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Is Technology Effective in Sports Competitions?

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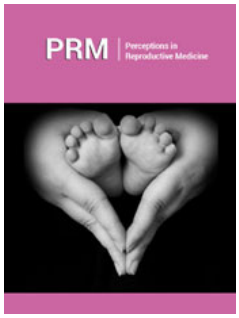

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Abstract

The technology is a term that people in every occupation, every country use frequently. They use on the streets, at school, at home and they have all of the control over many things thanks to the technology and technological developments. As they use technology, life become easier and they can get more energy for other things. Actually, it is seen that machines are over control on human lives. People get everything trusting on the technological developments. It seems like they do not use any human power on activities. Sports and sports people have been come to encounter with technology and technological developments too over the years pass by. The term smart equipment has come to face to be used commonly in sports area. It usually refers to instrument solutions with sensors embedded in equipment itself. Smart technological solutions and devices are allowed in sports. Although smart solutions are not allowed for competitions, technological devices are used to enlarge the success in competitions. Sports and technology have a long history of merging together fruitfully [1,2].

Technology has been very successful in offering sports people better and more nuanced feedback of their athletic performance. Advancements in sensor technology have been providing athletes with information about their abilities, skills and achievements in ways not previously attainable without technology. Not only technology has sustained information to athletes to gain insights of their abilities; but also it helps to boost athletic performance. In this article the technological sights of competitions and sports achievements is going to be discussed as well as technological equipment developments which are used in sports competitions. It is basically argued that technology and technologically developed equipment that are used in competitions help athletes to score better.

Introduction

Technology has served as a tool for sports people in many aspects. Technology as a tool has been used for training purposes by athletes and also by coaches trained to interpret the data to provide enhanced feedback for performance improvement. Technology systems have supported sports activities for many years. However, in recent years, new interactive technologies have emerged that have the potential to radically change the conceptual meaning of physical activity, thereby it changes the face of sports. A relatively large number of smart solutions have been reported in the sports technology literature, yet they were designed mainly for experimental purposes. Commercially available solutions are still limited and the market for smart equipment is still in its infancy. With the support of smart equipment solutions and the technological developments in sports equipment covering a large range of field, it is now possible to achieve higher performances with better results in athletic competitions. In this scope highly utopic results are now simply achieved thanks to technically developed sports equipment [3,4].

In fact, many sports especially in seriously competitive sports events are based on technically developed material use. Nowadays, it is common for many coaches, teams, ad players to train and use developed materials in the purpose of achieving this aim. Nearly every Olympics, people hear about a new broken world record in one sport or another. While much of this can be attributed to better training, coaching, and dietary techniques, the headlines never focus on the impact that technology has on these records. Although people like to believe

that new records are a result of people pushing boundaries, this is not necessarily the case given the numerous examples that sporting records moved in lock-step with technological innovation.

In the scope of this discussion many sports can be shown as an example of this competitive world. For example, introduction of smart skis affects the athletic performances in many fields of skiing. Also, introduction of small sport balls into the field of rugby has been effective in changing the ways of how the athletes play the games. There are many examples of world records that are based not only on athletes' performances but also on the design of the materials that are used in the competitions [5].

This article defines in a critical order how technological equipment is used in terms of its effects on athletic performances. It is a kind of explanation for how and why the technology and technically developed equipment effect the way athletes perform in the competitions. In this respect the article shows the technical developments and technology that are used in tennis rackets, balls, skis, and swimming suits etc. and how they are effective in athletic performances. The discussion of this statement is shown with many articles which are coated and with variable literature search which has been done on this purpose. With this scope on the way of research, the materials that are used in the competitions are identified respectively. Then, the results are implemented on the competitions and it is calculated to what degree they are effective in athletic performances [6].

Method

In order to analyze the statement the sports branches are researched through existent data. Sports materials that are used in the competitions are shown with a chronical order. The materials are technically defined and they are used in competitions as experimental aims also. However, it is clearly seen that athletic performance increases because of the materials used in the competitions. In this respect materials are seen in various shapes and forces in their historical development. It is shown that while they are developed the sports people are more successful throughout the games.

This statement is exemplified through the structure of the materials and their designs. Technology in contact sports has evolved in a very particular form in the past decades and especially over the past few years. A significant amount of technology is becoming portable and wireless, and data is now often being made available in real time for coaches, trainers and sport scientists. A recent example is the case of a partnership between Adidas and the Major League Soccer in the US in which the Adidas Mi Coach system has been approved and is currently being utilized by all MLS teams during practice sessions and during official competitions to track athletes' heart rate, speed, jump height, distance ran, and other data. Thanks to this technology it has been made possible with the use of miniaturized GPS, gyroscopes and accelerometers that have been embedded into a small system that is lodged in athletes' jerseys and in some cases in their cleats [7].

This system has also been utilized by Rugby teams in Europe, North America and Oceania. Tracking systems like MiCoach and Under Armour39 also assist an athletes' health maintenance through a number of analyses that can be made in regards to fatigue, overtraining and other important health related information with this information then being compared to their unique physical and medical conditions. With the goal to monitor contact sports athletes' health, another piece of technology has entered our courts, fields and rinks-these technologies have made it possible to track the intensity of head impacts experienced by athletes. This new device from Reebok, called Check light, is a very small and flexible system that fits to the athlete's head-the device is lodged in a beanie; it is also a standalone system that doesn't need additional software or to be paired with another device, instead, it uses an LED indicator that displays a yellow signal in the event of a moderate impact to the head, or a red signal in the event of a more intense impact. The Reebok Checklight is a game changing device developed by MC10, which is a company that specializes in developing stretchable, flexible, thin, and small sensors that are designed to be wearable and virtually unnoticeable by the user.

MC10 is currently developing multiple devices in this new area, including a system that will provide data on athletes' perspiration rate in real time. Within the same field Gatorade has developed and been working on analysis of sweat composition for each athlete in a team and implementing a personalized formula for rehydration for each team member according to the athletes' loss of fluids, electrolytes and minerals. This product can be seen in different sport teams and is going to be implemented during the 2014 FIFA World CUP. Another technological advance is the Hawk-Eye, from Hawk Eye Innovations. It is a precise ball speed and trajectory tracker that uses cameras and advanced software-The International Tennis Federation already approved the software for tournament play in 2005. It was launched in 2012 as a soccer simulator training system that tracks the ball's trajectory, spin and speed [8].

Some sport organizations have made use of geo analytics to try to have a better understanding of team strategies by analyzing athletes' and team's geographical positioning and movement on the field/court, by using systems like Arc Gis, which provides data including team and individual movement and positioning trends. More technology has been made available for on and off the field performance enhancement, and for athletes' health maintenance; some professional teams have followed this phenomenon and have increased investments in sport sciences. While some teams have done so in a more public way, like AC Milan from Italy, with the Milan Lab, and Real Madrid FC from Spain, with the Real Madrid TEC-Sanitas center; other teams have made investments in a more discrete and even secret fashion (How Technology Is Changing Contact Sports).

The governing performance in skiing is speed. The real time performance analysis system provides two types of biofeedback for sideways movement and speed. The amount of lateral displacement of the tail of the ski is converted into an audible signal, a beep, sent

to the athlete by earphones. Thus, athletes can hear the amount of displacement they produce and can specifically train avoidance of slipping sideways. The forward speed is converted to a frequency coded tone, changing its pitch proportionally with increasing or decreasing speed. This allows athletes to determine precisely what movement patterns cause an increase or decrease in speed [9].

Switzerland's Mélanie Meillard proved to be one of the stars of the Lillehammer 2016 Alpine skiing events, winning gold in the giant slalom and, silver in the combined, and finishing fourth in the super-G. She has since begun to enjoy similar success at senior level, stepping onto the podium three times in the FIS European Cup, including two slalom victories in Bad Wiessee; and she has also become a regular on the World Cup circuit, with several top-10 finishes to her name already (LILLEHAMMER 2016: WHERE STARS WERE BORN). Smart oval balls are confined to the international team sport of rugby football and the national football games of American and Australian football. It is mainly national interest which drives the instrumentation of these balls. Nowak embedded a triaxial accelerometer into an American football to measure spin and wobble along a football's trajectory. They used two electronic units, each consisting of two MEMS accelerometers in each of the ball.

Fuss and Smith (2011) developed a smart Australian Rules football, instrumented with a data logger, a lithium polymer battery and three high speed and MEMS gyros. The smart ball is fully inflatable and records the angular velocities about the three main axes of the ball, used for calculating and visualizing the resultant angular speed, the time dependent position of the spin axis, the precession axis of the moving spin axis and the angular speed of the spin axis about the precession axis. The position and movement of the spin axes allow the assessment of the precision of executing drop and torpedo punts, which is the most important skill in Australian Rules football. The more precise a torpedo punt is kicked, the closer is the spin axis to the end of the ball, the smaller is the precession and the aerodynamic drag, and the longer the distance is covered by the ball.

Rugby featured in its third Games at the 1920 Antwerp Olympics. Only two countries competed: USA (made up of Stanford University players) and France. The Americans caused a shock by defeating France 8-0 to claim the gold medal. There have been just six countries that have entered rugby teams for the Olympics: France, Germany, Great Britain, Australia, USA and Romania: USA claiming two gold medals, France and Australia winning one each. It seems like where the technology is used and developed the chance of game winning for the teams are more. Before the 80s tennis racquets were made of wood with relatively small elliptical hoops. These were quite flexible and have small sweet spots. Subsequently, racquets underwent considerable changes in material: metals such as steel and aluminum; fibre composites, such as fiberglass and carbon fibres, modern titanium and hyper carbon racquets. The two historical examples can be given on how much the tennis world has changes over the years. Between 1919 and 1926, Suzanne Lenglen lost only one match. In the ten sets it took her to win the 1920 Olympic title, she lost only four games. Lenglen teamed with Max Decugis to win another gold medal in mixed doubles and with Elisabeth d'Ayen to win a bronze in women's doubles. The Olympic Games occupy a special place in the heart of Roger Federer, who is the most successful men's tennis player of all time, with 18 Grand Slam victories to go with an Olympic men's doubles title won with Stan Wawrinka at Beijing 2008, and a Davis Cup title from 2014. Having missed out on Rio 2016 due to injury, he still has hopes of adding another Olympic title to his honors roll in 2020.

This has been especially evident in swimming, where technological innovation reached a point where it threatened the integrity of the competition. As there is little technology used within swimming, much of the advancement and innovation has mainly focused on textiles. Since athletes are required to be covered, most of the focus has been on reducing the drag caused by swimsuits because there is little else to alter other than removing body hair. Since the start of the Olympics in 1896, the primary focus of swimsuits was modesty rather than performance. Suits covered the majority of the body and were made of wool, which made swimming difficult as they tended to absorb water and get increasingly heavier as the race went on. While materials like silk were lighter and less absorbent, their exorbitant cost prevented them from being available to most competitors.

The development of materials like nylon in the 50s and Lycra in the 80s set the pace of innovative swimwear. These textiles enabled swimsuits to be form-fitting and less water absorbent made with synthetic fibers spun out of polymers. This means they are one long solid strand, rather than multiple porous cotton strands woven together. Further change came when designers better understood hydrodynamic forces; rather than minimizing the size and spread of the suit, it was understood that advantages could be gained from manipulating the body's contact with water. Previous designers worked under the assumption that textile technology could not reduce the drag between human skin and water. The best means of increasing speed was to minimize suit size as to maximize direct skin to water contact.

Fast skin changed all that. Fast skin is a biomimetic material that is based on the design of shark skin; Fast skin mimics the dermal denticles found on shark skin that reduces drag more effectively than the smooth surface of human skin.

The development of Fast skin inspired further modification to the concept of full-body suits; Speedo developed a new type of body suit (aptly called the LZR) in collaboration with NASA that was specifically engineered to reduce drag and increase performance through the use of computational fluid dynamics. These fluid dynamic studies led to the creation of a new ultrasonic bonding technique, as it was identified that stitching increased drag by up to 6 percent. Furthermore, the suit offered compression in specific areas such as the abdomen, which reduced the need for athletes to expend energy on maintaining proper form; this compression also had the effect of trapping air in the suit, which increased

the buoyancy of the swimmer. When introduced into Olympic swimming in the 2008 Beijing Olympics, the LZR had a tremendous impact on the competition results. Nearly 94% of races won and 98% of records broken were done by competitors wearing the suit. With the buoyancy and drag advantages apparently, competition got to the point where individuals were wearing two suits to maximize their competitive advantage. This led to significant claims of LZR being a form of 'technological doping', as it decreased natural ability as the primary influence on performance. In the graph below, a significant drop is identified the year the suit was certified for competition.

As a consequence of the rapid number of records that were broken, the International Swimming Federation (FINA) set rules that banned full-body suits and stipulated that all suits be made with 'woven' textiles; with little specification on what 'textiles' meant. Given this ruling, the shift in innovation has changed towards swim caps and goggles, but given that these do not cover the body in full, it's difficult to say what impact they will have on overall performance. Michael Phelps would appreciate having crack proof goggles after his were stepped on before a race. With the progress of technology being an inevitable influence on Olympic sports, it's critical to prevent technology from edging out human effort as the key focus of the games in order to maintain the integrity of the competition. However, this kind of bans can't avoid the fact that technology is as much a part of an athlete's part as nutrition, training and coaching. Another type of technological development in sports area is soccer. There are three main parts in the construction of a soccer ball. They are: the surface cover or casing the stitching or thermal bonding and the interior parts. The exterior surface is made of synthetic leather or non-water absorbing leather. However, the exterior surface of FIFA approved Adidas soccer balls have been made from polyurethane materials since 2002. The exterior surface consists of a series of panels, numbers of which vary significantly according to their design. The lining between the outer surface panels and the bladder is extremely important, as they provide structural strength and bounce.

Elite level soccer balls have at least four layers of linings and materials of those linings are generally of polyester and cotton. The bladder that holds the air is generally made of latex. The butyl bladder provides a better combined contact quality and air retention. Before 2006, most soccer balls consisted of 32 panels, of which, 20 panels were hexagonal and 12 were pentagonal. The assembled shape form and icosahedron, whose 12 rough edges, resemble pentagons. Under appropriate pressure, the external shape resembles a close replica of a sphere. The new generation balls without spin can have more erratic deviation in flight than the older ball. So, the soccer games would be easier to play thanks to knuckling ability of these balls.

Result

All in all, Olympic sports such as tennis, soccer, skiing, rugby and swimming have experienced the advance of technologies from past to nowadays. Like this, many sports technologies allow the enormous majority of amateurs outside the small elite groups of professional athletes to have more fun. Even though there are some obstacles, the future of sport and technology is bright-there is potential to see a great deal of improvement in team performance enhancement and health maintenance coming from sport and performance technologies, especially with programs that make the adequate use of, and correct adaptation of the technology that is currently available. Athletic performances in sports changes through years have experienced remarkable changes. These changes happened thanks to the basic solutions in the sports materials design and structure. Thus, these changes made it possible for the athletic world and sports people to break world-wide records in short time, using less energy. The thing which is obvious is that when these technological changes continue the sports arena would face better performances, and unbelievable records. The fact which makes it clear is that materials technology proves how the sports people perform well.

To conclude, The Olympics are the pinnacle of many athletes' careers, where all their hard work and honored abilities are shown in front of an expectant and spectacular public. While it's understandable that athletes would want to enter the Olympic arena in equipment that gives them the best chance of victory, it's important that it is the athlete's actual abilities that separate winners from losers. However, if that is the case people should question that is the material make it possible that the athletes break the records or the performance of the athletes are enough to break the records alone. Of course this is a controversial issue when it comes to discussion. Sport should be a test of 'pure' ability, not the isolated and 'technologized' one therefore external factor which might affect performance threatens to mislead about who is the best.

The problem with this is again, the difficulty of conceptualizing and isolating the essence that is supposed to be personal ability. No one suggests that if hard training, effective diet, expert coaching or physician advice contribute to one's success, then that success is not a real measure of one's ability and should be breaking the record. Therefore, it isn't clear why a performance-enhancing technological aid should be thought to provide a problematic result. Thus, it is the technology that does the work, not that the athletes pure abilities that break the records.

Discussion

It is clearly seen that technological equipment used in sports arena changes lots of results when they are closely identified. They sustain a lot of possible records to be broken, to win the competitions easily and make it possible to achieve spectacular performances. A lot of things can be thought on the issue of technological developments in sports. When it is clear that technological means and materials are totally help athletes, it is also questionable in some ethical senses. Therefore, it is questioned whether the athletes or the technology break records. Thus, it isn't clear why a performance-enhancing technological aid should be thought to provide a problematic result.

Thanks to the advances in technological equipment competitions experience unforgettable moments, unbelievable records and so on. However, coaches, teams and athletes may be under suspect that they are not spending much energy in training. Whether it is true for a competition filled with possible technologically developed materials to see easy and achievable results or not must be questioned globally. Sports and athletic performance is enhanced with the materials, and sports people are now ready to accept the best results without much effort. Thus, in the past the possibility of breaking 'crazy records' world-wide was rather utopic. However, breaking a new world record now is being an explainable, clear and easy issue. Why the athletes are not much responsible about their performances at the competitions should be questionable. As sports is a combination of material design and athletes' ability sports must evaluate and test the athletic ability without an extension or any help. Now it is clear that sports is not only testing athletic performance and ability but it also tests technological materials and design within the sports equipment.

To what degree that is acceptable in the sports arena should be another research issue. As the sports people are not only showing their abilities in front of the sports spectators but also, they show how their tennis racquets maneuvers, or how the soccer ball knuckles. As the athletes are showing their best at the competitions on the other side the help of technology cannot be denied. Then, it is concluded that effects of technology on the sports competitions are clearly seen. Technology affects the athletes and possible materials that are designed for sports like swimming suits, balls, etc. raise the chance of breaking unbelievable records.

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