THE IMPACT OF MODERN INFORMATIONAL TECHNOLOGY ON THE DEVELOPMENT OF TIME MEASURING AT THE OLYMPIC AND PARALYMPIC GAMES

Abstract:
Timing in the Olympic Games is one of the most important aspects of professional sports’ competitions which have evolved over time. Simple days of the Olympic Games with stopwatch as only technological device are long gone. Nowadays, there is the wide range of hi-tech time measuring devices, as well as hi-speed digital camera, electronic touchpad, new starting blocks, infrared beams and radio transmitters. This advanced IT equipment has replaced the human factor, thereby reducing the margin of error in time measurement to a minimum, which has enhanced the ranking of competitors in each race and match at the Olympic and Paralympic Games. The development of new timing technology makes it easier for spectators to follow the competition, improves their viewing experience, and helps coaches analyse the performances of their athletes.

Keywords:
Time measuring, Olympics, Paralympics, Electronic measurement, Technology.

INTRODUCTION

It has long been known that education and training with the aim of achieving top results in sports, as well as other highly stressful occupations [1], depend on a large number of factors, such as the anthropological characteristics of individuals [2], [3], training plan and program [3], [4], the selection of optimal training equipment [5], as well as the level of tactical-technical training [6]. The same applies to water sports, such as swimming [7]. What is less known is that, since the beginning of the modern Olympic Games, timing has been of great importance for the final ranking of competitors and tracking records? Until the 1932 Olympic Games, hand-held Omega stopwatches were used, which were not so precise in the cases of a photo finish, and the trend was towards electronic measurement, which measures time more accurately and clearly determines the order of the competitors. Since 1948, measurement technology has continuously progressed, thanks to the well-known OMEGA, SEIKO and LONGINES timers, so today, with the help of the cutting-edge OMEGA measuring devices, measurements of 1/1000th can be achieved, and the photo-finish of the race is segmentally recorded [8].
The overall digital revolution, largely connected with the Covid 19 pandemic [9], drew our attention to the fact that this important topic has not been sufficiently addressed in the scientific literature so far. In this paper, we investigate to what extent the measuring technology in swimming has evolved over time and which measuring devices have marked different Olympic and Paralympic periods. Also, in this historical review informational technology, its development and usage has a crucial impact. This approach is in line with the necessity of the interdisciplinary of scientific research [9], which the authors of these lines advocate.

The aim of this paper is to compile a historical overview of the application and development of technology in the service of recording results and sports competitions through archival research of historical and academic sources.

2. METHOD

The descriptive, archival as well as bibliographic methods were used in this paper. For the purpose of reviewing the relevant literature, electronic databases PubMed, Google and Google Scholar were searched. The key words and phrases for searching for the appropriate literature were timing technology, Olympic Games, Omega, Paralympic history, Olympics time measuring, and electronic timing.

The researches of key words in title and also in abstracts were performed. Initially, 26 044 results (Figure 1) were found, ranging from the year 1948 until the present day. After filtering out duplicates and irrelevant results, while focusing on the studies that deals with the technology of time measurement, 10 results were singled out as the most relevant. The vast majority of the results were found to deal with the issue of training technology, which confirmed our assumptions from the opening chapter. This paper have the exploratory nature first of all, having that in mind, we will present additional details from the relevant papers with aim of making synthetic conclusions.

3. RESULTS AND DISCUSSION

First 5 Olympics Games in modern era, until 1912, referees for each sport used stopwatches which are their property, resulting in timing problems as technical error [10]. Etienne Jules Murray used a new technology of chronophotography at 1900 Olympic Games in Paris, while in 1912 Swedish engineer Ragnar Carlstedt introduced an electronic automatic timing system [11]. At that time, there was a clear need to improve the use of technology in sport and no potential negative impact could be foreseen.

The first official timekeeper at the Olympic Games was Heuer (now Tag Hauer), whose chronograph Micrograph Pocket Chronometer became the official watch of the Olympic Games in 1920, 1924 and 1928, which measured hundredths of a second [10]. As the Games themselves become an economic and political event, the struggle of technological corporations for dominance in this area begins, which see the Olympic Games as a good training ground for promotion and the conquest of market superiority.
The Los Angeles Games in 1932 were awarded for the first time to another Swiss giant, Omega, and timing was measured by six judges with Omega pocket watches (accurate to a tenth of a second), and a Chronocinema camera (records the finish line and 1/100th of a second), thanks to which the winner in the 100m race by 0.2 seconds was declared [12].

Another turning point in the history of timing at the Olympic Games was a in the year of 1948. The birth of electronic timing with two different technologies that came to be used: the so-called “Magic Eye” photoelectric cells and the photo-finish camera (which measured 1/100 of a second and the exact order in which the athletes reached the finish line) [12]. In this way, Omega will be unshakable in the field of time measurement at the Olympic Games for a long time, but other companies will not give up the fight easily and will try to establish themselves as a leader in the field of time measurement technology in different ways.

The Paralympic Games first began in 1948, when 13 patients of doctor Ludwig Guttmann conducted their rehabilitation through sports, and participated in a shooting competition called the World Wheelchair and Amputation competition, held of the same date as the ceremony of opening of the London Olympics [13]. From the point of view of political and economic influence, they will remain in the shade of the Olympic Games from their establishment until today, and the war of companies for dominance in this event will either be only an echo of the main battle at the Olympic Games or will remain in the realm of a narrower market specialized in aids categories from which competitors come from.

In 1952, at the Helsinki Olympics, Omega patented an electronic and quartz chronograph that could generate an instant printout of results, which were accurate to 1 hundredth of the second. It was also the first portable device powered with the battery, awarded by the IOK “Cross of Merit.” This heralded the era of quartz and electronics [14]. At the Melbourne Olympics in 1956, Omega Swimm Eight-O-Matic, the world’s first semi automatic swim timer, was used to feature eight electro-mechanical counters in each of the eight bands. The work of all these counters was initiated by a pistol, while the counters were stopped by the timers using a manual electric timer [15]. This period was also marked by the dominance of the Swiss company, which at the time seemed impossible to be challenged or called into question.

The first televised Olympics were 1960 games in the capital of Italy. During these Olympics, the IOC agreed to hold the Paralympics in the same city as the Olympics [15]. This was another key event where the development of information technology had an incredible impact. Through televised games, the games become even more important global events and a training ground for corporate and political struggle, for which they throw the sports struggle and the Olympic spirit into the background.

In Tokyo, for the 1st time in 1964, the competitors’ result was shown live on tv. Seiko was designated as the official time keeper at Olympics for 1st time and it automated the timing system by connecting the starting gun which had quartz watch for timing and a cam for recording the finish time. Japan took advantage of hosting the games and for a Japanese technology company to take primacy in this field and challenge the dominance of the Europeans.

In Mexico City, 1968, Omega introduced electronic panels (touchpads) on the wall of the pool and placed the speakers in the back of each starting block so all competitors can hear the signal in same moment [16]. In Munich, 1972, the reaction time (Longines timing) was taken into account for the first time when measuring the time of athletes. At the Olympic Games in Montreal, in 1976, electronic displays were used for the first time to display measurements in real time [15, 16]. At the Los Angeles Olympics in 1984, Omega came up with devices to detect false starts from the starting blocks as soon as athlete’s feet would move from the block prematurely [16]. In the 1988 Seoul Games, in addition to providing mere timing, Omega began to store vital information and generate interesting statistics for TV broadcasting [16, 17]. Through technological innovation, Omega is regaining its dominance in the field of timekeeping, but the development of technology also enables the increased influence of technology companies on games.

During the Winter Olympics in Albertville, 1992, the electronic photo-finish was fully integrated with the timing system for the first time [15, 17]. During the 1992 Albertville Winter Games, Omega launched Scan’O’ Vision i.e. new technical system, which measured time down to 1/1000 of the second. He has become one of the best photo-finishing cams [15, 16]. Albertville (France) became host the Winter Olympic Games as well as Paralympic Games in the same year (1992) for the first time in history [15, 16]. This way, training ground for technological and economic struggle is expanding, although until today it will remain in the shadow of summer games, the importance of winter and Paralympics is gaining importance.
In Atlanta, 1996, radio waves were used for the first time in cycling and marathon races [16]. In this way, information technologies begin to directly affect sports results and performances.

In 2000, an contract was signed in Sydney between the International Olympic Committee and the International Paralympic Committee that a city bidding for the Olympic Games had to be host of the Paralympic Games along with the regular Olympics [15]. The importance of the Paralympics as the global sport happening was made official by this event, and the technological struggle for supremacy in this field is becoming more and more intense.

At the 2002 Winter Olympics in Salt Lake City, Utah, infrared rays replaced photoelectric cells in luge, and radio waves were used in cross-country skiing [17]. At Beijing Olympic Games, Omega deployed four hundred and twenty tons of time measuring devices to track the performance of 10,492 athletes in 302 events [15, 17]. For marathon and rowing competitions, Omega used the equipment with The Global Positioning System tracker (wireless radio signal transmitters) that gave the spectators real-time visuals of the conditions on the track [10]. The trend of learning technological development is becoming dizzying and the potential bad effects of the implementation of technology in sports competitions are beginning to be seen. The spirit of games is quite shaken by the corporate and political struggle that takes place around them, and new technologies threaten to establish a sedentary lifestyle. In this way, the games begin to send a paradoxical message about the importance of movement and a healthy lifestyle, but also an advertisement of technology and its influence in the daily life of consumers and companions of sporting events.

The Beijing Olympic Games also witnessed an extraordinary final in the 100m butterfly final between the US swimmer Michael Phelps and his Serbian competitor, Milorad Čavić, where Phelps beat Milorad by 0.01 seconds thanks to an amazing last double stroke and the better pressure on the electronic board in the pool [14]. This historical injustice, in which the suspicion is that the competitor’s better contract with the technology company that measures the time and tracks the results, has raised the question before the global public, can technology decide the winner in close races and has its influence in this area become too great? Since this event, the professional games represent a dizzying series of introduction of information technologies both in the competition itself and in the training process. Although it contributes to the improvement of results, the influence of technology increasingly leaves room for critical review.

Since the 2010 Vancouver Winter Games, Omega has decided to introduce a New Electronic Starter Gun consisting of a flash and sound generating box [15]. At the 2010 Vancouver Winter Games, “Paralympic” was included in the official name of the host committee, establishing a joint marketing agreement with the Paralympic Committee of the host country and putting both the Olympic and Paralympic flags side by side [15, 17].
This year we saw another revolutionary invention introduced by Omega – the quantum timer. This instrument can capture an astounding millionth of a second, making it five times more accurate than its predecessors and thus marking a new generation of equipment in sports timing [13]. In these games, Omega also introduced new starting blocks for runners that allowed them to measure the reaction time of each runner simultaneously [15, 17]. In 2012, sensors were placed in taekwondo vests that were activated by magnetic socks to record successful hits. The signals were transmitted wirelessly. For the first time, athletes were able to request a video replay during a competition, whenever in doubt [13]. An interesting example concerns athletes with disabilities who wear prostheses. He underwent numerous investigations before eventually being cleared to compete. In Rio, 2016, the latest version of Scan’O’Vision was used, capturing up to ten thousand pictures in each second, which made it easier to determine the winner in equal races up until the finish line [14]. For the upcoming Tokyo 2020 Games, 530 timers were used to operate 400 tons of equipment with 200 kilometers of wire for displaying the results in more than 400 scoreboards on arenas and in streets [14]. Additionally, a piece of equipment cannot be used in the Olympics until it has been tested in several other lower-stakes competitions to ensure that it functions perfectly [15, 17].

It should be said that technological supremacy is actually quite an advantage for competitors and coaches, which puts athletes from less technologically developed and influential countries in a subordinate position [18]. This position has only been somewhat shaken by the falling price of information technology and the trend of its democratization through very precise and cheap mobile platforms [19]. Internet, cloud as well as fog data storage, smart technological devices, and biofeedback information’s in the real time among others, there are only technologies that change the world of sports forever and indicate the possibility that the main sports battle for the result will be transferred from sports arenas to technological development centers [20], which changes the focus of the spirit of the game itself. The question is how much technological combat will be able to inspire nations to peace and tolerance as hand-to-hand physical combat could. Proponents of the wider application of technology in sports primarily focus on the improvement of sports results [21] but critical review is often absent. However, the need for greater influence of regulatory bodies in this area was clearly observed in order to eliminate potential threats [22].

And this paper represents a contribution to the polemical discussion on this topic. Artificial intelligence brings a new dizzying turn in this matter [23], which until a few years ago could not even be guessed among sports experts. It brings unimagined possibilities both in the scope of sports achievements as well as in the scope of the management in sport [24]. However, ethical dilemmas and their consideration, at least through theoretical works, currently represent a voice of caution and precaution, which unfortunately is not loud enough, but we hope that it will become louder and more influential.

Since the beginning of the modern Olympic and then Paralympic movement, a lot has changed. From the first swimming champion Alfréd Hajós to modern swimming stars (Figure 2). From Athens to the eagerly awaited Tokyo and Paris, 29 Summer Games, 24 Winter Games in 54 cities as well as 15 Summer Paralympics held in 13 different places and 11 Winter Paralympics held in 10 different places, technology has been an indispensable part of sports competition and its dizzying development today overshadows even the achievements of sports champions.

4. CONCLUSION

Omega has only scratched the surface of its potential concerning the data it collects, especially the ability to use artificial intelligence to create real-time insights (although the data isn’t necessarily used to judge). “We have artificial intelligence that also helps us understand the performance of athletes and ultimately gain or lose a time that was decisive for them to win or lose their race,” Zobrist said. “This is definitely an evolution that we will see in the next few years, so that we can explain to the audience and the fans how great these performances and athletes really are.”

Although the spirit of the times changes in the service of technology development, there remains great hope that the spirit of the Olympic movement, as well as all the positive values it promoted, will not be changed in the coming days, but will form the backbone not only of sports but also of future society.

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6. REFERENCES


