handling and managing player is a difficult task. Lastly, Researcher also believed that a wide range of systematic reviews could more accurately highlight the technological devices on sport performance.

Keywords: Technology, Games, Sports, Performance, Devices

1. Introduction

Today's sport world is becoming technologically advanced by combining natural athletic talent with advanced analytics and artificial intelligent to produce the best possible sporting outcomes ^[1]. In so many ways modern technology simplifies life and everyone defines technology in their own way. Throughout today's environment, where just about anything is more comfortable and available because of technical advancements in nearly every area of lifestyle. Everything in the world has both positive and negative impacts on both the living and society ^[2]. In the 21st century, more people participate in sports than ever before. The previous U.N Secretary-General Kofi Annan said sport has become essentially a common language, putting citizens together irrespective of their roots, history, religious values or economic status ^[3]. Actually, sports make friendship each other and bonding each other not only for one country but also for whole world. Due to the demands of sports performance from spectator the technological devices now take significant role. The difference between winning and losing games is often found in many sports and games, and in step-by-step team moves. As the sports industry's audience has grown alongside popularity, demand for research has increased. This is now above sports and gaming and now a billion dollar business ^[4]. Researchers Roy et al. (2017) argued that in many aspects new technology simplifies existence and each describes technology in their own way. In today's world, just about everything is more convenient and accessible because of technological advances across almost every aspect of lifestyle ^[2]. Most people's lives have been enhanced and simplified by the latest technological developments. Although the real nature of sport resides in the skill of talented athletes, their performance can be dramatically improved by incorporating advanced technologies, guaranteeing competitive play and successful outcomes ^[5]. Therefore, technology has the enormous capacity to improve performance and reduce the sports injury. In addition, it's unbelievable how technology has impacted sport. Using wearable technology, big data analytics, social media, and sensor technology has revolutionized the way sports are played, analyzed, and enhanced in today's connected world. Pro athletes can gain more insight into their performance, improve training methods and raise their skills through various modern advances and apps ^[6].

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2. Aim of the study

The specific aim of this scholarly qualitative study was to explore the impact of modern technology on sports performance.

3. Methodology

A thorough on-line and offline search procedure was applied for the acquisition of evidence in this systematic qualitative study. A critical analysis of the literature was systematically searched through online databases: PubMed, Google Scholar, and Google Advance Search.

4. Drone technology utilized in sports

The unmanned drone technology with an embedded camera helps to take high-quality images and videos from height. A Drone is simply, in simple terms, a flying robot. This aircraft is usually controlled from a specialized remote control, and with the help of intelligent software can track all things in the air [7]. Many athletes (runners, basketball players, skiers, climbers, etc.) are using drones to monitor their preparation to see whether any changes can be created. A slight improvement in personal best time for the competitor will take off seconds or break a second [8]. Nowadays a sports event has been more genuine and practical to air. The main advantage of using drones or unmanned aircraft in important international sports is their being able to get closer to international athletes [9]. Drone will capture and evaluate a clearly seen practice session in various athletic activities after the session is finished.



Fig 1: Drone Technology [10]

4.1. Drone technology in soccer training

A physically healthy soccer player complies with moving in various directions on the field [11]. However, the simplicity of the game and very few simple rules make the game popular [12]. Moreover, agility based work increase the demands of research in sports [13]. This movement nature explores the necessity of Drone technology to take the images and videos. Drones technology now map rivers to forecast flooding reliably, and identify illegal logging areas. Sport imaging is easier now for Drone invention. The main advantage of using Drones is that they can quickly navigate anywhere in the football field, where coaches find it very challenging to do. Football coaches and administrators often have a side-view of every tactical activity which is quite limited and vulnerable to misinterpretation of tactics [10, 11]. Researcher Islam (2020) [15] highlighted the importance of Drone technology in soccer training. He argued that Drone's picture and video may have been studied to determine the offensive and defending team form of the football match. Islam (2020) [15] clearly stated,

“The attackers, when they don't have the ball, immediately transform their role as defenders and vice versa. Defenders need to mark the ball as well as the space as necessary. The defensive strategy could have been strengthened by studying the Drone images and/or videos” (p.3) [15].

5. Technology used in cricket game

Nowadays advancement technologies are used in cricket game. These technologies make the game delightful for spectator. Following technologies are using in cricket [14, 15]:

5.1. Hot spot: This technology lets umpires and commentators see if the bat has struck the ball.



Fig 2: The Hot Spot [18]

5.2. LED lights: In cricket game, LED lights and bails are put in the stumps. When these are displaced the lights begin to flash.

5.3. Spider cam: This technology is seen in many other sports as well. It is a wiring system that allows a camera to move over the play area, both horizontally and vertically.



Fig 3: The Spider Cam [19]

5.4. The super sopper: The super sopper is a machine which helps remove water from the ground the heavy rainfall occurred.

5.5. The hawkeye: The technology may be used to trace the exact path that the cricket ball took after it was hit. This technology very much used by umpires to take LBW decision.

5.6. Ball speed measurement: A camera can be used to measure how quickly a ball travels in cricket bowling.

5.7. Snick-o-Meter: The Snick-o-meter identifies whether a snick occurred. A snick when the cricket ball comes in contact with the bat is a fine noise. That is expressed in the captured audio sound-waves. There is often confusion about whether the ball has made contact with the bat, or a batsman's gear.

6. Scientific NORD board for developing eccentric strength

It has been shown that the Nordic hamstring exercise (NHE) is an effective tool for developing higher maximum eccentric hamstring strength torques compared to regular hamstrings curl [20]. Nordic exercise training on hamstring curl may be a successful method for preserving the H:Q (hamstring to quadriceps) muscle power ratio [21]. The H:Q ratio may be lowering the hamstring muscle injury [20]. A scientific Nord Board technology developed by Vald performance is easy and fast way to precisely measure the eccentric and isometric hamstring muscle strength [21].

7. Wearable GPS technology

Global Positioning System technology has been utilized for some time in competitive sport, including in preparation exercises as well as during play. By using Electronic Performance and Tracking System (EPTS) devices, teams can track the movement of players at the pitch and collect large amounts of data about their performance [22]. In 2006 the first attempts to verify GPS for field sport applications were made. Although GPS has been certified for competitive sports activities, some questions remain regarding the suitability of GPS for tracking fast high-velocity runs. Consequently, GPS has been commonly used in American football, baseball, basketball, rugby union and league and soccer [23]. GPS efficiency in evaluating human locomotion is affected by specific factors as defined for validity in detail above. That is, sample rate, speed, task duration, and task type each in terms of GPS reliability [23]. The GPS is a tracking device that accesses the GPS satellite signal (or similar satellite networks such as GLONASS, GNSS, BDS or NAVIC) to triangulate its own position [24].



Fig 4: Wearable GPS Technology [25]

8. Digital Vernier Caliper

Manual second to fourth digit ratio (2D:4D) at the end of the first trimester of pregnancy is believed to be a biomarker of the balance between prenatal testosterone and prenatal estrogen hormone [19, 20, 21]. This digit ratio may be a biomarker of prenatal testosterone hormone which is helpful for competitive sports [29]. The length of index finger and ring finger is measured by digital vernier caliper [30] to know the

digital finger ratio. Interestingly, in scouting potential athletes, particularly soccer players, the low second to fourth digit ratio (2D:4D) may be an indicator [31].

9. Technology on yoga postures

Heart rate variation (HRV) consists of time interval changes between consecutive pulse intervals termed inter-beat periods [32]. The HRV data were acquired using the NeXus-10 device (Medical Device Directive 93/42/EEC; TMS International BV, the Netherlands). Researcher Anup et al. (2019) found an increase in LF % band and decrease in HF % band immediately after 15 min and 21 min practice of yoga postures. But there was a decrease in LF% band after 27 min yoga postures practice. Another component of HRV was HRV amplitude, which showed a trend towards a decrease in 21 min and 27 min of yoga postures [33].

10. Modern track and field events using technology

Track and field varies from most other disciplines, as it is measured in meters and seconds only. Within track, a fraction of a second can make all the difference. Which is why the equipment which tracks track and field race details has to be as reliable as precise as practicable [34]. An electronic starting pistol is another innovation used to improve track event startups. In addition, when the runner begins, they will follow their progress using Radio-Frequency Identification (RFID) chips. These chips are so valuable that in general they have become popular. RFID chips may be bandaged to sneakers to monitor the pace, distance and pattern of a runner [34].

11. Aerodynamics

While virtually any sport could be used to illustrate this new role of high-tech tennis, fencing, swimming, golf, and cycling – is a good example. In the 21st century, world-class tennis players (and their coaches and trainers) will have a clear knowledge of the laws of aerodynamics in order to fully grasp the sport and achieve an advantage over opponents [35]. Therefore when engineer develop technological devices for sports they have to analyze the actual aerodynamics of the respective games and sports.

12. Integrated technology (IT)

Integrated technology (IT), is includes accelerometers, global positioning systems (GPSs), and heart rate monitoring, has been frequently used in the public health sector. More recently, IT data has been used to assess training and performance demands in sports settings. Integrated technologies will lead to major changes in the areas of field-based competitive sports planning, conditioning and rehabilitation [36].

Technologies like CAD (Computer-aided design) can play an important role in improving sports equipment. Other technologies such as “smart” equipment can be used for performance assessments. Examples of “smart” technology innovations include systems used for workout intensity assessment and aerobic measurement, human response time and activity meter size, and systems with jumping and running characteristics [37]. On the other hand in cricket game hot Spot technology is very accurate and is the perfect tool for analyzing a raider's touches in Kabaddi action. Hot Spot technology, although reportedly extremely accurate, is not used in the Kabaddi sport to date [38]. Previous researchers argued that a mixture of GPS-accelerometer measurement technologies and accompanying video records that provide greater insight into the commitment and categorization of

sustained impact forces and accelerations during the regular and varied Super 15 Rugby Union match-play contact elements [39].

13. Conclusion

Recent developments in sports technology have created a variety of products to enhance and increase athletic performance. In reality, technology plays a major role in modern motor sport, which becoming an essential part of certain sports, and being used in other sports to enhance results. Technology not only allows the athlete but also allows the tool to ensure optimum performance and reduce the risk of injury. Hence, as the performance value increases, the demand for sports should increase. In modern coaching the modern technologies used in the present sports world should be known by the coaches and physical educators.

14. Conflicts of Interest

No conflicts of interest are declared by the author.

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